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DE LOS FINES Y PROPÓSITOS DE EDUWEB, REVISTA DE TECNOLOGÍA DE INFORMACIÓN Y COMUNICACIÓN EN EDUCACIÓN

Eduweb, la revista de Tecnología de Información y Comunicación en Educación, es una publicación de carácter nacional e internacional de divulgación del conocimiento, del uso, aplicación y experiencias de las Tecnologías de la Información y Comunicación (TIC) en ambientes educativos. Con la revista se pretende divulgar las innovaciones que en materia de TIC están siendo implementadas y ensayadas en los diferentes niveles y modalidades del sistema educativo venezolano e iberoamericano. De igual manera contribuir a proyectar las experiencias de estudiantes de pre y postgrado, docentes, investigadores y especialistas en TIC en educación en la Universidad de Carabobo y en otras universidades de Venezuela y de otros países de Iberoamérica. Es una revista arbitrada e indexada adscrita al programa de la especialización en Tecnología de la Computación en Educación, de la Facultad de Ciencias de la Educación de la Universidad de Carabobo, registrada bajo el ISSN 1856-7576. Editada en formato impreso y digital.

Visión

Ser un espacio académico-científico de difusión y divulgación de las distintas tendencias del pensamiento universal ubicadas en el área de TIC en ambientes educativos, con altos niveles de calidad académica.

Misión

Promover y facilitar la difusión y divulgación de los productos de las investigaciones y experiencias de los docentes e investigadores de la Universidad de Carabobo y otras universidades del país y del mundo en el área de TIC en ambientes educativos; motivar la participación en redes comunes de información y publicación nacional e internacional; coordinar esfuerzos y velar por la calidad de las publicaciones a fin de procurar elevar el nivel académico del personal docente y de investigación mediante el desarrollo de trabajos de investigación como función esencial en su crecimiento académico.

Objetivos

Servir como órgano de divulgación de las TIC y su influencia en ambientes educativos. Estimular la producción intelectual no solo en los docentes e investigadores de la Universidad de Carabobo, sino también en otros centros de educación e investigación nacional e internacional.

Propiciar el intercambio cultural, académico, científico y tecnológico con otros centros de educación superior en Venezuela y el mundo.

Contenido

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Editorial

La Revista Eduweb a través de su Volumen 19 Nº 1 abre un año de cambios regidos por el avance de la tecnología, en especial por el abanico de herramientas ofrecidas por la inteligencia artificial. Al respecto, celebramos el homenaje que ha hecho la UNESCO al dedicar el día internacional de la educación 2025 a la inteligencia artificial y es que ha hecho una petición a los Estados miembros para que inviertan en la formación de profesores y estudiantes en cuanto al buen uso de la tecnología y su impacto en la educación. Esta petición tiene un nivel estratégico de importancia además del impacto en el proceso educativo, podemos entender que el desarrollo tecnológico tiene que estar entrelazado con el desarrollo humano, así que, ratificamos nuestro compromiso de seguir difundiendo el conocimiento y ser puente entre la innovación tecnológica para apuntar a la transformación educativa. En este sentido, comentamos lo expresado en la introducción de la Guía para el uso de IA generativa en educación e investigación de la UNESCO año 2023. "Un conjunto temático de orientaciones sobre IAGen para la educación no debe entenderse como una afirmación de que sea la solución a los desafíos fundamentales de la educación. A pesar de la hipérbole mediática, es poco probable que la IAGen por sí sola resuelva cualquiera de los problemas que enfrentan los sistemas educativos de todo el mundo. Para responder a los problemas educativos de larga data, es clave mantener la idea de que la capacidad humana y la acción colectiva, y no la tecnología, son los factores determinantes para encontrar soluciones eficaces a los desafíos fundamentales enfrentados por las sociedades". La referida guía, además de presentar un prefacio, agradecimientos, acrónimos y abreviaturas y una impecable introducción se centra en una sistemática explicación de estructuras encabezadas por seis títulos y en cada una de ellas expresa con especial maestría las implicancias para la educación y la investigación. Podemos comprender acerca del concepto de IAGen y sus funciones; sobre las controversias en torno a la IAGen, también hay una declaración importante sobre la regulación del uso de la IAGen en la educación en donde nos explica el enfoque centrado en el ser humano y salvaguarda que la IA esté al servicio de desarrollar las capacidades humanas. La guía presenta un referente hacia un marco de políticas para el uso de la IAgen en la educación y la investigación; agrega incluso la relevancia del uso creativo de la referida IAgen y apuesta sobre el futuro de esta en relación con la educación y la investigación.

En este contexto de transformación educativa impulsada por la inteligencia artificial, presentamos a continuación una selección de artículos de investigación que abordan esta temática desde diversas perspectivas. Por favor, lean, compartan y citen los artículos cuya identificación temática y hallazgos coincidan con sus intereses investigativos. Sumérjanse en la lectura placentera y encontrarán palabras que despiertan ideas.

Inicia este número con el trabajo titulado "Competencia comunicativa en lenguas extranjeras en la era digital: Una metodología para estudiantes de diversas especialidades", sus autores destacan la importancia del aprendizaje contextual y el uso de tecnologías de la información digitales para mejorar la competencia lingüística de los estudiantes. Un segundo trabajo nos remite a la "Sinergia necesaria en las tecnologías educativas: diseño y aprendizaje" En este artículo se aborda la forma de mejorar el diseño de un laboratorio virtual a partir de los resultados obtenidos en la investigación llevada a cabo durante diez años. En tercer lugar, leeremos "Implementar una educación superior inclusiva mediante el uso de tecnologías digitales" este trabajo muestra los principales enfoques metodológicos que aseguran la implementación efectiva de las herramientas digitales en el proceso educativo de la educación superior. El cuarto lugar nos conduce por el "Conocimiento de la inteligencia artificial en futuros docentes de secundaria" cuyos autores investigaron sobre el conocimiento y uso de la tecnología e inteligencia artificial (IA) por parte de los futuros docentes de enseñanza secundaria. Por su parte, un quinto artículo lo representa el "Análisis del conocimiento de las Tic, Tac, Tep y Tric en el profesorado

Universitario" este estudio pretende comprobar el conocimiento que tienen 489 profesores sobre los conceptos de TIC, TAC, TEP y TRIC. En un sexto trabajo encontraremos "El trabajo educativo de los estudiantes en las instituciones de educación superior: una vertiente innovadora", el propósito del artículo fue revelar el componente innovador en el sistema educativo de las instituciones educativas. "Optimización del proceso educativo mediante el uso de la inteligencia artificial en el trabajo de los profesores" este artículo representa una séptima investigación centrada en estudiar las capacidades funcionales de la IA para optimizar el trabajo de los profesores de instituciones de enseñanza superior. Un octavo artículo "Generaciones de derechos humanos y su implementación en los sistemas jurídicos modernos: investigación científica moderna e implicaciones para la enseñanza" el objetivo de sus investigadores fue puesto en el análisis de las generaciones de derechos humanos y su implementación en los sistemas jurídicos modernos. Así también, el noveno trabajo "Utilización de servicios en línea para el desarrollo de la capacidad de comprensión oral en futuros profesores de lenguas extranjeras" indagó sobre la efectividad de los servicios en línea en el desarrollo de la comprensión oral y la motivación para aprender lenguas extranjeras en estudiantes universitarios. Por su parte, el décimo artículo titulado "Aprendizaje interactivo mediante chatbots en la educación superior" indagación sobre la implementación de chatbots educativos basados en inteligencia artificial como herramienta para el aprendizaje interactivo y el fortalecimiento de la cultura digital en estudiantes de educación superior. El décimo primero "Estrategias psicológicas y pedagógicas para la formación de la resiliencia emocional en los niños" analiza el impacto de estrategias psicológicas y pedagógicas en el desarrollo de la resiliencia emocional infantil. Un décimo segundo artículo "Formación profesional del profesorado de informática mediante el sistema de formación continua escalonada" evaluó la eficacia de la formación continua por etapas en la formación de competencias profesionales de los profesores de informática y su impacto en la adaptación a las tecnologías digitales. El décimo tercer apartado se titula "Política educativa sobre la calidad de la seguridad de las formas socioculturales de educación superior" este trabajo analiza la política educativa moderna enfocada en garantizar la calidad y seguridad de las actividades socioculturales en instituciones de enseñanza superior. Cerramos con el décimo cuarto artículo titulado "Identidad cívica y decisiones migratorias de estudiantes universitarios en zonas fronterizas de Ucrania en tiempos de guerra" cuya investigación se centro en estudiar las orientaciones vitales de los jóvenes en las zonas fronterizas bajo la ley marcial en Ucrania.

Como mencionamos el año pasado, este número está dedicado a toda la comunidad lectora de investigadores, estudiantes y docentes apasionados por el tema de la tecnología y la educación. El disfrute de la lectura es un modo de vida.

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Sinergia necesaria en las tecnologías educativas: diseño y aprendizaje

Necessary synergy in educational technologies: design and learning

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Resumen

La utilización de entornos de aprendizaje de realidad virtual (EARV) presenta actualmente una tendencia al alza en la educación, con el propósito de mejorar el proceso y los resultados de aprendizaje de los estudiantes. En este artículo se aborda la forma de mejorar el diseño de un laboratorio virtual a partir de los resultados obtenidos en la investigación llevada a cabo durante diez años en asignaturas del área de Ciencia e Ingeniería de Materiales (CIM) en el Grado de Ingeniería Mecánica. En este estudio se compara un conjunto de EARV creados en años anteriores con otros recientemente desarrollados. Los resultados de la encuesta planteada a 199 alumnos de CIM arrojan luz sobre cómo mejorar el aprendizaje, la retención y la transferencia de los conocimientos de los estudiantes. Este documento considera la teoría cognitiva sobre el aprendizaje significativo (AS) como principio que guía y sustenta el diseño en los EARV para mejorar los resultados del aprendizaje. A través de la aplicación de los principios del AS, se ha comprobado que el diseño de un EARV debe seguir un sistema de protocolo paso-a-paso como forma de presentar los contenidos de una manera intencionalmente estructurada. Este estudio identifica los patrones de diseño de un EARV para que favorezca el AS. Los resultados muestran que los contenidos que son aprendidos significativamente son más estables y menos propensos al olvido.

Palabras clave: ingeniería, diseño, tecnologías educativas, laboratorio virtual, universidad, enseñanza.

Abstract

The use of virtual reality learning environments (VRLEs) is currently a growing trend in education, with the purpose of improving the learning process and outcomes for students. In this paper is addressed the way to

improve the design of a virtual laboratory based on the results of research conducted over ten years in subjects of the field of Materials Science and Engineering (MSE) in the Mechanical Engineering degree. In this study, compare a set of virtual reality learning environments (VRLE) created in previous years with other recently developed VRLE. The results of the survey of 199 engineering students shed light on how to improve student learning, retention, and knowledge transfer. This paper considers cognitive theory of meaningful learning (ML) as a principle that guides and supports the design of VRLEs to improve learning outcomes. Through the application of the principles of the ML, it has been proven that the design of an VRLE must follow a step-by-step protocol system as a way to present the contents, in an intentionally structured way. This study identifies the design patterns of an VRLE to promote ML. The results show that content that is meaningfully learned is more stable and less likely to be forgotten.

Keywords: engineering, design, educational technologies, virtual laboratory, university, teaching.

Introducción

La Realidad Virtual y los EARV

La realidad virtual (RV) es una tecnología consolidada en el campo digital que ha alcanzado ya la “meseta de productividad”, según los informes de Gartner Hype Cycles (2017). Del mismo modo, sigue abriéndose paso como tecnología al alza en el ámbito educativo, singularmente en el sector terciario en las asignaturas STEM. Gracias al advenimiento de un hardware gráfico más potente y la reducción en los precios, el uso de entornos de aprendizaje de realidad virtual (EARV) a través de simulaciones y prácticas de laboratorio está ocupando un lugar cada vez más destacado en la enseñanza de las disciplinas técnicas y científicas.

Paralelamente a los inicios de la RV hacia los años 60 surgen en psicología los enfoques cognitivos. De estos años datan también los primeros intentos de desarrollar modelos de memoria humana orientados a la informática (Mandler, 2002). Basándose en cómo los ordenadores almacenaban y recuperaban la información, las teorías cognitivas se orientaron hacia la naturaleza compleja de los procesos mentales que subyacen al aprendizaje. Asimismo, los defensores de dichas teorías señalaban que el conocimiento humano está organizado de una forma lógica. La teoría cognitiva subrayaba además que el aprendizaje es un proceso activo, constructivo, acumulativo y autodirigido (Shuell, 1986). En su desarrollo posterior, el enfoque constructivista ha sustentado las bases de su teoría sobre la naturaleza cognitiva del aprendizaje a través de los estudios de Piaget, Vygotsky, Ausubel y Bruner. De acuerdo con este modelo, la adquisición de conocimiento es el resultado de una construcción cuyos fundamentos están formados por los conocimientos previos, lo que se denomina un “aprendizaje significativo” (AS).

La importancia del AS en el proceso educativo fue destacada por Ausubel (1977) como medio de aprendizaje eficaz frente a la repetición mecánica de listas o conceptos arbitrariamente relacionados. Este aprendizaje meramente repetitivo presenta muchas carencias, que en parte son constitutivas, tanto de la limitada capacidad de almacenamiento de información de nuestra memoria, como de la necesidad de repetir frecuentemente lo aprendido para que no se olvide y permanezca en la memoria a largo plazo.

Los procesos de AS, por el contrario, requieren que los nuevos conocimientos de una materia de estudio se relacionen intencionalmente con los conocimientos previos del individuo. De este modo, al conectar los nuevos conceptos o ideas con el contenido ya establecido en la estructura cognitiva, el individuo puede procesar o internalizar la información y almacenarla (retenerla) con menos esfuerzo y con más éxito a la hora de transferirla a otros contextos. Según Ausubel (2000) la adquisición y retención del aprendizaje a través de la relación entre las nuevas ideas y las ideas que ya posee el alumno no es un proceso pasivo o aislado, sino que es el producto de un proceso activo, integrador e interactivo.

Precisamente, Del Moral Pérez, & Villalustre Martínez (2005) sostienen que la presentación de la información en los entornos virtuales de aprendizaje ejerce una influencia sobre los procesos cognitivos de los alumnos. Así, cuando el diseño de los contenidos está adaptado a los estilos cognitivos de los estudiantes, se genera un espacio que potencia los aprendizajes significativos, facilitando de este modo

los mecanismos de adquisición, almacenamiento y reutilización de la información.

Son numerosos los estudios que han identificado los beneficios cognitivos y resultados de aprendizaje asociados al uso de la RV en la instrucción. Concretamente, las simulaciones y los EARV en el campo de las ingenierías son objeto de especial atención en los análisis que comparan la efectividad de estos recursos con las metodologías tradicionales (Dobrzański & Honysz, 2007; Hernández-de-Menéndez et al., 2019; Vergara et al, 2022a). Lee et al. (2010) aseguran que la RV es una herramienta imprescindible en el desarrollo de competencias nucleares para los alumnos de ingenierías. Asimismo, Antonietti et al. (2000) registran beneficios cognitivos en las áreas de comprensión, memorización, aplicación y visión de conjunto de la materia aprendida, así como beneficios metacognitivos asociados a la planificación.

Los EARV se proponen como entornos eficaces de enseñanza a varios niveles:

- Proporcionan un entorno único para que los alumnos ejerciten los seis niveles de la taxonomía de Bloom (Barari et al., 2020), con especial hincapié en los niveles superiores (Bell & Fogler, 1997).
- Fomentan la autorregulación y planificación del estudio (Lee et al., 2010), al potenciar que los alumnos puedan adaptar el ritmo y la secuencia de una presentación a sus propias necesidades (Schwan & Riempp, 2004).
- Apoyan el aprendizaje activo y el desarrollo de habilidades basadas en retos (Hernández-de-Menéndez et al., 2019).
- Permiten a los alumnos analizar sus problemas y evaluar las posibles alternativas (Bell & Fogler, 1997).
- Contribuyen a mejorar la retención a largo plazo de los conocimientos adquiridos a través de los EARV (Tax'en & Naeve, 2002; Pan et al., 2006; Jou & Wang, 2013; Joshi et al., 2021).
- Permiten hacer frente al aumento del número de estudiantes (Antonietti et al., 2000; Britain & Liber, 1999).
- Fomentan la satisfacción, el compromiso y la memoria de los estudiantes (Ryan & Poole, 2019).
- Elevan el interés y la motivación del alumno (Bricken, 1991; Huang et al., 2010; Lee et al., 2010; Vergara et al., 2017a).
- Permiten formular problemas e hipótesis, diseñar experiencias para comprobarlas, abordar la observación sistemática, la adquisición, representación, así como el análisis de datos y la interpretación crítica de resultados (Romero Ariza & Quesada Armenteros, 2014).
- Potencian el aprendizaje y optimizan el tiempo presencial disponible en el laboratorio (Romero Ariza & Quesada Armenteros, 2014; Vergara et al., 2013a; Vergara, 2019).
- Promueven la transferencia de habilidades, la colaboración, la resolución de problemas y el desempeño (Fraser et al., 2007; Tan et al., 2009; Halabi, 2020).
- Mejoran la flexibilidad, la explicación del concepto teórico y la repetición (Balamuralithara & Woods, 2009; Extremera et al., 2020).
- Estimulan la comprensión de materias o conceptos difíciles (Pan et al., 2006).
- Favorecen el desarrollo de la actividad docente en clases masificadas de alumnos (Vergara et al., 2017b).
- Reducen costos debido a la eliminación de equipos, personal, mantenimiento y gastos operativos asociados con el laboratorio convencional (Kovar et al., 2016; Sasongko & Widiastuti, 2019; Wolfartsberger, 2019; Vergara et al., 2018).
- Favorecen la participación activa de los alumnos en un entorno constructivista y de autoaprendizaje (Britain & Liber,1999; Molina-Jordá, 2013).
- Abren nuevas perspectivas para la sostenibilidad de la educación superior (Salmerón-Manzano & Manzano-Agugliaro, 2018).
- Desarrollan nuevas habilidades como compartir, mejorar la conciencia espacial, visualizar datos e incluso desarrollar nuevas habilidades lingüísticas (Vergara et al., 2013b; Srinivasa et al., 2020).
- Permiten a los estudiantes realizar experimentos sin riesgo o con riesgo insignificante para ellos mismos o para los demás (Pan et al., 2006; Vergara & Rubio, 2012; Joshi et al., 2021).
- Facilitan la adquisición de conocimientos con menos esfuerzo cognitivo que el del proceso de

aprendizaje tradicional (Chittaro & Ranon, 2007; Huang et al., 2010).

Aunque los beneficios de los EARV son abundantes, sin embargo, sigue habiendo retos en la implementación de la RV en educación superior, entre los que destacamos: (i) el llamado motion sickness o cinetosis (Liagkou et al., 2019); (ii) la obsolescencia en la que la tecnología cae rápidamente, que exige la constante actualización de los equipos (Vergara et al., 2020); (iii) el elevado precio de los dispositivos más potentes y avanzados (Liagkou et al., 2019); (iv) la cantidad de tiempo invertido en establecer o ajustar configuraciones y parámetros, así como la adaptación personal (Lee et al., 2010); (v) la falta de adaptación de los alumnos a la nueva metodología de aprendizaje, de confianza en sí mismos y la edad (Romero Ariza & Quesada Armenteros, 2014); (vi) el diseño de actividades de aprendizaje sin tener en cuenta los requisitos específicos de los entornos virtuales (Luetner, 2002); y (vii) la importancia de diseñar de forma adecuada el EARV para que sea eficaz a nivel educativo (Vergara, Rubio et al., 2020). En otras palabras, los EARV pueden no satisfacer las necesidades de los alumnos si no están guiados por un criterio pedagógico apropiado y si no están orientados por una investigación educativa centrada en los resultados de aprendizaje. Por ello es necesario que el profesorado reciba una formacion específica (Antón-Sancho et al., 2023).

A través de la aplicación de los principios del AS, los autores han estudiado las condiciones bajo las cuales los alumnos responden más positivamente al aprendizaje, retención y transferencia de los conocimientos aprendidos en un EARV. Para ello, se han comparado diferentes diseños de EARV utilizados por los autores a lo largo de nueve años en asignaturas vinculadas al área de Ciencia e Ingeniería de Materiales (CIM). Posteriormente, se han identificado los patrones de diseño que favorecen el AS y se han descrito, en un contexto general, los elementos clave que promueven una enseñanza eficaz. De este modo, los hallazgos del presente trabajo tienen un valor formativo que puede ser aplicado a otros entornos de aprendizaje basados en RV.

Entornos De Aprendizaje en Realidad Virtual

Los EARV, según la percepción de los estudiantes, pueden quedar "obsoletos" y "poco atractivos" en un plazo de aproximadamente 5-6 años (Vergara et al., 2020). Por esta razón, actualizar periódicamente los EARV es una práctica recomendable en el ámbito educativo. En este sentido en la Figura 1 se muestra cómo los autores han actualizado algunos de los EARV que han usado en los últimos años, y que han sido objeto de estudio en este trabajo de investigación.

En cuanto a los EARV representados en la parte izquierda de la Figura 1, el software utilizado para programar la interactividad fue Quest3D. Los modelos y entornos tridimiensioinales se crearon inicialmente con 3D Studio Max, que ofrecía menos posibilidades de creación 3D que las aplicaciones actuales. Por otra parte, los programas utilizados para diseñar las escenas 3D de los EARV de la parte derecha de la Figura 1 fueron versiones actuales de Autodesk 3DS Max para modelar los entornos tridimensionales, y Epic Unreal Engine 4 (UE4) para programar la interactividad. En la Tabla 1 se resumen las principales características de los EARV mostrados en la Figura 1. La importancia de estas características fueron analizadas profundamente en estudios previos (Vergara et al., 2015; 2017a) desde un punto de vista técnico. Merece la pena destacar que, a medida que la potencia de los ordenadores ha aumentado y las herramientas de desarrollo y programación de entornos 3D han evolucionado, los EARV han mejorado en diferentes aspectos: (i) mayor realismo gráfico; (ii) mejor adaptación al nivel de interactividad establecido en los criterios de diseño de la aplicación; (iii) simulación de fenómenos físicos en experimentos (p.e. colisiones); y (iv) facilidad de desarrollo y actualización en múltiples plataformas. Dado que estos aspectos influyen en el nivel de motivación de los estudiantes (Vergara et al., 2022b), los EARV diseñados con software actualizado (Figura 1, parte derecha) resultan más atractivos que las versiones más antiguas (Figura 1, parte izquierda), a pesar de haber sólo seis años de diferencia entre ellas.

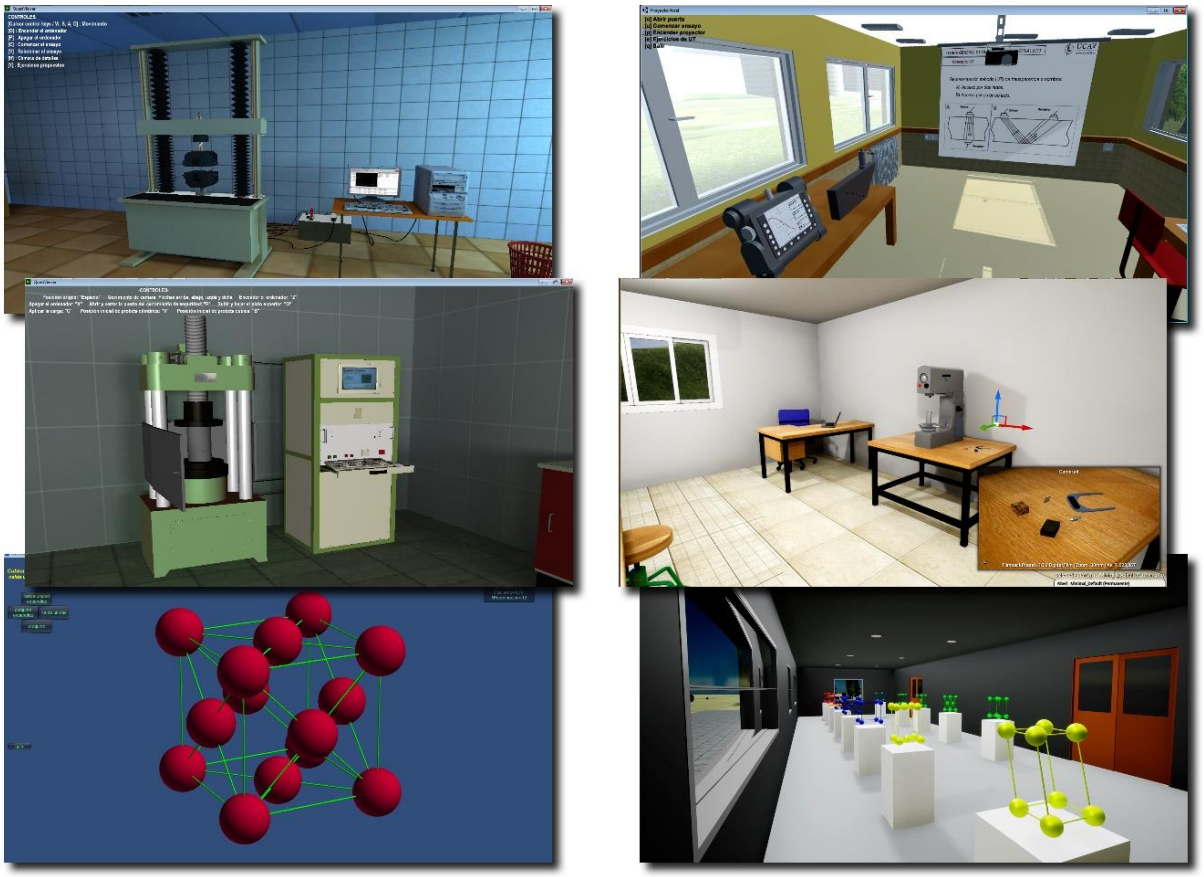

Figura 1. EARV diseñados con RV. En la parte izquierda están aquellos diseñados hace más de diez años (de arriba a abajo): máquina universal para ensayos de tracción, máquina para radiología industrial y cristalografía. En la parte derecha están los EARV actualizados (de arriba a abajo): escáner de ultrasonidos, durómetro Rockwell y cristalografía.

Tabla 1.
Comparativa de características de los EARV usados en este estudio.

Características	EARV (antiguas)	EARV (actualizadas)
Entorno virtual sujeto a las leyes de la física	No	Sí
La luz rebota según ecuaciones de la óptica	No	Sí
Materiales de aspecto realista	No	Sí
Se requiere un alto conocimiento en programación para desarrollo o actualizaciones	Sí	No
Posibilidad de adaptación a RV inmersiva	No	Sí
Fácil adaptación a plataformas distintas de los ordenadores	No	Sí

Diseño de un EARV

Según se describe en estudios previos (Vergara et al., 2017a), el desarrollo de un EARV se debe llevar a cabo siguiendo el siguiente proceso (Figura 2): (i) decidir el nivel de realismo necesario para alcanzar los objetivos del EARV; (ii) decidir el nivel de interactividad con el EARV; (iii) seleccionar el software y hardware que mejor se adapte a las necesidades de desarrollo surgidas de los pasos anteriores; (iv) modelar el entorno virtual y programar la interactividad; (v) probar la aplicación con usuarios piloto y realizar las modificaciones requeridas a raíz de dichas pruebas.

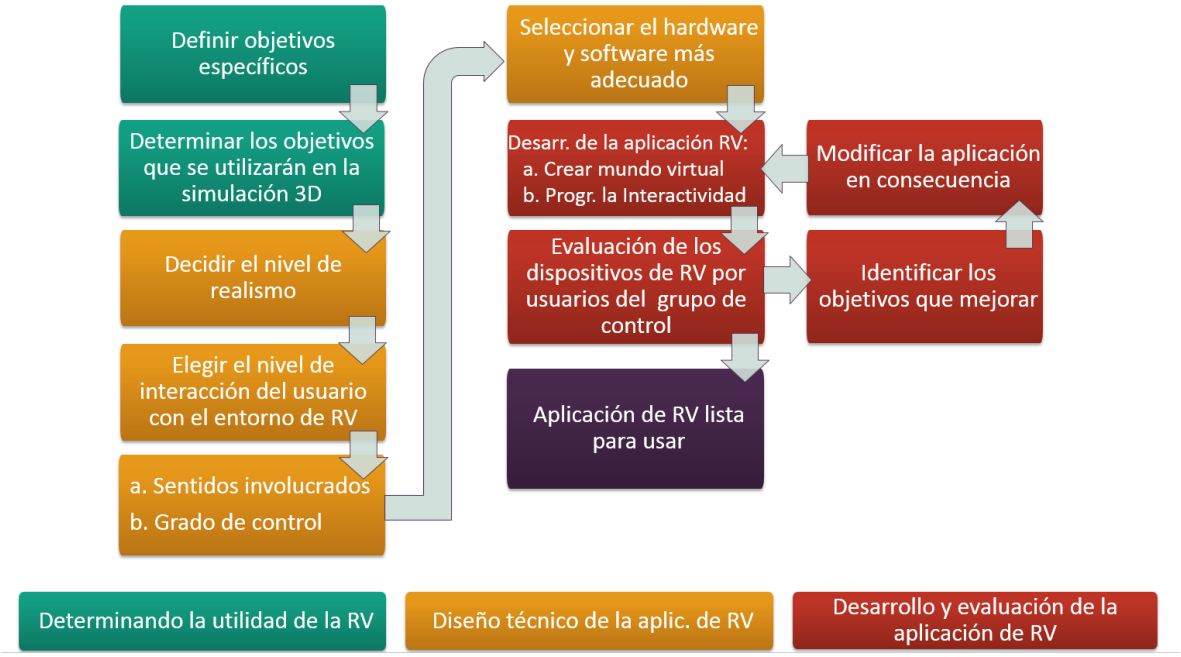

Figura 2. Proceso de diseño de un EARV.

No obstante, sobre la base de la propia experiencia de los autores, el proceso de diseño que se muestra en la Figura 2 no garantiza que se alcance un AS. Por lo tanto, en este artículo recomendamos incluir un protocolo paso-a-paso en el proceso de diseño de aquellos EARV que simulan experimentos de laboratorio, de tal forma que se cumplan los siguientes criterios: (i) presentar un nivel suficiente de interactividad para llevar a cabo el experimento virtual de manera motivadora y eficaz a nivel formativo (es decir, si el nivel de interactividad es bajo, el usuario no interactúa con el EARV y no retiene el conocimiento; sin embargo, si la interactividad es demasiado alta, el usuario puede perder el hilo del experimento y quedar desmotivado); (ii) indicar al usuario cuál es el siguiente paso a dar y cómo completarlo; y (iii) no permitir que el usuario realice acciones innecesarias o que lo conduzcan a fracasar en el experimento. En este sentido, el protocolo paso-a-paso de un experimento virtual ayuda, al usuario a centrarse en la comprensión de cada una de las etapas del experimento, evitando la necesidad de dedicar mucho tiempo a aprender a utilizar el EARV (Rubio et al., 2019). En la Figura 3 se muestra el resultado de la adaptación del protocolo paso-a-paso al diagrama de flujo anterior de la Figura 2.

La principal diferencia entre ambos diagramas de flujo (Figuras 2 y 3) radica en el nivel de interactividad alcanzado, que variará dependiendo del objetivo de la EARV, a saber: (i) ayudar al usuario a aprender cómo se llevará a cabo un experimento; o (ii) ayudar al usuario a comprender un concepto. Antes de realizar un experimento real, el estudiante recibe del profesor un procedimiento con los pasos detallados para completar la prueba. Del mismo modo, un estudiante que realiza un experimento virtual en EARV debe recibir los mismos pasos detallados que el estudiante seguiría en un laboratorio real. Por el contrario, cuando el objetivo del EARV es ayudar al estudiante a comprender un concepto, se pueden elegir diferentes niveles de interactividad que van desde un enfoque paso-a-paso con muy poca libertad de acción hasta un mundo abierto, que permitiría al estudiante llevar a cabo un gran número de acciones.

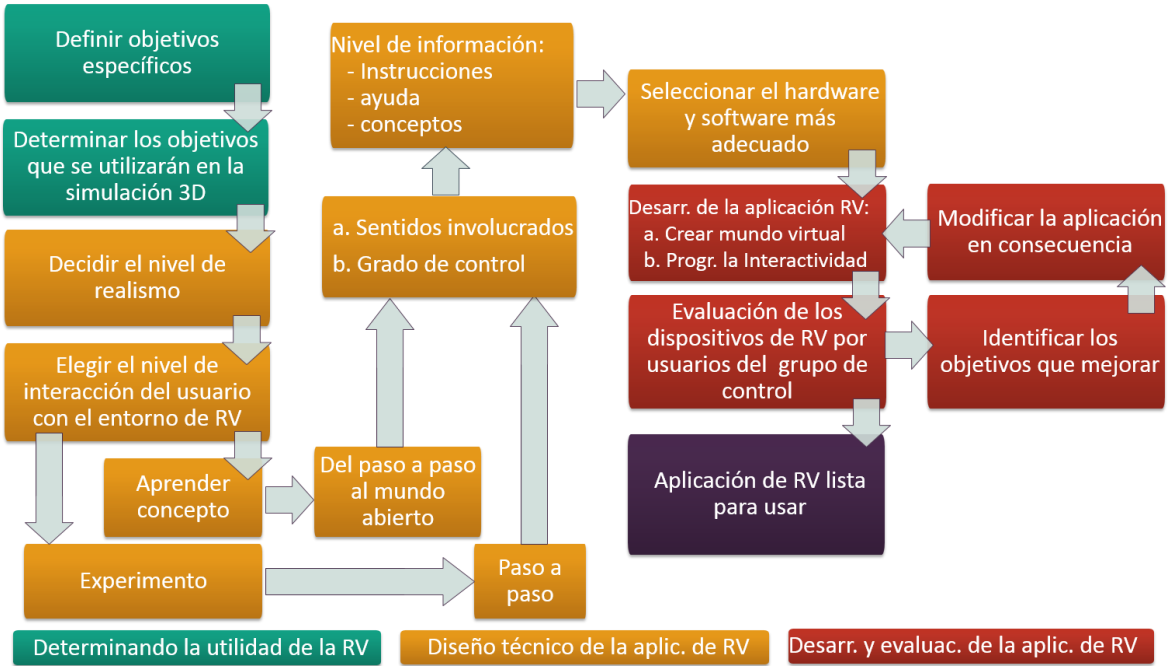

Figura 3. Nuevo proceso de diseño que incluye el guiado paso-a-paso.

Un análisis más detallado de los diagramas de flujo de las Figuras 2 y 3 revela que todos los aspectos relacionados con el diseño técnico de una aplicación (por ejemplo, la determinación del nivel de realismo, la determinación del modo de interacción, selección de hardware y software) están estrechamente relacionados. En este sentido, existe una correlación directa: cuanto mayor sea el presupuesto del hardware, mayor será el nivel de realismo e interactividad que pueda ofrecer el EARV, pero la difusión entre los usuarios finales será menor. Por el contrario, cuanto menor sea el presupuesto del hardware, mayor será la difusión del EARV pero menor su realismo e interactividad, convirtiéndose así en una herramienta poco atractiva para el estudiante.

Metodología

En titulaciones de Ingeniería, la formación sobre el funcionamiento de una máquina de CIM se lleva a cabo generalmente con grandes grupos de estudiantes, lo que dificulta un buen proceso de enseñanza-aprendizaje (Vergara et al., 2017b) y favorecería una experiencia con un bajo nivel de AS. Una posible solución a este problema es la implementación de un EARV para que así, pudiendo inteactuar de modo individual con las máquinas e instrumentos virtuales, la experiencia de aprendizaje alcance un alto nivel de AS. Sin embargo, tras seis años utilizando varios EARV similares a los que se muestran en la parte izquierda de la Figura 1, los autores verificaron que los estudiantes apenas recuerdan cómo funciona una máquina real en el año siguiente a la formación.

La metodología utilizada en los recientes EARV descritos en este trabajo (parte derecha Figura 1) se divide de la siguiente manera: (i) una clase teórica, cuya duración variará según la máquina real a simular; (ii) estimación del tiempo de uso individual del EARV, que puede tomar aproximadamente 10-15 minutos (además, los estudiantes pueden reutilizar el EARV en su tiempo libre); (iii) resolución de los ejercicios virtuales en grupos pequeños (2-3 estudiantes) incluyendo el EARV o los ejercicios tradicionales de aula (utilizando papel); y (iv) encuesta individual de carácter técnico un año más tarde (p.e. los estudiantes que usaron el EARV en 2014 completaron en 2015 la encuesta técnica para poder así evaluar su conocimiento sobre las máquinas CIM tras un año).

En la Figura 4 se presenta un esquema de la metodología seguida en este estudio. La aplicación y evaluación de los EARV se realizó entre los cursos académicos 2014-2015 y 2022-2023. Este estudio se desarrolló en la Universidad Católica de Ávila (España), participando cada año aproximadamente 20 estudiantes del Grado en Ingeniería Mecánica. Durante los cuatro primeros años (2015-2018) el estudio se basó en los EARV creados con el proceso de diseño mostrado en la Figura 2, que fueron utilizados por los estudiantes justo los años anteriores (2014-2017) a completar la encuesta. Sin embargo, más recientemente –a partir de 2019–, el estudio se basó en el nuevo proceso de diseño (protocolo paso-a-paso, Figura 3. En este caso, los estudiantes utilizaron los EARV actualizados a partir de 2018. Así pues, el proceso de diseño (protocolo paso-a-paso) es la diferencia significativa principal entre las metodologías utilizadas en ambos grupos de EARV.

Figura 4. Esquema de la metodología seguida en el presente estudio durante 2014-2018 y 2018-2024.

Resultados y discusión

En la Tabla 2 se muestra un resumen de los resultados de las encuestas técnicas recopiladas a un total de 199 estudiantes. Estos datos revelan el nivel de conocimiento que los estudiantes recordaban sobre las máquinas y los contenidos de CIM (que estudiaron un año antes de la encuesta a través de los EARV).

Hay que tener en cuenta que en el año 2021, a consecuencia del confinamiento sufrido en España en 2020 por la pandemia del Covid-19, no se procedió a realizar las encuestas de este estudio y, por eso, no se reflejan resultadosn en la Tabla 2.

Tabla 2.
Resultados estadísticos de las respuestas bien contestadas tras un año de haber usado los EARV.

Respuestas correctas	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Media (%)	45,33	51,33	48,41	49,84	64,76	66,03	-	65,24	65,93	65,74
Desviación (%)	6,93	7,60	7,50	7,11	11,23	10,94	-	10,93	10,64	11,31

Es prácticamente imposible que todos los estudiantes puedan retener el conocimiento durante un año sin olvidar parte de lo aprendido. A pesar de esta expectativa, la Tabla 2 muestra que el porcentaje de conocimientos retenidos varía de un año a otro: entre 2015-2018 apenas hay diferencias, pero en 2019 hay un aumento en el porcentaje de respuestas correctas. Los resultados de 2015-2018 se basan en el uso de EARV con diseño antiguo (Figura 2), mientras que los resultados obtenidos a partir de 2019 se relacionan con el uso de EARV con diseño actualizado Figura 3. Durante el período 2015-2018 la tasa de exactitud varía entre el 45% y el 51% (Tabla 2), mientras que en 2019-2024 el valor medio se eleva a casi el 64%, con lo que aumenta aproximadamente un 30% con respecto al bloque de años anteriores. Por

otra parte, la desviación típica es bastante similar en el período 2015-2018, lo que indica una variación no significativa de un año a otro (ampliando el número de respuestas correctas de 11 a 20 de 30). Sin embargo, la mayor desviación típica en 2019-2024 sugiere una mayor dispersión de los resultados, lo que pone de relieve que el nuevo proceso de diseño (protocolo paso-a-paso) resulta más eficaz para unos estudiantes que para otros. No obstante, teniendo en cuenta que el rango de datos en 2019-2024 se sitúa entre 13 y 24, es posible asegurar que el nuevo diseño favorece un mayor nivel de AS.

Varios factores podrían influir en estos resultados: (i) el profesor; (ii) los contenidos impartidos durante la clase en los diferentes años; (iii) el proceso metodológico utilizado durante la impartición de contenidos; (iv) las preguntas de la encuesta; (v) el nivel académico de los estudiantes; (vi) el software utilizado para crear los EARV; y (vii) el proceso de diseño utilizado en los EARV. Dado que los cuatro primeros factores han sido los mismos durante todos los años (2015-2018) –el profesor fue el mismo durante ese período, los contenidos no variaron de un año a otro, el proceso metodológico fue idéntico en todos los cursos académicos, y las preguntas de la encuesta fueron las mismas en todos los casos–, y que además los resultados de los estudiantes fueron similares, las variables clave que pueden haber tenido una influencia significativa en la mejora de los resultados en 2019 son: (i) el software utilizado para crear los EARV; y (ii) el nuevo proceso de diseño utilizado en los EARV en 2019-2024 (Figura 3), con un protocolo mejorado paso-a-paso que favorece la integración de los nuevos conceptos de una manera lógica con la estructura cognitiva del alumno.

Cabe señalar que la actualización de un EARV con un mayor realismo ayuda al estudiante a estar más motivado y, por lo tanto, más comprometido y centrado en los contenidos del EARV (lo que probablemente conduce a un mayor nivel de AS). Sin embargo, sobre la base de la propia experiencia en el diseño de diferentes EARV durante varios años, los autores han verificado que, en general, la motivación es siempre alta cuando se utiliza este tipo de herramientas didácticas. Sin embargo, este aspecto (mayor nivel de motivación por la actualización del software) no puede ser el factor clave que ha favorecido la mejora reflejada en la Tabla 2 de aproximadamente un 30% en el conocimiento retenido un año después. Dado que no hay diferencias significativas en las notas globales de los estudiantes entre 2015- 2024, la mayor motivación al usar un EARV actualizado podría ser circunstancial sin la intervención docente que organice y relacione los contenidos con la estructura cognitiva del alumno. Por consiguiente, el aspecto más relevante que afecta al AS mediante un EARV debería ser el nuevo proceso de diseño que incluya un protocolo paso-a-paso.

Además, el uso de un protocolo paso-a-paso en un EARV de CIM es más eficaz didácticamente que las prácticas en un laboratorio real, donde generalmente solo el instructor maneja las máquinas. Corroborando los resultados del presente estudio, también existen documentos previos que destacan el uso eficaz de un protocolo paso-a-paso para diseñar lecciones interactivas a través de libros electrónicos audiovisuales para el aprendizaje de CIM (Flores et al., 2012). Ciertamente hay circunstancias en las que los EARV no necesitan un protocolo paso-a-paso (por ejemplo, cuando el experimento simulado consiste en un solo paso o el ERV está destinado a la comprensión de un concepto básico) y el AS debe potenciarse de manera diferente. Por lo tanto, en este escenario es importante considerar los requisitos gráficos y el uso de los EARV. De hecho, como UE4 permite diseñar EARV para entornos inmersivos, es clave investigar cómo la inmersividad afecta el AS para entender y mejorar las diferencias observadas.

Conclusiones

Los entornos de aprendizaje de realidad virtual (EARV) son herramientas poderosas y útiles en el campo educativo, ya que pueden resolver algunos de los problemas típicos que ocurren durante las clases prácticas en los laboratorios reales. Las ventajas que un EARV puede presentar, desde un punto de vista didáctico, dependen directamente del proceso de diseño. En este trabajo se ha presentado una propuesta de diseño basado en los principios del aprendizaje significativo (AS) para mejorar el nivel de asimilación, retención y aplicabilidad de los contenidos practicados en un EARV. El proceso de diseño incluye un protocolo paso-a-paso como componente clave. A partir de los resultados obtenidos tras diez años usando diversos EARV en la docencia de la Ciencia e Ingeniería de los Materiales, cabe señalar que el proceso

de diseño de un EARV influye en el AS mucho más que otros aspectos, como p.e. el software utilizado. Por lo tanto, para asegurar un mejor nivel de AS mediante el uso de un EARV, los autores recomiendan diseñar el recurso didáctico con un protocolo paso-a-paso que permita relacionar la nueva información con lo previamente aprendido, siguiendo una secuencia cognitiva lógica. Dicha progresión lógica ayuda a la asimilación de los conocimientos y, en consecuencia, al procesamiento y almacenamiento de la nueva información. Gracias al protocolo paso-a-paso la materia recién aprendida se integra más eficazmente en los sistemas organizadores que rijen la retención del aprendizaje, haciéndolo menos vulnerable al olvido.

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Análisis del conocimiento de las Tic, Tac, Tep y Tric en el profesorado universitario

Analysis of knowledge of Ict, Tac, Tep and Tric in university faculty

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Resumen

El uso de las Tecnologías de la Información y la Comunicación (TIC) en el mundo educativo ha ido evolucionando hacia las TAC, las TEP y las TRIC, por ello, el profesorado se ve en la necesidad de conocerlas para poderlas aplicar de forma efectiva en sus clases. En este estudio se pretende comprobar el conocimiento que tienen 489 profesores sobre los conceptos de TIC, TAC, TEP y TRIC antes y después de recibir una conferencia sobre su significado. Para ello se ha llevado a cabo un método cuantitativo comparativo aplicando una encuesta inicial y una final sobre el conocimiento de dichos conceptos. En los resultados obtenidos se ha podido comprobar que el curso ha sido positivo para mejorar el conocimiento de los docentes sobre los cuatro conceptos y la valoración de la percepción de estos.

Palabras clave: Evolución, TAC, TEP, TIC, TRIC.

Abstract

The use of Information and Communication Technologies (ICT) in the educational world has evolved towards ICT, TEP and TRIC, therefore, teachers are forced to know them in order to be able to apply them effectively in their classes. This study aims to check the knowledge that 489 teachers have about the

concepts of ICT, TAC, TEP and TRIC before and after receiving a lecture on their meaning. To do so, a comparative quantitative method has been carried out by applying an initial and a final survey on the knowledge of these concepts. The results obtained have shown that the instruction has been positive in improving the teachers' knowledge of the four concepts and the assessment of their perception of them.

Keywords: Evolution, ICT, CT, PET, TRIC.

Introducción

Ante una situación de cambio constante, aparece la problemática de que los docentes deben presentar una buena alfabetización digital y estar actualizados en la evolución de las Tecnologías de la Información y la Comunicación (TIC) y los nuevos términos Tecnologías del Aprendizaje y el Conocimiento (TAC), Tecnologías del Empoderamiento y la Participación (TEP) y Tecnologías de la Relación, Información y Comunicación (TRIC). La sociedad actual es plenamente tecnológica lo que genera entre las personas una necesidad de estar en todo momento conectadas y actualizadas, produciéndose una evolución hacia la globalización digital (Shake & Riberio Soriano, 2021).

Tal y como se ha observado anteriormente, esta alfabetización digital se hace necesaria a nivel social (Manzuoli et al., 2019), por la evolución de los entornos de comunicación virtuales, y también a nivel educativo, por la aparición del aprendizaje cooperativo en línea (OECD, 2007; Jenkins & Griffin, 2019; Osuna-Acedo et al., 2018). Con el fin de motivar al alumnado y crear nuevas generaciones especialistas en el correcto uso y manejo de las TIC y reducir prácticas fraudulentas en la red, se están promoviendo y llevando a cabo cursos de formación en tecnologías digitales (Krieter, 2022; Tomaszek & Muchacka-Cymerman, 2019).

Para conocer el nivel de conocimiento de 489 profesores sobre las TIC, TAC, TEP y TRIC antes y después de impartirles una conferencia, este estudio plantea un método cuantitativo comparativo cuyo objetivo es comparar los resultados previos y posteriores a la conferencia. Para ello, el proceso seguido en la presente investigación ha sido el siguiente (Figura 1): (i) revisión del contexto teórico de estas tecnologías y determinación y definición de objetivos y variables; (ii) diseño del instrumento de investigación para evaluar el nivel de comprensión antes y después de la conferencia; (iii) impartición de la ponencia; (iv) recolección de resultados finales; (v) análisis de los datos; y (vi) redacción de conclusiones.

Marco teórico

El avance hacia la era digital se observa en todos los ámbitos y, especialmente, en las escuelas que se han convertido en uno de los escenarios para el uso de internet y de nuevos dispositivos educativos que favorecen la inclusión y la accesibilidad en el aula y la motivación del alumnado (Winn et al., 2022).

Esta fluidez en la evolución tecnológica ha generado entre los docentes la necesidad de mantenerse formados e informados ante estos cambios, especialmente tras la situación pandémica, para evitar caer en el aburrimiento y monotonía en sus clases (Haryati, 2021; Prodanović & Gavranović, 2021). En este sentido, han surgido nuevos términos que evidencian la evolución de las TIC hacia un uso más pedagógico centrado en la motivación y fácil acceso para los estudiantes (Hoque et al., 2010; Rivera-Laylle et al., 2017).

Con respecto a la alfabetización digital en la educación universitaria, se observa en los estudiantes una gran motivación por el uso de las TIC en su aprendizaje (Caldevilla-Domínguez et al., 2021; Siswoyo & Muliyati, 2021); pero el profesorado se resiste a aceptar su uso de forma generalizada por la falta de formación (Gause et al., 2022). A pesar de ello, los docentes muestran interés en implementar estas herramientas para desarrollar nuevas capacidades entre el alumnado, mejorar los procesos de enseñanza-aprendizaje en el marco del currículo tradicional y promover aprendizajes más autónomos creando situaciones prácticas en sus materias (Bottino, 2004; Bottino, 2019), evolucionando así el término

de TIC a TEP, gracias a que el aprendizaje se produce a través de medios digitales (Marta-Lazo et al., 2018).

Con el objetivo de utilizar la tecnología como herramienta educativa, surgen las TAC, que influyen de manera positiva en el ámbito educativo y social, contribuyen al buen uso de las TIC y promueven la cooperación entre las escuelas y las familias (McDonagh & McGarr, 2015; Aguayo & Eames, 2017). Las TAC son percibidas como herramientas facilitadoras del aprendizaje y transmisoras del conocimiento y no solo como medios de comunicación como las TIC (González Martínez, 2021). La eficacia de las TAC depende de la selección y estructuración de los contenidos y hacen factible la acción, reflexión, experimentación y puesta en práctica, que propicia una mejora importante en el rendimiento académico y en el clima del aula (Forero Álvarez et al., 2022).

En la actualidad, se ha comprobado que el uso de las TIC junto con las TAC mejora el proceso didáctico porque permiten desarrollar actividades inclusivas (García Pajares, 2019), al favorecer la atención a la diversidad por facilitar más recursos a los estudiantes (Rakhinsky et al., 2021). En este sentido, los docentes necesitan apoyo técnico y mejorar sus competencias digitales para sentirse motivados a utilizarlos en sus aulas (Novković Cvetković et al., 2022). Además, con las TEP se fomenta el trabajo en equipo, la comunicación y la autonomía en el aprendizaje porque permiten realizar simulaciones de la vida real (Pheng et al., 2021). Se ha constatado que existe una relación significativa entre la actitud de los docentes en el uso de las TIC y su percepción sobre su utilidad en el proceso didáctico (Ibrahim & Shiring, 2022). Hoy en día, las TIC, TAC y TEP deberían implantarse en las aulas, ya que facilitan el desarrollo de habilidades de resolución de problemas, de pensamiento crítico y de producción de nuevos conocimientos (Hoque et al., 2010).

Por último, las TRIC han facilitado a los docentes la adopción de un papel de guía y han favorecido las relaciones en el aula a nivel pedagógico, comunicativo y social (Otero-Agreda et al., 2023). Constituyen una nueva manera de aprendizaje a través de la cooperación entre docente y discente que permite al profesor adoptar un rol de facilitador del conocimiento (Ortellado & Smulders, 2021). Se ha comprobado que con su aplicación en el aula se fomenta en los estudiantes la reflexión, el análisis, la crítica y el autoaprendizaje, y facilita el desarrollo de habilidades para afrontar los desafíos sociales contextuales, permitiendo a los docentes ser creativos y promotores del pensamiento en sus aulas (Shake & Riberio Soriano, 2021; Figura 1).

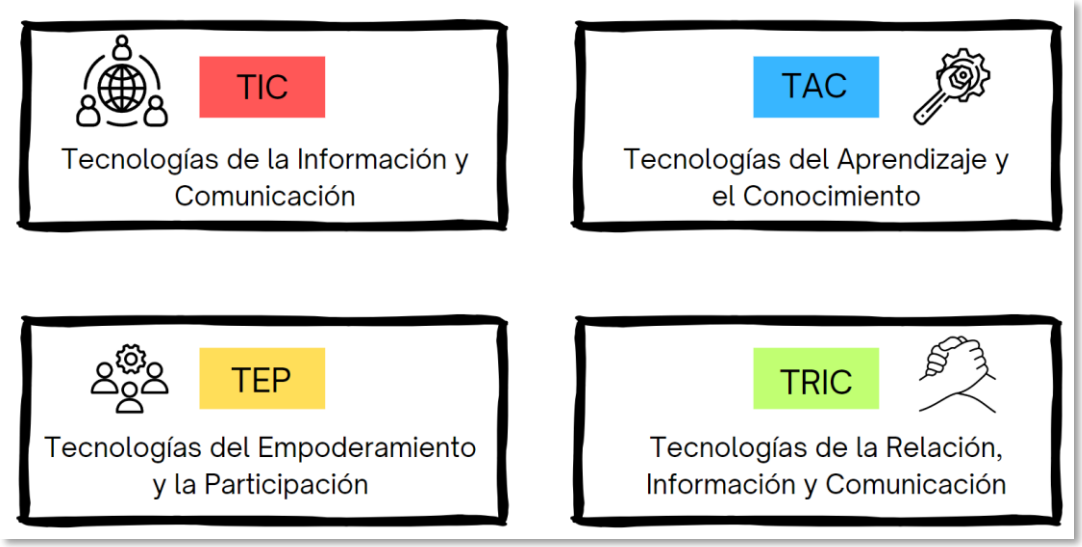

Figura 1. Definición de los términos TIC, TAC, TEP y TRIC.
Fuente: Elaboración propia.

Se ha comprobado que para el uso y desarrollo educativo técnico-digital es crucial fomentar habilidades digitales como la selección, reconstitución, intercambio de contenidos y vivencias en escenarios virtuales, así como la elaboración de contenidos digitales (Gómez-Trigueros, 2020). Para ello, es necesario que exista una relación directa entre la capacidad docente de los profesores y el uso de las TIC en sus actividades didácticas (Kundu-Bej & Dey, 2020), así como contar con recursos como software, dispositivos móviles y otros instrumentos para la gestión en las aulas virtuales y para que el alumnado se responsabilice de su aprendizaje (Sezen-Gultekin et al., 2021).

Los docentes necesitan realizar su programación con experiencias didácticas atractivas e incorporar recursos tecnológicos para contribuir al desarrollo del aprendizaje de sus estudiantes (Svrcek et al., 2022).

Asimismo, deben adaptar sus recursos y modos de enseñar al conocimiento y capacidad tecnológica de sus alumnos para lograr que el proceso didáctico sea más eficiente y de mayor calidad (Soomro et al., 2020; Maican et al., 2021).

En definitiva, urge un cambio paradigmático en cuanto al conocimiento y uso de las TIC, asumiendo los beneficios de las demás clasificaciones, ya que las TEP suponen una evolución hacia la participación y realización personal, las TAC se constituyen en guía para el buen uso tecnológico para favorecer el aprendizaje del alumnado con su participación, potenciando así el modelo pedagógico social que plantean las TRIC (Bernal et al., 2019; Lope Salvador, 2021).

Metodología

Esta investigación se ha llevado a cabo en seis fases (Figura 2): (i) determinación, definición y formulación de los objetivos y variables de investigación, así como de los criterios de inclusión de la población diana del estudio; (ii) diseño del cuestionario empleado como instrumento de investigación; (iii) ponencia a los docentes; (iv) recolección de las respuestas al cuestionario lanzado a la población diana; (v) análisis de los datos obtenidos; y (vi) obtención y formulación de conclusiones. Las Fases I y II se han llevado a cabo antes de la encuesta inicial. La Fase III después de la encuesta inicial y antes de la encuesta final. Y las Fases IV, V y VI después de la encuesta final.

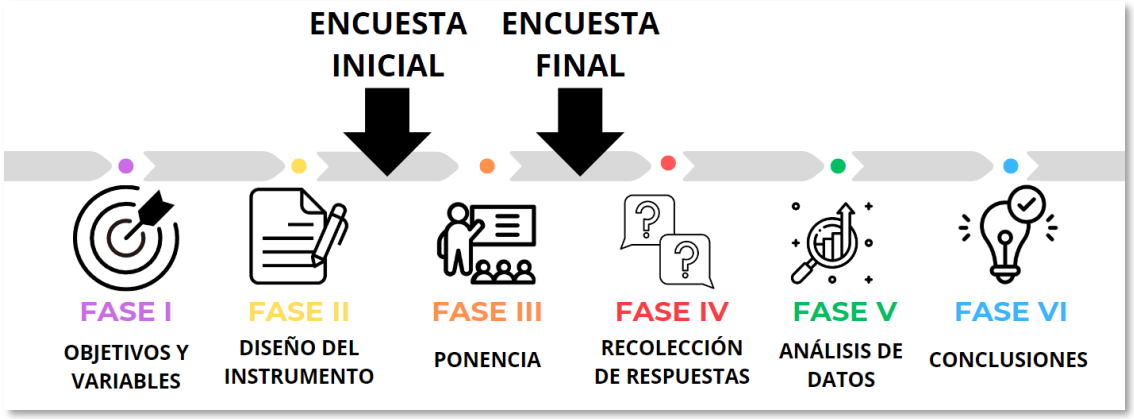

Figura 2. Fases de la metodología.
***Fuente*:** Elaboración propia.

Objetivos y variables

El objetivo principal es identificar si los docentes universitarios conocen los conceptos de TIC, TAC, TEP y TRIC. Para ello, se ha impartido una ponencia explicativa de todos los conceptos y diferentes

aplicaciones para usarlos; y para la obtención de datos se han comparado los resultados de una encuesta inicial (antes de la ponencia) y una encuesta final (después de la ponencia).

En este estudio, la variable independiente principal es la entidad de la universidad (pública/privada). Las variables secundarias son: (i) género (femenino/masculino) y (ii) edad (cuantitativa formada por la media de los rangos de edad). Las variables dependientes son el conocimiento antes de la ponencia sobre los términos (TIC; TAC; TEP; TRIC; encuesta inicial) y, tras la ponencia, el conocimiento del trato de las TIC para evolucionar hacia los conceptos TAC, TEP o TRIC (encuesta final; Figura 3).

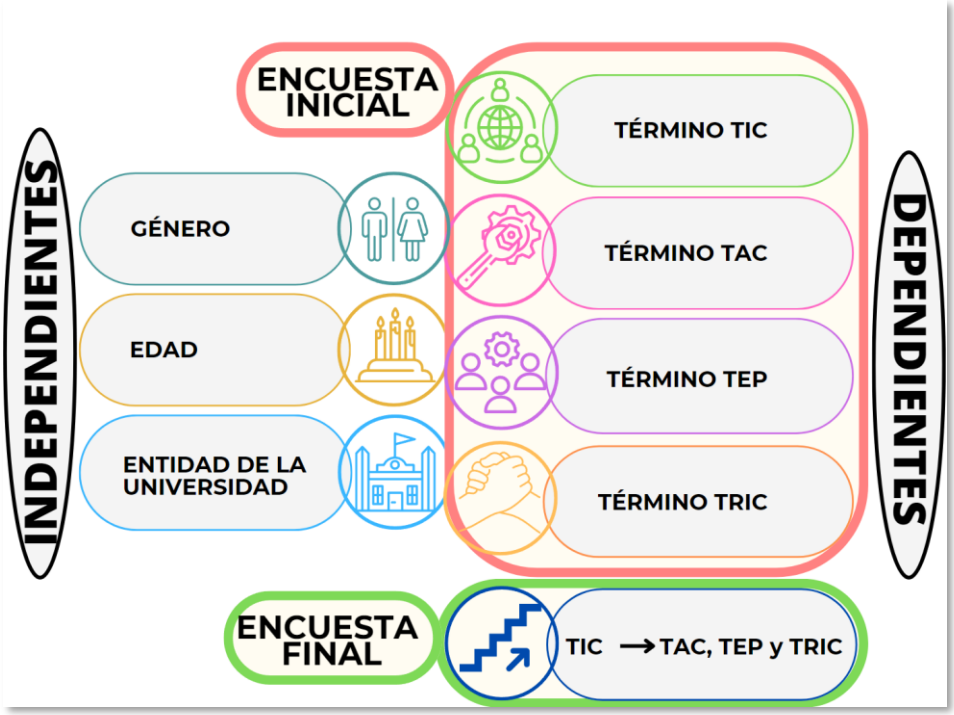

Figura 3. Variables dependientes e independientes.
Fuente: Elaboración propia.

Instrumento

El instrumento diseñado (Fase II, Figura 2) es un cuestionario dirigido a docentes universitarios compuesto por un bloque de preguntas de variables dependientes e independientes (Figura 3). Las respuestas de las preguntas dependientes son dicotómicas (Tabla 1) y las independientes son dicotómicas (género y entidad de la universidad) y politómicas (edad).

Tabla 1.
Preguntas del cuestionario.

	PREGUNTA	VARIABLE	OPCIÓN DE RESPUESTA
ENCUESTA INICIAL	1	¿Usted conocía el concepto de TIC?	DICOTÓMICA (SI/NO)
	2	¿Usted conocía el concepto de TAC?	
	3	¿Usted conocía el concepto de TEP?	
	4	¿Usted conocía el concepto de TRIC?	
ENCUESTA FINAL	5	¿Usted considera necesario conocer cómo tratar las TIC para evolucionar hacia los conceptos TAC, TEP o TRIC?	

Fuente: Elaboración propia.

Participantes

Se realizó un muestreo probabilístico en la población de los docentes de entre 20 y 75 años de edad. El único criterio de inclusión en el estudio fue ser docente en Universidades de Sudamérica. La población del presente estudio consta de 560 docentes de los cuales han participado 489. A estos se les envió el cuestionario y se les solicitó participar una vez informados de los propósitos de la investigación. Las respuestas fueron voluntarias, gratuitas y anónimas.

Según se puede ver en la Figura 4, los participantes por género se distribuyen en Masculino 38.1% y Femenino 61.9%. Por edad de 25 a 34 años, el 10.7%; de 35 a 44 años, 26.4%; de 45 a 54 años, 32.0%; de 55 a 64 años, 24.8%; y de 65 a 75 años, 6.1%. La entidad de la universidad se distribuye en Pública, 58% y Privada, 42%.

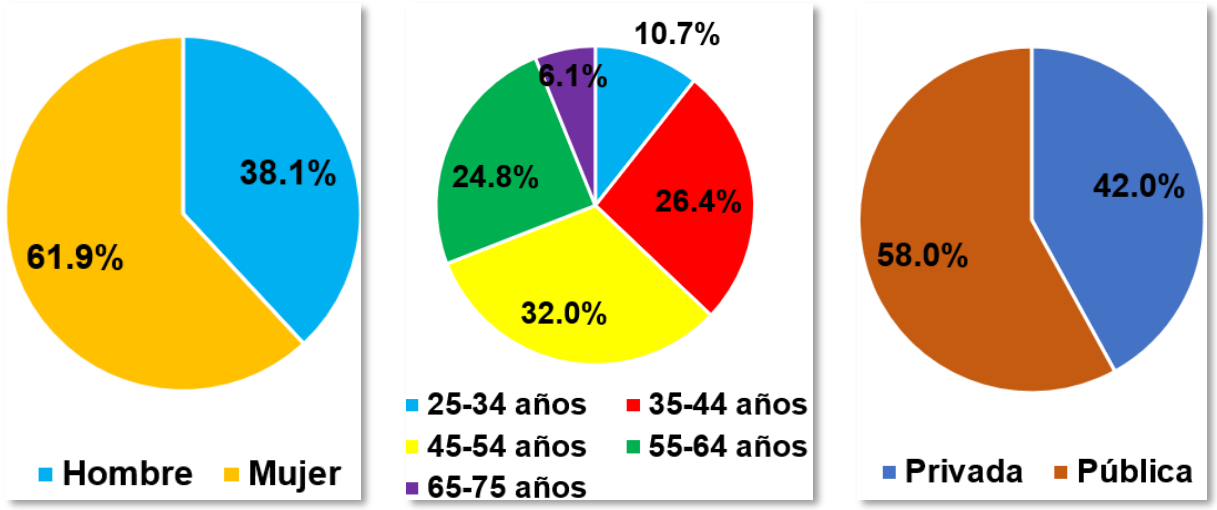

Figura 4. Distribución de participantes en el estudio.
***Fuente*:** Elaboración propia.

El cuestionario que se proporcionó a los participantes fue validado por un equipo de expertos en innovación docente, uso de tecnologías en el ámbito educativo y estadística, garantizando su adecuación y fiabilidad de uso para la evaluación del conocimiento del profesorado sobre los términos analizados (TIC, TAC, TEP y TRIC). Para el análisis estadistico, se ha utilizado (i) el software SPSS versión 29 para el estudio de las frecuencias de las respuestas y (ii) el programa Excel para realizar tablas de doble entrada.

Resultados

Encuesta inicial

Se ha consultado a profesores universitarios sobre su conocimiento de las TIC, TAC, TEP y TRIC (Figura 1) antes de asistir a una ponencia en la que se trataron estos conceptos. En la Tabla 2 se presentan los resultados de la encuesta inicial. Se puede observar que casi todas las respuestas sugieren un alto conocimiento del término TIC (pregunta 1), independientemente de la variable considerada (género, edad, entidad). Por el contrario, los términos TAC (pregunta 2), TEP (pregunta 3) y TRIC (pregunta 4) son bastante desconocidos por todos los docentes antes de haber asistido a la ponencia.

Tabla 2.
Respuestas de la encuesta inicial (%).

VARIABLES		PREGUNTA							
		1		2		3		4	
		SÍ	NO	SÍ	NO	SÍ	NO	SÍ	NO
GÉNERO	HOMBRES	37.3	0.8	11.1	27.0	5.5	32.6	3.5	34.6
	MUJERES	61.1	0.8	15.6	46.3	7.8	54.1	5.9	55.9
EDAD (años)	25-34	10.7	0.0	2.7	8.0	1.4	9.2	1.0	9.6
	35-44	26.0	0.4	6.1	20.3	2.9	23.6	2.3	24.2
	45-54	31.6	0.4	9.2	22.7	4.7	27.3	2.9	29.1
	55-64	24.6	0.2	6.8	18.0	3.1	21.7	2.3	22.5
	65-75	5.5	0.6	1.8	4.3	1.2	4.9	1.0	5.1
ENTIDAD	PÚBLICA	57.0	1.0	16.0	42.0	7.0	51.0	4.3	53.7
	PRIVADA	41.4	0.6	10.7	31.4	6.4	35.7	5.1	36.9

Fuente: Elaboración propia.

Encuesta final

En esta sección, se presentan los resultados de la encuesta final. Después de asistir a la ponencia, se consultó a los profesores sobre si consideraban necesario conocer cómo manejar las TIC para evolucionar hacia los conceptos TAC, TEP o TRIC (Figura 1). En la Tabla 3 se exponen los resultados obtenidos. En general, se observa una tendencia hacia la afirmación de esta necesidad, especialmente entre las mujeres y las universidades públicas (Tabla 3).

Tabla 3.
Respuestas de la encuesta final (%).

VARIABLES		PREGUNTA	
		5	
		SÍ	NO
GÉNERO	HOMBRES	35.7	2.5
	MUJERES	59.0	2.9
EDAD (años)	25-34	10.0	0.6
	35-44	25.2	1.2
	45-54	30.7	1.2
	55-64	23.0	1.8
	65-75	5.7	0.4
ENTIDAD	PÚBLICA	54.9	3.1
	PRIVADA	39.8	2.3

Fuente: Elaboración propia.

Análisis de resultados

Encuesta inicial

En la encuesta inicial, los datos sobre el conocimiento de las TIC entre los profesores por género y tipo de universidad (privada/pública), revelan diferencias notables: en las universidades privadas, el 97.6% de los hombres y el 99.9% de las mujeres conocen el término TIC, y en las universidades públicas, son del 98.1% y 98.4%, respectivamente (Figura 5). Por tanto, tanto en universidades privadas y públicas por género tienen un conocimiento amplio del término TIC. Sin embargo, se observan variaciones significativas según

la edad y entidad de la institución, lo que destaca la necesidad de estrategias adaptativas de formación en competencia digital (Figura 6).

En el caso de realizar el estudio por edad y por entidad universitaria sobre el conocimiento del término TIC entre profesores universitarios, los datos revelan patrones interesantes: en universidades privadas, las proporciones de conocimiento varían desde un 100% en el grupo de 25-34 años hasta un 92% en el de 65-75 años. En el caso de las universidades públicas, el conocimiento sobre TIC también es elevado en todos los rangos, disminuyendo también para el grupo de mayor edad a un 89.2% (Figura 6). Estos resultados subrayan la influencia de la edad y el tipo de institución en la familiaridad con las TIC, siendo mayor su porcentaje entre profesores de mediana edad en universidades públicas y destacando la necesidad de estrategias de formación adaptativas para apoyar la competencia digital en todos los grupos de edad y tipos de universidades, especialmente para abordar los desafíos de inclusión digital de profesores mayores.

En el caso de las respuestas a la pregunta 2 (Tabla 2) sobre el conocimiento de las TAC, los datos por género y tipo de universidad muestran una mayor proporción de desconocimiento en todas las categorías que el anterior. Cabe destacar que el porcentaje de hombres y mujeres que desconoce el término TAC en ambos tipos de universidades es similar. En el caso de las universidades públicas son los hombres los que presentan un porcentaje más elevado de desconocimiento sobre este término en un 73.2%, mientras que en las privadas son las mujeres las que muestran un mayor porcentaje en un 79.0% (Figura 7). Estos hallazgos indican una necesidad de enfocar esfuerzos en aumentar la sensibilización y capacitación sobre TAC, especialmente entre las mujeres y en el contexto de universidades públicas, para promover una mayor integración de estas tecnologías en la Educación Superior.

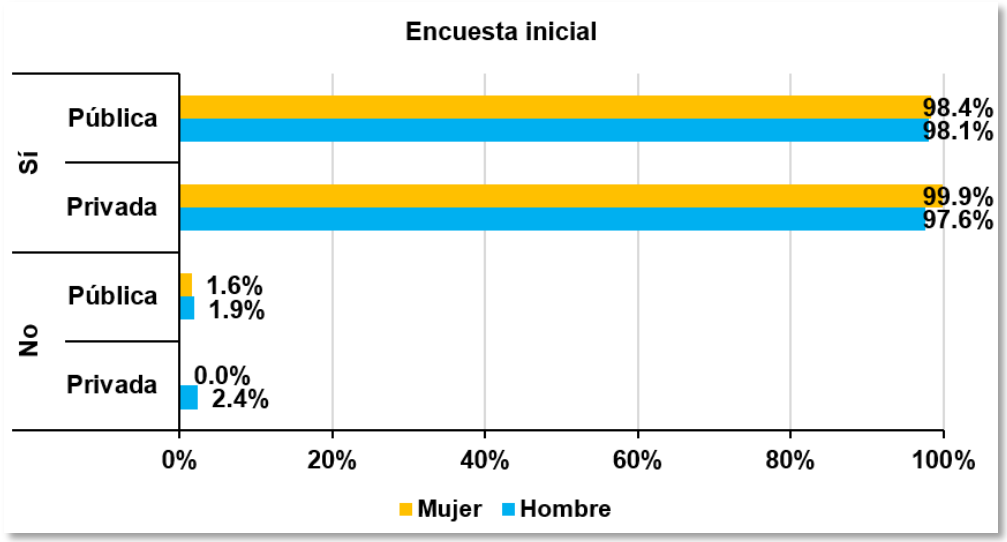

Figura 5. Resultados de la Pregunta 1 (encuesta inicial): ¿Usted conocía el concepto de TIC? (Tabla 1) por género y entidad.
Fuente: Elaboración propia.

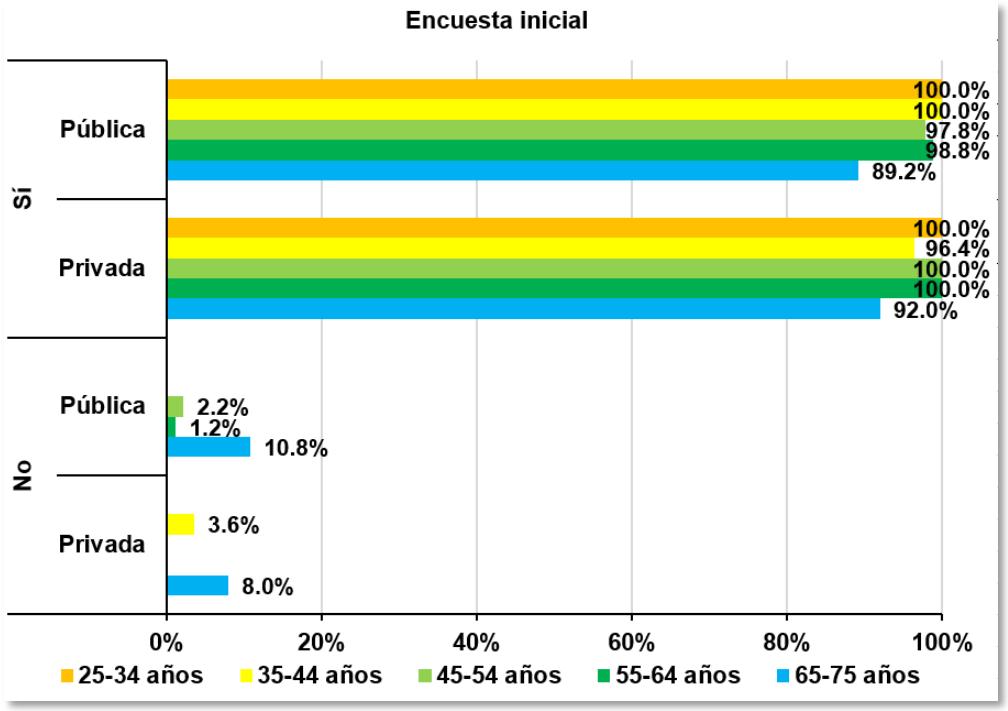

Figura 6. Resultados de la Pregunta 1 (encuesta inicial): ¿Usted conocía el concepto de TIC? (Tabla 1) por edad y entidad.
Fuente: Elaboración propia.

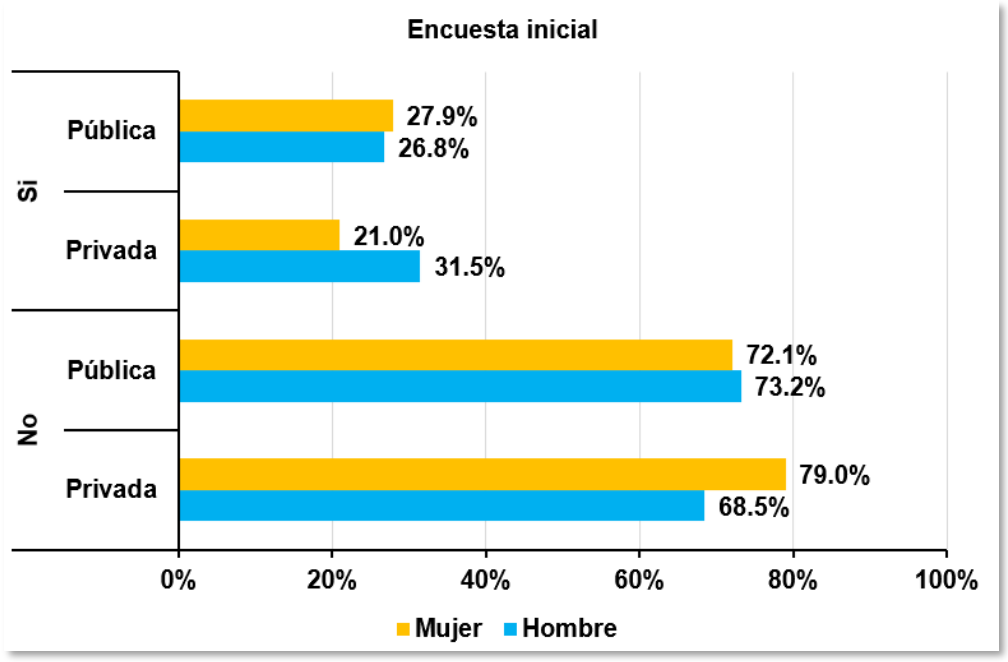

Figura 7. Resultados de la Pregunta 2 (encuesta inicial): ¿Usted conocía el concepto de TAC? (Tabla 1) por género y entidad.
Fuente: Elaboración propia.

En el caso de las respuestas a la pregunta 2 (Tabla 2) sobre el conocimiento de las TAC, los datos por edad y tipo de universidad indican que el desconocimiento sobre TAC es similar en universidades públicas y privadas ya que la media de todas las edades está en un 72% en ambos tipos de universidades. En el caso de las universidades públicas, hay mayor porcentaje de desconocimiento en los rangos de más edad. En el caso de las universidades privadas son los más jóvenes los que mayor porcentaje de desconocimiento han presentado. Por tanto, las proporciones de profesores que conocen el término TAC son bajas en todos los grupos de edad y en ambos tipos de universidades, lo que denota una limitada familiaridad con las TAC en el ámbito universitario (Figura 8). Este panorama subraya la importancia de implementar estrategias específicas de formación y actualización que mejoren el conocimiento e integración de estas tecnologías, abordando tanto las variaciones generacionales como las diferencias institucionales, para potenciar el uso de estas tecnologías en la enseñanza y el aprendizaje en la Educación Superior.

En cuanto al conocimiento del término TEP por género y tipo de entidad, la información revela una tendencia clara hacia un mayor desconocimiento del mismo en todas las categorías, con un 88.5% de mujeres en universidades privadas y un 86.6% en públicas, en comparación con los hombres que muestran un 79.2% en privadas y un 90.6% en públicas (Figura 9). Estos datos subrayan una brecha significativa en la familiaridad con las TEP en el ámbito universitario, lo que sugiere la necesidad de implementar iniciativas de formación y sensibilización que aborden estas disparidades y fomenten una mayor integración de estas tecnologías en la práctica educativa.

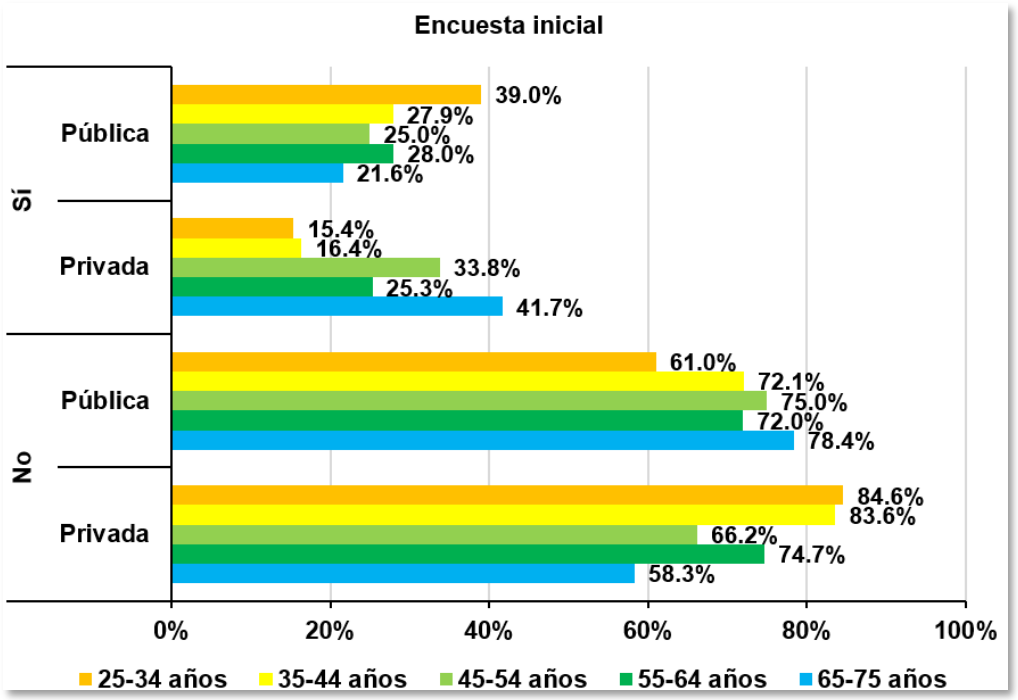

Figura 8. Resultados de la Pregunta 2 (encuesta inicial): ¿Usted conocía el concepto de TAC? (Tabla 1) por edad y entidad.
Fuente: Elaboración propia.

Los datos sobre el conocimiento de TEP por edad y tipo de entidad muestran una tendencia de desconocimiento más pronunciado hacia el término TEP, especialmente en las universidades públicas, siendo su puntuación más alta entre los 25-34 años y la más baja en 45-54 años. Su conocimiento es consistentemente bajo en todos los grupos de edad y ambos tipos de universidades, con ligeras

variaciones (Figura 10). Esta situación subraya una necesidad crítica de fortalecer la formación y sensibilización sobre las TEP dentro del cuerpo docente universitario, abordando especialmente las brechas identificadas en universidades públicas y entre los grupos de mayor edad, para promover una integración más efectiva de estas tecnologías en los procesos de enseñanza y aprendizaje.

En el caso de los resultados del término TRIC entre profesores universitarios, clasificados por género y tipo de entidad, se observa que la proporción de profesores que no conocen el término TRIC es significativamente alta en todos los grupos, siendo más elevadas las tasas de desconocimiento en las universidades públicas. En las privadas, el 85.1% de los hombres y el 89.3% de las mujeres desconocen el término, mientras que, en las públicas estos porcentajes aumentan, el 95.3% de hombres y el 91.0% de mujeres (Figura 11). Por lo tanto, también se revela una clara brecha en el conocimiento del término TRIC entre los profesores universitarios, especialmente pronunciada en el sector público y entre las mujeres. Destaca, por lo tanto, la necesidad de iniciativas de formación y sensibilización sobre las TRIC en el ámbito educativo superior, para fomentar una comprensión y adopción más amplias de estas tecnologías, que pueden jugar un papel crucial en la mejora de los procesos de enseñanza y aprendizaje.

Los datos sobre el conocimiento de TRIC por edad y tipo de entidad, muestran un patrón claro de desconocimiento generalizado entre los profesores, con una tendencia mayor en las universidades públicas con respecto a las privadas. En los grupos de edad en las públicas, los niveles de desconocimiento son entre el 95.1% y el 89.2% y en las privadas, entre un 87.7% y un 75.0% (Figura 12). Este análisis destaca una brecha significativa en la familiaridad con las TRIC dentro del cuerpo docente universitario, subrayando la necesidad en la integración de estas tecnologías, particularmente en el sector público y entre los profesores de mediana edad, para fomentar una comprensión más profunda y un uso efectivo de las TRIC en la Educación Superior.

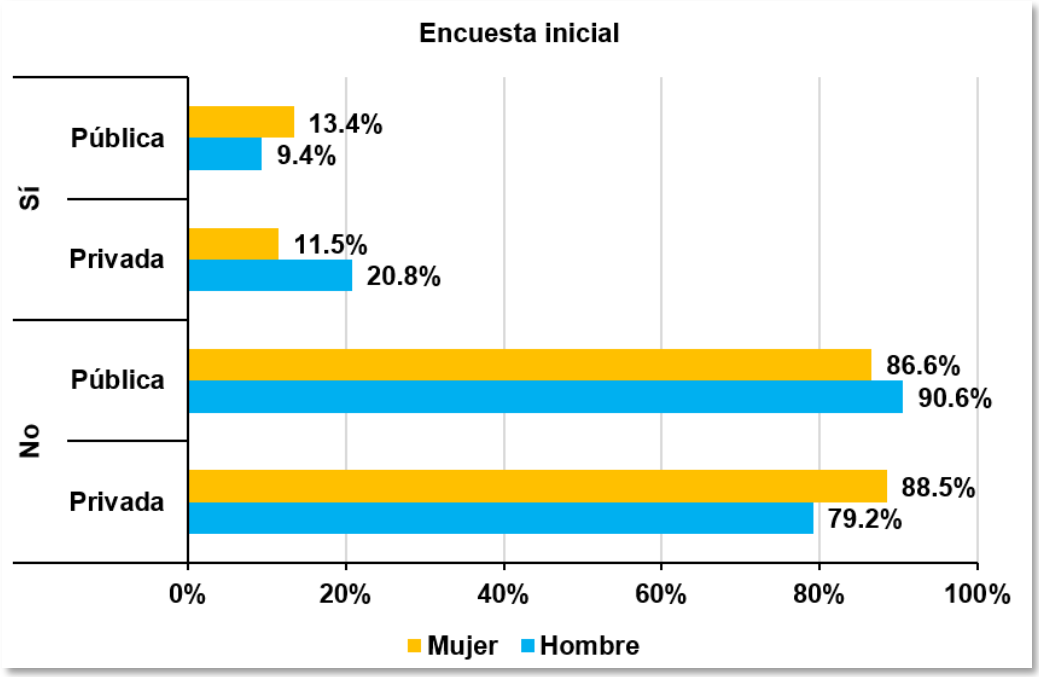

Figura 9. Resultados de la Pregunta 3 (encuesta inicial): ¿Usted conocía el concepto de TEP? (Tabla 1) por género y entidad.
Fuente: Elaboración propia.

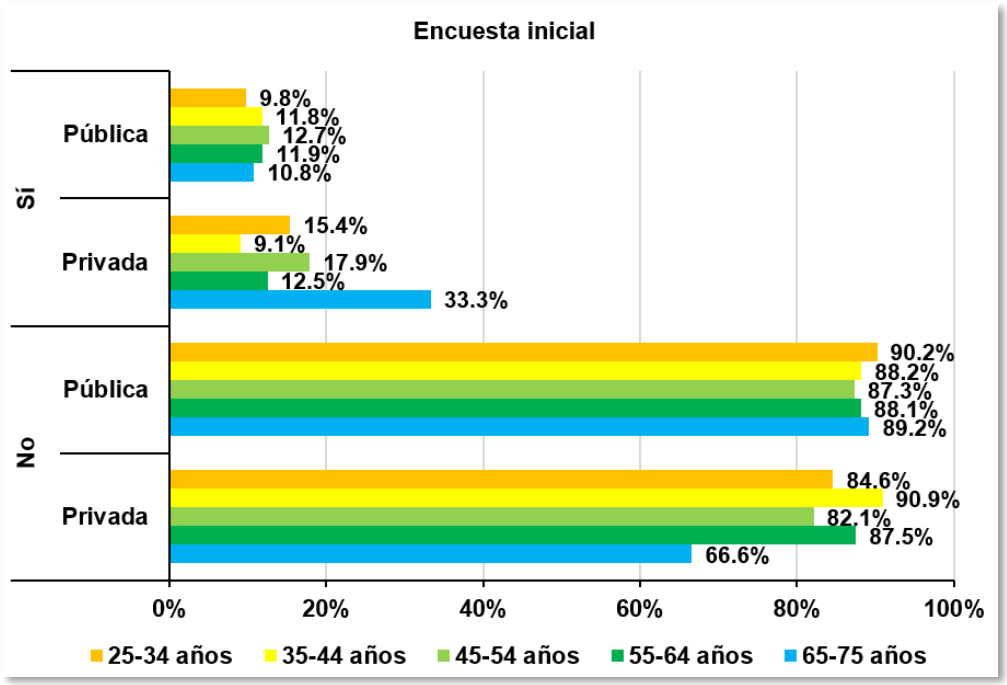

Figura 10. Resultados de la Pregunta 3 (encuesta inicial): ¿Usted conocía el concepto de TEP? (Tabla 1) por edad y entidad.
Fuente: Elaboración propia.

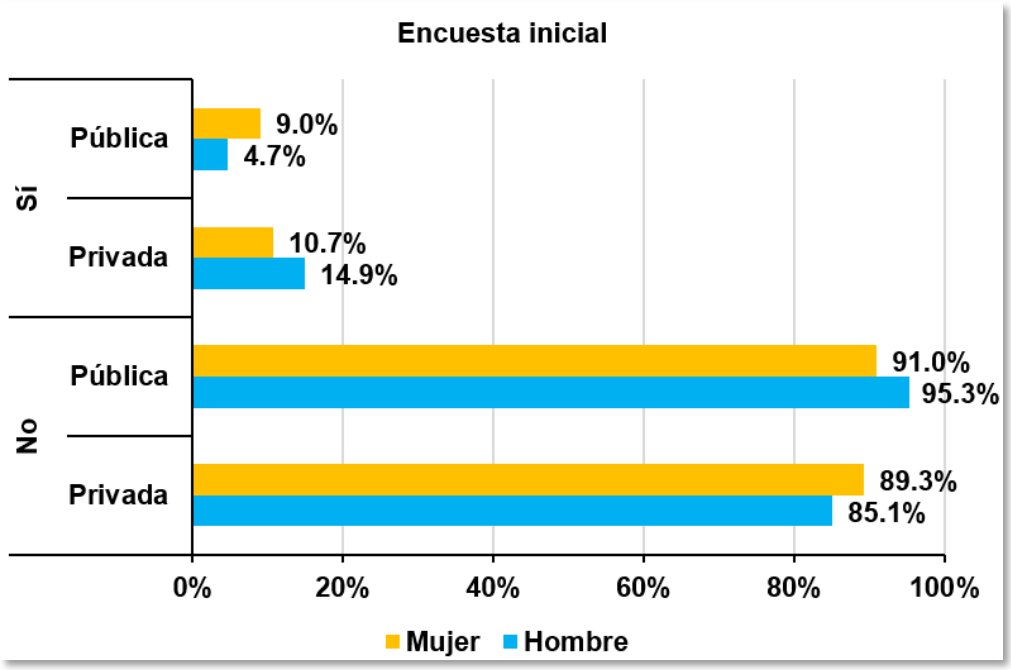

Figura 11. Resultados de la Pregunta 4 (encuesta inicial): ¿Usted conocía el concepto de TRIC? (Tabla 1) por género y entidad.
Fuente: Elaboración propia.

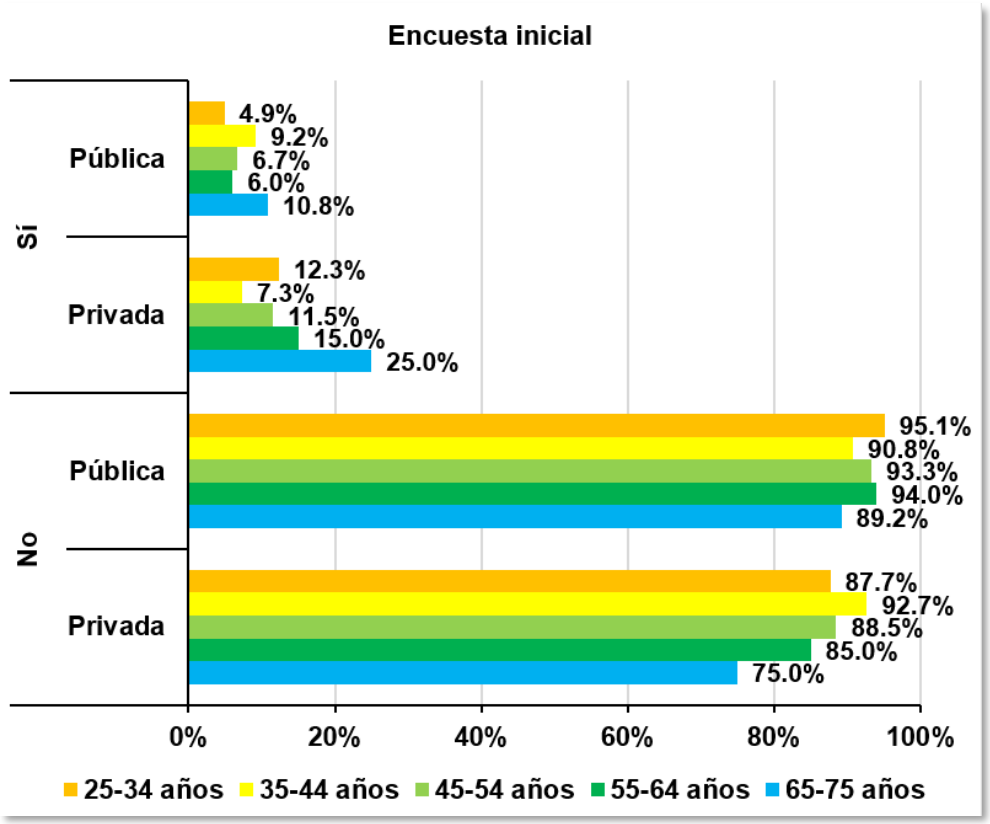

Figura 12. Resultados de la Pregunta 4 (encuesta inicial): ¿Usted conocía el concepto de TRIC? (Tabla 1) por edad y entidad.
Fuente: Elaboración propia.

Encuesta final

Los datos sobre si los docentes universitarios consideran necesario conocer cómo tratar las TIC para evolucionar hasta las TAC, TEP y TRIC tras la ponencia, divididos por género y tipo de universidad, revelan una clara inclinación hacia la afirmación de esta necesidad, especialmente notoria entre las mujeres y en las universidades públicas.

En el caso de las universidades privadas, el 95.2% de los hombres y el 94.4% de las mujeres consideran necesario este conocimiento y evolución conceptual y en las universidades públicas, el 92.5% de los hombres y el 96.2% de las mujeres. Estos datos sugieren una mayor concienciación o interés en los temas de tecnologías educativas entre los docentes de ambos géneros y en ambos tipos de universidad, lo que podría reflejar diferencias en la percepción de la importancia de las TIC y sus evoluciones en el ámbito educativo. La casi inexistente proporción de profesores que no ven necesaria esta evolución (3.8% de mujeres y 7.5% de hombres en la universidad pública y el 5.6% de mujeres y el 4.8% de hombres en la universidad privada) resalta la amplia aceptación de la importancia de estas tecnologías en la Educación Superior (Figura 13). Este análisis subraya la relevancia de las TIC y sus evoluciones (TAC, TEP, TRIC) en la formación y práctica docente universitaria, evidenciando una demanda de desarrollo profesional en estos ámbitos, para asegurar una integración efectiva de estas tecnologías en los procesos de enseñanza y aprendizaje.

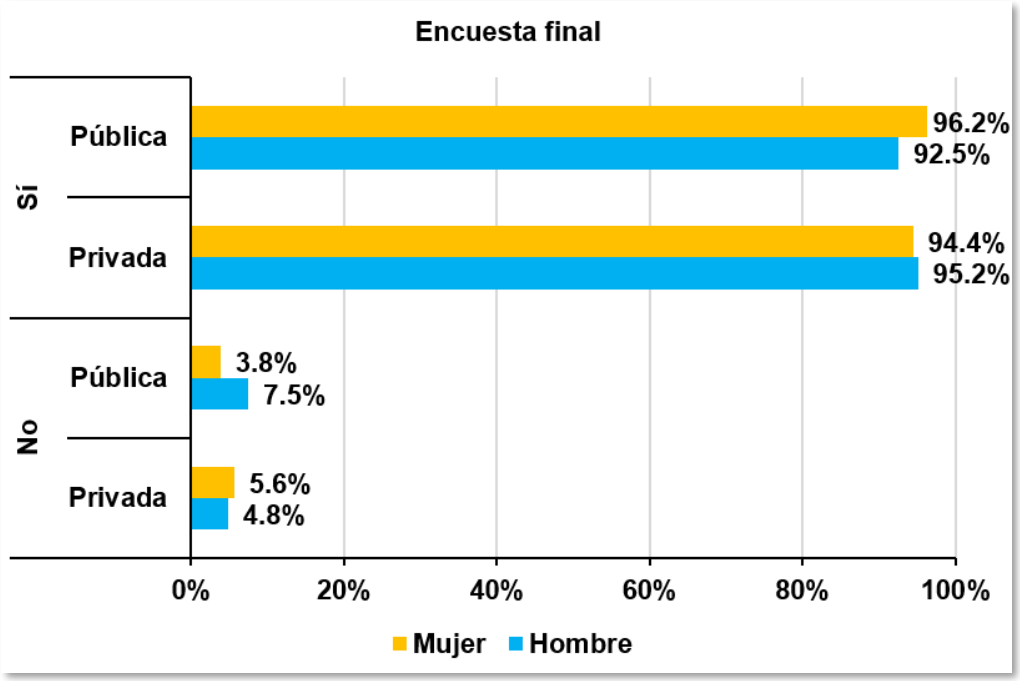

Figura 13. Resultados de la Pregunta 5 (encuesta final): ¿Usted considera necesario conocer cómo tratar las TIC para evolucionar hacia los conceptos TAC, TEP o TRIC? (Tabla 1) por género y entidad.
Fuente: Elaboración propia.

En el caso de la necesidad de conocer y tratar las TIC y evolucionar hacia los conceptos de TAC, TEP, o TRIC después de una ponencia, los datos por edad y tipo de entidad muestran una tendencia general hacia el reconocimiento de esta necesidad tanto en universidades públicas como privadas y en todos los tramos de edad. En las universidades públicas son los docentes de edades entre 45 y 54 años los que han dado un mayor porcentaje con un 97.8% mientras que en el caso de las privadas son los docentes de mayor edad (65 a 75 años) que han dado un 100%. El porcentaje entre los profesores que no ven necesaria la evolución en el conocimiento de los TIC, TAC, TEP, o TRIC no ha superado el 11% ni en las universidades públicas ni en las privadas. Por lo tanto, este análisis evidencia una demanda clara de formación y desarrollo en tecnologías educativas entre el profesorado universitario, con un énfasis particular en las universidades públicas y en los profesores de mediana edad, resaltando la oportunidad de implementar programas de capacitación que aborden estas necesidades para integrar efectivamente estas tecnologías en la enseñanza y el aprendizaje. Por último, los resultados obtenidos en las 5 preguntas muestran cómo la ponencia ha servido para que los docentes entiendan y utilicen los términos estudiados. Antes de la ponencia, los docentes encuestados solo conocían el término TIC, pero tras la ponencia, el 94.7% ha considerado que es importante conocer el término TIC para evolucionar al resto (Figura 15).

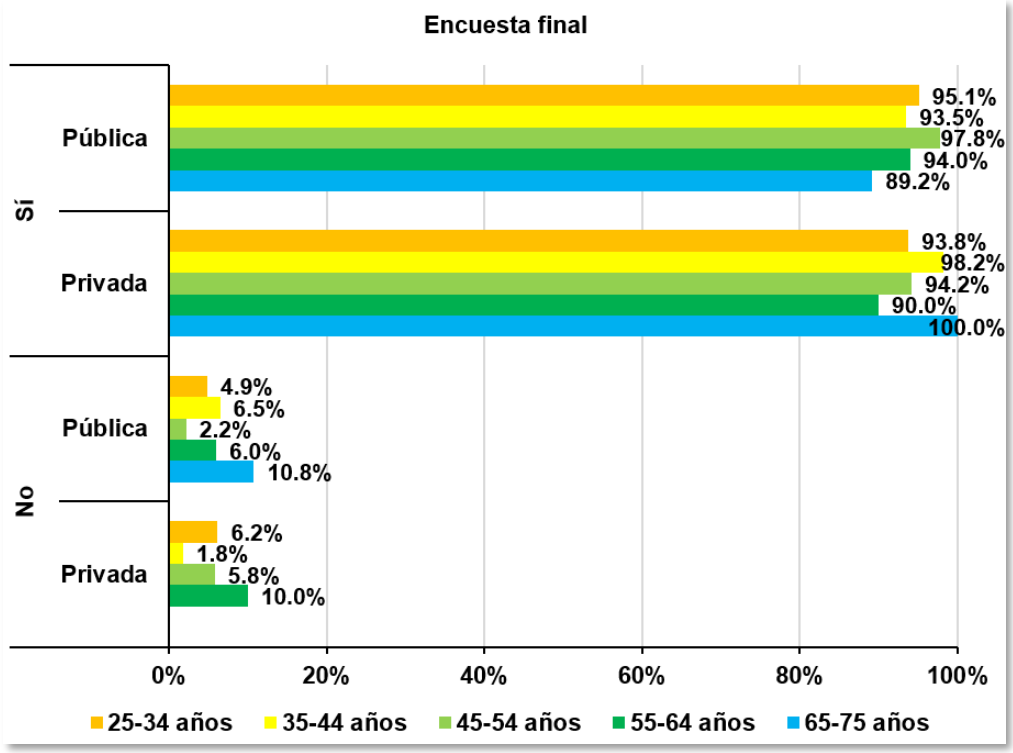

Figura 14. Resultados de la Pregunta 5 (encuesta final): ¿Usted considera necesario conocer cómo tratar las TIC para evolucionar hacia los conceptos TAC, TEP o TRIC? (Tabla 1) por edad y entidad.
Fuente: Elaboración propia.

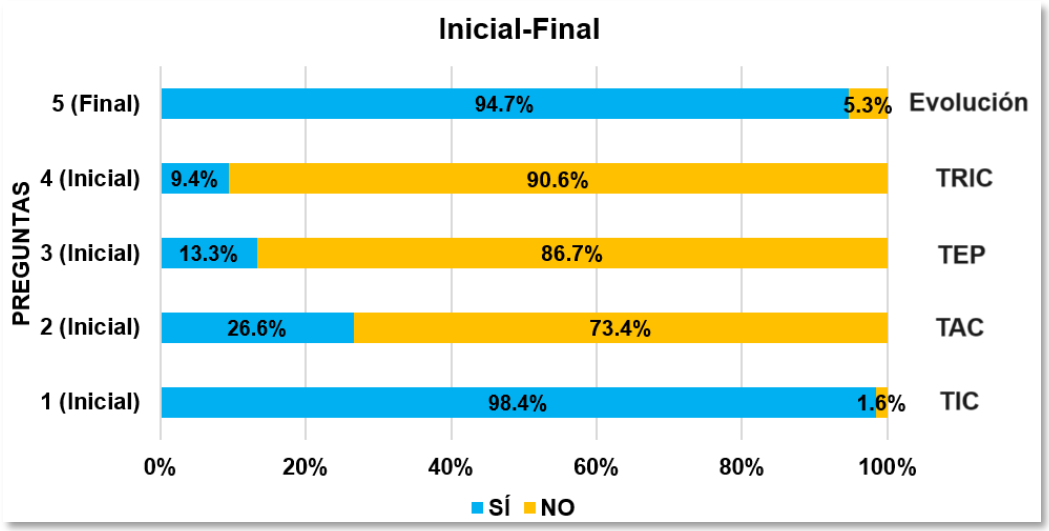

Figura 15. Resultados de todas las preguntas (Tabla 1).
Fuente: Elaboración propia.

Los resultados reflejan que tras la ponencia se produce una mejora significativa en el conocimiento docente sobre los términos TIC, TAC, TEP y TRIC, lo que confirma la importancia de la formación contínua en el ámbito educativo y de la innovación (Antón-Sancho et al., 2021; Haryati, 2021;

Prodanović & Gavranović, 2021), para favorecer el desarrollo de competencias digitales entre los docentes (Guillén-Gámez & Mayorga-Fernández, 2022; Fernández-Arias et al., 2025). En este sentido, cabe destacar la diferencia en el conocimiento inicial de las TIC respecto a los términos de TAC, TEP y TRIC, lo que sugiere la predominancia del uso más tradicional de la tecnología en la enseñanza. Esto refleja el desafío pedagógico de incorporar herramientas digitales innovadoras a la educación (Antón-Sancho et al., 2022), corroborando los resultados de otros estudios que evidencian que, a pesar del uso constante de las TIC en el ámbito educativo, su constante evolución puede abrumar al profesorado (McDonagh & McGarr, 2015).

A este reto, se le añaden los factores de edad y sexo, que tal y como reflejan los resultados pueden ser un condicionante de percepción y adopción de medidas formativas en el ámbito tecnológico. Estos resultados entran en consonancia con estudios como el de Shake & Riberio-Soriano (2021), donde se refleja que las docentes muestran mayor predisposición a la formación en estas áreas (Van Welsum & Montagnier, 2007), mientras que el profesorado de mayor edad presenta cierta resistencia debido a su menor experiencia en el uso de recursos digitales (Soomro et al., 2020).

En resumen, los resultados pueden contribuir a la implementación de programas de formación docente que fomenten la adquisición y aplicación de conocimientos en el aula, promoviendo la motivación entre el alumnado (Masek et al., 2018). La implementación de metodologías activas respaldadas por las TIC, podrían fortalecer el uso de estas tecnologías entre el profesorado (Pheng et al., 2021), pudiéndose reflejar en el futuro un avance positivo en la comprensión y uso de los conceptos TIC, TAC, TEP y TRIC en la educación.

Conclusiones

Ante la necesidad de aplicar las nuevas tecnologías en las aulas, se ha considerado fundamental evaluar el conocimiento que tienen los profesores sobre las TIC, TAC, TEP y TRIC, así como su aplicación en la práctica docente. Los resultados indican que los docentes conocen mejor las TIC, debido a su uso habitual en el entorno educativo. Asimismo, los profesores destacan la importancia de una actitud positiva hacia el uso de estas tecnologías y su valor en la enseñanza.

El estudio revela que el conocimiento de las siglas y conceptos de las TAC es significativamente menor, y aún más reducido para las TEP y TRIC. Esto subraya la necesidad de proporcionar información y formación específica sobre estos conceptos. Tras la ponencia organizada, se observó una mejora notable en el conocimiento de los profesores sobre estas tecnologías, así como un reconocimiento de la importancia de su uso en las aulas.

La mayoría de los docentes (94.7%) reconocieron la necesidad de avanzar en el uso de tecnologías más avanzadas como las TAC, TEP y TRIC. También manifestaron la conveniencia de implementar estos recursos para desarrollar competencias en los estudiantes y optimizar los procedimientos didácticos. Sin embargo, persiste una resistencia entre algunos docentes, quienes no se sienten suficientemente preparados o formados para utilizar estas tecnologías de manera generalizada.

En relación al conocimiento de las TIC es mayor entre mujeres en universidades privadas. En contraste, el conocimiento de las TAC y TEP es inferior entre las mujeres y sobre todo en las universidades privadas, aunque es similar en las públicas y entre diferentes rangos de edad. Esto destaca la necesidad de ampliar la formación entre los profesores universitarios, independientemente de su edad o género. Además, se percibe un menor conocimiento del término TRIC entre los docentes de universidades públicas y en todas las edades.

El estudio confirma que las mujeres en el ámbito público están más concienciadas e interesadas en el uso de las tecnologías educativas. Las mujeres, especialmente en las áreas de la educación y la salud, ocupan cada vez más puestos en los que se requiere un correcto uso de las TIC, mostrando un creciente interés

en su aprendizaje y aplicación adecuada.

Existen diferencias en las habilidades digitales según la edad de los docentes y el tipo de universidad (pública o privada), pero no existen diferencias significativas en función del género en cuanto a la competencia en el uso y desarrollo de las TIC. Sin embargo, los estudiantes presentan dificultades en la búsqueda de información contrastada en Internet y en la capacidad innovadora y creativa para crear elementos digitales de comunicación.

Un aspecto preocupante para los profesores es cómo aplicar las tecnologías en sus clases mejorando su enseñanza. Es esencial considerar factores como la programación, la adaptación gradual, la autonomía de los estudiantes y la formación contínua de los profesores. Para fomentar el uso de las tecnologías en las clases, es urgente capacitar a los docentes en habilidades digitales y ofrecerles apoyo técnico. Además, los docentes sugieren que se debería contar con profesorado experto en TIC para supervisar el uso didáctico de las TIC por parte de los estudiantes.

Con el fin de aplicar el conocimiento en este campo, se proponen futuras investigaciones que se enfoquen en evaluar el impacto de la formación de las TIC, TAC, TEP y TRIC en la práctica docente a largo plazo. Así como explorar el grado de aplicación real de estos conocimientos en el aula y su impacto en el aprendizaje de los estudiantes.

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Conocimiento de la inteligencia artificial en futuros docentes de secundaria

Artificial intelligence knowledge of future secondary school teachers

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Resumen

Este artículo se centra en el estudio del conocimiento y uso de la tecnología e inteligencia artificial (IA) por parte de los futuros docentes de enseñanza Secundaria. Para ello, se empleó un diseño analítico descriptivo transversal con una metodología de encuesta mediante un cuestionario online, que evaluó el conocimiento, uso y percepciones sobre la IA y las tecnologías educativas, además de variables socio-demográficas, de un grupo de estudiantes del Máster Universitario en Formación del Profesorado. La muestra, de tipo no probabilístico y seleccionada por conveniencia, fue analizada con técnicas estadísti-cas descriptivas y comparativas, incluyendo frecuencias, porcentajes, medias y diferencias significativas según variables demográficas. Las respuestas

cualitativas fueron codificadas para identificar patrones temáticos. Los resultados muestran que los futuros docentes tienen un conocimiento variable de la IA y las tecnologías educativas, con una actitud generalmente positiva hacia su integración en la enseñanza. No obstante, se identifican áreas de mejora, especialmente en la formación específica en estas herra-mientas. Asimismo, en este artículo se proponen recomendaciones para mejorar la capacitación docente en tecnología e IA, sentando bases para la implementación de programas formativos más completos.

Palabras clave: Conocimiento, Docentes, Inteligencia artificial (IA), Educación Secundaria, Tecnología.

Abstract

This article focuses on the study of both the knowledge and use of technology and artificial intelligence (AI) by future secondary school teachers. For this purpose, a cross-sectional descriptive analytical design was used with an online questionnaire survey methodology, which evaluated the knowledge, use and perceptions about AI and educational technologies, as well as sociodemographic variables, of a group of students of the Master's Degree in Teacher Training. The sample, non-probabilistic and selected by convenience, was analyzed with descriptive and comparative statistical techniques, including frequencies, percentages, means and significant differences according to demographic variables. Qualitative responses were coded to identify thematic patterns. The results show that prospective teachers have a variable knowledge of AI and educational technologies, with a generally positive attitude towards their integration into teaching. However, areas for improvement are identified, especially in specific training in these tools. This article also proposes recommendations for improving teacher training in technology and AI, laying the groundwork for the implementation of more comprehensive training programs.

Keywords: Knowledge, Teachers, Artificial Intelligence (AI), Secondary education, Technology.

Introducción

En la actualidad, el avance de la tecnología y la inteligencia artificial (IA) está transformando rápidamente todos los ámbitos de la sociedad (Náñez-Alonso, 2025), y la educación no es una excepción (Fern, 2024). La integración de estas herramientas en el entorno educativo plantea retos y oportunidades para los docentes. Por ello, la formación del profesorado en competencias digitales ha cobrado especial relevancia en los últimos años (Antón-Sancho et al., 2021), dado que el uso efectivo de la tecnología en el aula puede mejorar los procesos de enseñanza-aprendizaje (Antón-Sancho et al., 2024), adaptándolos a las demandas actuales de una sociedad cada vez más interconectada.

Investigaciones recientes han señalado que la IA está desempeñando un papel crucial en la mejora de los sistemas de gestión del aprendizaje (Vergara et al., 2024). La integración de la IA en estos sistemas no solo facilita la personalización de las experiencias de aprendizaje, sino que también permite una adaptación más precisa a las necesidades y estilos de aprendizaje de cada estudiante. Se puede decir que la IA está siendo cada vez más usada en el sector educativo, existiendo experiencias positivas del uso de la IA en diferentes áreas de conocimiento (Pesovski et al., 2024; Torres-Peña et al., 2024). Además, los algoritmos predictivos que la IA utiliza son capaces de identificar dificultades de aprendizaje de manera anticipada (Ravichandran et al., 2023), lo que puede ayudar a implementar intervenciones pedagógicas tempranas mejorando con ello los resultados académicos globales. Este tipo de avances refuerza la relevancia de que los futuros docentes deban comprender el valor de esta tecnología, a la vez que también cuenten con la formación necesaria para integrar las herramientas de IA en sus aulas de manera efectiva, asegurando una educación más inclusiva y personalizada.

Aunque la IA se conoce desde mucho tiempo antes, ha sido a finales de 2022 cuando su uso ha despuntando en diversos sectores de la sociedad, justo cuando OpenAI presentó ChatGPT, un chatbot de IA que captó gran interés en los ámbitos económico y académico (Cheng, 2023). Este vertiginoso afán por formar a los docentes, y que así puedan adaptarse al nuevo paradigma educativo, ha favorecido que esta temática sea un “hot topic” dentro del mundo de la investigación educativa y otros ámbitos científicos (Merchán et al., 2024; Paek & Kim, 2021; Regona et al., 2022). Este contexto plantea interrogantes clave

sobre la preparación de los futuros docentes para enfrentar los retos que la tecnología impone en el aula, especialmente en niveles educativos preuniversitarios como la enseñanza Secundaria y el bachillerato, donde el aprendizaje debe adaptarse a las habilidades y a las expectativas tecnológicas de los estudiantes. La tecnología educativa, definida como el uso de herramientas tecnológicas para facilitar y mejorar los procesos de enseñanza y aprendizaje (Hughes & Roblyer, 2023), abarca una amplia gama de recursos, desde pizarras digitales y plataformas de aprendizaje en línea hasta aplicaciones de realidad aumentada e inteligencia artificial. La inclusión de estas herramientas en la educación no solo exige un conocimiento técnico, sino también una reflexión crítica sobre cómo pueden influir en el desarrollo de competencias tanto técnicas como socioemocionales en los estudiantes, ya que es esencial que los futuros docentes no solo comprendan cómo utilizar la IA, sino también los aspectos éticos y sociales vinculados a su utilización (Williamson, 2017; Schiff, 2022).

En este sentido, el objetivo del presente trabajo es analizar los conocimientos de los futuros docentes preuniversitarios de las aplicaciones de IA más usadas en el sector educativo, así como examinar qué opinan estos de la utilidad de la IA en el proceso de enseñanza-aprendizaje. Para ello, este artículo consta de los siguientes apartados: (i) introducción, que presenta el estado actual sobre la relación entre la inteligencia artificial y el ámbito educativo; (ii) revisión de la literatura, donde se presenta una revisión del estado del arte del tema en cuestión; (iii) metodología, donde se describe el tipo de estudio, los criterios de selección de los participantes, el proceso de recogida de datos así como el tipo de análisis de los mismos; (iv) resultados y discusión, donde se muestran las respuestas de los investigados así como las relaciones entre ellas y una discusión de los datos obtenidos; (v) limitaciones del estudio, que indica las posibles restricciones y factores que podrían haber afectado los resultados y su interpretación; y (vi) conclusiones, que refleja las aportaciones más relevantes así como la sugerencia de recomendaciones.

Revisión de la literatura

Aunque ha habido un debate importante en el uso de la IA en el aula, dado que algunos docentes no son partidarios de dejar a los alumnos que la usen -debido a posibles dependencias tecnológicas y desafíos éticos (Selwyn, 2019)-, también hay otros que son partidarios a que los alumnos aprendan a usarla (Baidoo-Anu & Owusu-Ansah, 2023), dado que el hecho de conocer y saber usar correctamente la IA les puede ayudar en su futuro profesional (Bettayeb, et al., 2024; Luckin, 2025). Según estudios previos, la IA puede permitir a los profesores personalizar la educación y mejorar el rendimiento académico (Lucking et al., 2016), pero también hay profesores que temen la pérdida de control sobre el proceso educativo (Cui & Alias, 2024; Selwyn, 2024). Por otro lado, la percepción de los estudiantes es, en general, positiva, ya que la IA facilita el acceso a recursos educativos y asistencia automatizada (Holmes et al., 2022). Sin embargo, otros estudios evidencian su preocupación por una posible deshumanización del aprendizaje (Zawacki-Richter et al., 2019). De cualquier forma, en lo que están coincidiendo cada vez más los estudios es en la necesidad de capacitar al profesorado en recursos basados en las nuevas tecnologías, como por ejemplo la realidad virtual (Vergara et al., 2025), las aplicaciones de gamificación (Vergara et al., 2023), y por supuesto aplicaciones basadas en la IA, ya que esta formación sigue siendo una barrera significativa para su integración efectiva (Pokrivcakova, 2023). Por ello, el estudio presentado en este artículo es relevante al dar a conocer la opinión de futuros profesores de Educación Secundaria al respecto.

A pesar del creciente interés en la aplicación de la inteligencia artificial en contextos educativos y la abundante literatura sobre sus beneficios y desafíos, aún son escasos los estudios que abordan específicamente el nivel de conocimiento y las percepciones de los futuros docentes de Educación Secundaria en formación inicial. Este grupo es clave en la transformación pedagógica hacia entornos de aprendizaje más innovadores e inclusivos. Por ello, el presente estudio busca aportar evidencia empírica que permita comprender mejor las necesidades formativas de estos docentes respecto a la IA, identificando posibles brechas entre la teoría y la práctica, y proponiendo recomendaciones concretas para mejorar su preparación en esta área emergente.

Metodología

En la Figura 1 se muestra un esquema de la metodología seguida en el desarrollo de este trabajo de investigación. El trabajo aquí desarrollado se trata de un estudio analítico descriptivo transversal, basado en una metodología de encuesta. Para alcanzar los objetivos de este estudio, se desarrolló un muestreo no probabilístico intencional y de conveniencia constituido por alumnos del máster universitario en formación del profesorado (BOE número 340, 2020) que accedieron a participar voluntariamente. La población de este estudio estuvo constituida por los 140 alumnos matriculados en el curso 2023-24 en dicho máster de la universidad de estudio, de los cuales se obtuvieron 33 cuestionarios completados.

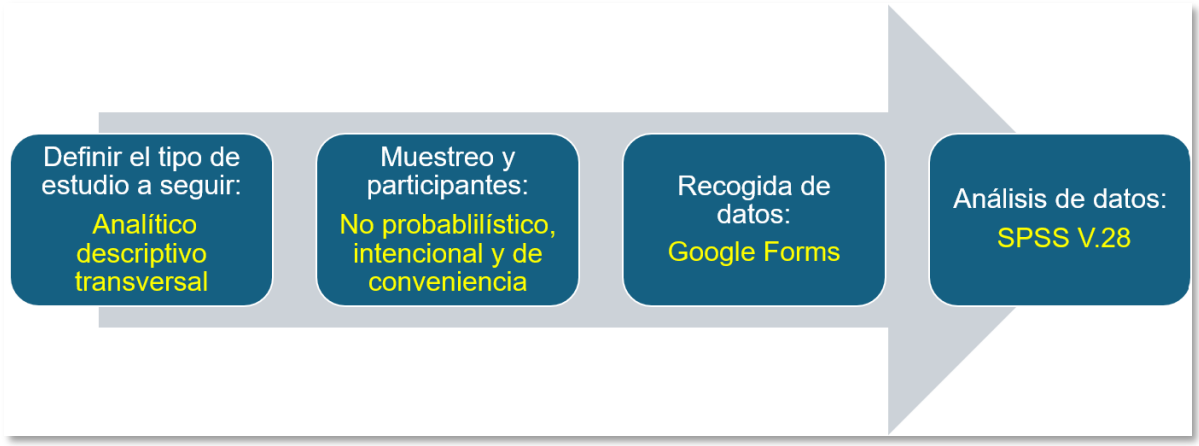

Figura 1. Esquema metodológíco seguido en el proceso de investigación.

Los criterios de selección de los participantes fueron los siguientes: (i) tenían que ser mayores de edad (>18 años); y (ii) tenían que haberse matriculado y finalizado los estudios del máster universitario en formación del profesorado en el curso académico 2023-24 (este aspecto limita el posible número de individuos, ya que gran parte de estos realizaron sus estudios en dos cursos académicos).

En el proceso de recogida de datos se elaboró un cuestionario *ad hoc* autoadministrado, supervisado por varios expertos en la materia y que consta de un total de 10 preguntas, dividido en tres secciones: (i) de carácter informativo para aceptar la confirmación de participación; (ii) de obtención de datos sociodemográficos (sexo, edad, experiencia laboral previa, lugar de residencia, especialidad en el máster) y del conocimiento acerca de la inteligencia artificial (8 preguntas con respuestas abiertas y cerradas con variables nominales y 2 preguntas con escala Likert –"Indique el grado de conocimiento que considera tener con respecto a los siguientes elementos" e "Indique la influencia que considera que tiene la inteligencia artificial en la educación tras el desarrollo de sus prácticas en el centro educativo"–); y (iii) de agradecimiento por la participación en la encuesta. Esta encuesta se diseñó en el entorno de la herramienta "Google Forms". Los datos obtenidos a partir de estos cuestionarios se evaluaron mediante el programa SPSS V.28. Se efectuaron estadísticos descriptivos para las variables cuantitativas mediante medias, desviaciones estándar y rangos, además de frecuencias y porcentajes para las variables cualitativas. Con la finalidad de relacionar las variables cuantitativas y cualitativas (más de dos categorías) se utilizó la prueba ANOVA y la prueba chi-cuadrado para la comparación de proporciones, estableciéndose el punto de significación estadística en $p<0,05$. Los datos obtenidos de la investigación fueron tratados conforme a la (BOE núm. 294, 2018) Ley Orgánica 3/2018, de 5 de diciembre, de Protección de Datos Personales y garantía de los derechos digitales.

Resultados y Discusión

La media de edad de los participantes fue de 37,3 años, siendo el 39,4% pertenecientes al género masculino y el 60,6% al femenino. Aunque el tamaño muestral podría considerarse una limitación del

estudio, conviene recalcar que presentó una destacada heterogeneidad, ya que los participantes procedían de diversas comunidades autónomas de España, como Castilla y León (10), Extremadura (6), Andalucía (5), Madrid (4), Comunidad Valenciana (2), Galicia (2), Asturias (1), Aragón (1), La Rioja (1) y Canarias (1). El 97% de los encuestados tenían experiencia laboral previa en sectores muy diversos, como sanidad, servicios, educación, economía, abogacía, construcción e incluso agricultura. Y las especialidades del máster en las que estaban inscritos eran procesos sanitarios (7), intervención sociosanitaria (3), economía (8), FOL (6), filosofía (4), tecnología (2), física y química (2) y matemáticas (1).

Los resultados obtenidos en relación con el conocimiento y destreza en el uso de diferentes aplicaciones de IA (Figura 2) resaltan que las aplicaciones más conocidas por los futuros docentes son Capcut, Canva y ChatGPT –esto se corresponde con la tendencia global a usar plataformas de diseño gráfico y generación de texto mediante IA en tareas cotidianas y profesionales (Dwivedi et al., 2021)–., mientras que otras aplicaciones como Runway, Designs.ai, Artbreeder, Dreamstudio, DinoBRAIN, Jasper AI, Rytr y Escribelo.ai, son completamente desconocidas para ellos. De todos modos, cabe destacar que algunas de estas aplicaciones están diseñadas para ámbitos específicos, como por ejemplo la creatividad y el diseño asistido por IA, y esto podría restringir su adopción entre los docentes (Hardaker & Glenn, 2025).

La falta de aplicabilidad directa en contextos educativos más generales podría explicar el menor interés o conocimiento sobre estas herramientas en comparación con aplicaciones de uso más extendido y versátil, como puede ser Canva o ChatGPT.

A pesar de ello, destaca que la mayoría de los encuestados considera tener un conocimiento limitado de estas herramientas más conocidas, ChatGPT y Canva, y otras aplicaciones avanzadas, lo que sugiere la necesidad formativa del profesorado de Educación Secundaria Obligatoria (ESO) en España. Este requerimiento de los docentes de tener una capacitación en IA es algo que se viene plasmando en muchos trabajos científicos (Iqbal et al., 2025; Khalil & Ebner, 2023; Lucas et al., 2024). De hecho, solo un 20% de los encuestados considera tener un “conocimiento alto” en competencias tecnológicas avanzadas, lo que refleja una desconexión entre la valoración de la IA y su aplicación práctica.

De este modo, los resultados mostrados en la Figura 2 sugieren que a pesar del crecimiento acelerado de la IA en diversas áreas, muchas herramientas especializadas basadas en la inteligencia artificial aún no son ampliamente conocidas por el profesorado. Esto se puede corresponder con estudios previos donde se ha indicado que la adopción de nuevas tecnologías depende en muchas ocasiones de factores como la accesibilidad, la educación y la familiaridad con la IA (Makridakis, 2017).

Los resultados del presente trabajo indican que, además, la mayoría de los encuestados (75,8%) considera “necesario” (45,5%) o “muy necesario” (30,3%) incluir la IA en el currículo docente, lo que coincide con investigaciones recientes que apuntan hacia la urgencia de incorporar estas herramientas en los programas de formación docente (Hughes & Roblyer, 2023). Además, estos resultados corroboran estudios previos donde se subraya que, aunque los docentes reconocen la importancia de las tecnologías emergentes, su implementación práctica es aún incipiente en los contextos educativos tradicionales debido a la falta de formación específica (Fernández-Batanero et al., 2022; Antón-Sancho et al., 2023).

Reforzando esta misma idea, conviene destacar que esta percepción generalizada de la relevancia de la IA en la educación es consistente con las recomendaciones de organismos internacionales, como la UNESCO (2020), que insta a los sistemas educativos a integrar la IA de manera estructurada y pedagógicamente significativa.

Por otro lado, en la Figura 3 se presentan los resultados de la percepción de los futuros docentes sobre la influencia que consideran que la IA tiene actualmente en el sector educativo, concretamente en cinco dimensiones clave del sector educativo: (i) metodología; (ii) contenidos; (iii) tareas o deberes del alumnado; (iv) aprendizaje; y (v) función y tareas del docente. Se ha usado una escala Likert subdividida en cuatro

niveles, indicando el 1 nada de influencia y el 4 influencia máxima. Aunque la IA tiene el potencial de personalizar las metodologías educativas mediante algoritmos que analizan el progreso del estudiante y ajustan los contenidos dinámicamente, su implementación masiva sigue siendo limitada (Lucking et al., 2016) y esto también queda reflejado en los resultados de la Figura 3 donde se observa que la metodología es valorada en su mayoría con bajas calificaciones.

En el resto de opciones (contenidos, tareas del alumnado, aprendizaje, tareas del docente) se puede apreciar que, aunque presentan una valoración superior, existe una reticencia a pensar que la IA tenga una gran influencia en el proceso de enseñanza-aprendizaje. En el caso de la influencia que puede tener la IA para el desarrollo de contenidos, muchos docentes prefieren mantener el control sobre el diseño curricular, como señala Holmes et al. (2022), lo que se corresponde con las valoraciones bajas encontradas en la Figura 3. Los resultados encontrados para las tareas del alumno son totalmente diferentes, ya que la valoración se encuentra principalmente entre 3 y 4, lo que es consistente con estudios previos que indican la posibilidad que ofrece la IA a los alumnos para resolver las tareas encomendadas por sus profesores (Álvarez-Herrero, 2024).

En relación a los resultados con el aprendizaje, la posición del profesorado no es clara, puesto que la mayoría de las valoraciones están centradas entre 2 y 3. Esto mismo ocurre con la última dimensión considerada (tareas del docente). Aunque es una realidad la capacidad de la IA para personalizar experiencias educativas y aumentar la accesibilidad a recursos educativos globales (Lucking et al., 2016), el profesorado aún percibe limitaciones en términos de interacción humana y desarrollo socioemocional.

Eso también se relaciona con el riesgo de deshumanizar el proceso educativo si se depende demasiado de la tecnología, lo que es un tema ampliamente tratado en muchos manuscritos (Kim & McGill, 2024).

Si esto último se une a la falta de conocimiento manifestada por los encuestados en relación a la IA –lo cual se corresponde con otros estudios recientes (Egara & Mosimege, 2024)–, sorprende que sí se valore que la IA es un factor influyente para realizar las tareas de los alumnos, pero no para las del profesor. Este resultado, que presenta cierta connotación negativa hacia la IA, es precisamente resultado del desconocimiento del profesorado ante las posibilidades de la IA, lo que vuelve a reforzar la necesidad de que los docentes necesitan una formación de esta tecnología. Este hecho se corresponde con otros artículos recientemente publicados, donde se habla de la alfabetización en la IA (Tramanillo & Zeni, 2024).

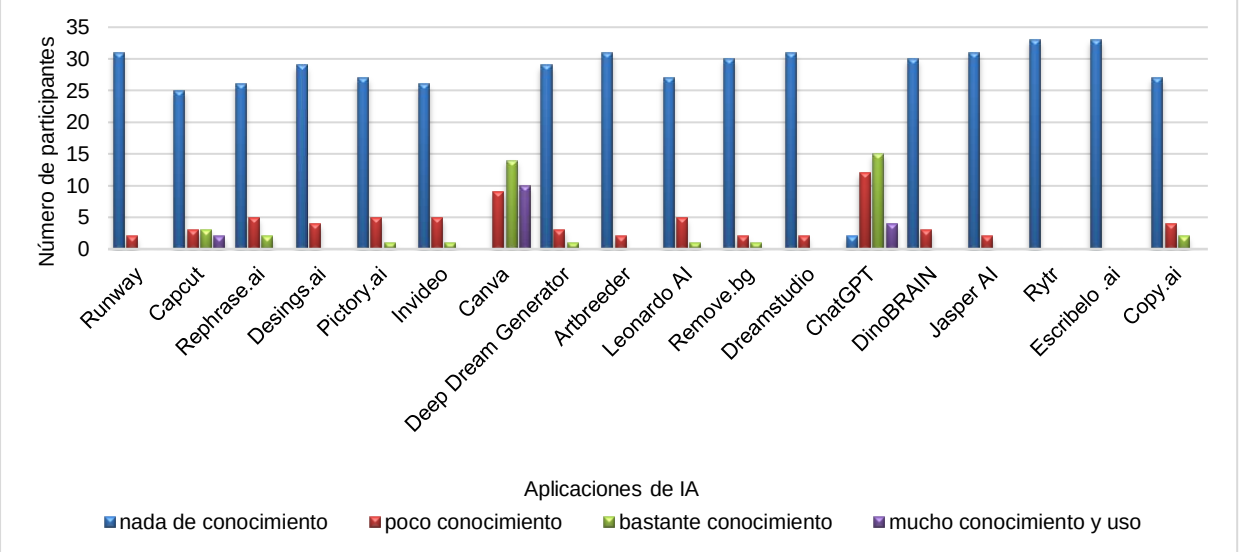

Figura 2. Conocimiento en aplicaciones de inteligencia artificial.

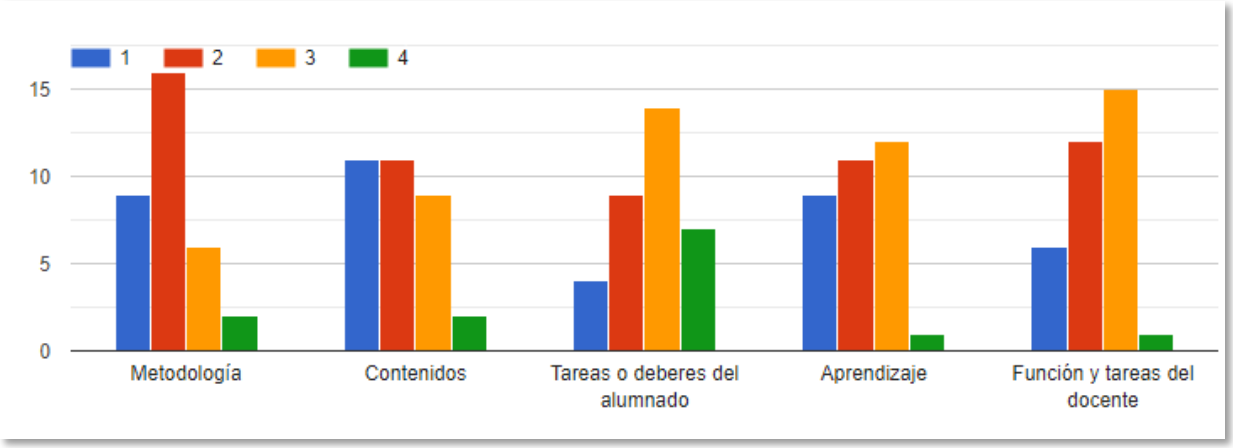

Figura 3. Influencia de la IA en la educación. Pregunta: "Indique el grado de conocimiento que considera tener con respecto a los siguientes elementos", siendo 1 – nada de influencia y 4 – mucha influencia.

Por último, se preguntó por las competencias que pudieran tener relación con la IA, con la opción de respuesta dicotómica (Sí/No), siendo las competencias de ámbitos más técnicos, como (i) competencia digital, (ii) competencia emprendedora, (iii) competencia matemática, científica, tecnológica e ingenieril, y la (iv) competencia lingüística, las más valoradas por el futuro profesorado de enseñanza Secundaria. En este sentido, las competencias más socioemocionales y creativas, como (i) competencia personal y social, (ii) competencia ciudadana y (iii) competencia en conciencia y expresión cultural, las que menos. Esto es consistente con estudios recientes (Goenechea & Valero-Franco, 2024) que respaldan la idea de que los futuros docentes de Educación Primaria asocian principalmente la IA con competencias técnicas, como la competencia digital y la competencia matemática, científica, tecnológica e ingenieril, mientras que la vinculan en menor medida con competencias socioemocionales y creativas, como la competencia ciudadana.

Ya existen muchos trabajos indicando que la tendencia a usar la IA en el mundo educativo es una realidad, y que por ello la formación en esta tecnología es necesaria (Leoste et al, 2021; Lin et al, 2022; Schiff, 2022). Hay que tener en cuenta que los estudiantes, por su juventud, van a estar más relacionados con este tipo de tecnologías recientes (IA, realidad extendida, chatboots, etc..), y que, por lo tanto, las generaciones de profesores más alejados en edad al surgimiento de esta tecnología serán los que más deban actualizar sus conocimientos. En este trabajo se ha encuestado a futuros docentes y los resultados sugieren que tampoco las nuevas generaciones de profesorado presentan una competencia suficiente para afrontar los retos a los que el sector educativo se va a tener que enfrentar en los próximos años, por lo que es necesaria una formación específica para que los futuros docentes dominen aplicaciones de IA.

En este sentido, la formación del profesorado novel también es fundamental e imprescindible, quizás incluso estudios como este hacen intuir que en los propios programas oficiales del máster en profesorado debería incluirse una formación específica al respecto.

Limitaciones del estudio

Conviene tener en cuenta que los resultados de este trabajo se obtuvieron al cabo de un año de que las aplicaciones de IA se empezaran a ser conocidas en el sector educativo, por lo que es muy probable que la opinión de los futuros docentes pueda cambiar a lo largo de los siguientes años. De hecho, una posible línea de investigación podría ser la comparativa de los resultados aquí presentes con los que se puedan obtener dentro de unos años en los que la IA esté más implantada en el sector educativo. Otra limitación del estudio es el número de futuros profesores encuestados, que sugiere realizar un estudio con una

población mayor para corroborar los resultados. De cualquier modo, al revisar la bibliografía científica los resultados aquí obtenidos son consistentes con otros trabajos previamente publicados.

Conclusiones

Aunque el profesorado reconoce que la inteligencia artificial representa una indiscutible transformación en el ámbito educativo, los resultados de este estudio revelan una preocupante brecha de conocimiento. De este modo, se evidencia un desconocimiento generalizado tanto sobre las herramientas de IA disponibles en el mercado como sobre las competencias técnicas y pedagógicas necesarias para su implementación efectiva. Esta falta de formación obstaculiza claramente su integración en las aulas y puede limitar el aprovechamiento de sus beneficios para el aprendizaje.

Por ello, un evidente requerimiento educativo puede ser el desarrollo e implementación de un plan integral de formación docente que no solo familiarice al profesorado con estas herramientas, sino que también les dote de habilidades críticas para evaluar su aplicabilidad y diseñar estrategias pedagógicas que integren la IA de manera ética, inclusiva y eficaz. De hecho, los autores de este trabajo plantean la posibilidad de implementar en los propios planes de estudios del Máster en Formación del Profesorado asignaturas específicas que ayuden a desarrollar en los futuros docentes una capacitación en el uso de apps basadas en IA con fines educativos. Solo a través de esta preparación, los docentes podrán afrontar con éxito los desafíos educativos de los próximos años y, al mismo tiempo, potenciar una enseñanza más personalizada y efectiva, optimizando así los resultados de aprendizaje de los estudiantes.

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Foreign language communicative competence in the digital age: A methodology for students of various specialties

Competencia comunicativa en lenguas extranjeras en la era digital: Una metodología para estudiantes de diversas especialidades

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Abstract

This study analyzes the development of foreign language communicative competence in the context of digitalization. It highlights the importance of contextual learning and digital information technologies in

enhancing students' foreign language proficiency. The study identifies key structural components of communicative competence and explores the role of students' adaptation to new digital learning methods in higher education. A methodology for developing foreign language communicative competence in students of various specialties is proposed, detailing essential tasks, motivations, approaches, and factors for its successful implementation. The study employs a mixed-method approach, combining theoretical analysis, pedagogical observations, student and teacher surveys, and an experimental study involving 160 third-year students. The experiment was divided into an initial assessment and an intervention stage, where the proposed methodology was applied to the experimental group. Results indicate a statistically significant improvement in the experimental group, confirming the methodology's effectiveness. The findings emphasize the value of integrating smart technologies and digital tools in foreign language education. The study concludes that digitalization enhances the formation of foreign language communicative competence, offering insights for curriculum development and pedagogical strategies in higher education. Future research should explore virtual learning environments and advanced training for educators.

Keywords: foreign language communicative competence, digitalization, higher education, smart technologies, pedagogical innovation.

Resumen

Este estudio analiza el desarrollo de la competencia comunicativa en lenguas extranjeras en el contexto de la digitalización. Se destaca la importancia del aprendizaje contextual y el uso de tecnologías de la información digitales para mejorar la competencia lingüística de los estudiantes. Además, se identifican los principales componentes estructurales de la competencia comunicativa y se examina el papel de la adaptación de los estudiantes a nuevos métodos de aprendizaje digital en la educación superior. Se propone una metodología para el desarrollo de la competencia comunicativa en lenguas extranjeras en estudiantes de diversas especialidades, detallando las tareas esenciales, motivaciones, enfoques y factores clave para su implementación efectiva. El estudio emplea un enfoque mixto, combinando análisis teórico, observaciones pedagógicas, encuestas a estudiantes y docentes, y un experimento con 160 estudiantes de tercer año. El experimento se dividió en una fase de diagnóstico inicial y una fase de intervención en la que se aplicó la metodología propuesta al grupo experimental. Los resultados muestran una mejora estadísticamente significativa en el grupo experimental, lo que confirma la efectividad de la metodología. Se concluye que la digitalización favorece la formación de la competencia comunicativa en lenguas extranjeras, proporcionando aportes para el desarrollo curricular y estrategias pedagógicas en la educación superior.

Palabras clave: competencia comunicativa en lengua extranjera, digitalización, educación superior, tecnologías inteligentes, innovación pedagógica.

Introduction

The process of effective expansion of international cooperation in education and with companies in various industries and economies with different countries has been taking place in recent years. Radical changes are being implemented in the educational process of higher education, and approaches, methods, and content of studies at universities are being revised. For all graduates of higher education, issues of international communications are becoming relevant. The problem of effective interaction between representatives of various industries of different countries is gaining particular importance. Cooperation with foreign partners requires the development of professional skills in students and communication skills, the development of high-level competencies related to business professional communication in a foreign language.

To successfully solve the above problems, systematic work is required from the future modern specialist to improve and develop skills and abilities for communicative, practical, business communication in a foreign language, in-depth knowledge of the specialty, to conduct conversations on professional and general topics, the ability to work with original literature while continuing to develop language competence.

In the process of innovative development of the higher education system, one of the most important tasks of forming a multicultural linguistic personality of a future specialist is the study of a foreign language, which has become necessary in the work of many people in various spheres of their lives, to travel abroad to borrow advanced experience, to communicate in writing or orally in a foreign language.

The development of mass media and the growth of people's mobility have contributed to an increase in the need for knowledge of a foreign language.

The formation of foreign language competence is envisaged during the educational process, where the student, together with the teacher, is responsible for the ultimate goal of forming readiness for intercultural communication through a foreign language, acquires learning abilities where he is the main participant in the educational process and plans his process of self-education, self-development, self-improvement to acquire new relevant knowledge.

Under the guidance of an experienced teacher in modern conditions, the correctly chosen methodology for teaching a foreign language, the organization of educational work, clear planning of the educational process taking into account the needs of the student's professional and language training, his mobility, organization, willingness to work on improving skills and abilities and their further development will give a positive result for fluency in a foreign language (Kohut, 2022).

Therefore, we see that the formation of foreign language communicative competence of students in the conditions of digitalization is an urgent problem of today.

Literature Review

Recently, in the conditions of digitalization, the formation of foreign language communicative competence of students in the field of higher professional education and highlighting the issue of defining professional competencies of the individual, methods of its formation are especially relevant.

S. Shandruk, & Yu. Arkushyna (2021) analyzed the content of the views of scientists on the definition of the concept of "competence" and showed the essence of the process of forming foreign language communicative competence in future specialists at non-linguistic faculties in higher pedagogical education institutions. As the basis of professional competence, they considered the history of the formation of the competency approach.

The research of V. Drozdova & K. Rudnitska (2021) highlights the content and structural components of foreign language communicative competence, which are fundamental to the development of general didactic principles for its formation.

H. Salashchenko (2019) reveals the features of the application of the project activity method to form foreign language communicative competence of students in the field of higher professional education. He devotes his research to implementing theoretical analysis of modern research and conducting a theoretical review of the specifics of the formation of foreign language competence in the process of student education.

The same problem is addressed in the study of I. Kohut (2022). A theoretical analysis of modern studies on the formation of foreign language competence in students of various specialties was carried out, taking into account the specifics of their future professional activity, and directions for developing general didactic principles for the formation of foreign language competence of subjects of study were identified. Based on the results of the generalization of the research results, the concept of foreign language communicative competence was analyzed; the goal of the formation of foreign language competence and the entire professional training of modern students in a foreign language was outlined, to carry out foreign language communication with native speakers of a foreign language, solving communicative tasks in the field of professional activity for the study of foreign experience. Contextual learning is presented as the basis for

the development of foreign language competence. Three basic forms of students' activity in contextual learning were identified: quasi-professional activity, academic-type educational activity, and educational-professional activity, which correspond to: imitation, social, and semiotic educational models.

The issue of forming foreign language communicative competence of students in the field of higher professional education is being paid attention to by scientists precisely in the conditions of digitalization.

N. Honcharenko-Zakrevska, & N. Diukanova (2022) presented a list of the most effective methods of increasing the level of communicative competence of students and forming foreign language communicative competence in them with wide access to open electronic resources, which is achieved through the use of innovative educational computer programs and is determined by the innovative format of education. They identified the advantages and features of digital learning, such as multimedia, flexibility, adaptability, personalization of learning in interaction, and cooperation with the teacher.

I. Hotsynets (2022) also considered the issue of forming foreign language communicative competence of applicants for the educational space of higher education in the conditions of digitalization of the education system, considered the issue of the expediency of introducing innovative technologies into the educational process, the search for optimal forms and methods of teaching a foreign language in universities, Recently, in the conditions of digitalization, the formation of foreign language communicative competence of students in the field of higher professional education and highlighting the issue of defining professional competencies of the individual, methods of its formation is especially relevant.

S. Shandruk, & Yu. Arkushyna (2021) analyzed the content of the views of scientists on the definition of the concept of "competence" and showed the essence of the process of forming foreign language communicative competence in future specialists at non-linguistic faculties in institutions of higher pedagogical education. As the foundations of professional competence, the history of the formation of a competency approach was considered. Research by V. Drozdova & K. Rudnitska (2021) highlights the content component and structural components of foreign language communicative competence, which are about the development of general didactic principles of its formation, fundamental. The features of the application of the project activity method to form foreign language communicative competence of students in the field of higher professional education are revealed. The feasibility of using Smart technologies and creating an effective educational space of higher education is presented. Attention is focused on technologies and methods used in innovative education, and their didactic characteristics are presented.

So, scientists consider the issue of forming foreign language communicative competence of applicants for the educational space of higher education in the conditions of digitalization of the education system, the issue of the expediency of introducing innovative technologies into the educational process, the search for optimal forms and methods of teaching a foreign language in universities. Recently, in the conditions of digitalization, the formation of foreign language communicative competence of students in the field of higher professional education and highlighting the issue of determining the professional competencies of the individual, methods of its formation are especially relevant. The content of the views of scientists on the definition of the concept of "competence" is analyzed and the essence of the process of forming foreign language communicative competence in future specialists as the basis of professional competence is shown, the expediency of using Smart technologies and creating an effective educational space of higher education in the conditions of digitalization is presented.

The purpose of the article is to verify the effectiveness of the developed methodology for forming foreign language communicative competence in students of various specialties in the conditions of digitalization.

Methodology

Research methods:

- *Theoretical* – analysis of literature on the problem of forming foreign language communicative competence in students of various specialties in conditions of digitalization to clarify the theoretical and methodological approaches of the study and the main definitions of the study, substantiation of the developed methodology for forming foreign language communicative competence in students of various specialties in conditions of digitalization;
- *Empirical* – generalization of innovative experience of the developed methodology for forming foreign language communicative competence in students of various specialties in conditions of digitalization, personal pedagogical experience; pedagogical questionnaires, conversations with students, teachers to determine the state of formation of foreign language communicative competence in students of various specialties; to determine the effectiveness of innovative methods of teaching a foreign language – the method of hierarchy analysis; observation of the process of using the proposed methodology. Pedagogical experiment was the main empirical research method. Methods of mathematical statistics were used during data processing to verify the formulated hypothesis.

The experiment involved 160 third-year students of various majors.

The experiment consisted of two stages: ascertaining and forming. The main diagnostic methods were: individual interviews with students and teachers; observation; questionnaire method.

The purpose of the ascertaining stage of the experiment was to determine the initial level of foreign language communicative competence in students of various majors in the conditions of digitalization and to identify the influence of dominant motives that determine students' attitude to learning a foreign language, in particular, to the use of computer technologies in the learning process.

The results obtained at the ascertaining stage of the experiment showed the need to implement the author's methodology for the formation of foreign language communicative competence in students of various majors in the conditions of digitalization and to divide students into two groups for further research. Students were divided into EG and CG.

At the formative stage of the experiment, training was conducted using the author's methodology for the formation of foreign language communicative competence in students of various specialties in conditions of digitalization, in which 80 EG students participated.

To verify the effectiveness of the developed methodology for the formation of foreign language communicative competence in students of various specialties in conditions of digitalization in the CG and EG, a final questionnaire was conducted at the formative stage of the study.

Based on the data obtained, it can be concluded that the developed methodology for the formation of foreign language communicative competence in students of various specialties in conditions of digitalization is effective, as evidenced by the positive changes observed during the formative experiment in the EG. In the control group respondents, there were minor changes in the levels of the corresponding formation of foreign language communicative competence in students of various specialties in conditions of digitalization.

In the study, we used the procedure for checking the significance of the relationship developed by R. Fisher to reconcile the sample results with the proposed assumption regarding the possibility of discrepancies.

The effectiveness of the implementation of the author's methodology for the formation of foreign language communicative competence in students of various specialties in the conditions of digitalization is proven

by determining the observed value of the student's t-test and comparing the results of the ascertaining and formative stages of the experiment.

With a reliability of α=0.05, we assert that a statistically significant difference was identified between the mean values, confirming the hypothesis of the experimental study. This is due to mathematical and statistical analysis showing a significant increase in the number of respondents from various specialties with high and medium levels of foreign language communicative competence in the experimental group, contrasted with a decrease among those with low levels of competence.

Consequently, the developed methodology for enhancing foreign language communicative competence in students from different specialties in the context of digitalization has positively influenced the development of the professional competence of future specialists.

The conducted experiment validated the working hypothesis: enhancing the level of foreign language communicative competence in students from various specialties in a digital context supports positive dynamics in forming the professional competence of future specialists and can be achieved through the application of the developed methodology methodology.

Results and Discussion

The content of foreign language communicative competence.

As part of the professional competence of a specialist, our study considers foreign language communicative competence, which consists in the future specialist's possession of a foreign language at a functional level, which will allow the specialist to constantly improve himself and expand business contacts with foreign partners through professional communication with foreign colleagues. Therefore, the concept of "foreign language competence" is a type of communicative competence and a component of professional competence.

At the stage of professional training, the formation of foreign language competence of students is determined by the system of requirements for modern specialists in the labor market and is an important task of modern higher education didactics. Because it is foreign language communicative competence, based on the developed and acquired skills to acquire new experience, that is a condition for the professional successful growth of a specialist through the implementation of intercultural interaction with specialists from other countries and the study of the results of the activities of foreign specialists.

Part of the professional competence of students is defined as foreign language competence, which is understood as a set of professional and general cultural competencies necessary for solving professional tasks at the functional level while mastering a foreign language.

One of the goals of specialized foreign language training and the formation of foreign language communicative competence in students of various specialties in the conditions of digitalization is to create conditions for the formation of readiness for mastering a future profession, the development of students' professional interests and educational and cognitive interests of students. In higher educational institutions, foreign language classes orient students of non-philological profiles to master the language within the framework of their chosen specialty as a means of communication. Therefore, it is logical that the assimilation of the content of a foreign language within the framework of a professionally oriented module is carried out, taking into account the profile of the higher education institution (Pérez & Heinsch, 2021).

The means of the discipline "Foreign Language" also form the skills of professional mobility of the future specialist. The student is immersed in a situation of professional activity when mastering professionally oriented content of training, which creates favorable conditions for additional motivation both for mastering the chosen specialty and for studying a foreign language.

Speaking about profile foreign language education, it should be emphasized that, on the other hand, when studying a foreign language, culture and language act in organic unity because mastering a foreign language means perfect mastery of a foreign culture. That is why a large amount of country-specific information about the country whose language is being studied is contained in the program of profile foreign language education and is professionally oriented and communicatively oriented.

Therefore, the main goal of teaching a foreign language is the formation of foreign language communicative competence in students of various specialties in conditions of digitalization. Considering the content of the definition of "foreign language communicative competence in students of various specialties" in the terminological field of modern scientific judgments, it is interpreted as a personal "ability of a specialist to solve a certain class of professional tasks using the knowledge obtained while studying a foreign language" (Stavytska, 2013).

Application of contextual learning for the development of foreign language communicative competence of students.

To develop the foreign language communicative competence of students, it may be worth applying contextual learning, which takes into account the context of professional real activity in the process of forming language competencies in participants of the educational process.

Three basic forms of activity in contextual learning of students are distinguished:

- Quasi-professional activity;
- Academic-type educational activity;
- Educational-professional activity.

In contextual learning of students, the basic forms of activity correspond to: social, imitation, semiotic, and educational models. The sequential implementation of forms of activity and the implementation of these models lead to the complex and holistic formation of foreign language communicative competence in students through the use of various technologies and educational tools (Kohut, 2022).

Aspects of interaction and the main components of foreign language communicative competence of a future specialist.

The success of communication primarily depends on the chosen styles and forms of communication, therefore, the formation of foreign language communicative competence should be aimed at mastering the following aspects of interaction by students:

- Within the framework of business contacts, language etiquette formulas, which are a component of professional language communication;
- Communicative genres, which are professionally defined for a specific specialty;
- The basics of rhetorical skills and knowledge;
- Skills to use terms in a business context;
- Patterns of determining the status-role characteristics of a partner;
- Rules for taking into account extralinguistic factors, which is an important parameter for planning communicative actions and assessing the communicative situation (personal qualities of a specialist and circumstances of communication).

We can see the main components of the foreign language communicative competence of the future specialist:

- *Linguistic (speech) component* – the student's ability to pronounce several grammatical phrases based on certain rules; the student's possession of a system of information about a foreign language at the lexical, phonetic, morphological, word-forming, stylistic, syntactic levels. The student possesses this component if he can use the language system in practice and has a clear idea of the language system. The level of skills and knowledge here depends on the level of language training;
- *Sociolinguistic component* – the student's ability, according to the situation, to transform and use language forms, places, relationships between communicants, etc., the formation of skills to use in adequate communication situations a unit of a foreign language, in combination with other words, the development of skills to correctly and competently use the mastered phonetic, grammatical, lexical material in oral and written forms in the process of learning a foreign language;
- *Social component* – the ability and desire to come into contact with other people; readiness and ability of the student to communicate; factors here are attitude towards other communicators, motives, needs, as well as self-esteem; ability of the student to quickly navigate in a social situation and manage it;
- *Socio-cultural component* contains knowledge of the socio-cultural context, the influence of the environment on the choice of language forms and assumes that the student knows the culture of native speakers and his own culture, differences and similarities between them, the ability in the socio-cultural context to use the resources of elements – social stereotypes, rules, customs, norms, etc.;
- *Reflective component* is characterized by the following aspects: mastery of joint activity skills; taking into account the features of various types of role behavior; objective assessment of one's contribution to solving collective tasks; independent organization of educational activities; mastery of skills in monitoring one's own activities; analysis of one's own achievements, behavior, character traits, physical and emotional state; compliance with norms of behavior in society, etc.; evaluation of one's activities from the perspective of aesthetic and moral values, legal norms, etc.;
- *Autolinguodidactical component* – the student's ability to independently reflect, constantly improve language skills, and be able to assess one's own level of knowledge of a foreign language;
- *Pragmatic component* – the student's ability to master the entire complex of communicative behavior in a particular linguistic and cultural community;
- *Discursive component* – the student's ability to achieve coherence of individual statements, to understand others, the ability to evoke discourse, and to use and interpret the forms and meanings of words to create texts.

These components meet the goals of teaching students a foreign language and fully reflect the content of foreign language communicative competence, and the effectiveness and efficiency of the formation of foreign language communicative competence of a future specialist is determined by the level of formation of each of the above-analyzed components (Ovcharenko, 2016).

Digital information technologies in the formation of foreign language communicative competence of students.

The most important structural components of foreign language communicative competence in the conditions of digitalization. Recently, in the conditions of digitalization, the formation of foreign language communicative competence of students in the field of higher professional education has become especially relevant.

Under modern conditions, digitalization is understood as a trend in the development of society, which is global and involves a comprehensive transformation of information into digital form in industry, economy, education, science, and other areas of human life.

One of the most sensitive to digitalization reform is the higher education system. The educational environment of a higher school includes in its content a set of digital technologies that enable higher education applicants to study at any time, taking into account a personally oriented approach and in any place, regardless of their localization (Knysh et al., 2024).

It is difficult to overestimate the importance of perfect command of a foreign language. Modern specialists of all industries must build a written and oral system of communication with colleagues, employees, and employers, which significantly increases their competitiveness in the global labor market within the global community.

Let us highlight the most important structural components (the level of development of which has quantitative dimensions) of foreign language communicative competence in the conditions of digitization:

- General, linguistic, professional, informational;
- Grammatical, lexical, phonetic, orthographic;
- Sociolinguistic, linguistic, regional studies;
- Pragmatic, strategic discursive (El Parlamento Europeo y el Consejo de la Unión Europea, 2006).

The formation of foreign language communicative competence of students in the conditions of digitalization is the final result of learning, which determines the readiness of a higher education graduate and his ability for professionally oriented foreign language communication in the process of professional activity.

Modern digital information technologies allow students to work with information independently, regardless of the starting level of foreign language proficiency (Topusov, 2017).

Advantages of using digital information technologies in the formation of foreign language communicative competence for students and teachers.

Let us highlight the advantages of using digital information technologies in the formation of foreign language communicative competence of students:

- When perceiving educational material, the possibility of strengthening the factor of clarity;
- An individual approach taking into account the personal qualities, abilities of students, and the level and type of motivation for learning;
- Increasing students' motivation through an interactive process of creative interaction with the resource;
- Emotional satisfaction of the main contingent of students.

Let us highlight the advantages of using digital information technologies for teachers in the formation of foreign language communicative competence in students:

- The possibility, due to the availability of information, of using interdisciplinary forms of learning;
- Focusing educational technologies on creative moments of planning and implementing the educational process;
- Creating comfortable working conditions;
- The possibility of interaction in an integrated environment of teachers of different disciplines;
- The possibility of organizing active communication in a foreign language in specific typical situations;
- Access to authentic material.

With this approach, in the conditions of digitalization, the teacher performs an advisory function, directing the efforts of students to achieve the desired result.

Adaptation of students to new methods and forms of learning in the conditions of digitalization after entering higher education.

Academic adaptation means the adaptation of recent entrants to the educational process at a higher education institution, the peculiarities of its organization, it is the psychological adaptation of students to a

new pedagogical system for them, to teaching methods, to the need to master a large amount of information and analyze methodological and scientific materials in a short time (Mytnyk et al., 2024).

In the conditions of digitalization, there is a growing need to improve and implement the resources of scientific and educational pedagogical activity, to develop cognitive-adaptive, innovative technologies, knowledge of which ensures high quality professional training of specialists in various specialties, enriching the content of professional disciplines with new technologies and ideas.

Supporting the process of adapting students to new methods and forms of learning in the conditions of digitalization after entering an innovative university cluster contributes to the formation of competencies, in particular, the formation of foreign language communicative competence, increasing their success, which is necessary for work in the professional sphere.

The use of digital information technologies accelerates the adaptation of students. Particularly effective are such technologies that include web quests, blogs, and podcasts. Participants in the educational process of higher education in the conditions of digitalization can create their own content and not only use ready-made Internet resources.

Also important are educational software in the conditions of digitalization, which include relevant databases, computer programs, electronic lectures, electronic textbooks designed for teaching, online directories, dictionaries, subject-oriented environments, educational and methodological complexes, generators of examples (situations), collections of tasks, computer illustrations and software and methodological complexes to support various types of classes (Bashkir, 2018).

Of particular importance in our context are educational computer programs, which are an essential adaptive tool for increasing the effectiveness of the formation of foreign language communicative competence of students. The principle of compiling educational computer programs is educational with rules, explanations, and samples of completed tasks. They may contain audio and video blocks, videos, slides, etc. (Bodnar, 2022).

It should be noted that the use of modern digital information technologies in the formation of foreign language communicative competence of students greatly facilitates the perception of new professional material.

If a text is simultaneously perceived by ear and displayed on the screen, the amount of knowledge that is remembered increases, the user's pronunciation and diction improve, and the person's vocabulary expands. After listening to the material, it is not difficult for a student to organize a discussion or compose a dialogue using emotional and personal content, which ensures optimal assimilation of information and the level of perception.

With this approach, students interact in a game setting, solve various situational tasks, reveal their creative potential, and distribute roles (Honcharenko-Zakrevska et al., 2022).

It is the work with computer educational programs that arouses interest in this type of tasks and a positive reaction among students.

Using innovative popular tools in learning foreign languages.

The most popular tool of the digital information environment is the modular object-oriented learning dynamic environment – the Moodle education management system, which is widely used in higher education institutions (Khalid, 2019).

When studying foreign languages, the system provides the opportunity to use innovative tools: authentic audio and video applications, video lectures, electronic teaching and learning materials, glossaries, webinars, and the ability to add hyperlinks to reference materials in Internet resources.

The use of Moodle in the educational space of higher education allows you to form and develop students' communicative and linguistic skills, taking into account their abilities and personal characteristics.

In higher education institutions, test tasks are often used, which allow you to automatically assess the level of students' knowledge online.

The teacher has the opportunity to adjust the test deadlines and increase the number of attempts during monitoring activities, as well as to comment in writing on both the success of the test in the group as a whole and the results of specific students.

When working independently, test tasks with automatic verification are effective because they enable students to control their level of assimilation of the material in dynamics through the gradual passage of certain stages of the educational process (Shuliak et al., 2022).

When learning a foreign language, an effective tool of the educational process is a vocabulary trainer, a modern Internet trainer, which allows the teacher to use this program in the mode of controlling knowledge of phonetic, grammatical, lexical aspects of a foreign language and to repeat and consolidate the studied material in classroom work.

Electronic dictionaries, various search and reference systems, encyclopedias are information and communication tools that allow you to make the educational process interesting, speed up work with the text, independently compile glossaries based on the use of search and reference systems, which can be used on relevant topics during classes (Honcharenko-Zakrevska & Diukanova, 2022).

Introduction of Smart technologies in foreign language classes to form foreign language communicative competence in students of various specialties in conditions of digitalization.

The main purpose of the development of educational systems is the concept of "Smart", which provides educational, electronic Internet content with technological operations, provides feedback from students and teachers and informatizes the exchange of knowledge between participants in the educational process of higher education.

The teacher, in conditions of digitalization, plays the role of coordinator and organizer of the educational process in the process of implementing Smart technologies in foreign language classes. Using educational content, the student and teacher are constantly in a linguistic authentic environment, searching for information, engaging in self-improvement and self-education, cooperating and communicating with other representatives of the educational community, etc.

The basis of the work of higher education institutions in conditions of digitalization should be the promotion and development of Smart education based on information and communication, innovative, sensory, mobile, and other technologies. In this case, the teacher's work is responsible and painstaking because the educational professional material must always be filled with relevant innovative content. It is necessary to constantly coordinate the work of students and provide them with qualified support.

New requirements for the training of future specialists are shaping the trends of the transition to Smart technologies. Creating conditions for higher education applicants to acquire skills and their own experience involves Smart approaches and not presenting "ready-made" knowledge to the student. The function of a teacher, according to the concept of Smart learning, is high-quality content navigation, and not the transmission of ready-made truths.

Today, many Smart technologies are used in the process of teaching a foreign language to form foreign language communicative competence in students of various specialties in the conditions of digitalization by teachers: Smart textbooks, interactive Smart Board, Smart projectors, social networks, websites, services, and Google tools (Hotsynets, 2022).

To form foreign language communicative competence in students of various specialties in the conditions of digitalization, we will propose the necessary tasks, motives, approaches, and factors for higher education institutions:

- Taking into account the specifics of the future professional activities of higher education applicants;
- In the context of a competency-based approach – developing the content of education in the subject;
- Identifying indicators and criteria for the development of foreign language communicative competence in higher education applicants;
- Determining the stages of studying thematic sections of the program during the training of higher education applicants;
- Determining the organizational and pedagogical conditions for the formation of foreign language communicative competence in students of various specialties in the conditions of digitalization;
- Developing a comprehensive program for the formation of foreign language communicative competence in students of various specialties in the conditions of digitalization, taking into account the complementary nature of modern scientific knowledge and interdisciplinary connections (Shandruk & Arkushyna, 2021).

The following motives contribute to the study of a foreign language in a higher education institution to form foreign language communicative competence in students of various specialties in the conditions of digitalization:

- *Linguistic-cognitive* – the desire of higher education students to learn speech phenomena;
- *Communicative* – determined in students in communication based on needs, ensuring the presence of communicative motivation, which consists in the desire to read special professional literature, to speak with native speakers in a foreign language, because in the native speech environment a foreign language has the status of an artificial means of communication;
- *Aesthetic* – associated with the awareness of personal significance and value for social development and with the highest feelings of a person;
- *Regional studies* – depend on the emotional interest of students and thematic orientation in the socio-domestic or professional sphere of communication.

In the process of studying a foreign language, the formation of foreign language communicative competence of students includes two approaches:

- A cognitive-activity approach that forms communicative skills in future specialists by creating situations in which higher education applicants have the opportunity to effectively form certain skills, master communicative-technological and communicative knowledge, and develop their own communicative professional qualities. The approach is based on the use of the following methods: methods of full and partial "immersion"; participation in international projects and programs of higher education applicants; modeling situations of everyday communication and business conversations; use of presentation educational and scientific activities, as a result of which the formation of foreign language communicative competence of students occurs; preparation of presentations in a foreign language related to future professional activities; holding discussions on a certain problem; situational and business games; use of innovative and interactive teaching methods – group work, discussions, brainstorming, etc.; participation in video and teleconferences; active use of modern training methods;
- A traditional approach, which, to form students' foreign language communicative competence, involves lecture and practical teaching of a foreign language and the formation of a system of basic knowledge in future specialists, which will serve as the basis for their further professional activities (Borovets,

2016), because the formation of foreign language competence consists in combining the skills of learning a foreign language with the content of the professional activity of the future specialist, which will contribute to the achievement of the key goal of training a higher education applicant – the formation of his own professional competence.

An integral quality of the personality is foreign language communicative competence because it is it that contributes to the adequate functioning of the individual in society and its adaptation in it, including the creative potential of the individual, certain values, and ways of communication. Provided that students possess a foreign language as a means of communication, the formation of foreign language communicative competence in future specialists occurs.

The priority factor that determines the content of the communicative process, its overall effectiveness, is the level of its formation. Therefore, the formation of foreign language communicative competence should include:

- The conscious position of students (communicatively competent), which will ensure their further professional development and self-improvement;
- Students acquire a basic system of skills, abilities, and knowledge necessary for effective foreign language communication in the process of professional activity (Shandruk & Arkushyna, 2021).

Results of experimental work on testing the methodology for the formation of foreign language communicative competence in students of various specialties in conditions of digitalization.

160 third-year students of various specialties participated in the experiment.

The experiment consisted of two stages: ascertaining and forming. The main diagnostic methods were: individual conversations with students and teachers; observation; questionnaire method.

The purpose of the ascertaining stage of the experiment was to determine the level of foreign language communicative competence in students of various specialties in conditions of digitalization and to identify the influence of dominant motives that determine students' attitudes towards learning a foreign language, in particular, to the use of computer technologies in the learning process.

According to the results of the initial questionnaire at the ascertaining stage of the experiment, the following results were obtained regarding the formation of foreign language communicative competence in students of various specialties in conditions of digitalization and readiness to use computer technologies for learning (Fig. 1):

- Initial level: – 42%;
- Average level: – 38%;
- Sufficient level: – 13%;
- High level: – 7%.

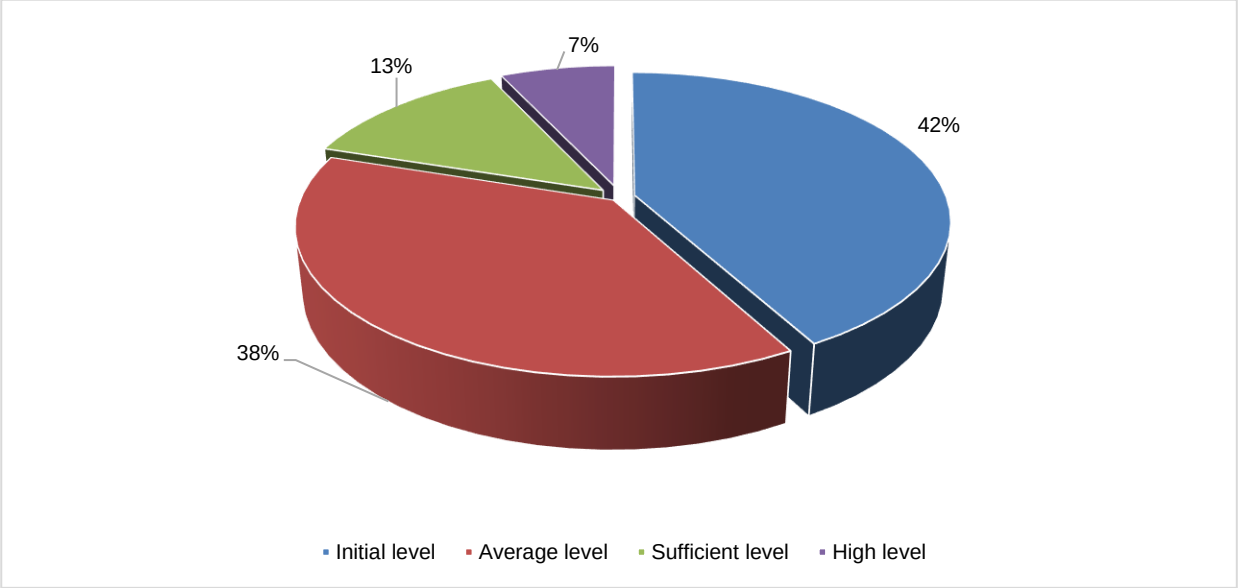

Figure 1. Distribution of Foreign Language Communicative Competence Levels.

It was found that students are not sufficiently prepared to use computer technologies in research and educational activities, do not use technical means in classes, have poor knowledge of software: web browser, programs for communication and data exchange, do not know enough about the resources of the electronic network for gaining knowledge and how to use computer technologies when solving practical exercises, are not confident enough in using them in practical and educational situations and independently mastering the functional characteristics of computer technologies and as a result, students of different specialties have unformed foreign language communicative competence in the conditions of digitalization. The results obtained at the ascertaining stage of the experiment showed the need to implement the author's methodology for the formation of foreign language communicative competence in students of different specialties in the conditions of digitalization and divide students into two groups for further research. Students were divided into EG and CG.

At the formative stage of the experiment, training was conducted using the author's methodology for the formation of foreign language communicative competence in students of various specialties in conditions of digitalization, in which 80 EG students participated.

Students were offered the use of contextual learning to develop foreign language communicative competence, the content of foreign language communicative competence was presented, and the main aspects of interaction and the main components of foreign language communicative competence of a future specialist were identified. The methodology included digital information technologies in the formation of foreign language communicative competence of students and helped to clarify the most important structural components of foreign language communicative competence in conditions of digitalization.

Students and teachers identified the advantages of using digital information technologies in the formation of foreign language communicative competence.

The use of innovative popular tools in learning a foreign language showed the need to implement Smart technologies in foreign language classes to form foreign language communicative competence in students of various specialties in conditions of digitalization. To form foreign language communicative competence in students of various specialties in conditions of digitalization, EG students were offered the necessary tasks, motives, approaches, and factors for high-quality implementation of the proposed methodology. CGs were engaged in standard methodology.

To verify the effectiveness of the developed methodology for the formation of foreign language communicative competence in students of various specialties in conditions of digitalization, a final questionnaire was conducted in CGs and EGs.

At the end of the experiment, we received the results of the final questionnaire, which proved that the effectiveness of the developed methodology is significant since we received positive dynamics of the research results.

After the formative stage of the experiment, the level distribution of EG students was as follows (Fig. 2):

- Initial level – 10% of students (versus 42% at the beginning of the experiment);
- Average level – 20% (versus 38% at the beginning of the experiment);
- Sufficient level – 35% (versus 13% at the beginning of the experiment);
- High level – 35% (versus 7% at the beginning of the experiment).

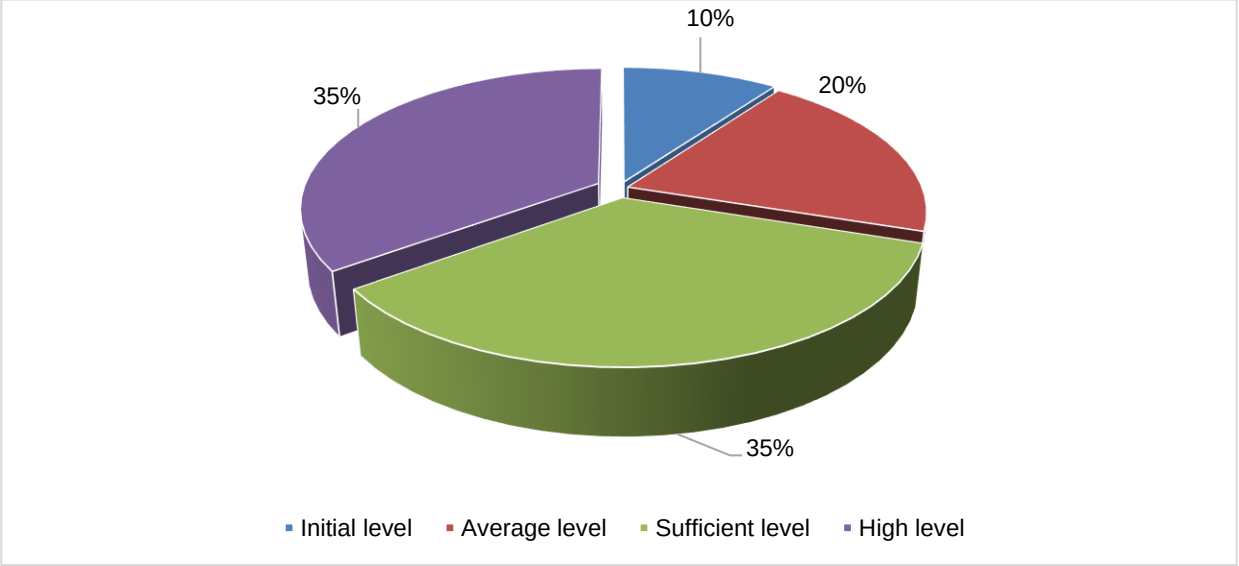

Figure 2. Student Level Distribution After Experiment.

In the control group respondents, there were minor changes in the levels of the corresponding formation of foreign language communicative competence in students of various specialties in the conditions of digitalization (Fig. 3):

- Initial level – 31% of students (versus 42% at the beginning of the experiment);
- Average level – 31% (versus 38% at the beginning of the experiment);
- Sufficient level – 26% (versus 13% at the beginning of the experiment);
- High level – 12% (versus 7% at the beginning of the experiment), which indicates a significant effectiveness of the training of EC students.

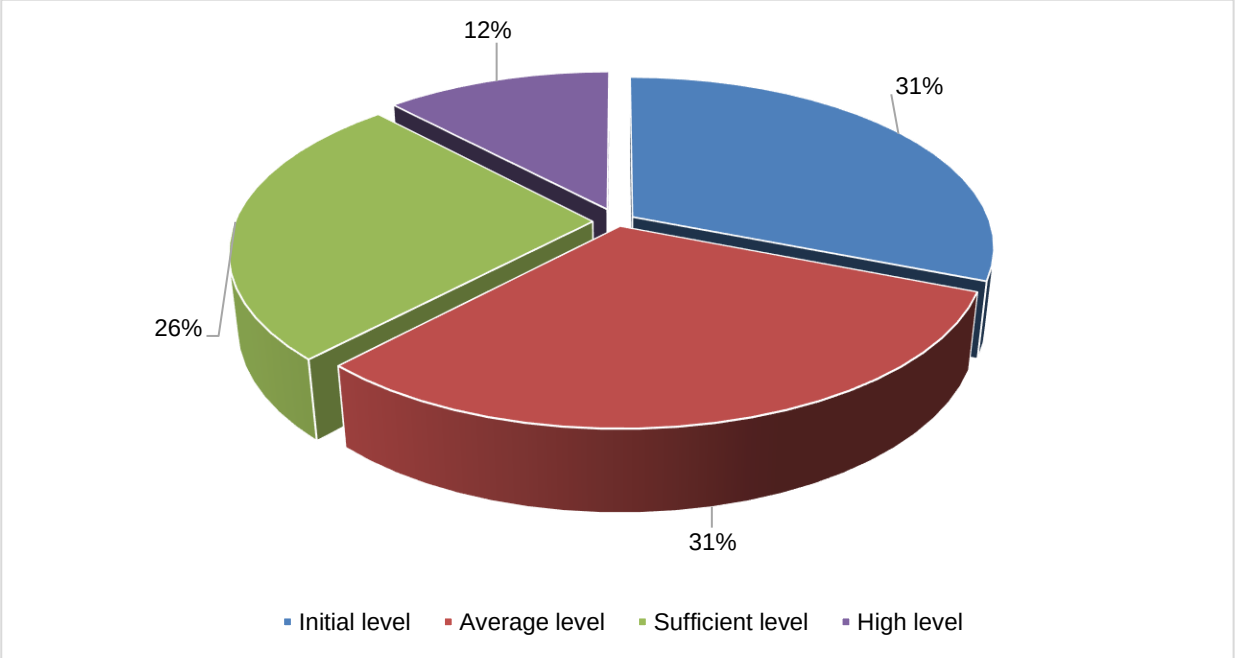

Figure 3. Levels of Foreign Language Competence in Control Group.

Based on the data obtained, it can be concluded that the developed methodology for the formation of foreign language communicative competence in students of various specialties in the conditions of digitalization is effective, as evidenced by the positive changes observed during the formative experiment.

In the study, we used the procedure for checking the significance of the connection developed by R. Fisher to reconcile the results of the sample with the proposed assumption regarding the possibility of discrepancies. The effectiveness of the implementation of the author's methodology for the formation of foreign language communicative competence in students of various specialties in the conditions of digitalization was proven by determining the observed value of the Student's t-test and comparing the results of the ascertaining and formative stages of the experiment.

With a reliability of $\alpha=0.05$, we claim that a statistically significant difference between the mean values was found, which confirms the hypothesis of the experimental study, since mathematical and statistical processing confirmed that we observe a significant increase in the number of respondents of different specialties with high and medium levels of formation of foreign language communicative competence in the experimental group and their decrease with a low level of formation.

Therefore, the developed methodology for the formation of foreign language communicative competence in students of different specialties in the conditions of digitalization contributed to positive dynamics in the formation of professional competence of future specialists. The conducted experiment confirmed the working hypothesis: increasing the level of foreign language communicative competence in students of different specialties in the conditions of digitalization contributes to positive dynamics in the formation of professional competence of future specialists and can be achieved by applying the developed methodology.

Conclusions

The content of foreign language communicative competence is analyzed. The importance of using contextual learning for the development of foreign language communicative competence of students, its interaction aspects, and main components are shown. Significant digital information technologies for the

formation of foreign language communicative competence of students are analyzed. The advantages of using digital information technologies in the formation of foreign language communicative competence for students and teachers are shown. The most important structural components of foreign language communicative competence in the conditions of digitalization are highlighted. The role of students' adaptation to new methods and forms of learning in the conditions of digitalization after entering higher education is revealed.

An essential factor is the introduction of Smart technologies in foreign language classes in order to form foreign language communicative competence in students of various specialties in the conditions of digitalization. To form foreign language communicative competence in students of different specialties in conditions of digitalization, a methodology for the formation of foreign language communicative competence in students of different specialties in conditions of digitalization has been proposed, which reveals the necessary tasks, motives, approaches, and factors for innovative work in higher education institutions.

An experiment was conducted. The results obtained at the ascertaining stage of the experiment showed the need to implement the author's methodology for the formation of foreign language communicative competence in students of different specialties in conditions of digitalization and to divide students into two groups for further research. Students were divided into EG and CG.

At the formative stage of the experiment, training was conducted using the author's methodology for the formation of foreign language communicative competence in students of different specialties in conditions of digitalization in EG.

Based on the data obtained, it can be concluded that the implementation of the developed methodology for the formation of foreign language communicative competence in students of different specialties in conditions of digitalization is effective, as evidenced by the positive changes observed during the formative experiment.

Thus, the developed methodology for the formation of foreign language communicative competence in students of various specialties in the conditions of digitalization contributed to positive dynamics in the formation of professional competence of future specialists.

Further research is required to develop a virtual learning environment for higher education, effective methods and forms of using innovative technologies in the formation of foreign language communicative competence in students of various specialties in the conditions of digitalization and advanced training of teaching staff in implementing the specified problem.

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Implementation of inclusive higher education through the use of digital technologies

Implementar una educación superior inclusiva mediante el uso de tecnologías digitales

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Abstract

The article reveals ways to use digital technologies to develop inclusive competence in future teachers. This will contribute to the practice-oriented teaching of students with special educational needs. A review

of modern digital technologies in education is revealed, and digital tools in inclusive higher education are revealed. The main methodological approaches that ensure the effective implementation of digital tools in the educational process of higher education are shown. The conceptual idea of the study is that the formation of inclusive competence in a future specialist through the use of digital technologies will contribute to practice-oriented teaching of students with special educational needs through the use of digital technologies, which is possible by forming a sufficient level of personal, cognitive and activity components. A pedagogical technology was developed, which was aimed at ensuring a sufficient level of inclusive competence of a future teacher for working with children with special needs. An experimental test of the effectiveness of the author's technology for training students was carried out within the framework of the implementation of the special course "Implementation of inclusive higher education through the use of digital technologies". As a result, we observe an increase in the overall coefficient of inclusive competence of students in the experimental groups, which indicates the effectiveness of the developed author's technology.

Keywords: inclusive education, use of digital technologies, inclusive competence of teachers, practice-oriented teaching, students with special educational needs.

Resumen

El artículo revela formas de formar competencias inclusivas en un futuro docente a través del uso de tecnologías digitales, lo que contribuirá a la enseñanza orientada a la práctica de estudiantes con necesidades educativas especiales mediante el uso de tecnologías digitales. Se realizó una revisión de las tecnologías digitales modernas en la educación y se revelaron las herramientas digitales en la educación superior inclusiva. Se muestran los principales enfoques metodológicos que aseguran la implementación efectiva de las herramientas digitales en el proceso educativo de la educación superior. La idea conceptual del estudio es que la formación de la competencia inclusiva en un futuro especialista mediante el uso de tecnologías digitales contribuirá a la enseñanza orientada a la práctica de los estudiantes con necesidades educativas especiales mediante el uso de tecnologías digitales, lo que es posible mediante la formación de un nivel suficiente de componentes personales, cognitivos y de actividad. Se desarrolló una tecnología pedagógica que tenía como objetivo garantizar un nivel suficiente de competencia inclusiva del futuro docente para trabajar con niños con necesidades especiales. En el marco de la implementación del curso especial "Implementación de una educación superior inclusiva mediante el uso de tecnologías digitales", se realizó una prueba experimental de la eficacia de la tecnología del autor para la formación de estudiantes. Como resultado, observamos un aumento en el coeficiente general de competencia inclusiva de los estudiantes en los grupos experimentales, lo que indica la eficacia de la tecnología desarrollada por el autor.

Palabras clave: educación inclusiva, uso de tecnologías digitales, competencia inclusiva del profesorado, aprendizaje orientado a la práctica, estudiantes con necesidades educativas especiales.

Introduction

Modern trends in education development have significantly changed approaches to learning in inclusive and special education. Digital technologies play a key role in ensuring the quality of learning and accessibility of learning for higher education students with special educational needs. An inclusive educational environment is created through the integration of digital tools, where all higher education students, regardless of cognitive, physical, and emotional barriers, have the opportunity to realize their potential.

Professional training of specialists in the field of inclusive education must meet modern requirements and challenges, providing them with the skills and necessary knowledge for effective further work. When training such specialists, it is the use of digital technologies that allows the integration of teaching methods, making them innovative, which contributes to improving the quality of the educational process in higher education. This includes a deep understanding of practical approaches and methodological foundations for the

implementation of digital tools and the technical aspects of their use. The ability to adapt the educational process of higher education to the individual needs of higher education students is one of the main advantages of digital technologies. To create interactive classes, individualized curricula, and adapted materials, teachers can use a variety of digital tools that meet the specific needs of each higher education student, which ensures equal opportunities for all participants in the educational process and contributes to their successful integration into the educational environment (Batsurovska & Kurepin, 2024).

Digital technologies, adapting the learning process to the needs and characteristics of higher education students, allow for its individualization. Meeting the requirements of inclusive learning, digital tools offer a wide range of modes and formats for presenting professional information (Hurenko et al., 2023).

The implementation of inclusive higher education through the use of digital technologies in higher education institutions requires ensuring equal access to education for all students, providing psychological and pedagogical support, support for students with special needs, and free access to the institution's infrastructure.

But, despite state support and the created regulatory and legislative foundation, the practical implementation of inclusive higher education is not taking place actively enough.

We must state that the educational needs of students in higher education are not fully taken into account, in particular from vulnerable groups of the population, such as persons with disabilities; orphans; low-income people; persons deprived of parental care; refugees, persons with limited capacity; victims of domestic violence and human trafficking, etc. Therefore, the problem of implementing inclusive higher education through the use of digital technologies is relevant and necessary today.

Literature Review

Having proven the relevance of implementing inclusive higher education through the use of digital technologies, let's analyze the works of scientists related to solving the problem.

Díaz Puppato et al., (2021) define an inclusive educational environment as one that provides all subjects of the educational process with opportunities for effective self-development and prove that solving the problem of educating young people with special needs is possible by adapting the educational environment to the needs of each participant in the education process, including equipment for the needs of all participants in the premises, methodological variability and flexibility of education, reforming the learning process, and a psychological climate that ensures the full participation of each participant in the educational process. H. Shevchuk (2021), in addition to solving the problem of educating young people with special needs by adapting the educational environment to the needs of each participant in the learning process, including equipment for the needs of all participants in the premises, methodological variability and flexibility of education, and reforming the learning process, emphasizes that in the context of creating an innovative inclusive educational environment, adherence to student-centered learning approaches is the basis for organizing the educational process, and the adaptation of educational activities must meet the capabilities and needs of each participant in the educational process.

Information and communication technologies in modern conditions have significantly changed education, providing participants in the educational process with completely new channels of influence and tools that affect the consciousness of the mass audience in the field of educational services.

Broad prospects for the accessibility of education and improving its quality are opened precisely by modern ICT tools for people with special needs. Therefore, A. Heta et al. (2018) conducted research at different levels of education on ICT support for inclusive learning. This collective study is one of the first attempts to systematize the experience of specialists in the aspect of implementing inclusive higher education through the use of digital technologies.

H. Davydenko (2023) analyzed the state policy of different countries of the world, revealed the theoretical and methodological principles of organizing digital inclusion, developed methodological recommendations for individuals from the most sensitive social groups, which revealed the accessibility of information presented in electronic and digital form, which is a significant methodological assistant for scientists, practitioners, educators working in the fields of the humanities and social sciences, for public activists who participate in the creation of easy-to-perceive content and socially attractive software.

The analysis of software developments and innovative research in the field of e-learning was carried out by A. Alekseeva, O. Antonenko, K. Zhadan & M. Lyfenko (2018) and they proved stable trends in the effectiveness of the implementation of e-learning throughout life, which requires a systematic transformation of the pedagogical and organizational foundations of education in higher education using the example of teaching students with visual impairments. They identified key areas in the field of e-learning education, which serve as a visual illustration of the transformation of education and the accessibility of technological innovations; they identified the main factors of the implementation of e-education in higher education institutions, in particular in the context of inclusion; in the field of e-learning, they identified trends in the development of research in the context of inclusion.

The problem of using digital technologies for work in an inclusive educational environment in the training of specialists in socio-economic specialties was considered by V. Berezan, N. Pakhomova, & V. Pakhomova (2022). The scientists revealed the essence of inclusive education, in the context of inclusive education they determined the role of a teacher, psychologist, defectologist, and speech therapist in working with children with special educational needs, showed the features of socio-pedagogical correctional and educational work with students with special educational needs and the possibilities of using digital technologies in the work of specialists in socio-economic specialties in the context of inclusive education, outlined ways to improve the system of professional training of specialists.

Taking into account the development of relevant guidelines for customers of educational services, H. Kossova-Silina & O. Potamoshnieva (2024) also analyzed the development trends and problems of modern digital technologies of inclusive education in the field of vocational education and considered the current problems of digital inclusion in vocational education institutions. Scientists have proven that "the successful implementation of digital technologies of inclusive education depends on solving certain challenges. It is important to constantly evaluate, study, and implement new initiatives in the field of digital learning and digital inclusion into the educational process, constantly update the educational process through the integration of digital technologies, and ensure the appropriate quality of educational programs and resources."

So, having analyzed the works of scientists related to solving the above problem, we emphasize that scientists have revealed the essence of inclusive education, emphasized the importance of adaptation to the needs of each participant in the educational environment, and the importance of student-centered learning approaches, which are the basis for organizing the educational process, researched ICT support for inclusive education, revealed the theoretical and methodological principles of organizing digital inclusion, determined the role of a teacher, psychologist, defectologist and speech therapist in working with children with special educational needs, showed the features of socio-pedagogical and correctional and educational work with students with special educational needs. However, we see the insufficiency of revealing the ways to implement inclusive higher education through the use of digital technologies.

Purpose of the research. Formation of inclusive competence in the future teacher through the use of digital technologies, which will contribute to practice-oriented teaching of students with special educational needs through the use of digital technologies.

Methodology

To achieve the set goal, a set of research methods was used:

- *Theoretical*: search and bibliographic – to systematize the analyzed source base (psychological, social, pedagogical, methodological); systemic analysis – carried out by the subject of research to clarify the essence of pedagogical phenomena; study of scientific and methodological literature, analysis of the state of development of the problem, Internet resources, experience of leading scientists and practitioners; systematization, induction, deduction –to formulate conclusions;
- *Empirical*: monitoring – at all stages of experimental work to determine the state of development of the problem under study; psychological and pedagogical diagnostics (oral and written survey, in particular using questionnaires) – to identify the level of formation of students' inclusive competence; pedagogical experiment – to test the effectiveness of selected forms of the educational process.

The conceptual idea of the study is that the formation of inclusive competence in a future specialist through the use of digital technologies will contribute to practice-oriented teaching of students with special educational needs through the use of digital technologies, which is possible by forming a sufficient level of personal, cognitive and activity components.

Therefore, the inclusive competence of a future teacher in the context of practice-oriented teaching of students with special educational needs consists of three components: personal (attitudes, motives, interests); cognitive (empirical and theoretical knowledge); and activity (strategies, skills, experience of students). To assess the level of formation of inclusive competence of a future teacher, criteria were developed: personal, cognitive, and activity. The study proposed the following indicators of the formation of inclusive competence of a future teacher through the use of digital technologies: theoretical, psychological, and practical. The coefficients of the formation of inclusive competence and levels were identified.

Experimental work on the formation of inclusive competence in a future teacher through the use of digital technologies to promote practice-oriented teaching of students with special educational needs through the use of digital technologies was carried out during 2022-2023 and covered 132 students of pedagogical specialties at the ascertaining stage. At the formative stage, 168 students were involved in the study.

During the ascertaining stage of the pedagogical experiment, it was found that the coefficient of the formation of inclusive competence of student teachers without specially organized training was low, which indicates the feasibility of its specially organized formation and development of inclusive competence in a future teacher through the use of digital technologies.

Therefore, at the formative stage of the experiment, we developed a pedagogical technology aimed at ensuring a sufficient level of inclusive competence of the future teacher for working with children with special needs. The implementation of the educational technology through the development of classes in the virtual learning environment Edmodo and web quests on the Zunal web platform, as well as test tasks and additional exercises on the Learning Apps web platform – electronic tools – provided for four consecutive stages: diagnostic stage, organizational stage, implementation stage, control and evaluation stage.

To compare the dynamics of the formation of inclusive competence of future teachers as a result of training using traditional methods and the author's technology, student training was organized. Accordingly, the formative stage of the experiment was divided into two substages.

At the first substage of the formative stage of the study, an experimental test of the effectiveness of the author's technology for training students was carried out, which was aimed at ensuring a sufficient level of inclusive competence of the future teacher for working with children with special needs during the study of the special course "Implementation of inclusive higher education through the use of digital technologies". Two samples were created: control and experimental. Based on the results of training using the author's technology and traditional methods, a comparison of the weighted average coefficients of the formation of inclusive competence of undergraduate students was carried out. They increased at the end of the

experiment, respectively, from 47% to 68% in the CG and 83% in the EG. The reliability of the results obtained was established using the Student's t-test. It turned out to be more than the tabular empirical value of the t-criterion, which indicates the effectiveness of the developed technology (temp.=14.49 > ttab. = 1.96). The error does not exceed 5% (0.05).

At the second substage of the formative stage of the study, an experimental verification of the effectiveness of the author's technology for training students of the master's (second) level of higher education for practice-oriented teaching of students with special educational needs through the use of digital technologies within the special course "Implementation of inclusive higher education through the use of digital technologies".

According to all indicators, the coefficient of inclusive competence of respondents has increased significantly. We observe an increase in the overall coefficient of inclusive competence.

Comparison of the weighted average coefficients of the formation of inclusive competence of future teachers through the implementation of educational technology by developing classes in the virtual learning environment Edmodo and web quests on the Zunal web platform, as well as test tasks and additional exercises on the LearningApps web platform – electronic tools before the beginning and end of training using the author's technology allowed us to talk about an increase in the corresponding coefficients to 83%. Using the Pearson χ2 (chi-square) criterion, the reliability of the results obtained was checked, which indicated the presence of significant changes in the studied indicators.

χ2empirical = 65.87 > χ2tabular = 7.81 as shown by the comparison of the values of the Pearson criterion. This indicates the effectiveness of the author's technology. Let's start with what does not exceed 5% (0.05). Thus, the results obtained at both substages of the formative stage of the experiment after the control experimental cut exceeded 70% and amounted to 83%, which indicates the effectiveness of the developed author's technology.

Results and Discussion

Digital tools in inclusive higher education: an overview of modern digital technologies.

The need of the hour is the application of digital technologies. Digital technologies are a tool that allows:

- To take into account the circumstances of each higher education seeker and the individual needs of the individual through the personalization of methodologies and curricula;
- To use online platforms to provide social support and psychological assistance, which is especially important for persons with special educational needs;
- To expand the reach of quality education to vulnerable and remote population groups;
- To quickly analyze and track the effectiveness of various strategies and pedagogical approaches, ensuring constant optimization of the educational process for persons with special educational needs;
- To strengthen the means for linguistic and cultural adaptation of national minorities and persons with special educational needs;
- Easily integrate pedagogical tools, new courses, and resources, creating flexible learning environments for individuals with special educational needs;
- Provide access to courses for acquiring new professional skills, allowing to respond to changes in the labor market;
- Maximize the use of available resources in the education system through digital optimization of administrative and management processes (Hurenko et al., 2017).

Thanks to the introduction of digital technologies in the modern world, the development of education has changed significantly, especially in inclusive education. An inclusive educational environment is created by

the integration of digital tools, where each higher education student has the opportunity to realize their potential, regardless of cognitive, physical, and emotional barriers.

In the training of specialists, the use of digital technologies allows for the implementation of innovative teaching methods that contribute to improving the quality of the learning process. This includes the creation of curricula and interactive individualized lessons. Thus, digital technologies contribute to the development of digital literacy, critical thinking, collaboration, and communication – key competencies of education students (Stratan-Artyshkova et al., 2022).

Digital tools play a key role in ensuring the quality of education for students with special educational needs in modern conditions of education development. Let us consider the impact of the main ones on the quality of inclusive education.

1. Online platforms and virtual classrooms, such as Google Classroom, Moodle, and Microsoft Teams, allow students with disabilities to communicate with teachers and classmates, and access educational materials. This ensures equal conditions for all participants in the educational process, regardless of physical limitations or their place of residence.
2. Assistive technologies, such as specialized keyboards and mice, devices for controlling a computer using gaze, and text-reading software, help students with any disabilities to take an active part in the educational process (Svensson et al., 2019). These technologies increase the effectiveness of learning and allow you to adapt educational materials to the individual needs of each student.
3. Interactive boards, such as SMART Board, allow you to create interactive lessons, which involve students in the learning process in active participation
4. Mobile applications (Duolingo, Khan Academy, ClassDojo) are designed for learning and development, which allow students to complete tasks and study materials independently at a time convenient for them. This is especially important for students with special needs because it allows them to learn according to their abilities and at their own pace (Knysh et al., 2024), which contributes to the development of communication skills, collaboration, and better assimilation of the material.
5. Mindomo and Inspiration – visualization software helps students with special needs to structure information, which makes the learning process more effective and facilitates its work.

The introduction of innovative digital tools in inclusive education provides an individual approach to learning and provides support to students with special educational needs, helps to improve the quality of education, and contributes to the creation of such an innovative inclusive educational environment, where each student of the educational space has the opportunity to realize their potential (Door, 2014).

Methodological approaches that ensure the effective implementation of digital tools in the educational process of higher education.

The introduction of digital technologies into the professional training of specialists requires a scientifically sound and systematic approach. Let us highlight the main methodological approaches that can be used for the effective implementation of digital tools in the educational process:

- the competency-based approach involves the integration of digital technologies into educational programs for the development of professional competencies: collaboration and communication, critical thinking, and digital literacy and is focused on the development of professional competencies in students that are necessary in the modern digital environment for the successful activity of an individual;
- the integrative approach serves to create adaptive and flexible educational programs and consists of combining digital and traditional teaching methods. The use of online courses, interactive platforms, and multimedia resources increases the motivation of students and ensures a variety of teaching methods;

- the project approach for the implementation of educational projects involves the use of digital technologies that allow students to apply the acquired knowledge in practice. This approach contributes to the development of planning and task performance, skills of independent work, cooperation with other project participants;
- a distance approach to organizing the educational process involves the use of digital platforms in remote mode, which allows applicants for educational space to receive education regardless of physical limitations and place of residence. Accessibility and flexibility of learning are provided by online courses, webinars, virtual classes, and interactive educational materials;
- a personalized approach aimed at adapting the educational process to the capabilities of each applicant and his individual needs. The use of digital technologies allows for online assessment, the creation of individualized curricula, and real-time feedback, which contributes to more effective assimilation of the material (McGlynn-Stewart et al., 2018).

The use of such methodological approaches to the implementation of digital technologies in the professional training of specialists contributes to the development of professional competencies in applicants for education and the improvement of the quality of education, allowing adapting the educational process to the capabilities of each applicant and his individual needs. The introduction of digital technologies into the educational process contributes to the formation of skills necessary for successful professional activity in the modern digital world and improves the quality of education (Santos et al., 2023).

The role of digital technologies in the development of key competencies of future specialists in inclusive education.

Digital technologies play an important role in the development of key competencies of future specialists in inclusive education.

Let's consider how digital technologies contribute to the development of key competencies of future specialists in inclusive education:

- Digital literacy is a fundamental competency of future specialists in inclusive education, which includes the ability to effectively use digital resources and tools. The use of various software allows higher education students to develop skills in working with information – text editors, databases, spreadsheets, and presentation programs;
- Cooperation between students depends on digital technologies, which significantly improve the opportunities for cooperation of each individual. The use of platforms for joint work (Slack, Microsoft Teams, Trello) allows you to exchange information, effectively organize teamwork, coordinate joint projects, which promotes interaction in the group and the development of communication skills;
- Critical thinking is improved by applying digital technologies to the educational process of higher education, which contributes to the development of critical thinking, allowing applicants to evaluate, and interpret information from various sources and analyze it. The use of analytical programs (SPSS, Tableau) helps applicants develop data analysis and processing skills, which are important for making informed decisions;
- Communication. Various means of communication are provided by digital technologies (video conferences, e-mail, instant messengers). The use of Zoom and Google Meet – video communication tools allows for webinars consultations, and online classes, which contributes to the development of information presentation skills and effective communication.

Thus, the use of digital technologies in the professional training of inclusive education specialists significantly increases the development of key competencies (Batsurovska & Kurepin, 2024).

The main benefits of using digital technologies are linked to the principles of Universal Design for Learning (UDL): expression and participation/engagement for those pursuing higher education, providing diverse forms of representation (Shuliak et al., 2022).

The text version, which may contain multimedia educational materials, facilitates the perception of information by persons with hearing impairments.

Screen access programs based on speech synthesis technologies speak text and graphic information displayed on the monitor and provide access to the Internet, and popular Windows applications, using a sound card and a built-in speech synthesizer to output the contents of the computer screen to speakers or Braille displays (Hurenko et al., 2017).

Digital tools enable visually impaired students to access higher education on an equal footing with other students.

For individuals with learning disabilities such as dysgraphia and dyslexia, voice recognition and screen reading programs, as well as simple changes to color, font, and line spacing, are important to make learning accessible (Vouglanis, 2023).

To help students with special educational needs receive higher education on an equal footing with other students, virtual assistants and chatbots are being created using artificial intelligence (Mohammed & Watson, 2019), and also for higher education students with significant speech impairments, there are speech synthesizers (Miao et al., 2021). This list is not exhaustive.

Accessible websites and mobile applications focused on the needs of people with special educational needs or certain health limitations.

Digital accessibility in the context of inclusive educational innovation plays a key role in ensuring equal access to digital technologies and services for all, including people with health limitations.

There is a growing awareness of the importance of ensuring digital accessibility for socially sensitive, socially vulnerable segments of the population. This is manifested in the use of mobile applications, web content, and other electronic media in socialization and the educational process during learning.

Public organizations and the private sector of IT companies play an important role in promoting digital accessibility.

An example can be the development of accessible websites and mobile applications of IT companies focused on the needs of people with certain health limitations or special educational needs.

Higher school specialists advise using the English-language BeWarned application, which detects and then signals (automatically analyzing sounds) about potential danger (car horns, screams, dog barking, alarm signals, etc.) in real-time. The application warns the user in case of dangerous situations using light signals and vibration, allowing you to “hear” music, converting music tracks into light signals or vibration using an equalizer, which allows people with hearing impairments to enjoy music visually and tactilely.

Huawei has developed a mobile application for smartphones called Facing Emotions, which can reproduce appropriate sounds, recognize human emotions, and display images on the screen, which will help people with visual impairments better understand the emotions of their interlocutors and receive (Kossova-Silina & Potamoshnieva, 2024).

Analysis of the results of research-experimental work.

The analysis of scientific literature and the experience of practitioners showed that the problem of implementing inclusive higher education through the use of digital technologies in the chosen direction is insufficiently developed.

From the standpoint of the principles and provisions of the theory of philosophy, the preparation of future specialists for practice-oriented training of students with special educational needs through the use of digital technologies was considered as:

- A subsystem of professional training in higher education, the integral result of which is the development of inclusive competence in students;
- A process of professional training in higher education, which takes into account the study of the state of spontaneously formed inclusive competence of practicing specialists about the education of people with special educational needs;
- An axiological component that determines the upbringing and development of inclusive consciousness in students;
- An environment for professional creative self-realization of future specialists.

The didactic prerequisites for practice-oriented training of higher education students to gradually implement inclusive education through the use of digital technologies among children with special educational needs include the implementation of such approaches as:

- *Activity approach* (principles of connecting theory with practice, activity-oriented learning, computerization of learning, designing the education process according to the model of professional activity, life situations, accessibility, activity, feasibility);
- *Competency-based approach* (principle of educational and developmental nature of learning);
- *Personality-oriented approach* (principles of differentiation and individualization).

The principles of feasibility and accessibility are implemented through modification and adaptation.

The principle of the educational and developmental nature of learning is implemented by involving a team of psychological and pedagogical support and ensuring its correctional and developmental orientation.

The methodological foundations include the use of a communicative approach to the implementation of inclusive education through the use of digital technologies.

The conceptual idea of the study is that the formation of inclusive competence in a future specialist through the use of digital technologies will contribute to practice-oriented teaching of students with special educational needs through the use of digital technologies, which is possible by forming a sufficient level of personal, cognitive and activity components.

Thus, the inclusive competence of a future teacher in the context of practice-oriented teaching of students with special educational needs consists of three components:

- *Personal* (attitudes, motives, interests);
- *Cognitive* (empirical and theoretical knowledge);
- *Activity* (strategies, skills, experience of students).

To assess the level of formation of inclusive competence of a future teacher, criteria were developed: personal, cognitive, and activity.

The activity criterion (the presence of strategies, developed skills, and experience in the student) is system-forming in our study.

Additional to our study is the personal criterion (the presence of developed personal traits and personally significant values) and the cognitive criterion (the formation of the necessary knowledge for effective teaching of children with special educational needs).

The study proposes the following indicators of the formation of inclusive competence of a future teacher through the use of digital technologies: theoretical, psychological, and practical.

The coefficients of the formation of inclusive competence and levels are identified:

- 0 – 59% – unformed level;
- 60 – 73% – initial or receptive-reproductive level;
- 74 – 89% – sufficient or independent level;
- 90 – 100% – high or integrative level.

Experimental work on the formation of inclusive competence in a future teacher through the use of digital technologies to promote practice-oriented teaching of students with special educational needs through the use of digital technologies was carried out during 2022–2023 and covered 132 students of pedagogical specialties at the ascertaining stage. At the formative stage, 168 students were involved in the study.

During the ascertaining stage of the pedagogical experiment, it was found that the coefficient of formation of inclusive competence of student teachers without specially organized training was low, which indicates the expediency of its specially organized formation and development of inclusive competence in a future teacher through the use of digital technologies. In particular, the state of formation of inclusive competence in respondents according to the results of the questionnaire according to the theoretical indicator of inclusive competence is (initial level) – 60%, and according to the practical (unformed level) – 54%, which indicates the need to organize appropriate training.

Therefore, at the formative stage of the experiment, we developed a pedagogical technology aimed at ensuring a sufficient level of inclusive competence of a future teacher for working with children with special needs.

The technology outlines pedagogical conditions, is based on the selected conceptual and methodological principles of the study, has an axiological character, and a practical orientation, and includes the updated role of the future teacher by ensuring a sufficient level of inclusive competence of the future teacher for working with children with special needs.

The use of educational technology involves the implementation of methods of comparing versions, semantic associations according to the scheme, symbolic vision, independent construction of concepts, heuristic research, semantic vision, and figurative vision, supplemented by the problem method, case method, project and simulation methods, methods for developing critical thinking and innovative forms, which determines the development of inclusive competence of students in the context of practice-oriented teaching of students with special educational needs through the use of digital technologies.

In virtual and blended learning modes, the possibility of using educational technology was designed by developing classes in the Edmodo virtual learning environment and web quests on the Zunal web platform, as well as test tasks and additional exercises on the LearningApps web platform – electronic tools. The use of educational technology involved the implementation of effective selected learning tools for organizing asynchronous and synchronous modes of pedagogical interaction.

The results of the study showed that in the formation of inclusive competence, the main integrating and semantic role of the future teacher in the context of practice-oriented teaching of students with special educational needs through the use of digital technologies is performed by the special course “Implementation of inclusive higher education through the use of digital technologies” developed by us, the content of which includes a set of practical material and necessary theoretical material for the formation of personal traits, value orientations, abilities, knowledge, skills, experience of quasi-professional implementation of inclusive higher education through the use of digital technologies. The methodological support of the special course "Implementation of inclusive higher education through the use of digital

technologies" also includes the content of media materials, additional video, graphic and text files, web quests, test tasks, and cases placed in a virtual classroom.

The implementation of the educational technology by developing classes in the virtual learning environment Edmodo and web quests on the Zunal web platform, as well as test tasks and additional exercises on the LearningApps web platform – electronic tools – involved four consecutive stages:

- *The diagnostic stage*, the purpose of which was to determine the level of educational and professional interests of teachers in working with children with special educational needs;
- *The organizational stage* ensured the implementation of the educational technology by developing classes in the virtual learning environment Edmodo and web quests on the Zunal web platform, as well as test tasks and additional exercises on the LearningApps web platform – electronic learning tools; instruction of assistant teachers, selection of methods and types of modification and adaptation of the educational process, drawing up an individual child development program, development of correctional and developmental exercises;
- *The implementation stage* provided for the implementation of the educational process in the context of the introduction of the principles: connection of theory with practice, activity-oriented learning, computerization of learning, design of the educational process according to the model of professional activity, life situations, accessibility, activity, feasibility, educational and developmental nature of learning, differentiation and individualization, feasibility and accessibility, educational and developmental nature of learning;
- *The control and evaluation stage* – a reflexive analysis of the directions of increasing the effectiveness of educational technology.

To compare the dynamics of the formation of inclusive competence of future teachers as a result of training using traditional methods and the author's technology, student training was organized. Accordingly, the formative stage of the experiment was divided into two substages.

At the first substage of the formative stage of the study, an experimental test of the effectiveness of the author's technology for training students was carried out, which aimed to ensure a sufficient level of inclusive competence of the future teacher for working with children with special needs during the study of the special course "Implementation of inclusive higher education through the use of digital technologies". Two samples were created: control and experimental. According to the results of training using the author's technology and the traditional method, a comparison was made of the weighted average coefficients of the formation of inclusive competence of undergraduate students. They increased at the end of the experiment, respectively, from 47% to 68% in the CG and 83% in the EG.

The reliability of the results obtained was established by the Student's t-criterion. It turned out to be more than the tabular empirical value of the t-criterion, which indicates the effectiveness of the developed technology (tempir.=14.49 > ttab. = 1.96). The error does not exceed 5% (0.05).

At the second substage of the formative stage of the study, an experimental verification of the effectiveness of the author's technology for training students of the master's (second) level of higher education for practice-oriented teaching of students with special educational needs through the use of digital technologies was carried out within the special course "Implementation of inclusive higher education through the use of digital technologies".

According to all indicators, the coefficient of inclusive competence of respondents increased.

According to the psychological indicator, the coefficient of inclusive competence of respondents increased (Fig. 1):

- At a high level from 4% to 14%;
- At a sufficient level – from 41% to 48%.

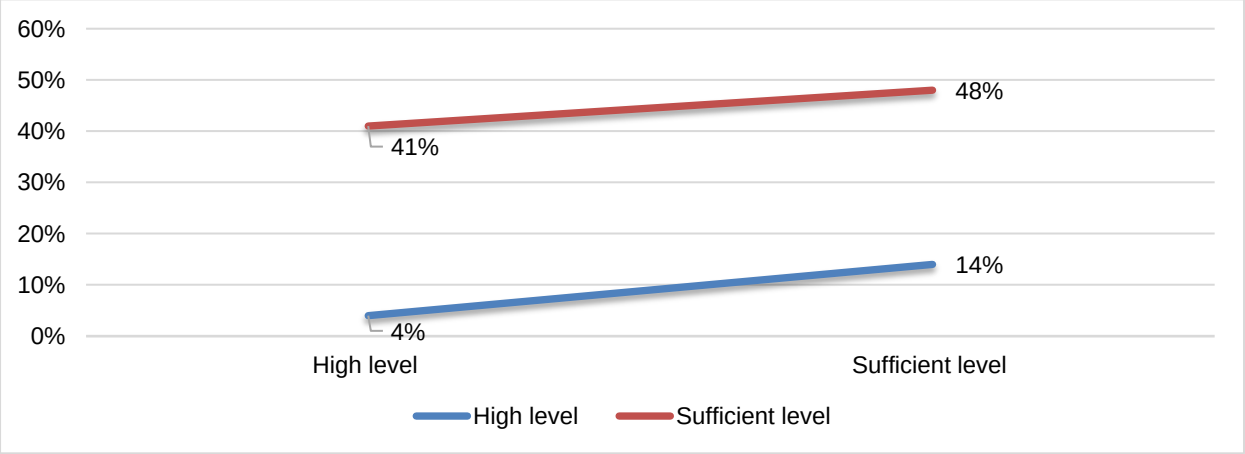

Figure 1. Changes in coefficient of inclusive competence (*psychological indicator*).

According to the theoretical indicator, the coefficient of inclusive competence of respondents increased (Fig. 2):

- At a high level from 4% to 12%;
- At a sufficient level from 42% to 50%.

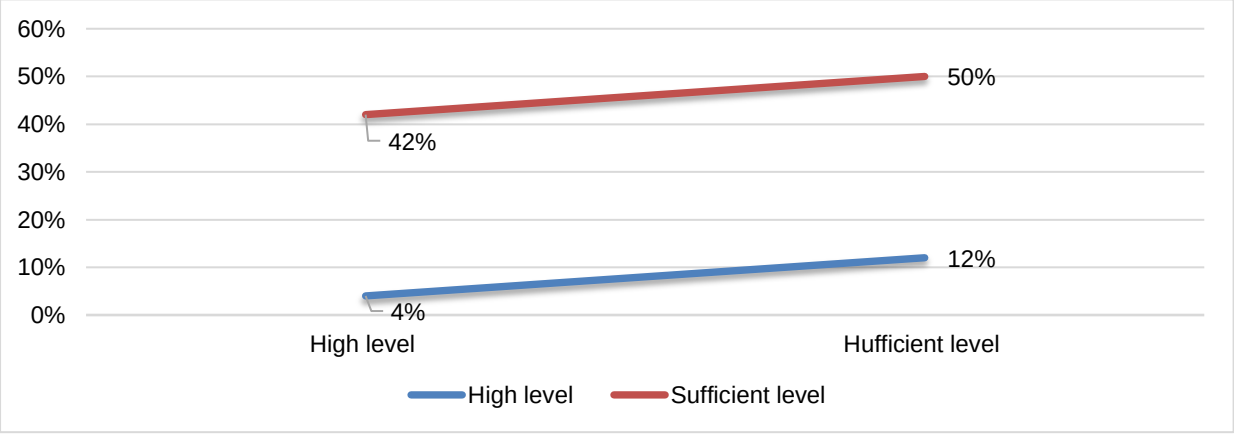

Figure 2. Changes in coefficient of inclusive competence (*theoretical indicator*).

According to the practical indicator, the coefficient of inclusive competence of respondents increased (Fig. 3):

- At a high level from 4% to 13%;
- At a sufficient level from 42% to 49%.

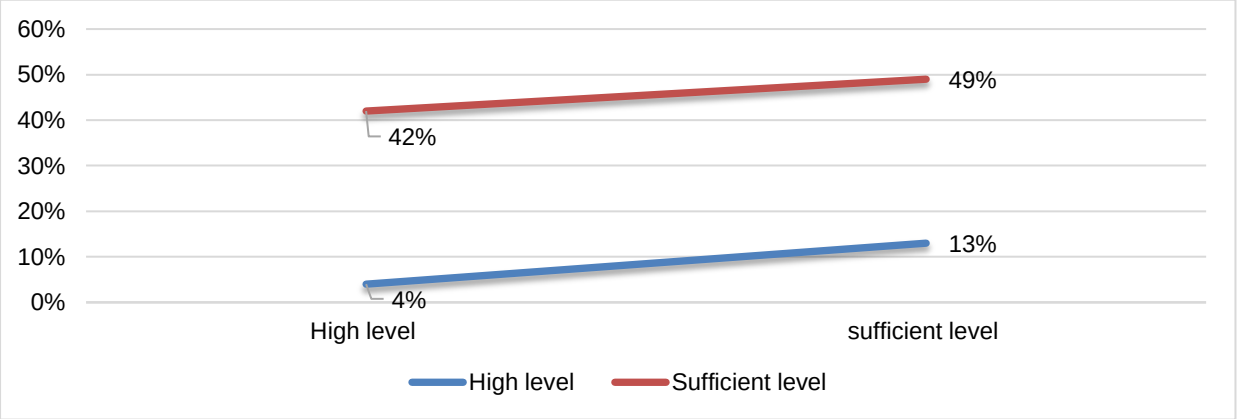

Figure 3. Changes in coefficient of inclusive competence (*practical indicator*).

We observe an increase in the overall coefficient of inclusive competence (Fig. 4):

- At a high level from 4% to 13%;
- At a sufficient level from 42% to 49%.

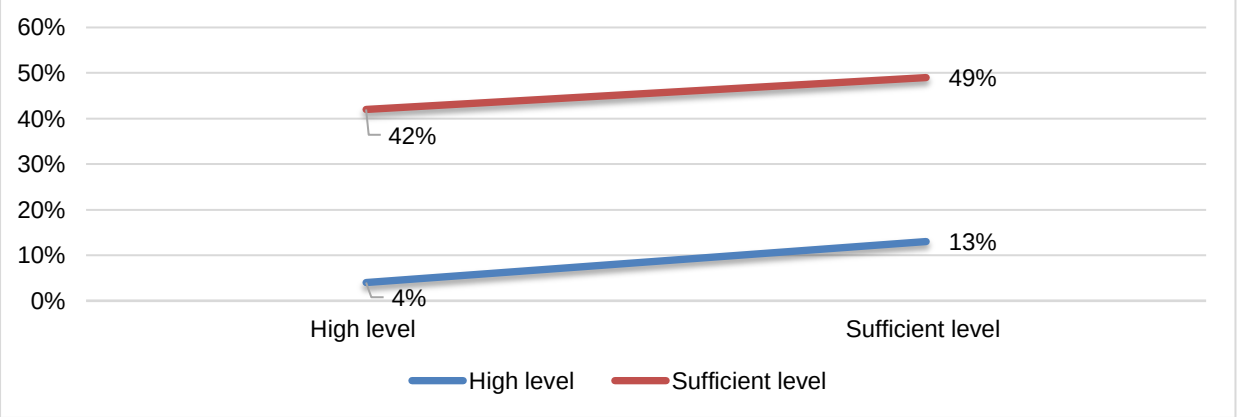

Figure 4. Changes in coefficient of inclusive competence (*overall coefficient*).

Comparison of the weighted average coefficients of the formation of inclusive competence of future teachers through the implementation of educational technology through the development of classes in the virtual learning environment Edmodo and web quests on the Zunal web platform, as well as test tasks and additional exercises on the LearningApps web platform – electronic tools before the beginning and end of training using the author's technology allowed us to talk about an increase in the corresponding coefficients from 68% to 83%.

Using the Pearson χ2 (chi-square) criterion, the reliability of the results obtained was checked, which indicated the presence of significant changes in the studied indicators.

χ2empirical = 65.87 > χ2tabular = 7.81 as shown by the comparison of the values of the Pearson criterion. This indicates the effectiveness of the author's technology. Let's start with what does not exceed 5% (0.05).

Thus, the results obtained at both substages of the formative stage of the experiment after the control experimental cut exceeded 70% and amounted to 83%, which indicates the effectiveness of the developed author's technology.

Conclusions

The ways of forming inclusive competence in a future teacher through the use of digital technologies are revealed, which will contribute to the practice-oriented teaching of students with special educational needs through the use of digital technologies.

An overview of modern digital technologies in education is made, and digital tools in inclusive higher education are revealed. The main methodological approaches that ensure the effective implementation of digital tools in the educational process of higher education are shown. The role of digital technologies in the development of key competencies of future specialists in inclusive education is substantiated; accessible websites and mobile applications focused on the needs of people with special educational needs or certain health restrictions are proposed.

The conceptual idea of the study is that the formation of inclusive competence in a future specialist through the use of digital technologies will contribute to the practice-oriented teaching of students with special educational needs through the use of digital technologies, which is possible by forming a sufficient level of personal, cognitive and activity components.

During the ascertaining stage of the pedagogical experiment, it was found that the coefficient of formation of inclusive competence of student teachers without specially organized training was low, which indicates the feasibility of its specially organized formation and development of inclusive competence in a future teacher through the use of digital technologies.

Therefore, at the formative stage of the experiment, we developed a pedagogical technology that aimed to ensure a sufficient level of inclusive competence of a future teacher for working with children with special needs. The implementation of educational technology through the development of classes in the virtual learning environment Edmodo and web quests on the Zunal web platform, as well as test tasks and additional exercises on the LearningApps web platform – electronic tools – involved four consecutive stages: diagnostic stage, organizational stage, implementation stage, control and evaluation stage.

To compare the dynamics of the formation of inclusive competence of future teachers as a result of training using traditional methods and the author's technology, student training was organized. Accordingly, the formative stage of the experiment was divided into two substages.

At the first substage of the formative stage of the study, an experimental test of the effectiveness of the author's technology for training students was carried out, which aimed to ensure a sufficient level of inclusive competence of a future teacher to work with children with special needs during the study of the special course "Implementation of inclusive higher education through the use of digital technologies". Two samples were created: control and experimental. Based on the results of training using the author's technology and the traditional method, a comparison was made of the weighted average coefficients of the formation of inclusive competence of undergraduate students. They significantly increased at the end of the experiment.

At the second substage of the formative stage of the study, an experimental test of the effectiveness of the author's technology for training students of the master's (second) level of higher education for practice-oriented teaching of students with special educational needs through the use of digital technologies within the special course "Implementation of inclusive higher education through the use of digital technologies".

According to all indicators, the coefficient of inclusive competence of respondents increased significantly. We observe an increase in the overall coefficient of inclusive competence.

Comparison of the weighted average coefficients of the formation of inclusive competence of future teachers through the implementation of educational technology allowed us to talk about an increase in the corresponding coefficients.

Thus, the results obtained at both substages of the formative stage of the experiment after the control experimental section exceeded 70% and amounted to 83%, which indicates the effectiveness of the developed author's technology.

We include a comparative analysis of the features of teaching students with special needs in leading countries in inclusive education in further scientific research.

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Students' educational care in higher education institutions: an innovative aspect

El trabajo educativo de los estudiantes en las instituciones de educación superior: una vertiente innovadora

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Abstract

The article analyzes the innovative system of educational work in an educational institution and proposes innovative approaches to improving the educational sector. The purpose of the article is to reveal the innovative component in the educational system of educational institutions and experimentally verify the effectiveness and importance of the innovative system of educational assistance in higher education institutions for education. The methodological basis of the study is presented at four hierarchically subordinate levels: philosophical, general

scientific, specifically scientific and technological. The structural elements of the innovative system of educational assistance in an educational institution, its components, and the main ways of professionalization are developed. We highlight the main innovative principles of education in educational institutions. The main innovative principles and methods of education in educational institutions are highlighted. An experimental study was conducted to confirm the effectiveness and importance of the innovative system of educational work in higher education institutions for education. As a result of the experiment, positive changes allow us to speak about an increase in the level of student learning.

Keywords: innovative approaches, educational system, higher education institutions, innovative educational technologies, Internet technologies, integrated educational environment.

Resumen

El artículo analiza el sistema innovador de trabajo educativo en una institución educativa y propone enfoques innovadores para mejorar el sector educativo. El propósito del artículo es revelar el componente innovador en el sistema educativo de las instituciones educativas y verificar experimentalmente la efectividad e importancia del sistema innovador de asistencia educativa en las instituciones de educación superior para la educación. La base metodológica del estudio se presenta en cuatro niveles jerárquicamente subordinados: filosófico, científico general, específicamente científico y tecnológico. Se han desarrollado los elementos estructurales del sistema innovador de asistencia educativa de una institución educativa, sus componentes y las principales vías de profesionalización. Destaquemos los principales principios innovadores de la enseñanza en las instituciones educativas. Se destacan los principales principios y métodos innovadores de enseñanza en las instituciones educativas. Se realizó un estudio experimental para confirmar la efectividad e importancia de un sistema innovador de trabajo educativo en las instituciones de educación superior para la educación. Como resultado del experimento, los cambios positivos permiten hablar de un aumento en el nivel de aprendizaje de los estudiantes.

Palabras clave: enfoques innovadores, sistema educativo, instituciones de educación superior, tecnologías educativas innovadoras, tecnologías de Internet, entorno educativo integrado.

Introduction

The modern development of the information society, the processes of world globalization and integration, and the innovative processes that occur in all spheres of human life contribute to the fact that education is a priority factor in the development of the socio-economic, socio-political, and spiritual and cultural life of any state.

The modernization of domestic education is designed to ensure that the educational process meets the present requirements. In this regard, the need for a thorough theoretical and methodological analysis and generalization of promising pedagogical experience on the problem of the innovative orientation of the modern education system is becoming more urgent. This would counteract destructive tendencies in the organization of the educational process and contribute to the development of innovative educational models, technologies, and methods (Vorozhbit-Gorbatyuk & Khizhnyak, 2022).

About 90% of students and teenagers have access to the Internet and actively use it for “business” (educational) purposes and as a means of communication, entertainment, and leisure. More than 55% of students have access to the Internet at home, and the rest (more than 40%) use it in Internet clubs, at their educational institution (at the institute, at school), at the homes of their acquaintances and friends, or elsewhere. Therefore, the Internet is an important part of the lives of modern children, is a modern learning tool and one of the social attractors that determines their content and quality.

The contribution of our research encourages subjects of learning to be active, creative, and apply the knowledge gained during their studies. Innovative education provides the subject of learning with conditions

for his self-determination, self-realization, and promotes the development of responsibility for his own initiatives, ideas, efforts, and actions.

The main idea of the study is the proposition that the formation of an innovative orientation of the educational process is a priority direction of the process of modernization of domestic education, which is determined by the needs of society and subjects of education, is based on the freedom and personal choice of subjects of education, is determined by the presence of responsibility for the consequences of one's own activities, takes into account the specifics of the educational process of educational institutions and the individuality of its subjects.

The general hypothesis of the study is the assumption that the formation of an innovative orientation of the educational process in educational institutions will be effective if it is carried out by scientifically substantiated theoretical provisions and taking into account positive practical experience through the implementation of its substantiated system (Dubasenyuk, 2021).

Effective solution of the problem of formation of innovative orientation of educational process is made impossible by the existence of contradictions between:

- The need of society in formation of a new generation with a fundamentally different philosophy of life, which is characterized by dynamism, flexibility in solving various problems, the desire to increase interconnections with the environment, and insufficient level of awareness of the essence and functions of innovations in education;
- The requirement of modernization of the educational process taking into account the humanistic-innovative paradigm and insufficient capabilities of the educational institutions for its implementation;
- The need to apply innovative educational technologies in practice and insufficient level of psychological and pedagogical readiness of teachers for innovative activity in the educational process;
- The need to implement the results of fundamental and applied research on the problem of innovations in education and limited application of educational innovations in mass practice;
- The spread of innovations in educational and upbringing systems and the insufficient development of the organizational and methodological mechanism for their implementation in educational activities.

The need to resolve the aforementioned contradictions and the need to overcome various complex issues in the educational process allow us to formulate the research problem, which consists in the need to highlight the theoretical, methodological and practical principles of the innovative orientation of the educational process in educational institutions. This will allow us to optimize and qualitatively improve the implementation of innovations in the educational process. On this basis, the topic of our article was determined.

The article deals with the following main issues:

1. The essence of the education process in a broad and narrow sense.
2. The main tasks of the innovative educational system of educational institutions.
3. The main directions of professionalization of the innovative system of educational care of the educational institution.
4. The provisions of innovative approaches in the system of educational care of educational institutions.
5. The positions that are necessary for innovative approaches in the system of educational care.
6. Tasks of the system of applying innovative approaches in educational care.
7. The groups of innovative approaches function in the system of educational care.
8. The main goals of innovative approaches in the system of educational care.
9. The main parameters of creativity, which are necessary when using innovative approaches.

Literature Review

System analysis and structuring of innovative learning technologies in different segments of scientific fields allow modeling optimal scenarios of their use in the educational process. Granting innovative learning technologies academic status in the higher education system reveals L. Kondrashova, O. Lavrentyeva, & N. Zelenkova (2008). They revealed the most appropriate innovative approaches in the system of educational care of educational institutions, taking into account advanced educational experience and achievements of pedagogical science. O. Dubasenyuk (2014) presented innovative approaches in the system of educational care of educational institutions as a holistic formation, which is necessary for the process of integration of education and upbringing components and promotes the self-development of the individual, continuous development throughout life, the creation of an educational and developmental environment of the educational institution and is oriented towards innovative conditions for taking into account the interests and needs of children and adults.

For the scientific and pedagogical discourse, the differentiation of the role and effectiveness of the implementation of innovative learning technologies in higher education institutions has become a significant problem. For different clusters of the scientific space, the level of involvement and effectiveness of the use of ICT and digitalization is different. This aspect is emphasized in the study V. Tretko (2011). He showed the role of innovative development of education, singled out innovative approaches in the system of educational care of educational institutions, and presented the content of educational technologies and innovative experiences in the educational process. In turn, scientists V. Gladush & G. Lysenko (2014) analyzed the main issues of higher school pedagogy, showed the role of didactics and the theory of educating students in educational institutions, and paid attention to the formation of the teacher's pedagogical culture and his scientific organization of work. V. Kovalchuk & A. Shcherbak (2018) improved the process of professional training of students, showed the main innovative approaches in the system of educational care of educational institutions, and offered innovative learning technologies in the educational space.

Educational realities have led to a real boom in scientific research devoted to innovative technologies of education in higher education. Strategic aspects of the development of innovative technologies of education were revealed in scientific research I. Krasnoschok (2019) clarified the essence and basic principles of innovative approaches in the system of educational care of educational institutions and proposed a system of innovative functioning of educational care for institutions of higher education. V. Vorozhbit-Gorbatyuk, & I. Khizhnyak (2022) revealed the goals, content, and features of innovative approaches in the system of educational care of educational institutions, substantiating the need in the educational institution for methodical content of educational care from the standpoint of partnership co-creation of pupils, educators, society, community.

The study of innovative experience shows that most scientific research is devoted to the topic of innovations, but there is a lack of a system-activity approach that makes it possible to analyze not only individual stages of the innovation process, but also to move on to a comprehensive study of innovations. The search for solutions to pedagogical problems of innovation is closely related to the analysis of existing results of research into the essence, structure, classification and features of the course of innovation processes in the field of education. Having analyzed the theoretical and methodological state and problems of education, the need for a new formation of dynamic pedagogical personnel capable of constantly updating professional knowledge, capable of being implemented in an innovative environment was revealed.

The study and systematization of modern trends in the modernization of training of education specialists contributed to the justification and creation of a model for updating teacher training using innovative technologies, which should become a prerequisite for achieving a high level of training of a highly qualified specialist.

The issues of forming an innovative educational environment, the role of innovative activity subjects in these processes, and the issue of innovative competence of teachers as the main resource that determines the readiness of an educational institution to implement innovations require systematization and further development.

Purpose. To reveal the innovative component in the educational system of educational institutions and experimentally verify the effectiveness and importance of the innovative system of educational assistance in higher education institutions for education.

Methodology

The methodological principles of the study are: leading provisions of the theory of scientific knowledge; general scientific principles of historicism, systematics, scientificity; conceptual provisions of pedagogical, psychological, sociological sciences; ideas of experience based on the synchronous study of pedagogical, socio-cultural and economic phenomena; philosophical and pedagogical ideas of the development of modern education.

At various stages of the scientific search, the following methods were used to achieve the goal: analysis, synthesis, comparison, generalization, and systematization – to study scientific literature, regulatory and legal acts, and Internet resources, which made it possible to find out the state of development of the selected problem, substantiation of conceptual foundations innovative system of educational care in an educational institution, organization of the obtained results; modeling, classification – to distinguish the components of the researched phenomenon of the innovative system of educational care in the educational institution; experimental methods – to conduct an experimental study to prove the effectiveness and importance for education of an innovative system of educational care in institutions of higher education.

During our research, it was necessary to observe the principles and provisions:

- The andragogical approach, which is represented by the individualization of students of education, systematicity, the need for awareness of learning and upbringing in the educational process, contextuality, electivity, the priority of independence of students of education and upbringing, joint activity, and interaction of all students of education;
- Systemic approach – the application of innovative approaches in the system of educational care of educational institutions, is a system that consists of a subject, a product, a goal, the conditions of the subject's development during the educational process, takes into account internal and external factors of influence, provides an idea of the role of the teacher, its planning, values and motives, a responsible attitude to the environment in the educational space;
- Acmeological approach, based on which, through acme-personality or acme-collective, acmeological mechanisms of personality formation, a self-education process, self-development of personality, self-education of education seekers, self-improvement of a person during life, self-monitoring, self-regulation, self-determination, self-organization of the personality;
- The position of the environmental, socio-cultural approach is created based on the methodological approach based on the systemic approach, based on the contradictory relations of society, where educational innovative processes and phenomena are manifested;
- The position of the procedural innovative approach in the system of educational care of educational institutions reflects the intentions of the competence of the specialist not only to satisfy his personal needs;
- The provisions of the contextual approach, which is effective for the implementation of innovative approaches in the system of educational care of educational institutions.

When determining the sample of subjects, the general specificity of the research subject was taken into account. The total sample size was 160 subjects. When forming the sample, the criteria of content, representativeness, and equivalence were taken into account. The sample was formed by random selection using the technical procedure for calculating the selection step.

The implementation of the pedagogical experiment was carried out in three stages: preparatory, main, and final.

At the preparatory stage, the goal and objectives of the study were determined, the experimental plan was developed, methods for measuring and processing the results were identified, control and experimental groups were selected, and their homogeneity was checked.

At the main stage, the experiment was conducted.

At the final stage, the results of the experiment were analyzed, their reliability was confirmed, and conclusions were drawn about the pedagogical effect of the experiment.

The reliability and validity of the obtained results, the objectivity of their assessment were ensured by the methodological soundness of the initial positions and the qualimetric mechanism for assessing the quality of the research, the use of a complex of complementary research methods, and the involvement of a group of respondents from a higher educational institution in the analysis of its results.

To assess the homogeneity of experimental and control data collection, statistical processing was carried out using MS Excel and SPSS (Statistical Package for Social Science) programs.

The study largely depends on the accuracy and reliability of the data. Within the framework of research work, the quality of data collection and analysis not only adds weight to the study, but also contributes to the formation of substantiated conclusions, which is key to academic success.

Qualitative research methods are characterized by the fact that experimental data are collected from a relatively small group of respondents and are not analyzed using statistics, therefore, in the study we used quantitative methods to study a large group of people and subsequently analyzed the data obtained using statistical methods.

The choice of pedagogical experiment in our study is a certain set of research methods that provides a scientifically objective and evidentiary verification of the correctness of the goal substantiated at the beginning of the study. It allows, more deeply than other methods, to check the effectiveness of certain innovations in teaching and upbringing, to compare the values of various factors in the structure of the pedagogical process and choose the best (optimal) combinations of them for the corresponding situation, to identify the appropriate conditions for the implementation of certain pedagogical tasks.

During the experiment, the target, content, and procedural components of specialists were implemented, and the effectiveness of the ways we identified in the use of Innovative technologies in education was tested. The results of the experimental study confirmed the applicability, optimality, and effectiveness of the proposed ways of using Innovative technologies in education.

Results and Discussion

The essence of the education process is in a broad and narrow sense.

The educational process is aimed at forming in students: a patriotic worldview, high moral qualities, culture, a democratic and humanistic worldview, is responsible for intelligence, creativity, and purposefulness in further professional life, makes them responsible specialists, and takes place with the help of innovative approaches in the system of educational care of institutions education.

Let's consider the essence of the education process in a broad and narrow sense. In a broad sense, the essence of the education process is the sum of influences on the psyche of a person, which is aimed at

preparing a person for active professional activity in the public, industrial, and cultural life of the public space (Popadych, 2017).

The ascertaining stage of the experimental study.

Using a questionnaire, we analyzed the survey of respondents at the ascertaining stage of the experimental study on the problem of implementing an innovative system of educational work in higher education institutions, which showed the following results.

In response to the question, “Are you satisfied with the educational system in higher education?” the following answers were received (Fig. 1):

- Yes – 42%;
- No – 58%.

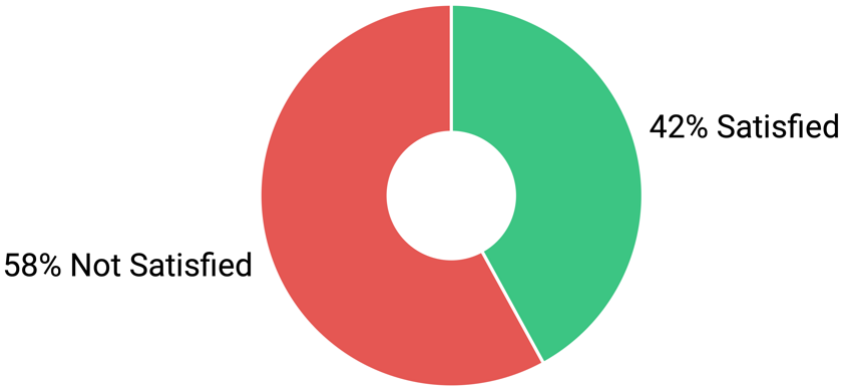

Figure 1. Satisfaction with Higher Education System.

In response to the question “What is your attitude towards innovations in the educational process of higher education?” the following answers were received (Fig 2.):

- Good, but I do not actively implement – 38%;
- Good, I actively implement – 34%;
- Good, but I do not implement – 28%.

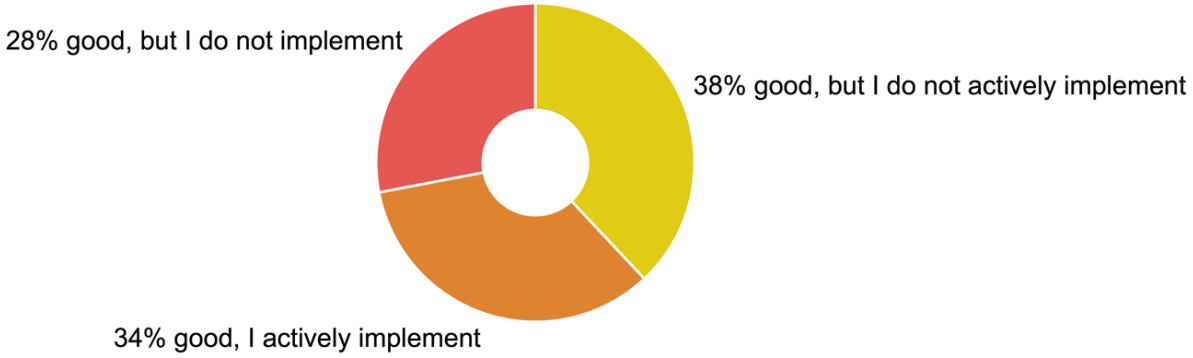

Figure 2. Distribution of Attitudes Towards Innovations in Higher Education.

In response to the question, “What prevents you from applying innovations in the educational process of higher education?” the following answers were received (Fig. 3):

- 47% – insufficient knowledge,
- 38% – lack of necessary skills and experience,
- 15% – lack of necessary resources.

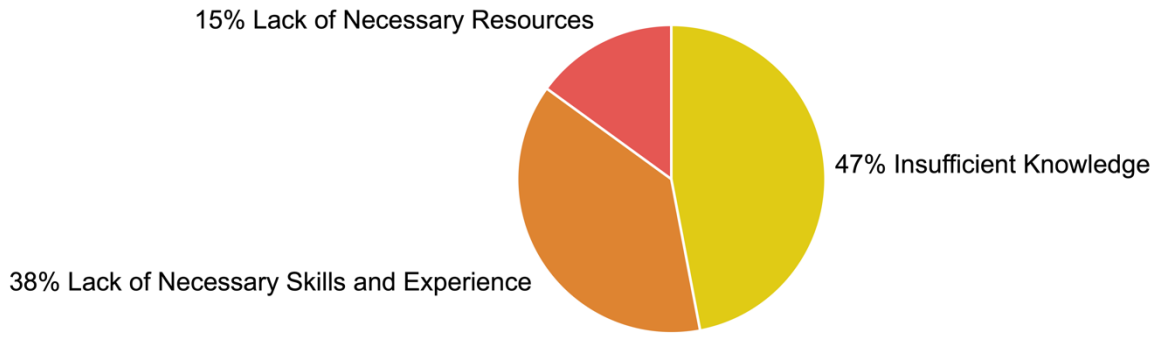

Figure 3. Barriers to Implementing Innovations in Higher Education.

Among those who implement innovations, to the question "What results have you achieved through innovations?" the following answers were received (Fig. 4):

- Significantly better results were achieved – 72%,
- Insignificant improvement in results – 28%.

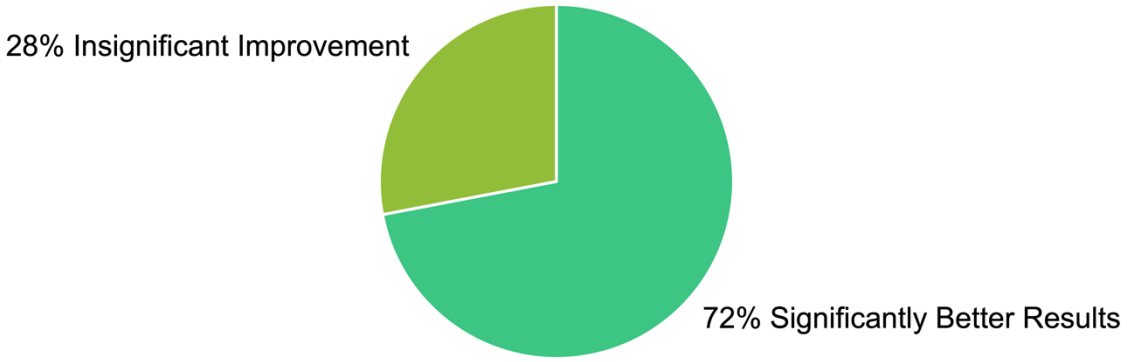

Figure 4. Results Achieved Through Innovations.

84% of respondents, assessing their own personal qualities at a high level, identified such qualities as: cooperation, originality, activity, friendliness; 75% of respondents assessed optimism, creativity, ingenuity, determination, flexibility as above average.

However, such qualities as perseverance, confidence, openness were assessed by respondents in polar terms, with almost the same number of points (Fig. 5):

- 42% – at a high level;
- 41% – at a low level.

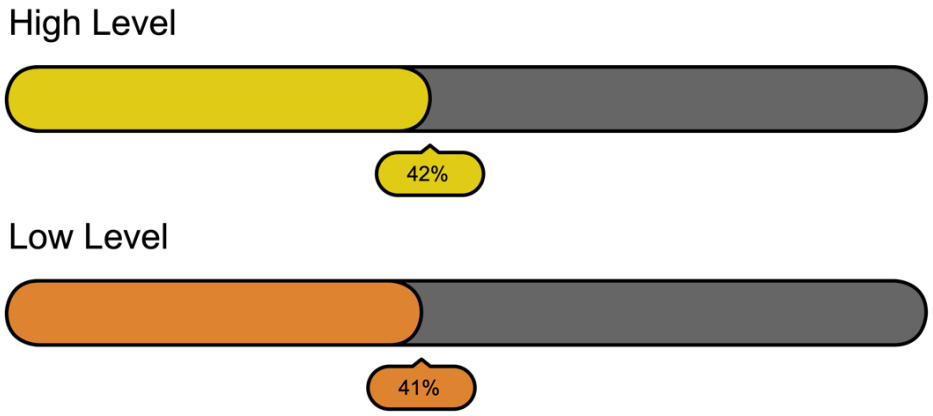

Figure 5. Assessment of Personal Qualities.

During conversations with respondents at the ascertaining stage of the experimental study, it turned out that they have a limited amount of knowledge on issues of innovative pedagogy, are prone to overestimation of self-esteem during the educational process, and are not sufficiently familiar with innovative educational technologies.

During the ascertaining stage of the study, it was taken into account that equal subjects of the educational process are, first of all, teachers and students who have different ages, social experience, roles, positions, etc. So, we formed groups: EG and CG, who participated in the experiment. Using the homogeneity criterion 2χ we determined the coincidence of the initial state in the groups regarding the level of formation of the innovative orientation of the educational process of higher education. For these measurements in the ordinal scale, we used the homogeneity criterion 2χ.

So, the empirical value of the criterion 2 comparing both groups was less than the critical value at the ascertaining stage of the experiment ($3.06<7.82$). That is, the characteristics of the EG and CG, which were compared, regarding the level of formation of the innovative orientation of the educational process, coincided with the significance level of 0.05. This indicates that there are no significant differences between the teachers of the two different groups, which became the basis for their conditional division into experimental and control groups. At the ascertaining stage of the experiment, based on the results of the diagnostics, we concluded the need for specially organized, purposeful work.

Structural elements, components, main tasks of the innovative system of educational work of an educational institution, which we used in the EG in the research process.

The structural elements of the innovative system of educational care of the educational institution are: purpose, content, methods and means of education, its forms, and obtained results (Silva, 2022).

The components of the educational process in the system of educational care of educational institutions, which are components of the innovative system, are the consciousness of the student, his behavior, and emotional and sensory spheres.

Let's define the main tasks of the innovative educational system of educational institutions:

- Formation of personal, social, and public experience in the student of education;
- Realization of the spiritual, cognitive, and creative potential of the individual;
- Stimulation and development of the future specialist;

- Involvement of innovative approaches for education seekers in the system of educational care of educational institutions;
- Formation of professional values, and personally significant socio-cultural components, the need for which is not met during training;
- Meeting the needs of the students of education in professional self-determination;
- Education of willpower in the student;
- Formation of a clearly formed life position in the student of education, etc.

We will group the main directions of professionalization of the innovative system of educational care of the educational institution:

- When conducting and organizing educational care with students, it is necessary to take into account the specifics of the specialty;
- Wide use of innovative approaches in the system of educational care of educational institutions, content, and forms of education, which show the specificity of the specialty of future specialists, which makes up the innovative system;
- Participation of students in professionally oriented activities.

The provisions of innovative approaches in the system of educational care of educational institutions.

Innovative approaches in the system of educational care of educational institutions that make up the innovative system should be based on the following provisions:

- Education – a process of pedagogical direction, which is related to work and its activity in preparing subjects for the planned process;
- During the educational care of educational institutions that make up the innovative system, changes occur in the emotional, intellectual, and physical spheres of the individual;
- Educational care in educational institutions is an independent activity that, in the educational care of educational institutions, constitutes an innovative system and is aimed at achieving the set goals;
- Comprehensive development of the personality of the future specialist in the process of educational care of educational institutions is carried out in the directions of formation of individuality; qualities of a professional and a citizen; a sense of responsibility for success in work and personal life; the student's needs for self-realization, self-improvement, and self-education.

Let's consider the positions that are necessary for innovative approaches in the system of educational care of educational institutions and provide for:

- Coordination of modern requirements for the future competitive specialist with his requests and interests in the process of setting the goal and tasks of the educational system of the educational institution;
- Ensuring consistency in the work of future specialists, by achieving coordination of the efforts of the subjects of the educational process;
- Creation and development of the professional, educational, and cultural space of the educational environment through the introduction of innovative approaches into the system of educational care of educational institutions;
- The application of pedagogical conditions for the application of innovative approaches in the system of educational care of educational institutions;
- Increasing the freedom of choice of activity when applying innovative approaches in the system of educational care of educational institutions, by all subjects of the educational process;
- Professional approach for full implementation of educational care;
- Professionalization of elements of the educational system when using innovative approaches in the system of educational care of educational institutions (Calvopiña Moncayo et al., 2022).

The main indicator of the effectiveness of the introduction of innovative approaches in the system of educational care of educational institutions is the process of expanding the personal space of the future specialist, which aims to promote the testing of the individual in the most diverse spheres of activity, to provide all opportunities for the development of his interests, the experience of various interpersonal relationships and the mastery of innovative approaches (Krasnoschok, 2019).

A necessary task today is to create an effective system of applying innovative approaches in educational care in every educational institution, which creates a holistic educational process. In such a process, integration takes place: training, upbringing, and development of education seekers. The described system has:

- Carry out self-knowledge of the student of education: form the ability to ensure self-realization and success;
- To provide the student with assistance in professional life self-determination, by his individual features;
- Help the learner to self-realize when applying innovative approaches in the system of educational care of educational institutions through the disclosure of potential opportunities;
- To help the student in the formation of competence in professional planning;
- Create conditions for revealing the creative possibilities of education seekers;
- To help students to choose a way of life that is most adequate for them;
- To provide conditions for the development and self-development of education seekers in the educational space;
- Create a situation of success for education seekers in their activities;
- To provide education seekers with freedom of choice in educational activities;
- Promote the reflective activity of education seekers;
- To manage self-education and self-education of education seekers.

When implementing innovative approaches in the system of educational care of educational institutions, three groups of functions are distinguished.

The first group is associated with the direct influence of the educator on the learner when applying innovative approaches in the system of educational care in educational institutions. This includes:

- Studying the individual characteristics of the learner, their development, interests, and environment when applying innovative approaches in the system of educational care in educational institutions;
- Programming educational impacts on the learner when applying innovative approaches in the system of educational care in educational institutions;
- Implementing a set of individualized activities, methods, and forms for the learner when applying innovative approaches in the system of educational care in educational institutions;
- Analyzing educational impacts to make effective predictions for the learner when applying innovative approaches in the system of educational care in educational institutions (Pertile & Rossetto, 2015).

The second group of functions is related to creating an innovative educational environment for learners when applying innovative approaches in the system of educational care in educational institutions:

- Fostering team cohesion when applying innovative approaches in the system of educational care in educational institutions;
- Creating a favorable emotional atmosphere within the team when applying innovative approaches in the system of educational care in educational institutions;
- Engaging learners in various activities when applying innovative approaches in the system of educational care in educational institutions;
- Developing student self-governance when applying innovative approaches in the system of educational care in educational institutions (Shetelya et al., 2023).

The third group of functions is essential for correcting the influences of various subjects of social relations on the learner when applying innovative approaches in the system of educational care in educational institutions:

- Providing social support to families;
- Continuous collaboration with the teaching staff;
- Overcoming negative influences of the educational community;
- Interacting with innovative educational institutions.

The content of the educational care of an education seeker when applying innovative approaches in the system of educational care of educational institutions includes: love for the native land, formation of national consciousness, respect for one's people, desire to improve the prosperity of the state, readiness to protect the native land (Kondrashova et al., 2008).

The significance of innovative educational technologies in the modern educational environment, innovative approaches in the system of educational care of educational institutions consist in facilitating the processes of memory, attention, and perception, which are based on friendly communication, and tolerant behavior of students during educational processes. With this approach to the education process, students acquire communication skills, interact with other people, in a group, with each other, learn to solve complex problems, think critically, analyze situational tasks of a professional direction, professional production situations, and information (Matsenko, 2019).

Let's define the main goals of innovative approaches in the system of educational care of educational institutions:

- Promotion of self-affirmation, and self-realization of students' personalities in the system of educational care of educational institutions;
- Focus on person-oriented, educational cultural values and humanistic when implementing innovative approaches in the system of educational care of educational institutions;
- Use of active, creative, innovative methods in the system of educational care of educational institutions;
- Formation of a high level of intelligence in the students of education;
- Application of individually differentiated forms of education;
- Developing and consolidating complex abilities;
- Development of the following types of intelligence among students: professional, economic, political-ideological, national-patriotic, general cultural, and social (Tverdokhlib, 2017).

We will reveal the main parameters of creativity, which are necessary when using innovative approaches in the system of educational care of educational institutions:

- Ability to generate ideas;
- Ability to identify problems;
- Non-standard ideas;
- Flexibility and variations of ideas;
- The ability to improve the object with the help of new elements;
- Ability to synthesize, analyze, and solve problems.

Creativity is the main prerequisite for creating innovations when using innovative approaches in the system of educational care of educational institutions, therefore it is important to develop creative thinking in students of education, which is determined by the synthesis of disparate elements, analysis, and combination, as an ability, creating new important knowledge and forms that have the significant socio-economic effect.

Experimental verification.

The following methods were used in the study: interviews, surveys, questionnaires, and pedagogical observation. To compare and process the results of qualitative and quantitative analysis of the data obtained during the experiment, an analysis of the results obtained was carried out, the method of mathematical statistics was used. The experimental work took place without changing the structure and course of the educational process, and was carried out in natural conditions. During the formative stage of the experiment, our task was to help respondents master the necessary knowledge and skills for the formation of the innovative orientation of the educational process of higher education. At this stage, the EG respondents were prepared for the implementation of the system for the formation of the innovative orientation of the educational process in higher education institutions. Trainings were held for students to acquire the necessary skills, training seminars, and ways of implementing innovative educational activities were considered.

During the experimental verification of the effectiveness and importance for education of a substantiated innovative system of educational care in institutions of higher education, the achievement of the main tasks defined by us of the innovative educational system of institutions of higher education was verified:

- Formation of personal, social, and public experience in the student of education;
- Realization of the spiritual, cognitive, and creative potential of the individual;
- Stimulation and development of the future specialist;
- Involvement of innovative approaches for education seekers in the system of educational care of educational institutions;
- Formation of professional values, personally significant socio-cultural components, the need for which is not satisfied during training;
- Meeting the needs of the student of education in professional self-determination;
- Training of willpower in the student;
- Formation of a clear formed life position in the student of education, etc.

The exploratory-experimental study was conducted to evaluate the upbringing of students in institutions of higher education because the main goal of institutions of higher education is to educate each student as a cultural, creatively active, and socially mature person, capable of innovative, creative activities in the social society, adaptation in it.

In the process of work, we used a complex of diagnostic methods that allowed us to investigate various aspects of the level of education of students. The obtained results were entered into the map of the student's personality education and were used to evaluate the correction and re-examine the dynamics of the indicators.

56 students from higher education institutions participated in the study. The experimental research took place in three stages: ascertaining, formative, and control.

The purpose of the ascertainment stage was to identify the starting level of formation and upbringing of students.

To evaluate the effectiveness of the educational process, monitor the progress of students' personal development, and adjust it as necessary, we have developed criteria and diagnostic tools: the student's appearance; physical and mental health; student behavior; development (work on oneself); relations in the student body; attitude towards oneself; value advantages; creative abilities; intelligence; cognitive activity; creative potential; productive life (maximum full use of one's capabilities, strengths and abilities), which was reflected in a test survey of higher education applicants.

During the ascertainment stage of the experiment, experimental and control groups of students were formed to determine the level of education of students.

In the process of psychological-pedagogical and socio-pedagogical diagnosis of students, we used the following methods: interviews, express surveys, testing, and pedagogical observation. For each student, a psychological-pedagogical card was drawn up according to the form developed by us, in which the results of the examination were entered.

In the process of psychological-pedagogical and socio-pedagogical diagnostics of students, we used the following methods: conversations, surveys, questionnaires, and pedagogical observation. A psychological-pedagogical card was drawn up for each student according to the form we developed, into which the results of the examination were entered.

Each student was personally informed of the results of the examination in a friendly manner and his educational route was jointly designed. The dynamics of the personal development of each student are periodically monitored.

The first results show that the evaluation of a student's upbringing, this process itself, is an effective means of stimulating self-education, self-development of each student, and the formation of an adequate self-esteem of his personality. The main task of the curator of the academic group of students and the teacher is to create a personal situation that actualizes the forces of self-development of the individual. The dignity of the situation as a method of education is that it cannot be created for any average student or group of students. In a situation that is different for each specific individual, it is possible to reveal the most hidden information about a person's inner world, which is difficult or simply impossible to obtain with the help of questionnaires, interviews, and observations.

At the beginning of the experiment, we used a personal approach, which can be implemented only by a teacher who has several necessary personal attitudes. We have singled out the following main attitudes: empathy; vision of the student's behavior, evaluation of his reaction, actions, deeds, from his own point of view, which during communication with him allows the teacher to look at everything around and at himself, including through the eyes of students; an expression of the teacher's inner confidence in the possibilities and abilities of each student, the so-called "pedagogical optimism"; "openness" of the teacher to his own thoughts, feelings, experiences (reflection) and the ability to openly express them in interpersonal communication with pupils; refusal of an open and direct assessment of the pupil, expressing one's attitude to events using the technique of "I-message" (considering a person's shortcomings as someone who did not have time to form, and therefore do not show their dignity – then self-confidence is strengthened, his self-esteem, activity and general well-being); treating the student as a unique individual (the student's difference from other people is noted, the uniqueness of his personal "I" is emphasized); situations of success as a necessary psychological condition for accepting one's "I" as a subject of activity (lays the foundations for the formation of the need for successful activity and the need for repeated success. Only a person who is confident in his abilities can express himself freely, and for this, he needs to experience the success of his own activity).

The results of personally oriented education are expressed in the attitude of the teacher and student towards the general activity, cooperation, with each other, in the psychological well-being, self-esteem, and growth of personal achievements of everyone.

In the context of the formative stage of the research, we tested various methods for determining the level of education of students, which made it possible to investigate various aspects of the level of education of students. The obtained results were entered into the map of the student's personality education and were used to evaluate the correction and re-examine the dynamics of the indicators.

The criteria for forming the innovative orientation of the educational process of higher education are defined as follows: motivational, cognitive, activity, personal, and reflective. The main indicator of the effectiveness of the introduction of innovative approaches in the system of educational care of educational institutions was the process of expanding the personal space of the future specialist, which aims to promote the testing of the personality in the most diverse spheres of activity, to provide all opportunities for the development of its

interests, experience of various interpersonal relations and mastering of innovative approaches (Panasiewicz, 2020).

According to the criteria developed by us and the diagnostic tools discussed above, the following levels are distinguished: high, medium, and low.

The purpose of the experimental study was initially to identify the starting level of education of the students: high (clearly expressed positive motives: positive self-affirmation, high level of self-awareness, conviction, striving for self-improvement, high and average level of intelligence, generosity, high level of collective orientation, self-criticism, active life, a positive attitude to professional activity, intellectual activity, a rich inner world, a high desire to satisfy cognitive needs, maximum full use of one's opportunities, strengths and abilities); average (motives with a positive orientation: positive self-affirmation, desire for self-improvement, average level of intelligence, activity, desire to satisfy cognitive needs, tendency to judge people by their actions, desire for social recognition, self-criticism, personal orientation, self-criticism, neutral attitude to professional activity , insufficient full use of one's capabilities, strengths and abilities); low (clearly expressed negative orientation: negative self-assertion, low level of intelligence, passivity, self-love, high level of conformity, lack of self-criticism, negative attitude to professional activity, poverty of the inner world, lack of initiative, personal-prestige orientation, lack of desire for self-improvement and self-development, difficulty in establishing contacts with people, incomplete use of one's capabilities, strengths and abilities).

The dynamics of the personal development of each student were periodically monitored. The first results showed that the evaluation of a student's upbringing, this process itself, is an effective means of stimulating self-knowledge, self-education, self-development of each student, and the formation of an adequate self-esteem of his personality.

Qualitative indicators of the level of education of the student made it possible to evaluate and monitor both individual and group indicators and adjust the methodology of educational care.

A modified author's method based on questionnaire data was used to indirectly assess the level of education of students.

Control stage of experimental work.

The final control was carried out as part of the control stage of our study.

The purpose of the control stage of the study was to obtain an objective assessment of the level of education of students. 55% of students have a high level of education, 40% have an average level, and 5% have a low level. The dynamics of positive changes in the education level of students are shown in Table 1 and Figure 6.

Table 1.
Dynamics of raising the level of education of students.

Education levels	Declarative stage		Control stage	
	Experimental group	Control group	Experimental group	Control group
	1 year	1 year	5 year	5 year
High	15%	5%	55%	5%
Medium	60%	50%	40%	60%
Low	25%	45%	5%	35%

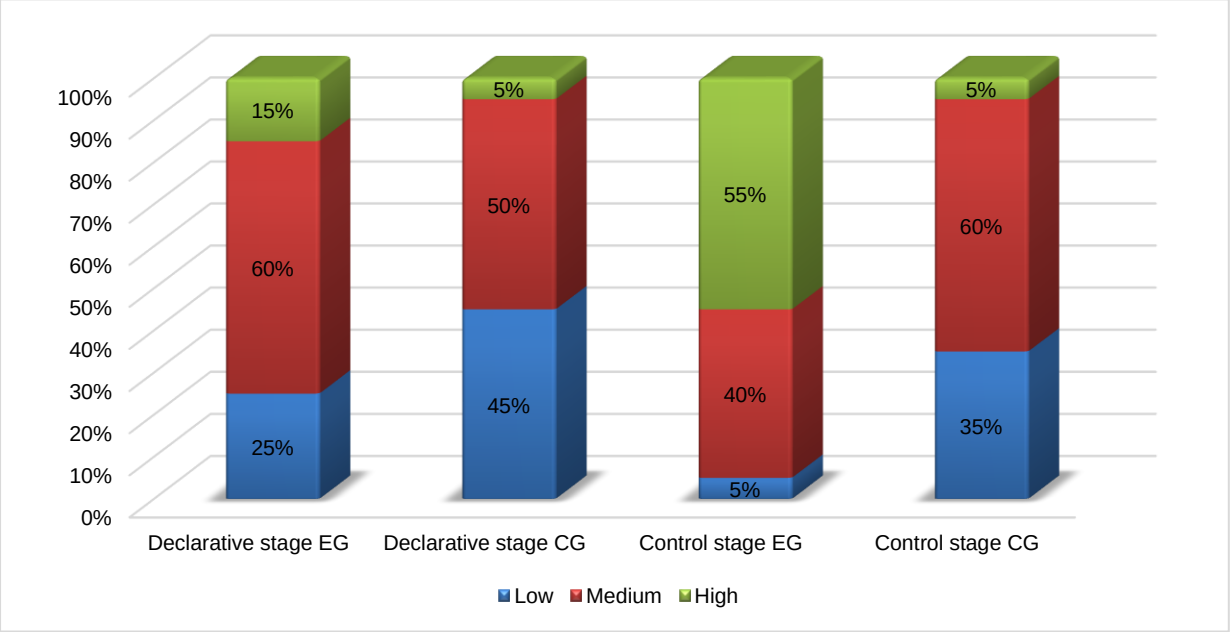

Figure 6. Dynamics of raising the level of education of students.

To compare the results of the ascertaining and final stages of the experimental study, a statistical analysis was carried out using the empirical value 2χ.

The results of the study showed that in the experimental group, the number of students with a low level of education significantly decreased and the number of students with a high level increased. Regarding the insignificant increase in the number of students, the average level is also characteristic. Positive changes allow us to speak about an increase in the level of education of students.

The reliability of the differences in the characteristics of the experimental groups and the control groups in the formation of the innovative orientation of the educational process of higher education is 95%. The changes that have occurred in the level of formation of the innovative orientation of the educational process in the EG are statistically significant, reliable, and occurred as a result of the implementation of the system for the formation of the innovative orientation of the educational process, which is evidence of the effectiveness of this system. Thus, the effectiveness of the system for the formation of the educational system in higher education institutions has been proven, and the results of the study complement previous studies.

The main goal of the experiment was achieved, that is, the effectiveness and importance for education of a well-founded innovative system of educational care in higher education institutions were proven and the achievement of the main tasks of the innovative educational system of higher education institutions identified by us was verified. During the experiment, the directions of professionalization of the innovative system of educational care of an educational institution were verified; the positions that are necessary for innovative approaches in the system of educational care of educational institutions were considered; the main innovative principles and methods in the system of educational care of higher education institutions were clarified.

Such a conclusion when obtaining the results of the study indicates the timeliness of the work being carried out, its relevance, and the effectiveness of the selected methods.

The introduction of this innovative educational system into the educational space of higher education institutions, and the use of pedagogical diagnostics provide for successful learning and social adaptation of students in a higher education institution. In our study, this is confirmed by the creation of a pedagogical

educational environment in a higher education institution that prepares a student for the transition to professional activity and independent life.

The development of students' creative potential depends on the following conditions: the creation of a psychologically comfortable climate in the teaching staff of a higher education institution; the integrity and interrelationship of educational and educational care based on the tasks of social and professional development of a future specialist. The modern approach to education implies an emphasis on self-education and self-realization of a person's qualities and abilities.

So, by the innovative system of educational care in a higher education institution we understand:

- The method of interaction between the student team and the teaching staff, in which the system of rights, relationships, and responsibilities of each member of the team is clearly defined;
- Content, innovative forms, and innovative approaches in the educational system of educational institutions constitute an innovative system that consciously stimulates the professional and personal development of a future competitive specialist while complying with the individual interests of the student, social requirements, abilities of the student, and his capabilities.

Methodological recommendations.

- To educate with the possibility of using innovative approaches in the educational system of educational institutions, that is: to form systems of relationships between people in such a way that the stimulation of the individual, a tolerant attitude towards oneself and others, towards society, towards work come to the fore.
- To consider the continuous process of education when using innovative approaches such as development and learning. Such an educational environment with innovative approaches is one of the main aspects of personality development, which directs its functioning to the improvement and implementation of the tasks of educational activity: humanization, which contributes to the improvement of working conditions, life, types, and forms of relationships, the content of educational and educational activity; implies the presence of spiritual space, an atmosphere that encourages creativity and self-development, stimulates the activity of the individual's life.
- Involving students in cultural and artistic, scientific and technical, public and educational, sports and recreational, economic and labor activities using innovative approaches in the educational system of educational institutions, to ensure the success of the student in the environment. It is thanks to this approach to the educational process that many educational tasks are solved in a relaxed, purposeful, unforced, and comprehensive manner.
- Paying great attention to self-education, which is the highest stage of the educational process, the highest form of personality development with the mandatory use of innovative approaches in the educational system of educational institutions: conscious, systematic, individual personal activity aimed at forming in oneself the intended aesthetic, mental, physical, moral qualities, eliminating negative habits, programming positive character traits, will. The leading component of this approach is the formation of moral and volitional qualities (Ortynsky, 2009).
- To provide in higher education a pedagogy of partnership, and cooperation, which is of great importance for the innovative process of education using innovative approaches in the educational system of educational institutions, which is not an authoritarian, dogmatic education and is based on the principle of accepting a person as nature created him.

To take into account that a necessary condition for the successful education of a higher education applicant when using innovative approaches in the educational system of the institution is, as an example, the personality of the teacher, his culture, homiletic and deontological ability, and spiritual qualities. Only a character can educate a character, only personality can influence the development and definition of personality. Its example is always the justice, decency, and principledness of the teacher that influence a young person (Gladush & Lysenko, 2014).

Limitations of the study

The implementation of the pedagogical experiment was carried out in three stages during 2022-2024: preparatory, main, and final.

At the preparatory stage (2022), the goal and objectives of the study were determined, the experimental plan was developed, the methods of measuring and processing the results were determined, the control and experimental groups were selected, and their homogeneity was checked.

At the main stage (2023), the experiment was conducted.

At the final stage (2024), the results of the experiment were analyzed, their reliability was confirmed, and conclusions were drawn about the pedagogical effect of the experiment.

Research relies heavily on the accuracy and reliability of data. The following digital data collection tools were useful in the study: MS Excel and SPSS (Statistical Package for Social Science) programs.

The total sample size in the article is 160 respondents. The sample of respondents was formed by random selection using the technical procedure for calculating the selection step.

During the experimental study, diagnostic data on the levels of social competence of higher education applicants were determined through information influence and divided into a control group (79 students) and an experimental group (71 students).

The study was implemented by using methods and various forms: multimedia technologies (projector, multimedia board, video and audio equipment), software that combines animation, graphic, text, video and sound data and information, their simultaneous use in the information space; mobile devices, personal computers, web-based resources that are freely available and free of charge (YouTube, author's website, specialized sites, social networks, cloud technologies, social network technologies), etc.

The limitations of this study allowed for the following impact on the results: improving the qualitative characteristics of the material, optimally specified goals and objectives, and increasing the effectiveness of the results.

Conclusions

An analysis of the innovative system of educational care in an educational institution was made, and the importance and necessity of using innovative approaches in the system of educational care of educational institutions was proved. The characteristics of an innovative educational system are analyzed: purposefulness, integrity, dynamism, interaction with the environment, and openness to other systems. The structural elements of the educational institution's innovative educational system, its components, and the main areas of professionalization are highlighted.

The functions of educational care when using innovative approaches in the system of educational care of educational institutions are grouped into groups. Let's highlight the main principles of education in the system of educational care of educational institutions.

An important role in solving educational tasks when using innovative approaches in the system of educational care of educational institutions is played by innovative technologies in the field of education and training, which represent the process of introducing into practice new models and methods of educating pupils and students that have been tested in the course of experimental activities and that increase efficiency educational process.

The essence of modern innovative educational technologies is revealed, the goals of innovative technologies are prescribed when using innovative approaches in the system of educational care of educational institutions, the importance of self-education – the highest stage of the educational process, pedagogy of cooperation, partnership, which is of great importance for the innovative process of education – is emphasized.

An experimental study was conducted to prove the effectiveness and importance of the innovative system of educational care in higher education institutions. Positive changes allow us to talk about raising the level of education of students.

The application of a complex of scientific approaches enables a multifaceted analysis of the problem of researching innovation processes, and the synthesis of its results entails a critical analysis of the accepted content of the basic concepts, a change in the initial positions and methods for interpreting existing ones and building new theoretical concepts and re-evaluating the established experience of innovations and innovative activities.

The practical significance of the results obtained lies in the possibility of their direct application to improve the Use of innovative technologies in the training of specialists in higher education institutions.

Future lines of research are the application of synergistic principles, which are designed to strengthen the interaction between innovative and traditional segments of the educational process. A clear understanding of the format of application and purpose will allow the use of information and communication, technological, and digital tools to improve the quality of education in the higher education cluster.

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Optimization of the educational process through the use of artificial intelligence in teachers' work

Optimización del proceso educativo mediante el uso de la inteligencia artificial en el trabajo de los profesores

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Abstract

The integration of artificial intelligence (AI) into the education sector opens up new opportunities for transforming educational processes, rethinking traditional teaching methods and implementing effective changes in approaches to learning. The aim of the article is to study the functional capabilities of AI to optimize the work of teachers of higher educational institutions (HEIs) and increase its efficiency. The research was conducted using empirical methods such as experiment, observation, and questionnaire survey. The model of integration of AI tools into the educational process was proposed and tested. The results of the study showed that the functions of AI have a powerful potential for improving the teacher's work in the context of optimization of educational processes and increasing their effectiveness in general, which was confirmed by 98% of the surveyed respondents. The ranking of promising areas of application of AI-based solutions was headed by the implementation of adaptive learning strategies (4.868 points), followed by feedback and evaluation (4.507 points), the generation of educational content ranked third (4.258 points), the management of educational activities ranked fourth (4.139 points), interaction and communication ranked fifth (3.910 points). The article may be useful for teachers interested in improving pedagogical effects through innovative digital

solutions. Research prospects may be the study of the impact of AI tools on improving the learning effectiveness of postgraduate students, as well as on the level of their learning motivation.

Keywords: Optimization of the teacher's work, management of the educational process, artificial intelligence (AI), adaptive learning, learning strategies, interactive educational environment.

Resumen

La integración de la inteligencia artificial (IA) en el sector educativo abre nuevas oportunidades para transformar los procesos educativos, replantear los métodos tradicionales de enseñanza y aplicar cambios eficaces en los enfoques del aprendizaje. El objetivo del artículo es estudiar las capacidades funcionales de la IA para optimizar el trabajo de los profesores de instituciones de enseñanza superior (IES) y aumentar su eficiencia. La investigación se llevó a cabo utilizando métodos empíricos como la experimentación, la observación y la encuesta por cuestionario. Se propuso y probó el modelo de integración de las herramientas de IA en el proceso educativo. Los resultados del estudio mostraron que las funciones de la IA tienen un poderoso potencial para mejorar el trabajo del profesor en el contexto de la optimización de los procesos educativos y aumentar su eficacia en general, lo que fue confirmado por el 98% de los encuestados. La clasificación de áreas prometedoras de aplicación de soluciones basadas en IA estaba encabezada por la implementación de estrategias de aprendizaje adaptativo (4,868 puntos), seguida de la retroalimentación y la evaluación (4,507 puntos), la generación de contenidos educativos ocupaba el tercer lugar (4,258 puntos), la gestión de actividades educativas el cuarto (4,139 puntos), la interacción y la comunicación el quinto (3,910 puntos). El artículo puede ser útil para profesores interesados en mejorar los efectos pedagógicos mediante soluciones digitales innovadoras. Las perspectivas de investigación pueden ser el estudio del impacto de las herramientas de IA en la mejora de la eficacia del aprendizaje de los estudiantes de posgrado, así como en el nivel de su motivación para el aprendizaje.

Palabras clave: Optimización del trabajo del profesor, gestión del proceso educativo, inteligencia artificial (IA), aprendizaje adaptativo, estrategias de aprendizaje, entorno educativo interactivo.

Introduction

The rapid technological progress, which affects all aspects of human life and activity, makes the issues related to the digital transformation of the educational system in order to prepare students for the challenges of the modern labour market especially important. Implementation of the strategy of digital transformation of educational services in educational institutions requires numerous researches and developments, as well as technical, organizational, labour, and cultural changes (Hashim et al., 2021).

The development of adaptive learning platforms is changing learning methods, offering innovative solutions and tools for obtaining practical learning experiences and distance collaboration. The flexibility of such platforms enables students to gain knowledge and experience in an environment that promotes independence and unimpeded learning (Apture et al., 2023). Virtual learning environments provide an immersive atmosphere for collaborative learning, interaction, information visualization, and real-time virtual feedback (Tapalova & Zhiyenbayeva, 2022). Cloud computing has become a necessary component of university education systems, and the AI capabilities to personalize the educational process taking into account the students' individual needs open up new prospects and clearly outline the priority vectors of higher education development in the era of digital innovations. The creation of an interactive, innovative educational environment is the goal of not only the management of HEIs and teachers, but also a means of promoting quality educational services in the global space.

Technological progress opens up a wide range of opportunities for effective pedagogical activity. Online learning technologies enable the adaptation of learning material and the use of blended learning models, giving students freedom in the mode and pace of learning, as well as flexible access to courses (Sîrghi et al., 2024). AI technologies are gradually changing the teachers' role in educational activities (Wang et al., 2021), as AI tools are increasingly integrated into educational practice, opening new opportunities for personalized and adaptive learning in an immersive educational environment, providing students with personalized support, improving their learning success. Deep learning approaches have demonstrated positive effects on enhancing learning motivation, promoting personalized learning experiences, and improving assessment strategies (Shi et al., 2023). Personalized AI learning systems are able to qualitatively adapt educational content, pace and

learning resources to the unique characteristics and needs of each student, thereby creating a more effective and engaging learning environment.

AI technologies demonstrate advantages not only in the context of improving students' educational experience, but also in the context of optimizing the teachers' work, enabling them to achieve maximum efficiency in achieving pedagogical goals. However, even though AI adaptive learning systems are proactive systems in which students have access to a set of personalized learning tools that they can adapt to their personal preferences and skills, such systems do not guarantee learning motivation. A special role of teachers as instructors and moderators of educational activities is revealed in this aspect, which is becoming increasingly important (Bhutoria, 2022). Therefore, additional empirical research is needed to determine the AI potential to optimize teaching activities and the teacher's role in the students' interactive adaptive learning path.

Although the results of recent studies show the advantages of adaptive learning with the use of AI technologies to ensure effective learning, there are still insufficiently resolved issues regarding the optimization of pedagogical activity through the inclusion of AI tools in professional practice. Taking this into account, the aim of the article is to study the functional capabilities of artificial intelligence to optimize the work of teachers of HEIs. The aim was achieved through the fulfilment of the following research objectives:

- Develop a model for integrating AI tools into the educational process;
- Explore the functions and test AI tools during the three-month online course Artificial Intelligence in Pedagogy;
- Study the teachers' attitude to the integration of AI technologies in their professional activities;
- Assess the potential impact of AI tools on the optimization of the teacher's work in the following segments: i) planning, organization and management of educational activities; ii) creation and design of interactive educational content; iii) differentiation of educational resources and organization of a personalized interactive learning environment; iiii) organization of joint work of students and creation of a single learning space for active learning and communication; iiii) development of a system for evaluating educational achievements and providing feedback.

Literature Review

The concept of adaptive learning is based on the idea that students have different cognitive abilities, experiences and learning preferences. The functions of AI open up new opportunities for the implementation of personalized adaptive learning, taking into account the individual abilities and needs of each student. Adaptive learning supported by artificial intelligence tools, uses training data and machine learning algorithms to create dynamic and interactive learning processes, develop individual learning trajectories, provide personalized feedback and analyse the learning progress of each student. AI algorithms can continuously monitor student progress and adjust the level of difficulty of learning content accordingly, generate detailed performance analytics reports, and provide predictive analytics to identify potential learning gaps or areas for improvement (Akavova et al., 2023). Furthermore, AI and machine learning algorithms can analyse student interactions, group dynamics, and social media data to provide personalized recommendations for group projects, collaborative learning activities, and constructive feedback (Gligorea et al., 2023). Educational AI-based applications can qualitatively influence the modernization of the learning environment: from personalization of learning to the development of modern virtual classrooms and conditions for obtaining an interactive learning experience (López-Chila et al., 2024).

Diao (2020) claims that the use of artificial intelligence in education can help teachers to develop higher quality current educational content, improve it and adapt it to the students' personal needs through the integration of feedback tools, the creation of personalized learning trajectories and the evaluation of educational achievements with the use of educational data analytics tools, which will significantly reduce the burden on teachers and increase the effectiveness of education. According to Salido (2023), AI can help teachers to save time by automating administrative processes such as grading assignments, tracking student attendance, and preparing lessons. AI can also help to identify knowledge gaps and learning difficulties for students and provide them with additional support to improve overall performance. This view is consistent with the opinion of Liu (2023), that smart analysis and assessment of the level of student training on educational platforms make it possible to establish a multi-level topological connection with educational resources through the use of intelligent tags, creating a knowledge map by year of study, which enables teachers to implement a personalized educational approach with minimal time spent.

Today, generative artificial intelligence (GenAI) is penetrating various fields of activity and demonstrates its functional advantages. Unlike machine learning (ML) algorithms, whose functions are aimed at analysing and interpreting data, GenAI is designed to create new, original results by generating new content (text, images, audio, and video), thereby being functionally capable of solving more complex tasks (Li et al., 2024). Moreover, GenAI can perform many functions and tasks to effectively organize educational activities, including the creation of personalized educational content, realistic simulations, or engaging virtual learning environments (Lee et al., 2023). GenAI has the potential to change the educational landscape by offering adaptive learning pathways and releasing teachers from routine responsibilities (Mishra et al., 2024).

According to Wu (2023), it is important to recognize the unique strengths and weaknesses of the integration of GenAI into education, the practical use of which must preserve important aspects of the human learning experience relying on the fundamental ideas of learning theories, witnessing the dawn of a new era in the field education and training. This view is supported and supplemented by the study of Li et al. (2024), who believe that a deeper understanding of learning processes can be achieved by applying GenAI in the process of developing personalized learning methods. Improved results in learning can be achieved by creating a symbiotic relationship between the development of AI and the theory of education.

The researchers from the UAE (Kamalov et al., 2023) studied the potential impact of AI on education in three main areas: applications, benefits and challenges. They identified several challenges related to the AI implementation, which include data privacy, security and bias in the teacher/student relationship. It is worth noting that the fight against cybercrime is currently a problem not only in Ukraine, but also in the whole world. According to the authors of the study on the causes of fraud using IT technologies (Punda et al., 2023), the development of information technologies (IT) has significantly expanded the types of cybercrimes and accelerates their occurrence. Active participants of virtual interactions need to protect personal data from the technical side and take preventive measures in order to avoid dangers in the Internet. The article by Fusco (2022) covers the issue of AI-generated fake news. He believes that raising public awareness through media literacy and critical thinking campaigns is critical to building a more informed and sustainable society. Teaching AI literacy and ethics should be integrated into thematic curricula to foster an inclusive, equitable, and effective learning environment that meets the diverse needs of the 21st-century learners. When implementing AIEd in educational practice, it is necessary to observe flexibility in decision-making, as careful implementation of AIEd may not always lead to the desired results, because students do not necessarily perceive the implementation of these technologies positively (Rodway & Schepman, 2023).

According to the authors of the article, the process of updating educational approaches and implementing advanced technological achievements to improve the quality and efficiency of educational activities is becoming relevant for practicing teachers in the current conditions. Besides, new opportunities for the use of technological solutions for the improvement of pedagogical activity, its optimization and adaptation to modern trends open up for teachers.

Methods and Materials

Research design

At the initial stage of the study of the potential impact of AI tools on optimizing the teacher's work and increasing its effectiveness, the authors developed a model for integrating AI tools into the educational process (Figure 1). The model demonstrated five areas of pedagogical work that can benefit from interaction with modern educational AI tools. The model revealed the potential of system interaction of AI tools to ensure an effective educational process, as well as outlined the principles of implementing post-graduate education using the AI capabilities.

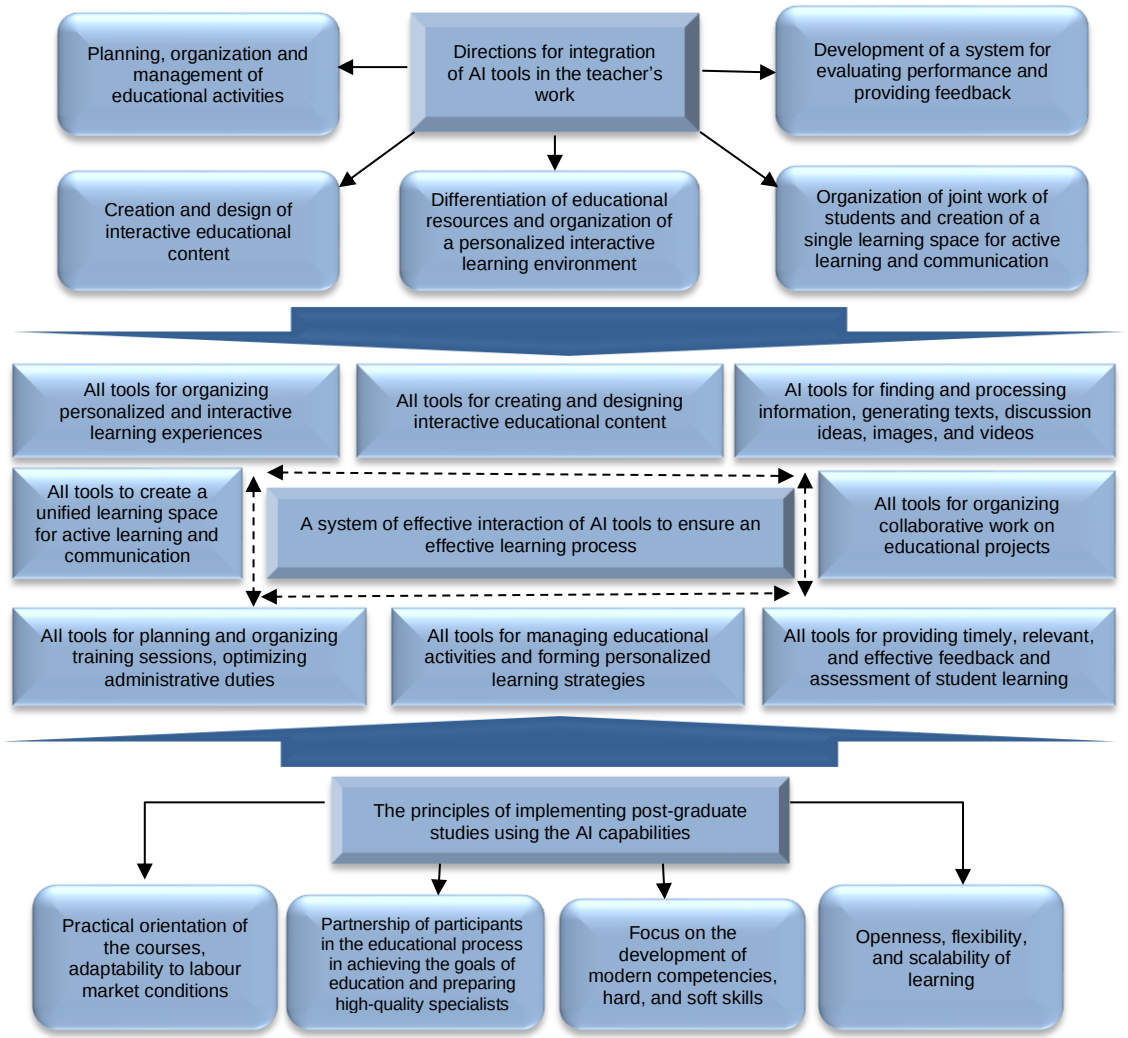

Figure 1. Model of integration of AI tools in the educational process
Source: developed by the author

At the next stage of the research, the authors conducted an online seminar entitled the Possibilities of Artificial Intelligence in Improving the Quality of Postgraduate Education on the Google Meet communication platform (https://meet.google.com/), involving postgraduate education teachers of Borys Grinchenko Kyiv Metropolitan University and Kirovohrad Regional In-Service Teacher Training Institute named after Vasyl Sukhomlynskyi. The invitation and the registration form for participation in the seminar were sent by e-mail to the administrators of the departments. The seminar involved a total of 134 people. The participants of the seminar were given the opportunity to learn more about the functionality of AI tools during the free training course, for which 97 people registered.

Based on the author's model of integration of AI tools into the educational process, the authors developed and delivered a three-month online course — Artificial Intelligence in Pedagogical Activity, which was offered in a mobile application developed on the SkillzRun platform (https://skillzrun.com/). Course participants had the opportunity to explore the AI tools, test them, and explore the possibilities of using them to improve and optimize their pedagogical activities. The training course included 7 modules designed to reveal the potential of individual AI tools to improve the effectiveness of the teacher's work and optimize it.

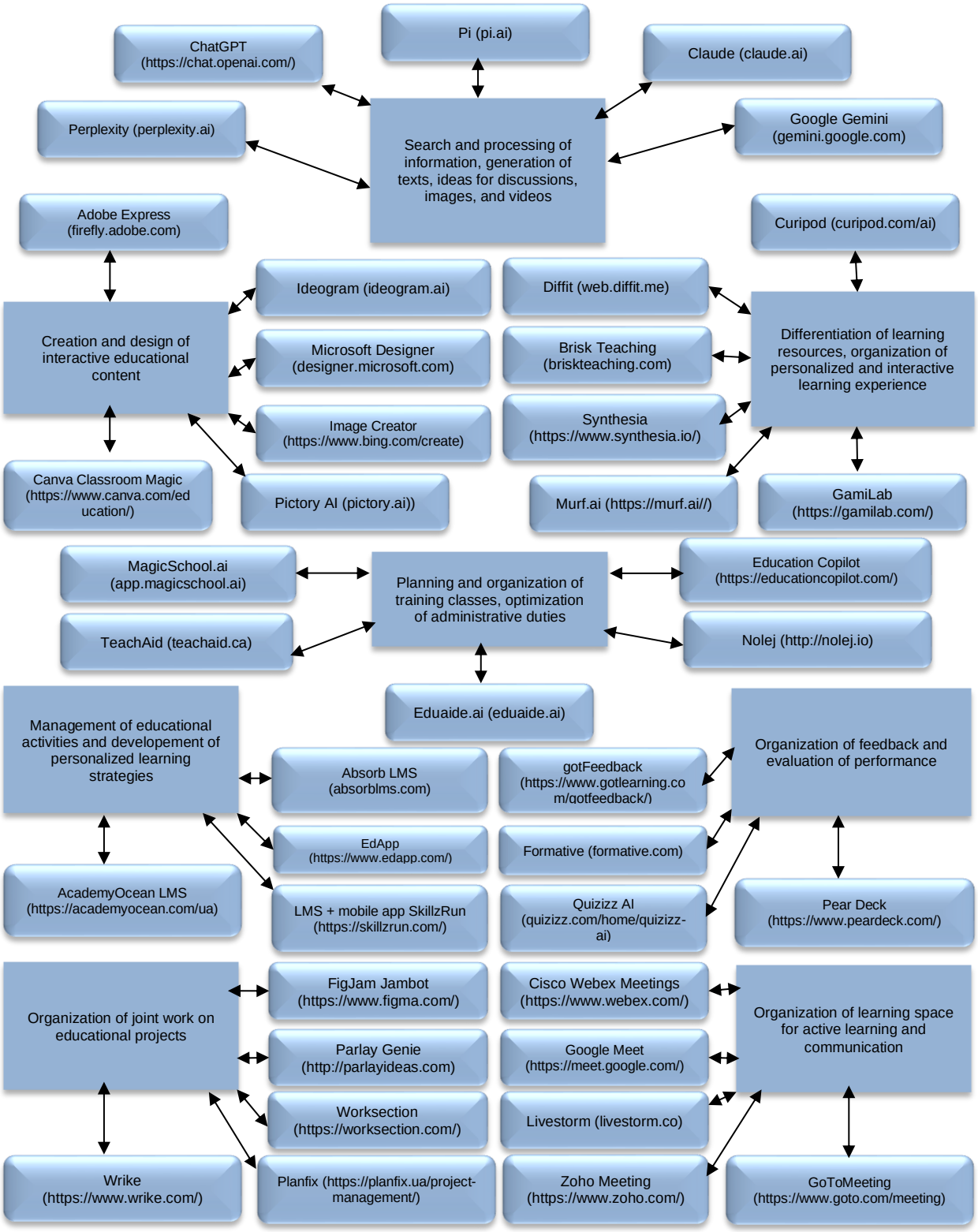

Figure A.1. AI tools explored and tested by the course participants.
**Developed by the author*

Sample

The training took place from January to April 2024 involving 97 postgraduate education teachers (Table 1). Four educational groups were formed using the method of random selection (Group 1 — 25 teachers, Group 2 — 23, Group 3 — 24, Group 4 — 25). The training course was moderated by 4 teachers of the Institute of Postgraduate Education of Borys Grinchenko Kyiv Metropolitan University. All participants of the training course took part in the survey, which was conducted upon the completion of the course.

Table 1.
Participants of the training course

Number of respondent teachers (people)	Teaching experience (years)	HEI
32	7-17	The Institute of Postgraduate Education of Borys Grinchenko Kyiv Metropolitan University, the Department of Preschool and Primary Education
36	9-19	Kirovohrad Regional In-Service Teacher Training Institute named after Vasyl Sukhomlynskyi
29	3-20	The Institute of Postgraduate Education of Borys Grinchenko Kyiv Metropolitan University, Department of Science and Mathematics Education and Technologies

Methods

The research was conducted using empirical methods such as experiment, observation, and questionnaire survey. The experiment method was used for developing the structure of the course and its implementation in order to test the functionality of AI tools. The observation method was used by the authors of the study when administering the educational course in order to identify the effectiveness of the developed model of integration of AI tools in the educational process. The questionnaire survey method was implemented after the completion of the training course in order to identify promising directions for the optimization of pedagogical activity using the functional capabilities of AI tools. The survey of respondents — postgraduate education teachers — was conducted at the beginning of April 2024 in a mobile application on the SkillzRun platform. The purpose of the survey was to study the teachers' attitude to the functional capabilities of AI tools in the context of optimizing the teacher's work and increasing its efficiency. The survey questionnaire was developed by the authors of the training course (Appendix B, Table B.1 (please use https://docs.google.com/document/d/1AXniAGxp7TfrmqtuSXbsw5WC8_hgWkkSt0Fw1L7yIMs/edit?usp=sharing)). The questionnaire was checked for validity and reliability. The Pearson correlation coefficient was 0.87, which indicates that the questionnaire has high validity. Cronbach's alpha ranges from 0.84 to 0.89, which indicates that the internal consistency of the questionnaire scale is quite high, the questions in the questionnaire are homogeneous and interconnected.

Instruments

The obtained data were analysed and processed using statistical methods and Microsoft Office Excel software. The survey used a psychometric Likert scale in 5 gradations: 1 — absolutely does not affect; 2 — does not affect; 3 — partially affects; 4 — affects to a large extent; 5 — maximum effect. Respondents' questionnaires were sorted by relevance, an independent sample T-test was performed, and the results showed no significant difference (P> 0.049). Harman's univariate method was used to check the systematic error of the general method. The variance of the first factor was 34.57% (less than 50%), confirming the absence of systematic error of the general method in this study.

Ethical criteria

The study was developed in accordance with the recommendations of the Declaration of Helsinki, the respondents gave written consent to participate in the study, personal data processing. The survey was anonymous and the obtained data were used in a generalized form only.

Results

The results of the survey of respondents after the completion of the training course Artificial Intelligence in Pedagogical Activities demonstrated the teachers' positive attitude towards the integration of AI technologies in their professional activities. In particular, according to 89% of respondents, the integration of AI technologies can improve the quality and efficiency of interaction with students. A total of 86% of respondents believed that the use of AIEd technologies greatly facilitates the educational process, making it convenient for both teachers and students. According to 97% of the respondents, the use of AIEd technologies contributes to the creation of a modern and exciting learning environment that engages students in learning and promotes better assimilation and retention of knowledge. Furthermore, 95% of respondents believed that AIEd tools optimize the organizational aspects of their pedagogical activities and direct efforts to improve pedagogical skills. According to 93% of surveyed teachers, AIEd tools enable generating a variety of learning situations and simulating an immersive environment for acquiring practical skills and abilities. A total of 98% of respondents believed that the use of AIEd technologies can improve the quality of education in general.

The results of teachers' assessment of the influence of the functional capabilities of AI tools on the optimization of pedagogical work and increasing its effectiveness are presented in Appendix C, Table C.1 (please use https://docs.google.com/document/d/1AXniAGxp7TfrmqtuSXbsw5WC8_hgWkkSt0Fw1L7yIMs/edit?usp=sharing). Segment C "Differentiation of educational resources and organization of a personalized interactive environment" with an average score of 4.868 ranked first in terms of the impact of AI tools on the optimization of the teacher's work. Segment E. "Development of a system for evaluating performance and providing feedback" ranked second with an average score of 4.507. Segment B. "Creation and design of interactive educational content" ranked third with an average score of 4.258. Segment A. "Planning, organization and management of educational activities" ranked fourth in the influence ranking with an average score of 4.139. Segment D. "Organization of joint work of students and creation of a single learning space for active learning and communication" ranked fifth with an average score of 3.910.

According to the respondents, AIEd tools are maximally able to optimize the teacher's work in the field of planning, organization, and management of educational activities due to the function of mobile learning with the ability to organize effective distance learning, flexible access, gamification, automation of assessment and certification of knowledge. The respondents highly rated the potential of using AIEd tools in the work of creating a single knowledge base with structured materials, building a system of effective communication and student interaction. Figure D.1

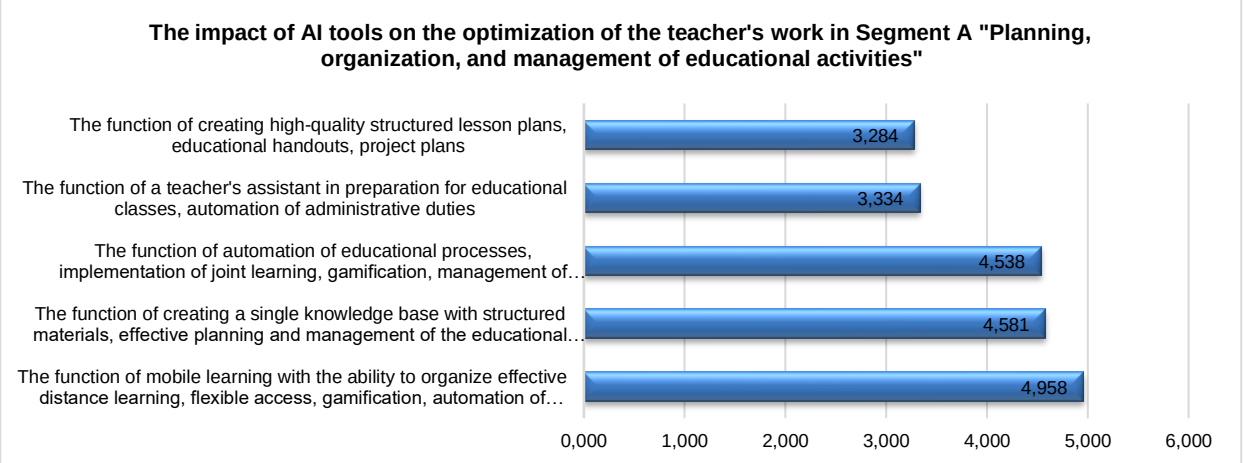

Figure D.1. Assessment of the impact of AI tools on optimizing the teacher's work in Segment A.
**Developed by the author*

According to the respondents, AI tools are able to maximally influence the optimization of the teacher's work in the creation and design of interactive educational content due to the function of automatic creation of interactive content based on textbooks, videos, and online media resources. The respondents highly rated the function of a chatbot with GenAI for searching and processing information, generating texts, ideas for discussions, images, and videos. Figure D.2

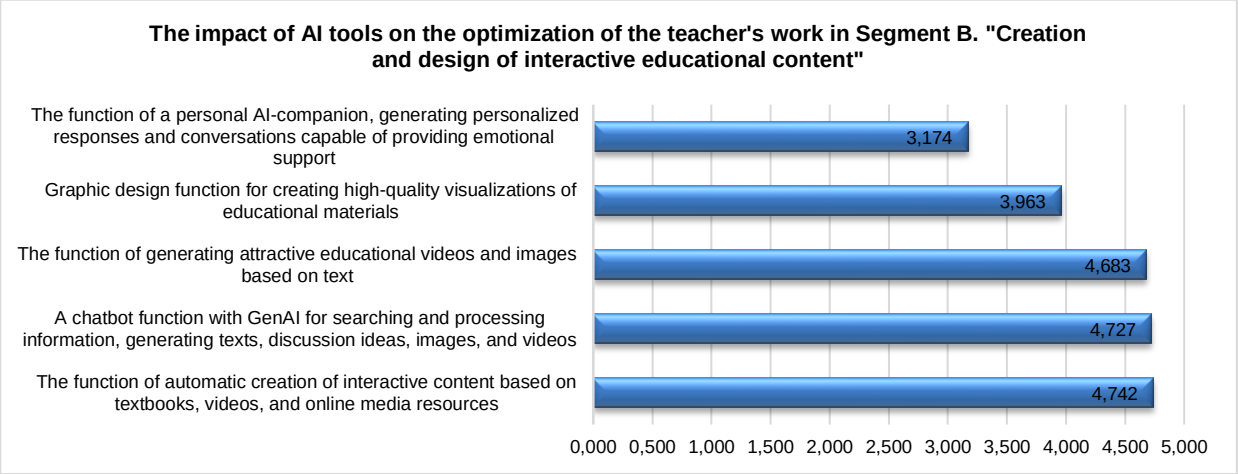

Figure D.2. Assessment of the impact of AI tools on optimizing the teacher's work in Segment B.
** Developed by the author*

The AI function of creating differentiated learning resources for different types of student activities and personalized learning experience was highly rated by educators in Segment B. Moreover, the respondents gave high ratings to the function of creating complex personalized learning strategies for key competencies and the function of creating interactive presentations, meetings, and seminars, development of interactive games and tasks. Figure D.3

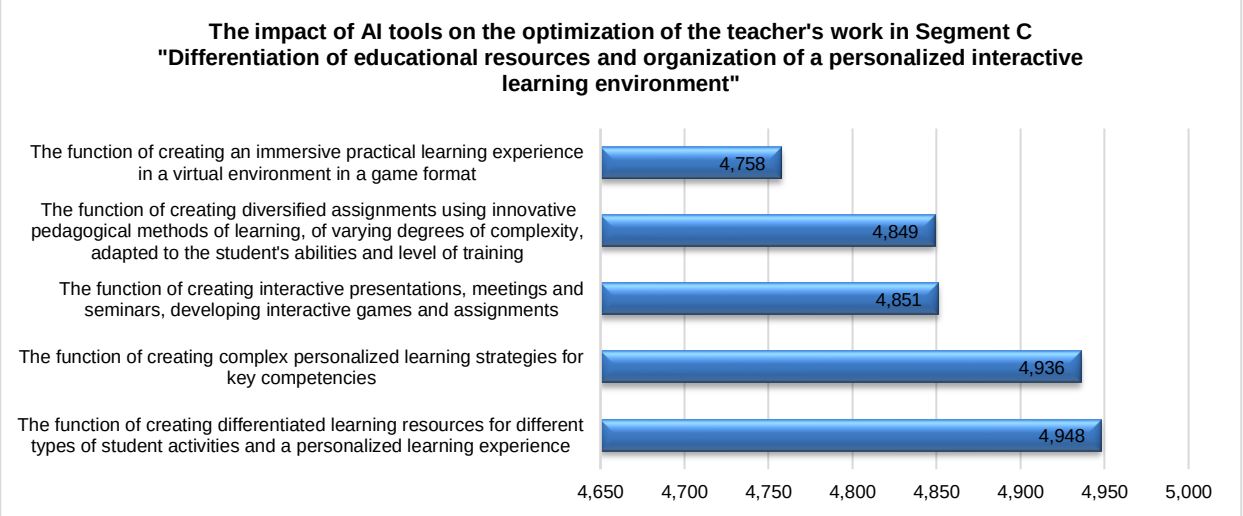

Figure D.3. Assessment of the impact of AI tools on optimizing the teacher's work in Segment C
** Developed by the author*

According to the respondents, AI tools are able to maximally influence the optimization of the teacher's work related to the organization of students' joint work and the creation of a single space for active learning and communication due to the functions of generating questions for higher-order discussions (ideas for

brainstorming) based on the topic, YouTube videos or articles, and features of educational gamification in a virtual environment in real time Figure D.4

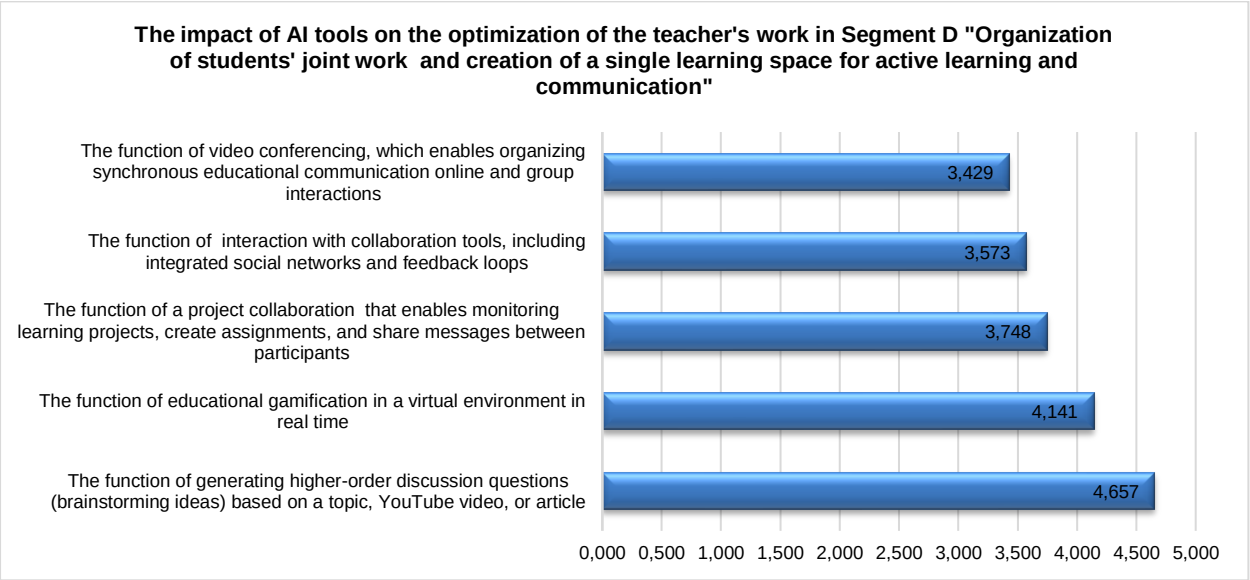

Figure D.4. Assessment of the impact of AI tools on optimizing the teacher's work in Segment D
** Developed by the author*

The respondents highly rated the AI potential in the development of a system for assessing learning achievements and providing feedback to students, namely the function of providing personalized, goal-oriented, timely, continuous, and consistent feedback and the function of assessing and identifying skill gaps, and provision of personalized practical recommendations. Figure D.5

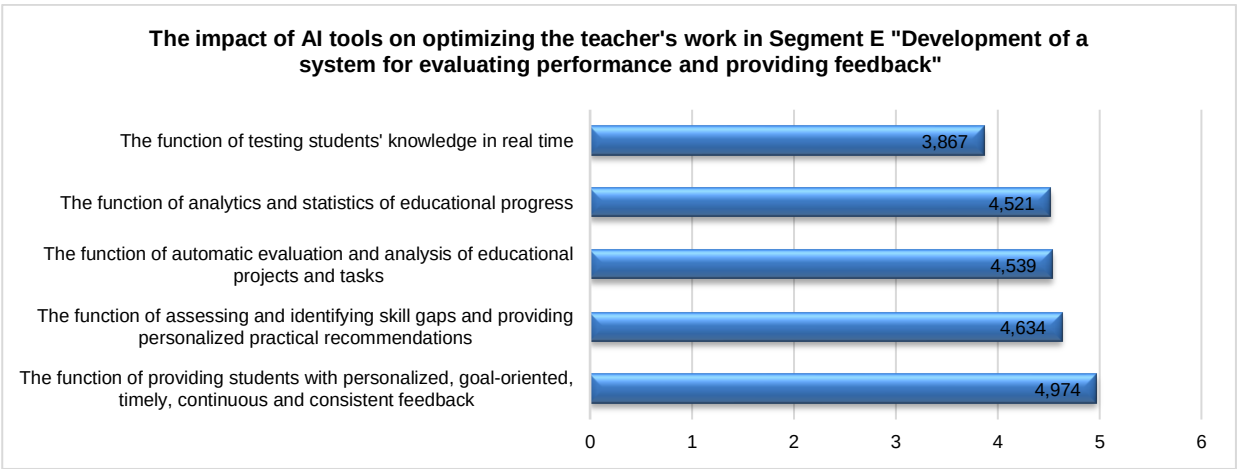

Figure D.5. Assessment of the impact of AI tools on optimizing the teacher's work in Segment D
** Developed by the author*

In order for the AI tools to maximally reveal their potential in educational activities, the management of HEIs must direct administrative and organizational efforts to ensure the teachers' ability to improve digital literacy in the field of AI. The teachers should:

- Have sufficient digital skills to organize educational activities on educational online adaptive learning platforms;
- Have the skills to develop interactive educational content for individual and group learning using machine learning and GenAI technologies;
- Have the skills of organizing a system of cooperation and social learning, in particular working on joint projects, organizing discussion forums and discussions in social networks integrated with online learning platforms;
- Have the skills to develop personalized educational recommendations and learning strategies using GenAI technology, taking into account the abilities and needs of each student;
- Have the skills to work with educational data analytics;
- Have the skills of interaction with the virtual educational environment in the field of providing constructive feedback on educational issues, forming a system for evaluating individual and collective educational results;
- Have the skills of supervising the course: ensuring the quality of the course and updating the content in the paradigm: relevance, accuracy, educational value;
- Have the skills to scale the course and implement the principle of open and accessible education.

Discussion

Our study was aimed at evaluating the teachers' attitude to innovative AI-based technologies and the possibilities of using certain AI tools in the professional activities of postgraduate education teachers. This orientation was determined by the fact that modern post-graduate education has entered a special phase of relevance in view of the current challenges, and also needs the latest approaches to its organization. The authors proposed a model in which the principles of implementing post-graduate education in the current conditions are outlined, in particular: i) practical orientation of courses, adaptability to labour market conditions; ii) partnership of participants in the educational process in achieving educational goals and high-quality training of specialists; iii) focus on the development of modern competencies, hard, and soft skills; iiii) openness, flexibility, and scalability of training.

The survey results demonstrated the teachers' positive attitude towards the integration of AI technologies in their professional activities. Being able to explore and test the functionality of AI tools, the participants of the initial course agreed that artificial intelligence has a strong potential to improve the teacher's work in the content optimization of educational processes and increase their effectiveness in general. This is consistent with the results of Bower et al. (2024), who evaluated the teachers' attitude to the implementation of AI tools in pedagogical activity and found that AI can become a valuable catalyst for positive changes in education, particularly in assessment methods. The authors Rulinawaty et al. (2023) confirm that the organization of training on online platforms for adaptive learning is able to optimize the training process and increase its effectiveness due to the creation of a more dynamic, flexible, and inclusive educational environment. Asynchronous learning in an online environment provides flexibility and makes education more adapted to the students' individual needs due to the use of cloud computing and a learning management system. The implementation of personalized learning with the help of machine learning tools can enhance students' learning motivation and improve its effectiveness. The combination of self-study and interactive elements of courses on online platforms make learning modern and comfortable for the students.

The results of our research showed that the combination of educational tools based on machine learning and GenAI integrated into the educational process provides excellent outcomes in creating strategies for effective adaptive personalized learning. The results of a study of the impact of AI on the organization of educational activities conducted by American scientists (Latif et al., 2024) showed that the integration of AI into pedagogical design can provide differentiated learning and support the diverse needs of students. The results of a quantitative and qualitative analysis of the impact of AI and computer science components on the effectiveness of teaching conducted by Spanish researchers (García-Martínez et al., 2023) revealed

that the use of AI in education can provide significant support to teachers at all stages of the educational process, optimize opportunities and resources to create an effective learning environment.

Exploring the possibilities of using ChatGPT in education, researchers van den Berg & du Plessis (2023) concluded that generative AI can provide teachers with constructive assistance in lesson planning by providing specific materials and support mechanisms that will allow contextualizing educational materials and adapting to specific contexts and student groups. Besides, generative AI can make connections between different subjects and provide interdisciplinary learning content and experiences (Yu & Guo, 2023). The results of our research support the idea that GenAI has the potential to create effective learning environments. Furthermore, the generation of interactive learning content for group learning using GenAI reveals its potential in creating an effective interactive environment for learning interactions and creating an environment of situational practical learning.

According to American researchers, adaptive learning platforms that already include machine learning provide an ideal environment for realizing the benefits of GenAI, which increase the efficiency of existing machine learning algorithms (Li et al., 2024). This is also consistent with the results of our study, in which the teachers confirmed that the integration of AIEd digital tools based on machine learning and GenAI can positively affect the improvement and optimization of pedagogical activities, as well as the improvement of the quality of postgraduate training in general. In the context of optimizing teaching activities, GenAI is able to reduce the time spent on content creation. The results of a study by Dickey & Bejarano (2023) show that GenAI can be useful in the stage of creating educational content with its ability to model multiple points of view, which will allow teachers to create a more holistic and inclusive educational experience, as well as facilitate the effective adaptation of the created content to the course-specific purposes.

In view of a significant potential of AI technologies in improving pedagogical activity, it is necessary to take into account the problems that arise in the process of implementing digital approaches to the organization of the educational process. According to Allam et al. (2023), privacy is a key issue at the stage of introducing AI tools into the educational process. AI systems that interact with students' personal data must meet the strictest data protection and monitoring standards. Moreover, teachers need to understand the limitations, potential risks, and ethical issues associated with the use of these technologies. The authors of a study on the impact of AI on pedagogical activities (Tang, 2024) concluded that the use of AI may be limited by infrastructure requirements, inclusiveness and equity, teacher readiness and training, data privacy and ethics, and the possibility of unequal access to technologies. Our research reveals the potential of AI digital literacy training for teachers as an opportunity to minimize the risks associated with the use of AI in education, but does not take into account the technical aspects of its ecological implementation and does not offer ways to solve the problem of technological inequality.

The researchers (Jaboob et al., 2024) believe that GenAI has enormous potential to transform teaching in higher education if implemented thoughtfully and ethically. This is consistent with the opinion of Shanto et al. (2023), who believe that the progressive joint efforts of the management of educational institutions, teachers, researchers, and technologists will be crucial in overcoming obstacles to the competent implementation of GenAI tools in educational activities of HEIs. According to Antonopoulou et al. (2023) it is important to achieve a balance between virtual online learning and real classroom learning, which should depend on various factors, including the subject, the purpose of learning, as well as the students' individual preferences and needs.

Conclusions

The development of AI-based educational technologies has opened new opportunities for the improvement of pedagogical activity, its optimization and adaptation to modern trends for teachers of HEIs. The possibilities of updating educational approaches and methods with the integration of advanced technological achievements that increase the quality and efficiency of educational activities are studied in the article. The results of the study demonstrated the enormous potential of using AIEd to implement

effective training of students in the field of postgraduate education. A survey of respondents — teachers of HEIs of Ukraine showed that the integration of AI technologies improves the quality of interaction with students (89%); significantly simplifies the educational process, making it convenient for both teachers and students (86%); enables creating a modern and exciting educational context that engages students in learning and promotes better assimilation and retention of knowledge (97%); optimizes organizational aspects of pedagogical activity and direct efforts to improve pedagogical skills (95%); enables generating a variety of learning situations and simulate an immersive environment for acquiring practical skills and abilities; improves the quality of education in general (98%).

The practical value of the research is the possibility of applying the author's model of integration of AI tools in the educational process for researching promising ways to optimize the teachers' work and creating strategies for improving education through the use of AIEd.

Research limitations

The main limitation of the study is its small sample: the survey involved 97 teachers from 3 HEIs of Ukraine. Furthermore, the inclusion of AI tools in the course Artificial Intelligence in Pedagogy was selective and their number was significantly limited. The study is of conceptual descriptive nature and requires a more thorough study using the method of quantitative and qualitative analysis of impact factors.

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Generations of human rights and their implementation in modern legal systems: modern scientific research and implications for teaching

Generaciones de derechos humanos y su implementación en los sistemas jurídicos modernos: investigación científica moderna e implicaciones para la enseñanza

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Abstract

This article examines the development of the concept of human rights generations and their implementation in modern legal systems. In response to global challenges such as digitalization, climate change, and the rights of indigenous peoples, the study highlights the need to reassess the traditional three-generation classification proposed by Karel Vasak. Using legal policy analysis, comparative analysis, and empirical

methods, the research explores how civil, political, economic, social, cultural, collective, and emerging rights—such as digital and bioethical rights—are addressed within international and national legal frameworks. Special attention is given to the indivisibility of rights and the growing relevance of a potential fourth generation of rights. Additionally, the article analyzes the teaching of this subject in law faculties worldwide, emphasizing interdisciplinary approaches, technological tools, and experiential learning through virtual simulations and case analysis. The findings suggest that existing legal mechanisms must adapt to contemporary realities by integrating new rights categories and ensuring more effective enforcement. The article concludes by recommending legal and educational reforms aimed at improving the protection of human rights and promoting sustainable development and social justice in an increasingly interconnected and complex global context.

Keywords: teaching, generations of rights, social justice, sustainable development, legal mechanisms, civil society.

Resumen

Este artículo analiza el desarrollo del concepto de generaciones de derechos humanos y su implementación en los sistemas jurídicos modernos. Frente a desafíos globales como la digitalización, el cambio climático y los derechos de los pueblos indígenas, se plantea la necesidad de revisar la clasificación tradicional de tres generaciones propuesta por Karel Vasak. A través del análisis de políticas jurídicas, métodos comparativos e investigación empírica, el estudio examina cómo se abordan los derechos civiles, políticos, económicos, sociales, culturales, colectivos y emergentes—como los derechos digitales y bioéticos—en los marcos jurídicos internacionales y nacionales. Se presta especial atención a la indivisibilidad de los derechos y a la creciente importancia de una posible cuarta generación. Además, se analiza la enseñanza de este tema en las facultades de Derecho, destacando enfoques interdisciplinarios, el uso de herramientas tecnológicas y metodologías activas como las simulaciones virtuales y el análisis de casos. Los resultados indican que los mecanismos legales actuales deben adaptarse a las nuevas realidades mediante la integración de nuevas categorías de derechos y el fortalecimiento de su aplicación. Se concluye con recomendaciones orientadas a reformar marcos jurídicos y educativos para mejorar la protección de los derechos humanos y promover el desarrollo sostenible y la justicia social.

Palabras clave: enseñanza, generaciones de derechos, justicia social, desarrollo sostenible, mecanismos legales, sociedad civil.

Introduction

The issue of human rights generations remains one of the key topics in modern legal science, as it reflects the evolution of approaches to ensuring fundamental rights and freedoms amid global transformations. The concept of three generations of rights, proposed by Karel Vasak in 1979 (EIFEC, 2024), has served as the foundation for numerous legal studies. However, contemporary realities necessitate a reassessment of this traditional classification and the integration of new categories of rights. One of the primary challenges remains the need to ensure the indivisibility of human rights, as confirmed by international documents and analytical studies.

According to the analytical report At a Glance (European Parliament, 2018), the issue of the indivisibility of human rights is one of the key concerns in the context of unifying the two main international covenants: the International Covenant on Civil and Political Rights and the International Covenant on Economic, Social, and Cultural Rights. Despite their shared principles, the implementation of these rights within national legal systems remains uneven, creating barriers to their effective enforcement. Similarly, the Office of the High Commissioner for Human Rights (Office of the High Commissioner for Human Rights, 2023) emphasizes that economic, social, and cultural rights are often perceived as less significant compared to civil and political rights, complicating their full realization.

Modern international discussions highlight the necessity of a comprehensive approach to human rights. EU Priorities for UN Human Rights Fora in 2025 (European Union, 2025) states that the European Union actively promotes the strengthening of human rights protection on a global scale, particularly by improving mechanisms for their implementation and monitoring. At the same time, the United Nations Human Rights Appeal 2025 (Office of high commissioner, 2025) underscores the growing importance of collective rights in response to global challenges such as climate change, migration, and digital transformation.

Another important aspect is the interrelation between human rights and business. According to Top Ten Business and Human Rights Issues in 2025 (IHRB, 2024), corporate responsibility, the ethical use of technology, and the enforcement of social standards are becoming an integral part of modern legal discourse. This demonstrates the need to adapt legal systems to new realities and to integrate the fourth generation of rights, which includes digital, environmental, and bioethical aspects.

The object of this study is the human rights system, its classification by generations, and the mechanisms for implementation in modern legal systems as well as the teaching process of the subject "Generations of Human Rights and Their Implementation in Modern Legal Systems" in law faculties worldwide, focusing on its unique features, methodologies, and challenges. The subject of the study is the legal regulation, implementation, and protection of different generations of human rights in international and national law, their interconnection, development trends, and contemporary challenges.

The research objectives are as follows:

- Analyze the theoretical foundations of the concept of human rights generations.
- Identify the main features of the implementation of civil, political, economic, social, cultural, and collective rights in modern legal systems.
- Analyze and highlight the unique features of teaching the subject "Generations of Human Rights and Their Implementation in Modern Legal Systems" in law faculties worldwide. This includes examining different pedagogical approaches, curriculum structures, regional variations, integration of theoretical and practical aspects, interdisciplinary connections, use of digital tools, and the role of international cooperation in legal education.

One of the main research problems is the lack of a unified doctrinal position on the number and content of human rights generations. Despite the widely accepted concept of three generations, contemporary challenges related to technological development, globalization, and environmental issues necessitate a reconsideration of the traditional approach. The relationship between civil and political rights and socio-economic guarantees remains a subject of debate. Additionally, there is a gap between states' international human rights obligations and their actual implementation.

Thus, studying human rights generations in modern legal systems requires a comprehensive analysis that considers the concept of rights indivisibility, international trends, and emerging challenges. In this context, an essential task is to examine the mechanisms for implementing all generations of rights and to explore ways to ensure their effective protection in today's world.

Theoretical Framework or Literature Review

The analysis of scientific works allows for an assessment of modern approaches to this concept, its rethinking, and its impact on national and international legal systems (e.g. Ivankiv (2019), Reid (2019), Cornescu (2009), etc.).

Thus, in his work, Batan (2018) examines the issue of collective rights as a component of the third generation of human rights. The author emphasizes that collective rights, such as the right to development and environmental rights, are closely linked to individual rights but require different implementation mechanisms. Special attention is given to the legal recognition of these rights in the constitutional law of

various countries. The study highlights the importance of expanding legal protection for collective rights and their implementation in national legislation.

Bratko (2017) focuses on analyzing the interconnection between human rights and the concept of sustainable development. The author examines international and European legal mechanisms for ensuring sustainable development, emphasizing the role of human rights as a tool for achieving a balance between social, economic, and environmental interests. In our opinion, the study confirms that the concept of third-generation human rights includes not only individual rights but also global issues of sustainable development and environmental security.

Magnovsky, Shevchuk, & Berezovenko (2024) explore the concept of humanity's rights, emphasizing their connection with the collective rights of the third generation. The authors point out that globalization and environmental challenges necessitate the expansion of legal protection at the level of all humanity and that modern threats, such as climate change and technological risks, require adaptation of existing legal mechanisms. Their research broadens the traditional concept of human rights, stressing the need to recognize humanity's rights as a separate category.

At the same time, Tyryna (2011) criticizes the traditional three-generational model, pointing out its shortcomings in modern conditions. She proposes alternative approaches to the classification of human rights that consider new challenges, particularly the development of digital rights and artificial intelligence rights.

A similar perspective is developed by Jensen (2018), who explores modern critical approaches to the concept of human rights generations, emphasizing its conditionality and proposing alternative models of understanding human rights based on historical context and legal institutions. Jensen questions the relevance of Karel Vasak's concept, arguing that the division of rights into three generations is arbitrary and does not reflect the real dynamics of human rights development. He also stresses that human rights cannot be strictly classified by historical periods, as many economic and social rights evolved alongside civil and political rights. Moreover, he argues that the generational theory contributes to a hierarchy of rights, which may create an imbalance in their protection. Instead of a three-generational division, he suggests a more flexible approach that acknowledges the interconnection of all categories of rights and their simultaneous evolution in different contexts.

Fredman (2006) analyzes the role of states' positive obligations in the realization of human rights, criticizing the traditional division into "negative" rights (which limit state interference) and "positive" rights (which require active state involvement). The author argues that all human rights demand both negative and positive obligations and that the generational division of rights may be artificial in light of this interdependence. Fredman emphasizes that instead of a mechanical distribution of rights, they should be viewed through the lens of state obligations concerning equality, social justice, and effective human rights policy.

Domaradzki, Khvostova, & Pupovac (2019) analyze Karel Vasak's contribution to human rights theory and the modern interpretation of his concept. They note that the three-generational model has significantly influenced international law, particularly through the activities of the UN and the European Union, but also has several shortcomings. In particular, the researchers highlight problems in implementing collective rights of the third generation, which often remain declarative and lack sufficient enforcement mechanisms. They also emphasize that the modern human rights discourse extends beyond the three-generational concept, considering digital rights, artificial intelligence rights, and environmental rights as separate legal categories that do not fit into Vasak's traditional classification.

Fantin (2022) explores the evolution of the human rights system and its relationship with the concept of generations of rights. The author agrees that the three-generational model is an important historical stage in the development of human rights but emphasizes that modern challenges, such as digitalization, the environmental crisis, and globalization, require a rethinking of the human rights protection system. She

suggests considering human rights dynamically, recognizing their ability to transform in response to new social realities.

The analysis of scientific works allows for several important conclusions regarding the implementation of the concept of generations of human rights in modern legal systems. The legal protection of third-generation human rights remains underdeveloped, as collective rights, such as the right to development or environmental rights, do not have the same legal force in different countries. There is a need to rethink the traditional three-generational model, as some authors propose alternative approaches that include new categories of rights, such as digital rights or humanity's rights. Ensuring sustainable development requires expanding international legal mechanisms, highlighting the necessity of strengthening international cooperation for the realization of third-generation rights.

Criticism of the traditional concept indicates its shortcomings, as modern global challenges call its universality into question. National legal systems adapt this concept differently: in some countries, collective rights have constitutional status, while in others, they remain merely declarative.

Many researchers point to the conditional nature of dividing human rights into three generations, as civil, political, socio-economic, and collective rights develop in parallel and do not have clear historical boundaries. They propose more dynamic models that recognize the interconnection of all rights and their joint evolution. Furthermore, instead of treating different generations of rights as separate categories, modern scientific approaches emphasize their unity. Human rights cannot exist in isolation: the realization of civil and political rights is impossible without socio-economic guarantees, and the protection of collective rights depends on the security of individual rights.

Contemporary scholars actively study new groups of rights that do not fit into the traditional three-generational concept, including:

- Digital rights (protection of personal data, the right to privacy in the digital environment, freedom of expression on the internet);
- Artificial intelligence rights and bioethical issues (legal aspects of AI usage, human rights in the context of technological development);
- Environmental rights (the right to a clean environment, state responsibility for climate change).

Researchers increasingly focus on the role of the state in ensuring human rights. The traditional division into "negative" (limiting state interference) and "positive" (requiring active state involvement) rights is becoming outdated. Instead, concepts of comprehensive obligations are proposed, including active protection mechanisms at all levels of state governance.

Studies show that while third-generation rights (the right to development, environmental rights, the rights of peoples) have gained international recognition, they remain insufficiently protected in practice. Scholars analyze the problems of their legal recognition and possible mechanisms for effective implementation.

Among the prospects for further research, the need to integrate digital rights into the concept of generations of human rights, analyze the role of artificial intelligence and technology in expanding human rights, and further develop legal mechanisms for ensuring collective rights should be highlighted.

Overall, the concept of generations of human rights continues to evolve, and scientific discussions about its effectiveness and relevance are crucial for the future of modern legal systems.

Methodology

The study is based on a comprehensive approach to analyzing the evolution of the concept of human rights generations and their implementation in modern legal systems. The research methods used ensured the

scientific validity of the conclusions and allowed for an assessment of the effectiveness of existing legal mechanisms for human rights protection.

The method of legal policy analysis played a key role in identifying trends in the development of human rights at both the international and national levels. A systematic analysis was conducted on foundational documents such as the Universal Declaration of Human Rights (UN General Assembly, 1948), which laid the groundwork for the subsequent classification of rights by generations, as well as the International Covenant on Civil and Political Rights (UN General Assembly, 1966a) and the International Covenant on Economic, Social, and Cultural Rights (UN General Assembly, 1966b), which contributed to distinguishing between the first and second generations of human rights. The analysis of the African Charter on Human and Peoples' Rights (Organization of African Unity, 1982) and the UN Declaration on the Right to Development (UN General Assembly, 1986) enabled an evaluation of the development of third-generation rights. Through this method, it was established that national legal systems integrate the concept of human rights generations unevenly. For instance, in EU countries, social and economic rights enjoy a higher level of protection, whereas in the Global South, the concept of collective rights is actively evolving.

The comparative method was applied to assess different approaches to classifying human rights. The study examined the classical concept of three generations of human rights, which divides rights into civil-political, socio-economic, and collective categories. A comparison of this concept with the critical perspectives of other scholars, who advocate for revising the three-tier model in response to contemporary challenges and question the clear separation of generations, revealed that while the three-generational concept remains significant, it requires updating. Notably, there is a growing trend toward recognizing a fourth generation of human rights, related to digital technologies and the rights of future generations.

The empirical research method was used to analyze the actual implementation of human rights in modern legal systems. Primary sources for this analysis included UN reports reflecting progress in social and economic rights, EU documents on human rights—particularly regarding priorities in climate justice and digital rights—as well as studies on the impact of business on human rights. This analysis led to the conclusion that different legal systems are adapting to evolving understandings of human rights, and the international community is increasingly focusing on issues of environmental security and technological development.

The combination of legal policy analysis, comparative analysis, and empirical research provided a comprehensive understanding of the evolution of human rights generations and their implementation in modern legal systems. This confirmed the need to reassess the classical theory of human rights generations and adapt it to contemporary global challenges.

Results and Discussion

Basic grounds

The concept of generations of human rights is a key approach to understanding the development of international human rights discourse. The concept of human rights divides them into three main generations: the first generation includes civil and political rights, the second encompasses socio-economic and cultural rights, and the third consists of collective and environmental rights. Contemporary research also discusses the possibility of a fourth generation of rights, which includes digital rights, rights in the field of biotechnology, data protection, and rights related to the development of artificial intelligence.

The concept of human rights is a fundamental element of modern international law and policy. It is based on the aspiration to ensure equality, freedom, and dignity for every person, regardless of race, nationality, gender, or social status. At the same time, the historical development of this institution reflects the complex process of forming a system of human rights that continuously evolves under the influence of social, political, and economic factors (Domaradzki et al., 2019).

The generational approach to human rights allows for an understanding of their evolution and interconnection. Although the traditional division into three generations is widely accepted, modern challenges, such as digital rights and ethical aspects of artificial intelligence, indicate the necessity of expanding this concept.

In international practice, there is growing awareness that the realization of civil and political rights is impossible without socio-economic well-being, and collective rights are essential for maintaining global stability. Thus, modern legal systems must adapt to new challenges, ensuring a comprehensive approach to human rights protection.

The first generation includes fundamental freedoms related to personal autonomy and protection from state interference. It is based on the ideas of natural law and legal humanism that emerged during the Enlightenment.

1. The Declaration of the Rights of Man and of the Citizen (National Assembly of France, 1789) was one of the first legal acts to establish the fundamental principles of liberty, equality before the law, property rights, and resistance to oppression.
2. The United States Bill of Rights (1791) consists of the first ten amendments to the U.S. Constitution, guaranteeing freedom of speech, religion, the right to a fair trial, and protection from arbitrary state interference.
3. The Universal Declaration of Human Rights (UN General Assembly, 1948) is a foundational international document adopted by the UN General Assembly, proclaiming the right to life, liberty, equality before the law, and protection against discrimination.

These documents became the basis for the further development of the international human rights law system, ensuring their implementation through national and international protection mechanisms.

This generation includes rights that guarantee personal autonomy, including:

- The right to life;
- Freedom of speech, conscience, and religion;
- The right to privacy;
- Freedom of assembly and association;
- The right to a fair trial.

The second generation of rights is associated with the development of the welfare state and the concept of social justice:

- The right to work and fair remuneration;
- The right to social security;
- The right to education;
- The right to medical care and health protection;
- Cultural rights and the right to participate in cultural life.

It is based on the need to guarantee economic equality and access to basic social benefits.

1. The International Covenant on Economic, Social and Cultural Rights (UN General Assembly, 1966b) enshrines the right to work, fair remuneration, social security, health care, education, and cultural development.
2. The Declaration on the Right to Development (UN General Assembly, 1986) recognizes development as an inalienable human right and emphasizes the obligation of states to create conditions for socio-economic progress.
3. The Council of Europe's Recommendations on the Dignity of Older Persons in Care Settings (Council

of Europe, 2018) aim to protect the rights of the elderly and ensure their autonomy in social security systems.

Unlike civil and political rights, economic and social rights require an active role of the state and appropriate financial mechanisms for their implementation, which creates challenges for their full realization.
The third generation of rights emerged in the second half of the 20th century in response to global challenges such as the environmental crisis, decolonization, and the struggle for the rights of Indigenous peoples.

These rights include:

1. The right of peoples to self-determination;
2. The right to a clean environment;
3. The right to development;
4. The right to peace.
5. The Stockholm Declaration (UN General Assembly, 1972) was the first international document to recognize the right of every person to a favorable environment.
6. The Rio Declaration on Environment and Development (UN General Assembly, 1992) established the principle of sustainable development and the need for international cooperation in environmental protection.
7. The UN Declaration on the Rights of Indigenous Peoples (United Nations, 2007) guarantees Indigenous peoples the right to autonomy, control over their natural resources, and the preservation of cultural identity.
8. The African Charter on Human and Peoples' Rights (Organization of African Unity (OAU), 1982) recognizes collective rights, including the right of peoples to self-determination and economic development.

The third generation of rights is aimed at protecting group interests, making them difficult to implement legally, as they do not always align with classical legal mechanisms.

In modern conditions, technological advancements necessitate a reassessment of legal approaches to human rights protection. The fourth generation of rights includes:

The right to personal data protection and digital security – regulated by the EU General Data Protection Regulation (GDPR).

Bioethical rights – concerning the protection of human rights in the context of genetic developments, artificial intelligence, and medical technologies.

The Paris Agreement (Law 1469-VIII, 2016) – dedicated to climate change and emphasizing the interconnection between environmental and social rights, which are part of the new generation of human rights.

An analysis of international legal documents demonstrates the gradual evolution of the human rights concept. As noted by the European Parliament (2018): “Ensuring economic, social, and cultural rights is impossible without the observance of civil and political rights,” highlighting their indivisibility and universality. The UN Office of the High Commissioner for Human Rights (2023) emphasizes the need for a comprehensive approach to human rights implementation, particularly in the context of sustainable development.

Implications for teaching the subject

Teaching the subject "Generations of Human Rights and Their Implementation in Modern Legal Systems" in law faculties worldwide has several unique features that distinguish it from other legal disciplines. This

course requires an interdisciplinary approach, combining legal theory, history, political science, and international relations (Baxi, 2012; Donnelly, 2013). Given the evolving nature of human rights, the curriculum must be flexible and continuously updated to reflect contemporary challenges such as digital rights, climate justice, and emerging ethical dilemmas related to artificial intelligence and biotechnology (Klabbers, 2017; De Feyter, 2011).

One of the key features of this subject is the emphasis on the historical evolution of human rights. Law students must understand the theoretical foundation of Karel Vasak's concept of three generations of rights and how they have expanded over time (Vasak, 1977). The inclusion of a possible fourth generation of rights, encompassing digital and bioethical issues, requires a critical analysis of legal frameworks and international treaties that govern these emerging areas. This historical perspective helps students see how human rights norms have adapted to political, economic, and technological shifts (Freeman, 2011).

A distinctive characteristic of teaching this subject is the comparative approach to legal systems and their role in human rights protection. Students analyze different regional and national mechanisms, comparing, for example, the European Court of Human Rights, the Inter-American Court of Human Rights, and domestic constitutional frameworks (O'Connell, 2017). This comparative analysis enables future legal professionals to appreciate the strengths and weaknesses of various enforcement models and how geopolitical factors influence the effectiveness of human rights protections.

Another important aspect of teaching this course is the integration of case law and practical applications. Students study landmark human rights cases to understand how courts interpret and enforce different generations of rights. Special attention is given to cases concerning socio-economic rights, collective rights, and contemporary legal disputes involving digital privacy, climate change litigation, and indigenous rights (Smith, 2019). Moot courts and legal clinics focusing on human rights advocacy provide students with hands-on experience in legal reasoning and argumentation.

Pedagogical Strategies and Technological Innovations

To ensure effective teaching and learning, law faculties are increasingly incorporating modern pedagogical approaches and digital tools into the curriculum. Problem-based learning (PBL) has emerged as a valuable strategy, encouraging students to analyze real-world human rights scenarios and propose legal solutions (Barrows, 1986). Gamification techniques, such as interactive quizzes and virtual court simulations, foster student engagement and practical skill development (Deterding et al., 2011).

Additionally, competency-based approaches ensure that students not only gain theoretical knowledge but also acquire practical competencies crucial for modern legal practice. For instance, legal simulators enable students to practice drafting human rights complaints and arguing cases in virtual courtrooms. Augmented reality (AR) applications can recreate historical human rights events, helping students to visualize and critically analyze the evolution of rights over time.

Digital tools, such as artificial intelligence-based legal research platforms, streamline access to human rights case law and treaty databases (Ashley, 2017). Online learning platforms facilitate collaboration between students from different countries, allowing for comparative legal analyses and discussions with international experts (Laurillard, 2012). Furthermore, virtual guest lectures provide valuable perspectives on human rights implementation from various jurisdictions (Keppell et al., 2013).

Application of Technological Resources in Teaching Practices

Specific examples of technological integration include the use of platforms like LexisNexis and Westlaw for comprehensive legal research, alongside AI-powered tools that analyze large volumes of case law to identify patterns and emerging trends in human rights jurisprudence. Virtual moot court competitions, hosted through platforms like Zoom and Microsoft Teams, simulate real-life litigation scenarios, preparing

students for professional practice.

Augmented reality applications, like those developed by educational technology companies, provide immersive experiences where students can explore the historical contexts of landmark human rights decisions (Bower et al., 2014). This interactive approach makes abstract concepts more tangible and facilitates deeper understanding.

Incorporating these contemporary pedagogical models and technological tools not only enhances student engagement but also prepares future legal professionals to navigate the complexities of human rights advocacy in a technologically advanced world.

Relevance and Practical Outcomes

The study of "Generations of Human Rights and Their Implementation in Modern Legal Systems" prepares students not only for careers in law but also for work in international organizations, NGOs, and governmental institutions. By engaging in debates, legal drafting, and policy analysis, students develop critical thinking skills essential for addressing contemporary human rights challenges in an increasingly complex and interconnected world (Tibbitts, 2002).

The generational framework of human rights, introduced by Karel Vasak, remains a useful tool for structuring discussions on human rights, though this concept has faced some criticism over time. It provides a clear distinction between rights that emerged in different historical periods in response to changes in political and social conditions. Modern legal systems, considering the impact of globalization, technological progress, and new challenges, must adapt these categories of rights to ensure their effective implementation (Sen, 2004).

Therefore, in contemporary conditions, legal systems must adapt to emerging challenges related to digital transformation, climate change, and ethical issues arising from technological advancements. Consequently, the concept of human rights generations remains open to further development and revision, as human rights continue to expand in response to societal and scientific progress.

Conclusions

1. Using the empirical method, it has been established that the concept of generations of human rights, proposed by Karel Vasak in 1979, remains an important approach to understanding the development of human rights. The analysis confirmed that the division of rights into three generations reflects the evolutionary process of their recognition and implementation in international law. At the same time, modern research questions the rigid distinction between generations of rights, emphasizing their interdependence. New challenges (digital rights, environmental threats) require a reassessment of the traditional classification of human rights and the possible introduction of a fourth generation of rights.
2. The policy analysis method has helped determine that the implementation of civil and political rights in modern democratic legal systems has a high level of protection due to constitutional guarantees, the activities of international judicial bodies, and human rights mechanisms. Socio-economic rights largely depend on the level of development of specific states and have weaker judicial protection mechanisms. Collective rights (environmental rights, indigenous peoples' rights) face implementation challenges due to conflicts of interest between states and global corporations. Overall, the effectiveness of human rights implementation depends on a comprehensive approach that includes international standards, national legislation, and public oversight.
3. Modern challenges in the field of human rights go beyond traditional categories of rights protection. Globalization promotes economic development but also exacerbates inequality and exploitation. Technological progress creates new challenges, particularly in the areas of digital rights and privacy protection. Environmental threats (climate change, pollution) jeopardize fundamental rights such as the right to life and health. Armed conflicts, especially in relation to Russia’s war against Ukraine,

demonstrate the weakness of international human rights protection mechanisms. In this regard, there is a need to improve legal mechanisms for responding to contemporary challenges.

4. To enhance human rights protection mechanisms, measures must be taken at the international, regional, and national levels. At the international level, it is essential to reform the United Nations to improve the effectiveness of human rights bodies, strengthen the enforceability of international standards, and create new mechanisms for rapid response to mass human rights violations. At the regional level, it is necessary to expand the jurisdiction of the European Court of Human Rights, strengthen the role of the African and Inter-American Courts of Human Rights, and promote the development of effective human rights protection mechanisms in Asia, where such institutions are still underdeveloped. At the national level, key tasks include improving the judicial system to ensure its independence and accessibility, strengthening the role of ombudsmen as an effective mechanism for public oversight of human rights compliance, and actively implementing digital technologies for monitoring and enforcing human rights, allowing for faster detection and response to violations. A comprehensive approach to improving human rights protection mechanisms will help strengthen the international human rights protection system, ensure its adaptation to contemporary challenges, and enhance the effectiveness of rights and freedoms enforcement on a global scale.
5. The subject "Generations of Human Rights and Their Implementation in Modern Legal Systems" is a critical area of study within law faculties across the globe. Its unique features lie in the complex evolution of human rights, the need for a multi-disciplinary approach, and the adaptation of traditional legal frameworks to contemporary global challenges. The subject requires an understanding of historical context, international law, and the intersection of social, political, and technological factors that shape human rights today. Legal education on this topic promotes critical thinking, encourages active engagement with international human rights issues, and prepares students to address ongoing and emerging challenges in the protection and implementation of human rights. As this field continues to evolve, its teaching must be dynamic, incorporating new legal developments and societal changes to stay relevant and effective in producing competent legal professionals capable of contributing to human rights advocacy and reform.

Further scientific research on the generations of human rights and their implementation in modern legal systems should focus on several key areas. First and foremost, it is necessary to study the impact of globalization on the development of human rights, particularly the interdependence between economic processes and social standards. Another important area is the analysis of challenges related to technological progress, particularly concerning the legal regulation of artificial intelligence, digital human rights, and cybersecurity. The environmental dimension of human rights also requires further research, especially in the context of climate change and its impact on fundamental rights such as the right to life, health, and a clean environment. Additionally, attention should be given to mechanisms for adapting human rights institutions to contemporary crises, such as armed conflicts, pandemics, and migration processes. Another crucial task is improving international law in the field of collective rights protection and the rights of vulnerable groups, such as indigenous peoples, women, children, and persons with disabilities. Future research should not only analyze existing problems but also develop practical recommendations for their resolution, considering the legal, social, and political realities of the modern world.

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Interactive learning using chatbots in higher education

Aprendizaje interactivo mediante chatbots en la educación superior

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Abstract

This article presents a study on the implementation of AI-based educational chatbots as a tool for interactive learning and the enhancement of digital culture among higher education students. Identifying a gap in the literature regarding the pedagogical use of chatbots, the authors developed an educational system aimed at strengthening digital competencies through automated interaction. The research followed a three-phase design: exploratory, intervention, and evaluation, and was conducted with university students divided into experimental and control groups. Questionnaires, diagnostic tests, and statistical analyses (Student's t-test) were applied to measure the impact of the intervention. The results show a significant improvement

in both motivational and cognitive indicators in the experimental group compared to the control group, thus validating the effectiveness of the implemented system. The study concludes that the use of educational chatbots not only enhances interaction and access to learning content but also promotes the development of essential skills for navigating digital environments. Further research is encouraged to explore specific didactic principles that can reinforce the integration of such tools into educational settings.

Keywords: digital culture, educational chatbots, interactive learning, artificial intelligence, higher education.

Resumen

Este artículo presenta un estudio sobre la implementación de chatbots educativos basados en inteligencia artificial como herramienta para el aprendizaje interactivo y el fortalecimiento de la cultura digital en estudiantes de educación superior. Partiendo de la identificación de una brecha en la literatura sobre el uso pedagógico específico de chatbots, se desarrolla un sistema educativo orientado a mejorar las competencias digitales mediante la interacción automatizada. La investigación se estructuró en tres fases: exploratoria, de intervención y evaluación, y se llevó a cabo con estudiantes de nivel universitario divididos en grupo experimental y grupo de control. Se aplicaron cuestionarios, pruebas diagnósticas y análisis estadísticos (t de Student) para medir el impacto de la intervención. Los resultados evidencian una mejora significativa en los niveles motivacionales y cognitivos del grupo experimental en comparación con el grupo de control, validando así la efectividad del sistema implementado. El estudio concluye que el uso de chatbots educativos no solo optimiza la interacción y el acceso a contenidos, sino que también fomenta el desarrollo de habilidades esenciales para desenvolverse en entornos digitales. Se sugiere continuar explorando principios didácticos específicos que fortalezcan la integración de estas herramientas en contextos educativos.

Palabras clave: cultura digital, chatbots educativos, aprendizaje interactivo, inteligencia artificial, educación superior.

Introduction

Modern society is currently at the stage of information development, which affects human life, the digitalization of all spheres of society – education, scientific research, medicine, production of goods, everyday life, culture, etc. In the global context, trends in the digitalization of society are: the development of cloud technologies, artificial intelligence, mobile technologies, augmented reality, telemedicine, the development and use of chatbots, database protection systems, electronic databases, combating cybercrime, etc.

All spheres of human life are actively influenced by rapid changes in the field of information technologies. This also applies to the field of educational services.

The latest information technologies and developments are increasingly used in the educational process. Modern information technologies are especially in demand during the education of students at universities, because the use of critical thinking by the student, the abstractness and complexity of the conceptual apparatus, the assimilation of one's own nomenclature, the constant need for mathematical calculations in research, conducting laboratory experiments require the teacher to have a modern approach to the educational process and pedagogical skills.

The issue of automating the educational process is quite relevant for the field of education. This may apply to both educational work, where each teacher can find convenient tools for presenting material that facilitate work with students, and convenient tools for organizational work, where the higher school administration automates the processes of information exchange with students and their parents. Therefore, researching the possibility of using chatbots for interactive learning in higher education to form the digital culture of future specialists is a rather important and relevant issue.

Chatbots have rapidly invaded the educational process of higher education institutions, as well as all areas of our lives, which has led to the need for modern specialists to "have virtual assistants in their arsenal" to increase the efficiency of the educational process and professional activities (Hrytsenko & Holiiad, 2024).

Having analyzed the current practice and pedagogical theory of using chatbots for interactive learning in higher education to form a digital culture of future specialists, we can attest to the lack of specific research devoted to this problem.

Literature Review

The problems of digitalization of education, the use of chatbots for interactive learning in higher education, the introduction of digital technologies into professional activities and the educational process at different stages and levels of education are highlighted in the studies of researchers from different countries.

The issue of using and implementing automated student communication systems using virtual assistants is considered by L. Hrytsenko, & R. Holiiad (2024). Special attention is paid to the ways of using virtual assistants in the educational process and chatbots as tools for interactive learning of students, the redistribution of time for interaction between higher education students and teachers when using chatbots. To acquire the necessary skills and abilities for professional activity, improve the assimilation of knowledge, the authors highlight the capabilities of automated systems and reveal the role of the teacher's digital culture for the effective implementation of modern virtual assistants in the educational process. The importance of chatbots for education and their capabilities for individualizing learning, improving the assimilation of knowledge and increasing the motivation of higher education students is proven. In particular, the possibility of using the Telegram chatbot by computer science teachers to organize the educational process is considered by D. Makharadze et al. (2024). Various ways of creating chatbots for the Telegram messenger are considered by scientists, and their main advantages and disadvantages are also given; recommendations are given on the use of virtual assistants in secondary education institutions by computer science teachers in organizing the educational process, and a comparative analysis of various tools is conducted.

The research of N. Morze et al. (2020) is devoted to the digital culture of teachers. Scientists interpret it as “the mastery of skills in using information and communication technologies in professional activities, the need for which arises in the context of the transformation of the global Internet into a space for the realization of a teacher and a means of earning money”, and D. Krugliy (2020), considering digital culture, considers it the main component of “the professional culture of future teachers, which characterizes the ability to use information and communication technologies to search, process, exchange information and solve professional tasks”. Taking into account the scientific achievements of previous researchers, K. Litvinova (2016) proved that a teacher's digital culture is "a system of knowledge, skills, and abilities to determine information needs and search for the necessary information that may be contained in various information resources, as well as its further processing, storage, analysis, structuring, integration, and creation of new information products".

Studying the main characteristics of the digital culture of teachers, V. Oliynyk et al. (2020) prove that the information culture of a person includes the information culture of a specialist, and by it, researchers understand in the information society the readiness to master a new way of life, the ability to form one's own attitude to phenomena and objects of the information world, to build one's own picture of the world, to determine the possibilities of transforming the information space.

Z. Ryabova, & H. Yelnykova (2020) define digital culture through the characteristics of a set of main phenomena, which include: social networks, the Internet, chat rooms, blogs, virtual communities, distance learning platforms, forums, computer games, electronic clips, electronic media, etc. Scientists have identified the main features of the digital culture of the individual: freedom of access; openness to members of the information society; remoteness or distancing; liberalism as the absence of clear rules and norms,

including ethical ones, interactivity in obtaining access to information; virtuality; electiveness; innovation as a process of scientific developments, constant updating of content related to electronic communication, electronic art.

The prerequisites for the emergence of the social phenomenon of digital culture and the transition of the individual to the digital era were studied in detail by O. Skyba et al. (2020), in particular: the transition from physical and analog content to digital, which allows the individual to use existing digital content, manage and create their own and thus build their own trajectory of individual activity; the modification of the function of information and communication technologies, where the main feature is the controllability of the main features of communication activity to network from vertical.

As a social phenomenon, the impact of digital culture on the process of professional training of future specialists was investigated by F. Pimentel et al. (2020) and showed in the context of modern pedagogical science the ways of using this phenomenon, which requires the development of a new type of human thinking, going beyond the simple use of information and communication technologies, the creation of electronic educational resources (digital products), the widespread introduction of innovative forms and methods of educational interaction, which are artifacts of digital culture.

Thus, the problems of digitalization of education, the use of chatbots for interactive learning in higher education, the introduction of digital technologies into professional activities and the educational process at different stages and levels of education are highlighted in the studies of researchers from different countries. Special attention is paid to the ways of using virtual assistants in the educational process and chatbots as tools for interactive learning of students, the redistribution of time for interaction between higher education students and teachers when using chatbots. Scientists have revealed the role of the teacher's digital culture for the effective introduction of modern virtual assistants into the educational process. The importance of chatbots for education and their ability to individualize learning, improve knowledge acquisition, and increase motivation of higher education students has been proven. However, the problem of using chatbots for interactive learning in higher education to form the digital culture of future specialists is insufficiently disclosed and necessary for research.

Research purpose – to prove the validity of the developed system for forming students' digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education.

Methodology

To achieve the set goal, a set of research methods was used at different stages of the study:

- *Theoretical:* theoretical systematic analysis of psychological, pedagogical, methodological literature on the research problem to generalize the learned experience, determine the conceptual and terminological apparatus of research on the issues of digitalization of education, the use of chatbots for interactive learning in higher education to form the digital culture of future specialists;
- *Empirical:* diagnostic (questionnaires, testing, interviews, conversations, observation of the process of using chatbots, the use of digital technologies for interactive learning in higher education to form the digital culture of future specialists and create electronic educational resources); pedagogical experiment to determine the effectiveness of the developed system of using chatbots for interactive learning in higher education to form the digital culture of future specialists;
- *Statistical methods:* verification of the reliability of the results of experimental work, qualitative and quantitative analysis, use of expert evaluation methods, Student's t-criterion to verify the statistical significance of the research results.

The main task of the experimental study was to verify the effectiveness of the theoretically grounded and developed pedagogical system for forming the digital culture of future specialists through the use of educational chatbots for interactive learning based on artificial intelligence in higher education.

In the conditions of the real educational process, an experimental study was developed and an innovative system of the educational process was implemented in the EG during the 2022–2024 academic years. The experimental study covered higher education applicants, in particular, bachelor's level.

In the unity of three stages – ascertaining, content-organizational, diagnostic – research and experimental work was carried out.

67 respondents were involved in the experimental work.

Experimental verification of the effectiveness of the system for forming the digital culture of future specialists through the use of educational chatbots for interactive learning based on artificial intelligence in higher education was carried out using diagnostic tools: traditional methods of pedagogical research; pedagogical experiment; implementation of projects with the development of digital resources, with the use of digital technologies, participation in events using digital technologies; questionnaires; testing; statistical methods for analyzing the data obtained.

As an assessment tool in our study, we gave preference to questionnaires and testing, since we believe that these methods will allow us to quickly carry out the procedure for measuring levels of formation and cover a significant number of respondents.

We have identified motivational and knowledge criteria that characterize the structural and component composition of students' digital culture and have prescribed indicators.

In the process of research, the levels of formation of students' digital culture were identified: low, medium, sufficient, high.

The main goal of the experimental work was to verify the effectiveness of the developed system for forming students' digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education based on the analysis of quantitative and qualitative indicators of learning in experimental and control groups.

The study allowed us to draw a conclusion (generalizing the indicators of formation of all components) regarding the positive dynamics in all levels of formation of the digital culture of respondents in the experimental group compared to the control group, which indicates the effectiveness of the system for forming students' digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education.

In the experimental study, the Student's t-test was used to test statistical significance in a scientific study aimed at assessing the differences in the mean values of two normally distributed samples, which allows us to refute or confirm the effectiveness of implementing a system for forming students' digital culture in the educational process through the use of educational chatbots for interactive learning based on artificial intelligence in higher education with a significance level of 5%.

We reject the null hypothesis and confirm the alternative hypothesis.

The dynamics of changes in the level characteristics of the manifestation of indicators of the formation of students' digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education EG and CG between all stages of the conducted pedagogical experiment confirmed the effectiveness of the developed system for the formation of students' digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education. Based on the obtained research results, we conclude that the proposed system for the formation of students' digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education is effective.

Results and Discussion

Content, types of chatbots and their advantages.

Chatbot is software designed to answer users' questions in a chat, which is automatic. A chatbot can perform various tasks, interact in natural language with the user, provide reference information, answer questions, etc. (Hrytsenko & Holiiad, 2024).

Let's name two types of chatbots used in the educational process of higher education:

- Chatbots are created and work according to rules;
- Chatbots use artificial intelligence, which uses machine learning to understand questions, which is necessary for further processing and generating an answer to the task or question posed.

It is chatbots that use artificial intelligence that are difficult for an average teacher to implement in the educational process of higher education, because this process requires access to the platforms of leading developers of artificial intelligence and specific programming skills. However, today, higher education teachers have the opportunity to independently develop and implement rule-based virtual assistants in the educational process. They can reproduce possible, predicted in advance dialogues between a chatbot and a higher education applicant, and answer specific questions. There are a sufficient number of platforms (depending on the level of professional training of the teacher) on which you can create a virtual assistant in any subject for a high-quality educational process. There are free platforms on the market for creating chatbots: Chatfuel, ManyChat, FlowXO, Botsify, and paid services: Rasa, ChatterON, MEOKAY, Botkit (Hrytsenko & Holiiad, 2024).

Let's name several advantages of using chatbots in the educational process of higher education, which facilitate the work of the teacher and student and, due to the rationalization of the time used, make it more productive when interacting with students:

- Accessibility – virtual assistants interact with all participants in the educational process around the clock and simultaneously, which allows teachers and students to attract the attention and additional time of students to study professional disciplines. Students have the opportunity to receive help at a time convenient for them;
- Individualization – chatbots easily adapt to the individual learning needs (repeating the material covered) of each student and their pace, make it possible to move on to studying new topics when the student is ready for this;
- Motivation – for students, the use of chatbots in the educational process is more interactive and interesting throughout the entire period of study. Experiments and demonstrations that took place in class can be repeated to summarize the learned material and reviewed when doing homework (Holiiad & Stukalo, 2023);
- Sending Push-messages to stimulate and encourage the cognitive activity of higher education students by a virtual assistant. In this way, the vocabulary of messages is adjusted so that the virtual assistant morally encourages and supports students in mastering and studying material in specialized subjects. Successes will be appreciated, and temporary failures will be converted condescendingly into the need to continue and not stop at what has been achieved to overcome all difficulties;
- Saving time and reducing the burden on the student and teacher – chat bots partially replace teachers in organizational issues, which usually require the participation of an assistant: briefing on laboratory work or safety, checking those present at the lesson, monitoring the assimilation of knowledge; recording homework, which will be always available and possible to complete at a convenient time for students; reminders to complete tasks and other organizational issues (Hrytsenko & Holiiad, 2024).

Creating chatbots for different platforms.

Many large companies that created virtual interlocutors and their own chatbots were founded back in the 2000s. Several tools have appeared in our time that allow anyone to create their own chatbot for any purpose.

You can create a chatbot both using third-party online designers and independently. With their help, you can create chatbots for different platforms. Let's consider some of them:

- Sendpuls is a designer with which you can create a chatbot for many online platforms. The designer helps you use the landing page designer and create mailings. Sendpuls can analyze user responses and requests, subscriptions, and mailings for a given time;
- Bot kits are a cloud-based service that creates bots using flowcharts and does not require programming skills; allows you to create a bot for websites and messengers. Bot kits provide access to user statistics and users, access to external libraries, the ability to send text, video, photo, audio, the ability to create many combinations of assistant behavior;
- Botmother is a simple platform that supports many platforms for creating chatbots. You only need to connect a few elements to create a chatbot. Botmother has the following capabilities: connecting an operator to a dialogue with the user; quick bot setup; the ability to send messages; the ability to accept payments for training through online services;
- Chatfuel is a multifunctional and free service that can also be used to create chatbots for many messengers. Chatfuel has subscription and mailing capabilities; an unlimited number of bots, the ability to pay for training through online services, speech recognition;
- Aimylogic is a service that allows you to create a real conversationalist, not a regular text bot, that will be used in mobile applications, messengers, and websites. Alexa and Google Assistant voice assistants work with this bot. Aimlogic has the following capabilities: voice assistant integration; speech recognition; nonlinear stories and dialogues data analytics (Semenikhina et al., 2020).

It is worth emphasizing the importance of chatbots that are written manually. Their chat functions work through their own API. To operate and create such a bot, you need a server, hosting, and databases. The capabilities of such a bot are limited only by the programming skills of each student and the capabilities of the platform on which the student will create it. The most popular messengers for creating chatbots are: Viber, Telegram, and Facebook. About 80% of chatbots are focused on these platforms (Shuliak et al., 2022).

If you do not purchase advanced features and functions, then chatbots created using the designer are free. Without programming skills, you can create a chatbot. Such a chatbot, unfortunately, cannot self-learn. The complexity of scenarios with the possibility of refinement in such a chatbot is standard. Using the designer, you can make refinements and edits to the chatbot at any time (Makharadze et al., 2024).

So, there are many chatbots used for various needs, in particular, in the educational process of higher education: to consolidate and acquire knowledge, to check the digestibility of information, to introduce various tests, to generate recommendations, to track the student's efficiency throughout the day and to build a study schedule (Knysh et al., 2024).

The most popular AI-based chatbots that are necessary for use in the educational process of higher education.

Let's name the most significant of the AI-based chatbots used in the educational process of higher education:

- *ChatGPT* – introduced in 2022, an AI chatbot developed by OpenAI that can create a variety of creative content, generate text, and provide informative answers to questions (Dergaa et al., 2023);

- *Bard* – launched in 2022, is a large language model (created by Google AI) of an AI chatbot, can include providing informative answers to questions, language translation, text generation, and creating various types of creative content (Rudolph et al., 2023);
- *Replika* – is an AI chatbot platform launched in 2017, designed to help students: can give advice and help students, listen to students' problems, and make them feel less alone (Pentina et al., 2023);
- *Ada* – is a chatbot launched in 2017 and is used for personalized learning for college students. Ada can provide feedback, answer questions, and facilitate individualized learning for students (Alsanousi et al., 2023);
- *Habitica*, used to help students develop good academic, professional, and work habits, launched in 2013. Habitica can be used by all students to manage their study schedules and their academic tasks. Students are more motivated to complete their tasks by turning their to-do list into a game (Zhang, 2023);
- *Socratic* – an AI-based educational platform launched in 2013, which was acquired by Google in 2018. It is not a chatbot per se, but it has chatbot-like features and an interface designed to help students learn new concepts (Wang et al., 2020);
- *Piazza* – is a chatbot that serves to collaborate and facilitate discussion of specific problems, used in the educational process of higher education, in classrooms, and academic institutions. Launched in 2009, it allows teachers and students to ask questions, participate in discussions, share information, and complete assignments related to the content of the course being studied (Labadze et al., 2023).

Content, objectives and main provisions of the experimental study.

Research and experimental work was carried out in three stages: ascertaining, content-organizational, diagnostic.

The first, ascertaining, stage of the experiment allowed us to analyze the methodological, pedagogical, psychological, philosophical literature, during which we clarified the basic concepts of the study; create a CG and EG in compliance with the requirements for sample homogeneity; prescribe a program for a formative experiment; to develop a bank of questions, practical tasks, which allowed to determine the level of formation of the digital culture of future specialists through the use of educational chatbots for interactive learning based on artificial intelligence in higher education according to criteria (motivational, knowledge) and indicators.

The second stage, content-organizational, was aimed at conducting a formative experiment where the pedagogical system for the formation of the digital culture of future specialists was modeled, which determined the goal, educational and methodological support, tasks, results, pedagogical conditions, methods and means of forming the digital culture of future specialists through the use of educational chatbots for interactive learning based on artificial intelligence in higher education, as well as the criteria and levels of formation of the phenomenon under study, its diagnostic tools to measure the effectiveness of the proposed work.

At this stage, based on the modernization of bachelors' professional training, educational and methodological support for the formation of the digital culture of future specialists was developed and implemented in the educational process of higher education (in EG) through the use of educational chatbots for interactive learning based on artificial intelligence in higher education, which included: a special distance course "Digitalization in Education" was developed and pedagogical conditions were developed:

- By the trends of digitalization of education through the use of educational chatbots for interactive learning based on artificial intelligence in higher education, updating the content of professionally oriented academic disciplines;
- Implementation of the developed system for the formation of the digital culture of future specialists through the use of educational chatbots for interactive learning based on artificial intelligence in higher education;

- Creation of a web environment for distance learning for students, which provides for the support and development of distance courses in professional disciplines;
- Providing students with the necessary set of skills, knowledge, and abilities to work with digital content and digital technologies;
- Organizing effective digital communication of students through the use of educational chatbots for interactive learning based on artificial intelligence in higher education by participants in the educational process, developing digital collaboration and netiquette.

In the EG, in the process of implementing a pedagogical experiment on the formation of the digital culture of future specialists through the use of educational chatbots for interactive learning based on artificial intelligence in higher education for applicants of the first (bachelor's) level of higher education, such pedagogical conditions and specific methods for the digital educational environment and innovative means were used that were included in the system for forming the phenomenon under study.

In the process of conducting the formative stage of the experiment, we believed that chatbots can automatically form useful professional information for students during training.

Let us present in more detail several examples of our use of chatbots in the educational process of higher education in the EG:

- Supporting students in learning new topics in the educational process of higher education. The chatbot helped students learn new topics. For example, the chatbot offered additional reading materials or offered videos for viewing, to better understand the new material by students;
- Using a chatbot to answer students' questions. For example, a student had the opportunity to ask about the class schedule or ask about the material that was presented at the lecture. The chatbot answered these questions efficiently and quickly, which reduced the workload on students and teachers of the higher education institution;
- Using a chatbot to support distance learning. A chatbot was especially useful for distance learning where students did not have direct access to teachers. At the same time, the chatbot provided students with real-time support in answering questions;
- Using a chatbot to plan and organize tasks. The chatbot helped students monitor the implementation of tasks and plan them. For example, the chatbot reminded students of deadlines and suggested making a list of tasks that needed to be completed;
- Using a chatbot for evaluation and feedback. The chatbot was used to collect and evaluate feedback from students. For example, after the course, the chatbot suggested that students fill out a questionnaire to find out about the quality of training and students' opinions about the course.

To simplify interaction with applicants, existing and new students, today we in higher education are increasingly using educational chatbots based on artificial intelligence.

The educational process in the CG was organized according to traditional methods.

The third, diagnostic, stage was aimed at determining changes in the levels of formation of the digital culture of future specialists by using educational chatbots for interactive learning based on artificial intelligence in higher education and conducting a final diagnosis. A qualitative and quantitative analysis of the experimental data obtained was carried out at this stage, conclusions were formulated, and prospects for further research were outlined.

67 respondents were involved in the experimental work.

Experimental testing of the effectiveness of the system for forming the digital culture of future specialists by using educational chatbots for interactive learning based on artificial intelligence in higher education was carried out using diagnostic tools: traditional methods of pedagogical research; pedagogical

experiment; implementation of projects with the development of digital resources, with the use of digital technologies, participation in events using digital technologies; questionnaires; testing; statistical methods of analyzing the data obtained.

Diagnostics of the levels of formation of digital culture of future specialists through the use of educational chatbots for interactive learning based on artificial intelligence in higher education.

Let us dwell in more detail on the procedure for diagnosing the levels of formation of students' digital culture by using educational chatbots for interactive learning based on artificial intelligence in higher education, for which the criteria, main indicators and levels of formation of the studied component were characterized.

As an assessment tool in our study, we gave preference to questionnaires and testing, since we believe that these methods will allow us to quickly carry out the procedure for measuring levels of formation and cover a significant number of respondents.

We have identified motivational and knowledge criteria that characterize the structural and component composition of students' digital culture and the prescribed indicators.

The motivational criterion in our study determined the formation of the motivational component of students' digital culture and was revealed by indicators: the formation of interests, needs, motives for using digital technologies in educational activities and future professional activities, awareness in the digital environment of the value of digital communication, the value of information; students' desire to develop their own educational digital resources.

The knowledge criterion in our study determined the formation of the cognitive component of students' digital culture and was revealed by indicators: the formation of the basic thesaurus of digital education, a certain level of information knowledge, forms and types of educational digital content, and when working with digital information – security measures; when working with digital technologies – rules of academic integrity and the use of digital content; the formation of technological knowledge about the features of information processes, students' knowledge of electronic educational platforms, features of digital technologies, ways of their functioning, sequence and methodology of using digital technologies, creation of digital educational resources; norms of behavior in the digital environment, online activities for communication, ethical rules and means of organizing feedback.

The formulated criteria and indicators are considered signs of the formation of students' digital culture.
In the process of the study, the levels of formation of students' digital culture were identified: low, medium, sufficient, high.

At the beginning of the experimental study, the respondents of the experimental groups had approximately the same indicators, which were established by analyzing the level of academic overall success of the respondents and amounted to:

- EG – 72.4%;
- CG – 73.5%.

This percentage ratio ensured the objectivity of the initial indicators for the further conduct of the pedagogical experiment.

Within the framework of the ascertaining experiment, a questionnaire was initially conducted among respondents to identify indicators of the development of the motivational component (motivational criterion) of students' digital culture. Respondents were asked to fill out an online questionnaire developed in the Google Forms service, the questions of which were conditionally divided into three blocks:

- Questions aimed at identifying interest in using digital technologies in professional activities;

- Questions aimed at identifying students' desire to use and develop educational digital resources;
- Questions aimed at identifying interest in participating in and organizing communication events in the digital environment.

Higher education students, answering the questionnaire questions, had to evaluate on a scale from 1 to 5 what corresponded to their own assessment of interests, motives, and needs for the formation of digital culture.

The quantitative analysis of the respondents' responses allowed us to say that students showed high levels of motivation for the formation of digital culture.

As a result of the survey of respondents in the EG and CG, the generalized data obtained demonstrate that the manifestation of aspirations, motives, and goals for the formation of digital culture in general was positively expressed.

Thus, 50% of respondents in the EG and CG have a sufficient and average level of the motivational criterion of the formation of digital culture, which indicates that future specialists have a desire and interest in developing digital educational resources, using digital technologies, and a desire to communicate effectively in a digital environment during their studies in higher education and professional activities.

Due to the qualitative analysis of the respondents' answers, a correlation of sufficiently high quantitative indicators to clarifying open-ended questions for students occurred, which made it possible to say that respondents like to use digital technologies in educational activities:

- EG – 86.7% of respondents;
- CG – 87.4% of respondents.

However, a significant number of respondents cannot independently perform tasks using digital technologies. They resort to the help of other friends, teachers, students, and try to find solutions to problems on the Internet.

The list of digital technologies that students use most often included (Fig. 1):

- Mobile applications and chatbots for interactive learning in higher education to form a digital culture (32.1% in EG, 33.3% in CG);
- Video content (video lessons) (17.3% in EG, 15.2% in CG),
- Online tests (23.1% in EG, 22.7% in CG),
- Other digital technologies used by students (27.5% in EG, 28.8% in CG).

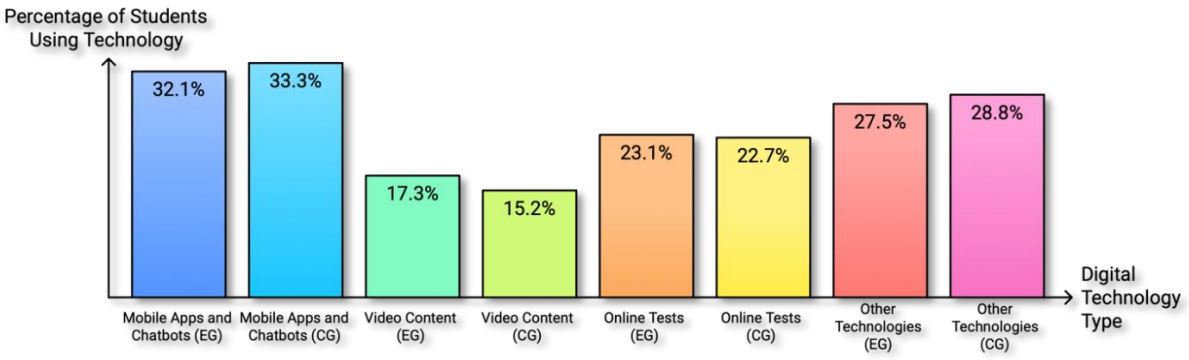

Fig. 1. Usage of Digital Technologies in Education.

When asked whether respondents plan to use digital educational resources in their professional activities or whether they consider them effective, most respondents noted (Fig. 2):

- 65.1% in the EG, 63.8% in the CG – digital resources are interesting,
- 28.8% in the EG and 29.5% in the CG – the use of digital technologies allows us to visualize the material being studied;
- 6.1% in the EG and 6.7% in the CG – the use of modern digital resources has a positive effect on the formation of a person's digital culture – noted by a small number of respondents.

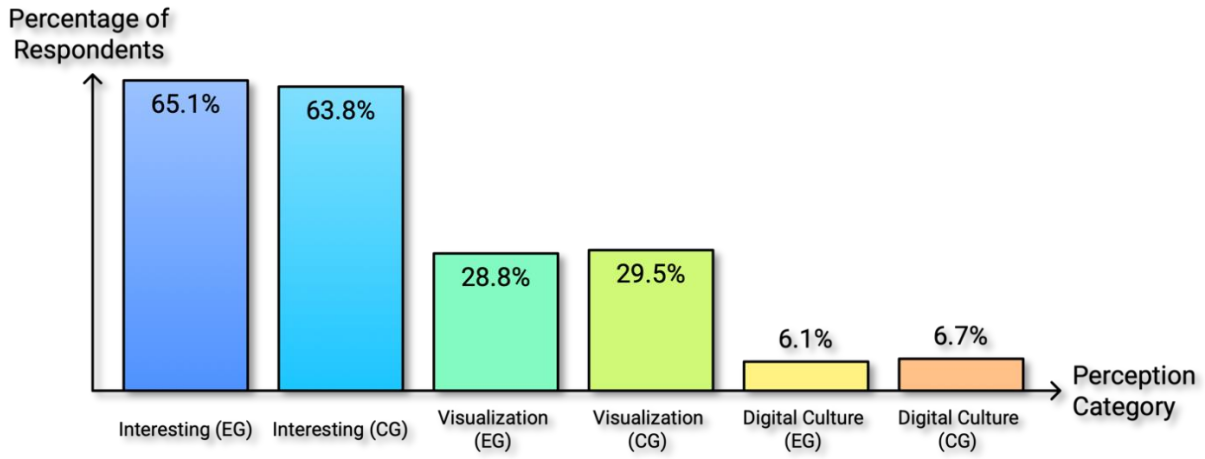

Fig. 2. Perceptions of Digital Educational Resources.

The main method of measuring the formation of the cognitive component (knowledge criterion) of a student's digital culture was testing.

The questions about the methods of work and the essence of digital content included questions aimed at interaction in the digital space, search, critical evaluation, data selection, understanding of digital communication services, sharing digital technologies, digital identity management, netiquette, establishing the level of awareness of respondents on digital content: organization, structuring, storage, use and interpretation of content in the digital environment. The block of questions was focused on determining the level of knowledge in the field of digital culture.

The block of questions about digital technologies concerned the digital educational environment and online services, editing and creating educational content using digital technologies for organizing educational activities. Regarding digital security, the block of questions included questions about the protection of personal data, devices, and confidentiality.

For the convenience of testing, the convenience of collecting and analyzing the results obtained, the testing was carried out using the Google Forms service.

Analysis of the results of student testing showed insufficient knowledge, weak awareness of students in the field of digital technologies, low general level of information activity, lack of knowledge about the rules and norms of online communication, lack of orientation in issues of protecting one's own data and security.

Quantitative analysis of the results obtained (knowledge criterion) allows us to state that more than 70% of respondents (73.6% in the EG, 72.5% in the CG) revealed a low and average level of development of digital culture.

Respondents could not score 100 points, with the maximum score for the test being 455, that is, they demonstrated a lack of knowledge in all blocks of the test related to digital content and awareness in the field of digital communication, digital technologies, and security.

Organization and implementation in the EG of a system for forming students' digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education.

The purpose of the experimental study was to implement the developed system for forming students' digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education and to verify its effectiveness, which was ensured by the implementation of the developed and presented above pedagogical conditions.

The use of digital educational resources of various forms, the involvement of the system for forming students' digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education made it possible to implement the method of digital visualization, increase the level of informativeness of practical and lecture classes, which had a positive effect on strengthening, to form a digital culture, the motivation of future specialists to use educational chatbots for interactive learning based on artificial intelligence in higher education.

The acquisition of the outlined knowledge, skills and abilities took place within the framework of studying the special distance course "Digitalization in Education".

Analysis of the results of the experimental study.

Conducting a control stage of experimental work to verify the effectiveness of the implementation of the developed system for the formation of students' digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education became the main task of the diagnostic stage of the study.

A control section was conducted in the experimental and control groups and an analysis (quantitative and qualitative) of the results obtained was carried out, the systematization of experimental data and their statistical processing were performed, the effectiveness of the developed system for the formation of students' digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education was assessed, the main conclusions were formulated, and further scientific explorations were outlined.

In the experimental work, comprehensive testing was chosen to organize the control stage by the diagnostic method to measure the level of formation of each component of the digital culture of students participating in the experiment.

The conducted comprehensive testing consisted of subtests.

The first subtest focused on identifying the level of formation of the motivational component of the phenomenon under study, and the second subtest focused on identifying the level of formation of the cognitive component.

100 points was the total maximum amount of points that respondents could receive during the diagnosis.

This approach to measuring the academic success of students in higher education corresponds to the ECTS grading scale.

For each subtest, the answers to the questions of the comprehensive test were evaluated separately, which made it possible to measure the levels of formation of each component of digital culture in future specialists. By the established weighting coefficient, the distribution of points for each of the subtests took place.

The weighting coefficient of the first subtest was 50 points, the weighting coefficient of the second subtest was also 50 points.

Level Total points
High 90 – 100
Sufficient 89 – 75
Average 60 – 74
Low 0 – 59

Analysis of the results of the first subtest, in which applicants were asked to answer the questions of the questionnaire regarding the formation of the motivational component of students' digital culture, showed that the indicators of the motivational component in the experimental groups increased significantly, compared to the ascertaining stage of the experiment. In the control group, the indicators of the motivational component underwent small changes.

60% of respondents have an average and sufficient level of formation of the motivational criterion of digital culture in the CG.

The proportion of respondents with an average and sufficient level of EG decreased to 22%, and the high level indicators increased to 67% (motivational criterion), which indicates that respondents have an interest in developing digital educational resources, a desire to use digital technologies, and a desire to communicate effectively in a digital environment.

The answers to the test questions allowed us to draw the following conclusions:

1. Familiarizing students with the practical and theoretical foundations of the use of digital technologies in interactive learning based on artificial intelligence in higher education and further professional activity significantly affects the level of formation of the motivational component of students' digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education. Possessing even elementary knowledge about the place and role of digital culture in professional activity, future specialists show positive, stable motivation for their systematic application in higher education and implementation in further professional activity.
2. Basically, all EG applicants expressed their conviction in the need to constantly improve the level of digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education.
3. In the process of implementing the developed system for forming students' digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education, respondents were happy to develop their own digital educational resources, using a significant number of online services and digital technologies.

Let us present the visualized and summarized indicators of the formation of the motivational component of the respondents' digital culture at the diagnostic stage.

According to the results of the experiment, the indicators of the motivational component in the EG underwent significant positive changes (Fig. 3):

- The high level increased by 12.1%,
- The sufficient level increased by 9.7%.

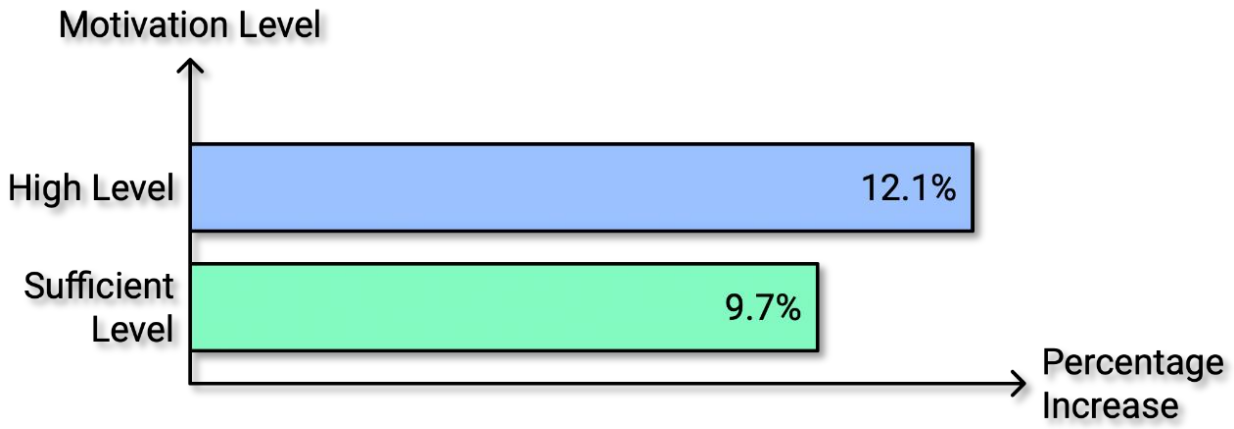

Fig. 3. Changes in Motivational Component Indicators (EG).

Accordingly, the average level and the low level decreased by 12.1% and 9.7%.

The indicators of the motivational component, according to the results of the experiment in the CG, underwent minor changes (Fig. 4):

- High level increased by 2.1%,
- Sufficient level increased by 1.5%.

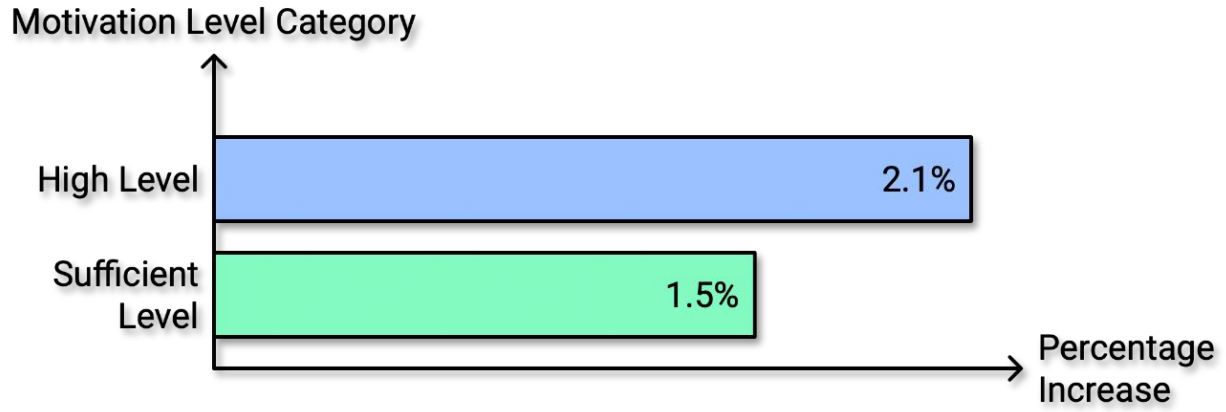

Fig. 4. Changes in Motivational Component Indicators (CG).

Respectively, the average level and low level decreased by 1.5% and 2.1%.

Analysis of the results of the control complex testing of students of the second subtest at the diagnostic stage showed higher results of the formation of the cognitive criterion of digital culture in EG applicants who were involved in the experimental study of the developed system for forming students' digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education than in CG students (Fig. 5).

In EG:

- High level – 18.4%,
- Sufficient level – 31.1%,

– Average level –33.5%,
– Low level –18%;

In CG:

– High level – 13.4%,
– Sufficient level – 19%,
– Average level – 41.02%,
– Low level – 26.4%.

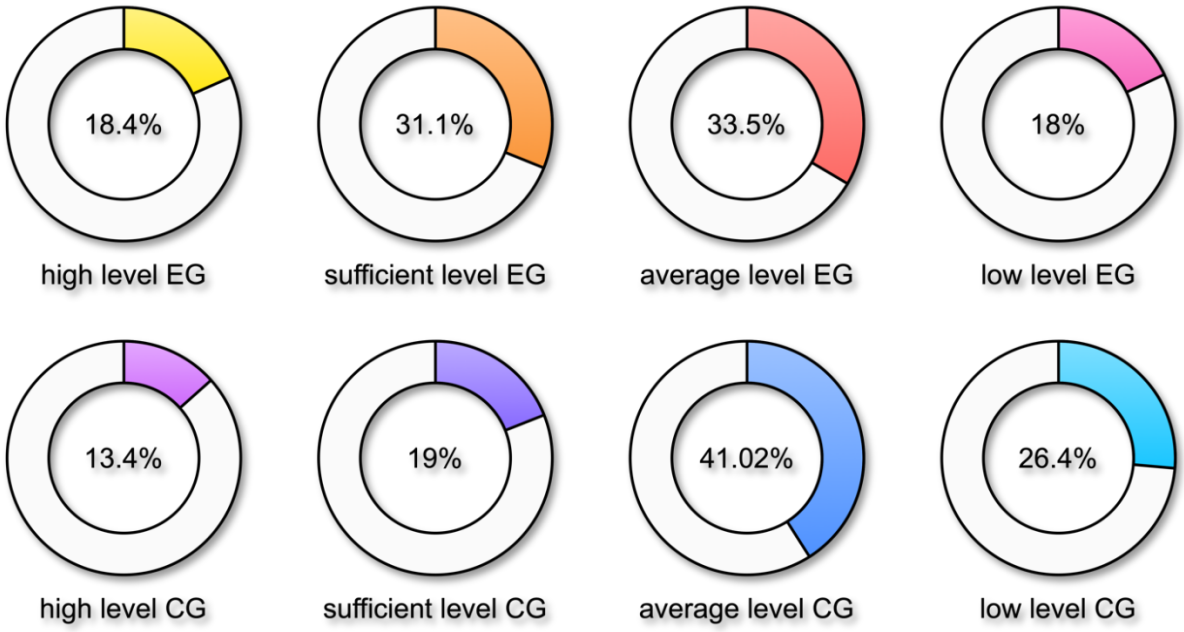

Fig. 5. Comparison of Levels in EG and CG.

A comparative analysis of the dynamics of changes in the cognitive criterion indicators showed that in the EG, the indicators of sufficient and high levels increased by 17.4% and 4.7%, and the low and average levels decreased by 13.6% and 8.3%, respectively.

These indicators for the CG changed as follows: we observe an increase in the high level by 1.7%, sufficient by 4.0%, the average level increased only by 0.5%, and the low level decreased by 6.3%.

We can conclude (generalizing the indicators of the formation of all components) about the positive dynamics in all levels of the formation of the digital culture of respondents in the experimental group compared to the control group, which indicates the effectiveness of the system for forming the digital culture of students through the use of educational chatbots for interactive learning based on artificial intelligence in higher education.

We formulate the hypotheses – null and alternative:

H0: taking into account the arithmetic mean of the scores in the control groups and the arithmetic mean of the scores in the experimental groups – the proposed system for forming students' digital culture by using educational chatbots for interactive learning based on artificial intelligence in higher education does not affect the level of digital culture of respondents 2 1 x x = 1x 2 x.

H1: the proposed system for forming students' digital culture by using educational chatbots for interactive learning based on artificial intelligence in higher education is effective for forming the level of digital culture. 1x 2x.

The tabular value of the Student's t-test for all respondents who participated in the experiment and the significance level of 5% is ttab.= 1.9679.

temp=7.356 is the empirical value of the criterion and significantly exceeds the tabular value, therefore we reject the null hypothesis and confirm the alternative hypothesis.

Therefore, the differences in the mean scores of respondents in the control and experimental groups are not accidental, and are the result of the implementation of the system for forming students' digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education, as evidenced by a significantly higher level of success in the experimental groups.

Conclusions

Having analyzed the modern practice and pedagogical theory of using chatbots for interactive learning in higher education to form the digital culture of future specialists, the lack of specific research devoted to the outlined problem was confirmed.

The article describes the content, identifies the types of chatbots and lists their advantages. The ways of creating chatbots for different platforms are described. The most significant AI-based chatbots used in the educational process of higher education are named.

The purpose of the experimental study was to implement the developed system for forming the digital culture of students through the use of educational chatbots for interactive learning based on artificial intelligence in higher education and to verify its effectiveness, which was ensured by the implementation of the developed author's pedagogical conditions.

The dynamics of changes in the level characteristics of the manifestation of indicators of the formation of students' digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education in the EG and CG between all stages of the pedagogical experiment confirmed the effectiveness of the developed system for the formation of students' digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education.

Based on the obtained research results, we conclude that the proposed system for the formation of students' digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education is effective.

Further research requires substantiation of the principles that will contribute to the effectiveness of the system for forming students' digital culture through the use of educational chatbots for interactive learning based on artificial intelligence in higher education: specific principles that are characteristic of digital education (principles of distance learning, adherence to convergence, academic integrity, communication, visualization, adherence to a culture of behavior on the Internet, etc.); general didactic principles that will ensure the coordination of the tasks and goals of the study with the forms, methods, and content of the educational process (systematicity and consistency, scientificity, integration of practice and theory, activity and consciousness, critical self-assessment, interdisciplinary connections, self-development and self-improvement of future specialists).

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Using online services for the development of listening skills in future foreign language teachers

Utilización de servicios en línea para el desarrollo de la capacidad de comprensión oral en futuros profesores de lenguas extranjeras

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Abstract

This study examines the effectiveness of online services in developing listening skills and enhancing motivation to learn foreign languages among university students training to become future teachers. Using an experimental and longitudinal design, the research evaluated changes in listening comprehension in control and experimental groups through standardized tests, structured interviews, and the Attitude/Motivation Test Battery (AMTB). Results revealed statistically significant improvements in all listening indicators within the experimental group, as well as increased motivation and reduced anxiety levels. A strong correlation between motivation and listening development was observed. The findings suggest that digital tools such as TED Talks and BBC Learning English can effectively support traditional language instruction, especially when integrated with adaptive pedagogical approaches. Future research should explore long-term impacts and the use of immersive technologies in language education.

Keywords: communicative competence, foreign languages, listening skills, motivation, digital technologies, teacher training.

Resumen

El estudio analiza la efectividad de los servicios en línea en el desarrollo de la comprensión oral y la motivación para aprender lenguas extranjeras en estudiantes universitarios que se preparan como futuros profesores. A través de un diseño experimental y longitudinal, se evaluaron los cambios en las habilidades de escucha de dos grupos (control y experimental) mediante pruebas estandarizadas, entrevistas y el cuestionario Attitude/Motivation Test Battery (AMTB). Los resultados muestran mejoras estadísticamente significativas en el grupo experimental en todos los indicadores de comprensión auditiva, así como un aumento en la motivación y una disminución en los niveles de ansiedad. Se evidenció una alta correlación entre la motivación y el desarrollo de las habilidades de escucha. El estudio concluye que los servicios digitales, como TED Talks o BBC Learning English, pueden ser herramientas eficaces para complementar el aprendizaje tradicional, especialmente si se integran con enfoques pedagógicos adaptativos. Se sugieren investigaciones futuras sobre el impacto a largo plazo y el uso de tecnologías inmersivas.

Palabras clave: competencia comunicativa, lenguas extranjeras, comprensión oral, motivación, tecnologías digitales, formación docente.

Introduction

The relevance of the study is determined by the need to develop effective methods of teaching foreign languages for students of technical majors. The use of interactive online platforms for the development of listening skills is a promising direction. It enables the adaptation of the educational material to the specifics of technical texts and enhances students' motivation for independent work (Aggarwal, 2023). Research in this area will contribute to the development of new pedagogical technologies that will help to prepare specialists who are able to communicate effectively in an international professional environment.

Listening is an integral part of the comprehensive development of speaking competence (Fayzullayeva, 2023). It is closely related to other types of speech: speaking, reading, and writing. Understanding speech by ear contributes to expanding vocabulary, improving grammatical structures, and forming correct pronunciation. Listening enables immersing oneself in the cultural environment of the language, which is important for the development of intercultural competence (Anggreni et al., 2023).

The task of developing sustainable listening skills is solved by using online services for learning a foreign language. They provide students with unlimited opportunities for developing listening comprehension. A variety of materials, interactive exercises, and the ability to control the pace are just some of the advantages of such platforms. They allow students to get acquainted with different styles of speech. An individual approach, provided by the creation of individual educational trajectories, contributes to effective learning (Frumkina et al., 2020).

The insufficient level of development of listening skills among students is a pressing problem in modern language education and defines the problem of the study. Despite the importance of listening for effective communication in a foreign language, this aspect is often underestimated in curricula. The study focuses on analysing the impact of various teaching methods, in particular online services, on the development of students' listening skills. Particular attention is paid to the capabilities of interactive and accessible online platforms to stimulate active assimilation of audio materials. The aim of the study is to assess the effectiveness of online services for developing listening and studying students' motivation to learn a language in students studying to become foreign language teachers. The aim involves the fulfilment of the following research objectives:

- Conduct pre-experimental and post-experimental assessment of the level of listening skills in both groups;
- Study changes in listening skills through expert assessment;
- Study students' motivation to learn a foreign language.

This article proceeds with the following structure. Initially, a comprehensive review of existing literature concerning online services for the enhancement of listening proficiency and the cultivation of motivation in language acquisition is provided. Subsequently, the methodological framework, encompassing the research design, participant sampling, and assessment instruments, is delineated. The ensuing results section presents both quantitative and qualitative findings derived from the study. Following this, a critical discussion of the implications of these results is undertaken. Finally, the conclusion synthesizes the principal insights and proposes avenues for future scholarly inquiry.

Literature Review

In the academic literature, the issue of studying foreign languages in higher education institutions (HEIs) is one of the most relevant in modern linguistic didactics. The study of Dereka (2024) focuses on the issue of the growing international cooperation. According to the researcher, it is determined by the requirements of the labour market and the need to train specialists who have a high level of foreign language proficiency. According to Andrieieva & Kolyaska (2024), language learning in HEIs, involves not only the development of lexical and grammatical knowledge. It should provide for the development of communicative competence, which includes the ability to understand authentic speech, participate in dialogues and create various texts. The researchers place particular emphasis on the importance of integrating modern technologies into the educational process.

A special place in the academic literature is occupied by the problem of developing listening skills as one of the key components of studying a foreign language. In the article by Sam (2024), listening is considered as a process that ensures the perception and understanding of speech by ear. It is the basis for the development of other types of language activities, such as speaking, reading and writing. We share the thesis that listening contributes to the development of lexical, grammatical and communicative skills through contact with authentic language samples.

The importance of authentic material for the development of listening skills should now be emphasized. The article by Chou (2023) emphasizes the role of using audio and video materials that reflect real speech practice. The author examines the impact of technological innovations, such as interactive platforms, mobile applications, and multimedia resources, on the quality of training listening comprehension. The use of innovative digital technologies for the development of listening skills is also covered in the work of Peixoto et al. (2023). The study focuses on how the use of technological innovations takes into account the personal differences of students, their level of language proficiency, and cognitive characteristics. We believe that these works open up new opportunities in the study of the development of listening skills using modern digital technologies.

The work of Tursunovich (2023) emphasizes the role of online services in training listening comprehension, emphasizing their significant potential in the development of students' speaking competence. Popular online resources used to develop listening skills include such platforms as YouTube, Netflix, BBC Learning English, Duolingo, TED Talks, etc. Researchers note that these resources provide access to authentic language material that covers a wide range of topics and styles of speech. We share the opinion that online services help to familiarize oneself with different accents, speech patterns, and cultural characteristics of native speakers of a particular language.

According to Rashov (2024), the advantages of online services in teaching listening comprehension are their accessibility, flexibility, and the ability to adapt to individual students' needs. The researcher notes that online tools enable students to learn at their own pace, use subtitles, repeat audio fragments, and adjust the speed of speech. According to Panagiotidis et al. (2023), the interactive features of online services enhance students' learning motivation. However, researchers also draw attention to the disadvantages of using online services. In particular, students may find it difficult to organize the process of independent learning without proper teacher support. We accept such concerns and consider it appropriate to investigate students' motivation when using online services in more detail.

According to Badary (2024), the educational capabilities of online services for the development of listening skills depend on their correct use in the educational process. The researcher notes the need to combine online services with traditional teaching methods in order to ensure consistency and control over the assimilation of the material. As Benamara & Benmouhoub (2024) noted, online services can be effective in creating situations of real communication, simulating dialogues, conducting listening comprehension, etc. The researchers state that teachers can use these resources to individualize learning, adapting tasks to the students' level and their educational needs. We agree with such statements and consider online services to be an excellent educational supplement to the main methods of learning a foreign language.

The use of online services for the development of listening skills is a promising direction in the methodology of learning foreign languages, which requires further research. The issue of personalizing learning taking into account individual cognitive styles and rates of information perception remains poorly studied. An important role is played by motivational factors that affect the effectiveness of self-study, and mechanisms for their support in the online environment. The technological aspect of the problem involves the study of optimal formats of audio materials for the development of listening skills. A promising direction is the creation of immersive learning environments using virtual reality (VR) and augmented reality (AR) technologies. Psychological aspects that should be studied include the relationship between emotional state and the ability to perceive information audibly during listening.

Methods

Research design

Based on the aim and objectives of the study, it can be defined as experimental and longitudinal, as it studies the change in listening skills over time. It was conducted in several stages. Figure 1 illustrates the research procedure.

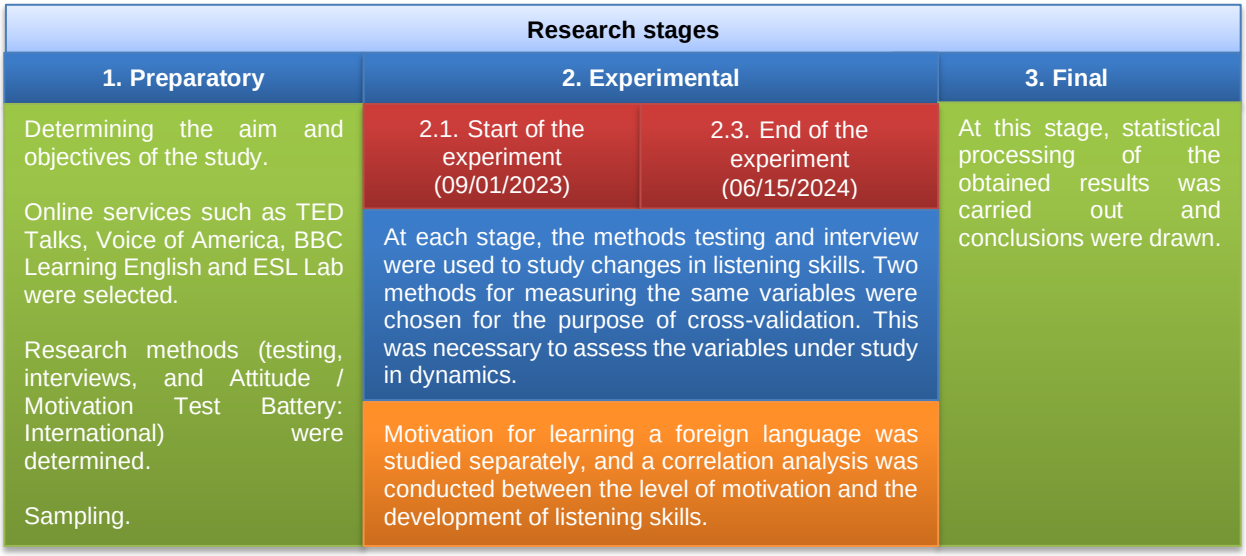

Figure 1. Research stages and their content.
Source: developed by the authors of the research.

Sampling

The study involved the students of the Department of Foreign Philology, Translation and Professional Language Training at the Faculty of Economics, Business and International Relations of the University of Customs and Finance; and the Department of English Philology at the Faculty of Ukrainian and Foreign

Philology and Art History of Oles Honchar Dnipro National University. All students were in their 3rd year at the time of the experiment. The total sample size was 140 people, 70 in the EG, and 70 in the CG. Both groups were homogeneous in terms of foreign language competence. The distribution into groups was made by drawing lots. The inclusion criteria were proficiency in English at level A2, being a full-time student, and permanently residing in Ukraine. The EG students were invited to supplement their studies with materials from platforms such as TED Talks (ESL Brains, n.d.), Voice of America (n.d.), BBC Learning English (n.d.), and ESL Lab (n.d.). These platforms provide authentic audio material for different levels. Access is free of charge. The use of these resources does not violate the principles of academic integrity and copyright and/or other related rights. The study meets the high requirements of academic integrity, ethics, professionalism, and scientific accuracy. The obtained results are interpreted solely for the purpose of obtaining sound data, excluding any discrimination. The respondents provided informed consent to the processing and publication of the obtained results.

Methods

1. Testing for the purpose of pre-experimental and post-experimental assessment of the level of listening skills in both groups. This method made it possible to identify both the initial listening competencies of students and their academic progress. Besides, before the experiment, this ensured that both groups were homogeneous in terms of listening competencies. Listening skills assessment tests were used, which are publicly available on the British Council website (n.d.).
2. Assessment of listening skills using in-depth interviews. Listening skills consist of several important components that ensure a full understanding of oral speech. The following indicators were assessed during the interview: sound recognition, word and phrase recognition, content understanding, intonation and rhythm of speech, context understanding, content prediction. Duration for one respondent was 15 minutes. The tasks during the interview met the criteria of authenticity, variety, and accessibility. The respondents were assessed according to the following single criteria: understanding the main idea, understanding details, vocabulary, understanding grammatical constructions, ability to draw a conclusion. The interview was conducted by an expert group of 20 people from among the English teachers of the above-mentioned HEIs. The experts had an educational and qualification level of a master's degree and above. Of them, 13 experts have the degrees of Candidate of Sciences (PhD) and Doctor of Sciences. All experts have over 10 years of teaching and/or translation experience.
3. The Attitude/Motivation Test Battery: International (AMTB) was used to investigate students' motivation to learn a foreign language (Gardner, 2004). The test examined students' attitudes towards learning a foreign language, in particular through online services. The instrument covers key components such as attitude towards the language community; integrative motivation; instrumental motivation; diligence in learning, as well as anxiety and comfort.
4. The study used descriptive statistics such as standard deviation (SD) and standard error of the mean (SEM). SD shows how much the values in the group vary around the mean. SEM demonstrates the precision of the estimate of the mean. A smaller SEM means that the group mean was determined with greater precision.
5. The study used descriptive statistics methods such as standard deviation (SD) and standard error of the mean (SEM). SD shows how much the values in the group vary around the mean. SEM demonstrates the accuracy of the estimate of the mean. A smaller SEM means that the group mean was determined with greater accuracy.
6. The use of one-way analysis of variance (ANOVA) determined the statistical significance of changes in the levels of development of listening skills and motivation in the EG. Such changes cannot be explained by random factors. So, the obtained results confirm the effectiveness of the experimental interventions used.
7. The Pearson correlation coefficient (PCC) was used to quantitatively assess the relationship between motivation and the level of development of listening skills. This statistical method determines the strength and direction of the linear relationship between two variables. The values of the coefficient vary from –1 to +1, identifying how changes in one indicator affect changes in the other.

The reliability of the research results was ensured through an assessment of the internal consistency of

the instruments and the cross-validation method. A high level of internal consistency indicates that individual elements of the instruments measure the same construct. Cross-validation made it possible to verify that the results obtained are not random and can be generalized to other data samples. The use of these procedures ensured a high level of confidence in the obtained results.

Results

The level of development of listening skills was measured at the beginning, middle, and end of the study using standardized tests and interviews. This made it possible to study the change in skills over time in experimental and control pedagogical conditions. The results of the study of changes in listening skills using standardized tests are presented in Table 1.

Table 1.
Changes in the level of development of listening skills in the CG and EG at different stages of the study

Skills	Group	At the beginning	In the middle	At the end	Change (%)	The results of ANOVA (F)	Statistical significance (p)
Understanding the main idea	CG	3.2 ± 0.4	3.4 ± 0.5	3.6 ± 0.5	+12.5	0.45	$p > 0.05$
	EG	3.3 ± 0.4	4.2 ± 0.4	4.8 ± 0.3	+45.5	15.65	$p < 0.01$
Understanding details	CG	3.0 ± 0.4	3.2 ± 0.4	3.5 ± 0.4	+16.7	0.88	$p > 0.05$
	EG	3.1 ± 0.3	4.0 ± 0.3	4.6 ± 0.3	+48.4	13.89	$p < 0.01$
Vocabulary	CG	3.5 ± 0.5	3.7 ± 0.5	4.0 ± 0.4	+14.3	1.03	$p > 0.05$
	EG	3.4 ± 0.4	4.3 ± 0.4	4.9 ± 0.3	+44.1	12.25	$p < 0.01$
Understanding grammar	CG	3.4 ± 0.4	3.6 ± 0.5	3.9 ± 0.4	+14.7	0.62	$p > 0.05$
	EG	3.5 ± 0.4	4.2 ± 0.4	4.8 ± 0.3	+37.1	11.45	$p < 0.01$
Ability to draw a conclusion	CG	3.1 ± 0.5	3.3 ± 0.4	3.6 ± 0.5	+16.1	0.93	$p > 0.05$
	EG	3.2 ± 0.4	4.1 ± 0.4	4.7 ± 0.3	+46.9	14.67	$p < 0.01$

Source: developed by the authors of the research.

Table 1 demonstrates the initial homogeneity of the CG and EG in all listening parameters, which is confirmed by the close mean values. At the end of the study, the EG showed a statistically significant increase in the results for all indicators, especially in understanding the main idea (+1.6), details (+1.4), and vocabulary (+1.2). This indicates the effectiveness of the training method used. The CG shows smaller changes, which confirms the lack of similar progress without experimental intervention. For the CG, the statistical significance of the ANOVA test showed the absence of significant changes ($p > 0.05$), which confirms the homogeneity and stability of the results in the group. In the EG, the ANOVA test showed statistically significant changes ($p < 0.01$) in all aspects of listening, which indicates the effectiveness of the method used. In turn, the results of the interviews using the same criteria demonstrated the results presented in Figure 2.

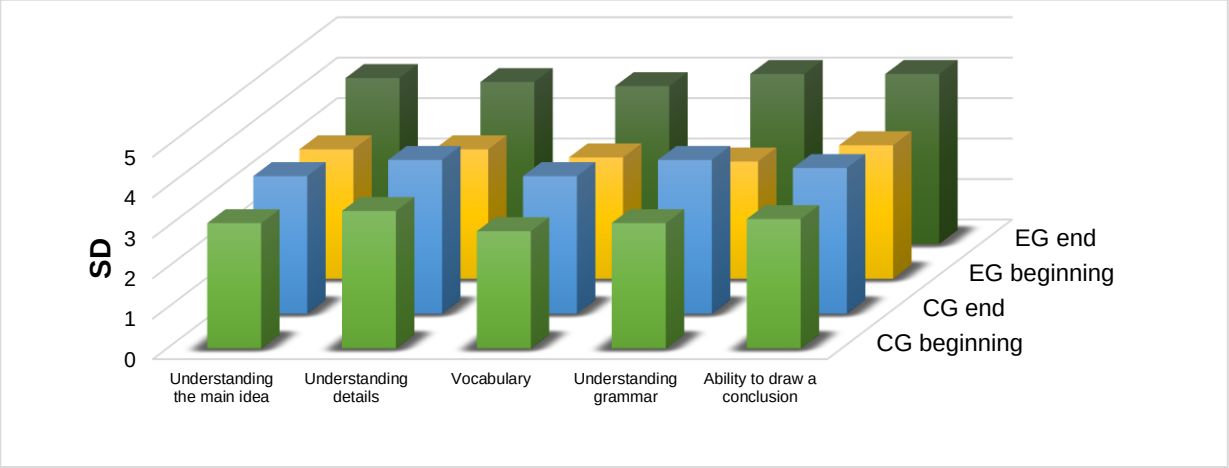

Figure 2. Changes in the level of development of listening skills in the CG and the EG at different stages of the study based on the results of the interview
Source: developed by the authors of the research.

Figure 2 shows that the CG participants significantly improved their results according to all the criteria of the study. The improvement of listening skills in the CG was not so pronounced. On the one hand, this demonstrates the effectiveness of traditional teaching methods. On the other hand, this proves the high efficiency of using online services to develop the auditory perception of a foreign language. The motivation to learn a foreign language was also studied during the experiment. The results are presented in Figure 3.

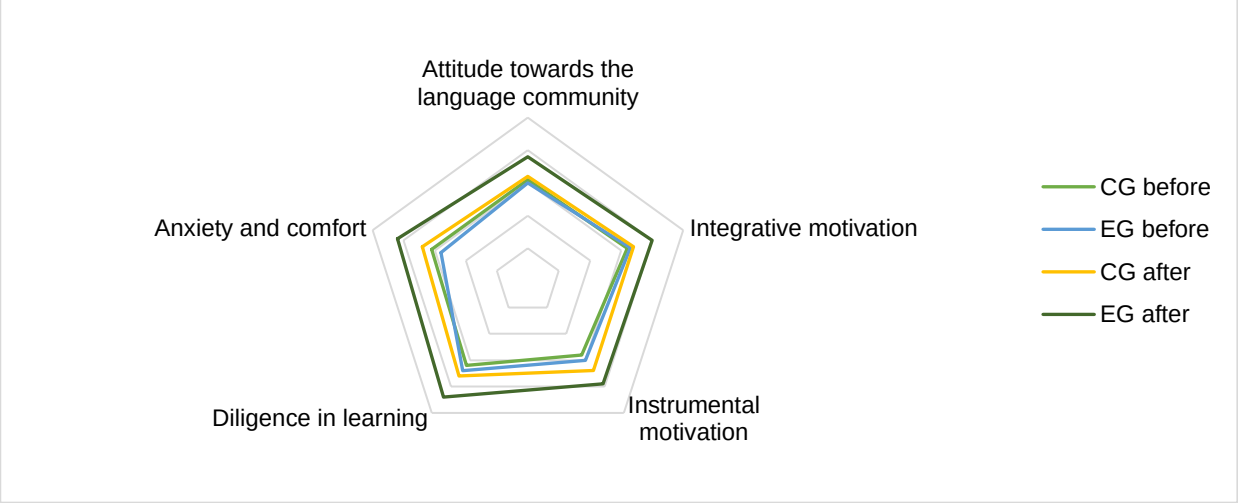

Figure 3. Research on motivation to learn a foreign language in the CG and EG.
Source: developed by the authors of the research.

The analysis of the data presented in Figure 3 demonstrates a statistically significant increase in all components of motivation to learn a foreign language in the EG compared to the CG. The most pronounced increase is observed in the indicators of attitude to the language community (Δ = 0.7 points), integrative motivation (Δ = 0.7 points), and diligence in learning (Δ = 0.8 points). At the same time, the level of anxiety in the EG decreased by 1.4 points. These results indicate the high effectiveness of the experimental intervention in enhancing motivation to learn a foreign language. Table 2 shows the correlation between motivation to learn a foreign language and changes in the level of development of listening skills in both groups.

Table 2.
The results of the correlation analysis between motivation to learn a foreign language and changes in the level of development of listening skills in both groups

Indicator	Correlation with listening level (CG)	Correlation with listening level (EG)
Attitude towards the language community	0.35	0.68
Integrative motivation	0.40	0.75
Instrumental motivation	0.30	0.70
Diligence in learning	0.45	0.80
Anxiety and comfort	-0.25	-0.65

Source: developed by the authors of the research.

The correlation analysis shows that the EG has a significantly higher level of correlation between positive motivational indicators and the level of development of listening skills compared to the CG. In particular, the correlation coefficient between diligence in learning and the level of listening in the EG is $r = 0.80$ ($p < 0.01$). This indicates a strong positive relationship. At the same time, the negative correlation between anxiety and the level of listening in the EG indicates that a decrease in the level of anxiety contributes to an increase in the effectiveness of training listening comprehension.

Discussion

The study revealed significant differences in the relationship between motivational factors and the level of development of listening skills in the EG and CG participants. The EG participants demonstrated significantly stronger positive correlations between attitude to the language community, integrative and instrumental motivation, diligence in learning and the level of development of listening skills. This confirms not only the positive effect of using online services to improve listening skills, but also the ability of these services to positively affect student motivation. At the same time, in the EG, a higher correlation was also observed between the level of anxiety and learning efficiency, which indicates the need to manage the emotional state during learning.

The obtained results indicate the effectiveness of online services in enhancing the positive impact of motivational factors and minimizing the negative impact of anxiety on the success of training listening comprehension. In support of our conclusions, it is worth referring to the results of such works as Bonner et al. (2023) and Ludwig & Tassinari (2023). The researchers provide data to support the effectiveness of online services as additional educational tools in learning a foreign language.

According to Derakhshan & Fathi (2024), online services have become a powerful tool for developing listening skills. The researchers state that they provide access to a wide range of authentic materials that reflect a variety of speech situations. An individualized approach, adaptation to the user's level, and interactive tools such as subtitles, electronic dictionaries, and feedback contribute to the effective assimilation of the material. Kianinezhad (2023) believes that the use of artificial intelligence technologies allows for the personalization of learning by analysing errors and developing individual improvement strategies. The researcher notes that such high-tech online services allow for continuous improvement of the students' personal educational trajectory by enhancing their learning motivation. The conclusions presented in both studies confirm the data we obtained on the effectiveness of using online services to improve listening skills.

However, according to Lyu (2024), pure online learning has certain limitations. The lack of direct communication can make it difficult to apply the acquired knowledge in real communicative situations because of the lack of psychological skills to perceive a real speaker. Long work in front of the screen can lead to visual fatigue and reduced concentration. Furthermore, according to Chaiyasat et al. (2024),

excessive dependence on technology can negatively affect the development of autonomy in learning.

So, it can be concluded that online services are a valuable addition to traditional methods of teaching listening comprehension. Their effectiveness largely depends on a balanced approach. It involves combining online learning with interactive forms of work that stimulate live dialogue and the development of communicative competencies.

Online services have become a powerful tool for enhancing motivation to learn foreign languages. According to Wei (2022), they owe this to their interactivity, the possibility of personalizing the learning process, and the availability of a wide range of authentic materials. Flexibility in choosing the pace and level of difficulty, gamification, virtual achievements and operational feedback contribute to maintaining a sustainable interest in learning and a sense of progress. According to Negoescu & Mitrulescu (2023), the integration of cultural context through multimedia resources stimulates the development of integrative motivation. The researchers explain this by promoting a deeper understanding of the cultural peculiarities of the language community. The results of our study also prove that the use of online services enhances motivation to learn a foreign language.

However, exclusive reliance on online platforms has certain limitations. Franchisca et al. (2024) draw attention to the fact that the lack of direct interaction with native speakers can negatively affect the development of communication skills. This can reduce the level of emotional involvement in the learning process. According to Rintaningrum (2023), excessive dependence on external stimuli, such as awards or ratings, can lead to the replacement of intrinsic motivation. We agree with the above arguments and insist on the feasibility of further research into the specifics of the formation of motives when learning a foreign language through online services. So, we found that online services are a valuable supplement to traditional methods of learning a foreign language, in particular the development of listening skills. However, their effectiveness depends on a balanced approach that involves a combination of independent work with online platforms and interactive forms of learning. This will help to stimulate lively dialogue and the development of communicative competencies.

The study deepens the theoretical understanding of the impact of online services on the development of listening skills and enhancement of motivation to learn foreign languages. The results confirm the relationship between motivational components and the level of language skills, in particular listening. Practical applications include improving educational programmes, integrating online tools, and creating hybrid learning methods. The results are also useful for platform developers who seek to increase the effectiveness of educational technologies.

Limitations

The results should be interpreted taken into account some limitations. The limited representativeness of the sample (students from only two HEIs) may limit the generalizability of the findings to a wider population. In addition, the methods used to assess listening skills may not fully reflect the complexity of these skills. The limited duration of the experiment does not allow drawing conclusions about the long-term effects of the intervention. Finally, individual differences among participants that were not consistently accounted for may influence the interpretation of the results.

Recommendations

The development of listening skills is a gradual process that requires regular practice. Regular listening to authentic materials, such as podcasts or audiobooks, allows the brain to adapt to different language patterns. Interactive online platforms provide an opportunity to train auditory perception in a playful way, thereby enhancing motivation. Transcript analysis helps to establish connections between the sound of a word and its spelling, contributing to the expansion of vocabulary. Repetition of the listened material consolidates new lexical units and grammatical structures in memory, which ultimately leads to the automation of the process of understanding speech by ear.

Conclusions

The relevance of the obtained results is demonstrating the effectiveness of online learning methods for developing listening skills and enhancing motivation to learn a foreign language. The establishment of a high correlation between motivational indicators and the level of listening in the EG confirms the importance of the targeted use of innovative approaches. The results showed that the level of listening in the EG increased from 3.1 to 4.2 points, in the CG — from 3.2 to 3.4. The correlation between motivational indicators and listening skills in the EG turned out to be high: attitude towards the language community — 0.68, integrative motivation — 0.75, instrumental motivation — 0.70, diligence in learning — 0.80. The negative correlation between anxiety and comfort and the level of listening was –0.65 in the EG. The data confirm the effectiveness of online methods for improving motivation and skills. The obtained data can be used to develop interactive educational programmes that contribute to improving learning outcomes. The results are also interesting for improving pedagogical practices and adapting the educational process to modern digital technologies. The research prospects include studying the long-term impact of online learning on listening and integrating adaptive technologies to personalize the educational process. Furthermore, it is important to analyse the effectiveness of the methods that combine online services with traditional approaches.

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Professional training of computer science teachers through the system of staged continuing education

Formación profesional del profesorado de informática mediante el sistema de formación continua escalonada

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Abstract

The aim of the study is to assess the effectiveness of staged continuing education in the formation of professional competencies of computer science teachers and its impact on adaptation to digital technologies. The research methods included questionnaire surveys of teachers with different work experience, a pedagogical experiment with division into control and experimental groups, analysis of learning outcomes, and statistical assessment of the impact of digital technologies on teaching. The results of the study showed that the staged education system significantly increases digital literacy (+38%), the integration of STEM methodologies (+34%), and the effectiveness of adaptive curricula (+29%). The best indicators were demonstrated by teachers with 5–8 years of experience, who were able to combine technological training with practical experience. The findings prove the effectiveness of the implementation of staged education for the development of technical and pedagogical

competencies. The academic novelty is the developed integrated training model that combines adaptive programmes, digital platforms, and interactive methods. Further research prospects include a long-term analysis of the effectiveness of this model in training teachers of other subjects and expanding its capabilities by integrating artificial intelligence and virtual reality.

Keywords: Continuing education, teacher training, computer science, educational technology, pedagogical competence, digital platforms, technical literacy.

Resumen

El objetivo del estudio es evaluar la eficacia de la formación continua por etapas en la formación de competencias profesionales de los profesores de informática y su impacto en la adaptación a las tecnologías digitales. Los métodos de investigación incluyeron encuestas por cuestionario a profesores con distinta experiencia laboral, un experimento pedagógico con división en grupos de control y experimental, el análisis de los resultados del aprendizaje y la evaluación estadística del impacto de las tecnologías digitales en la enseñanza. Los resultados del estudio mostraron que el sistema de enseñanza por etapas aumenta significativamente la alfabetización digital (+38%), la integración de metodologías STEM (+34%) y la eficacia de los planes de estudios adaptativos (+29%). Los mejores indicadores los demostraron los profesores con 5-8 años de experiencia, que fueron capaces de combinar la formación tecnológica con la experiencia práctica. Los resultados demuestran la eficacia de la implantación de la formación por etapas para el desarrollo de competencias técnicas y pedagógicas. La novedad académica es el modelo de formación integrada desarrollado, que combina programas adaptativos, plataformas digitales y métodos interactivos. Otras perspectivas de investigación incluyen un análisis a largo plazo de la eficacia de este modelo en la formación de profesores de otras materias y la ampliación de sus capacidades mediante la integración de la inteligencia artificial y la realidad virtual.

Palabras clave: Formación continua, formación del profesorado, informática, tecnología educativa, competencia pedagógica, plataformas digitales, alfabetización técnica.

Introduction

Modern computer science teacher training requires the integration of digital technologies into the educational process. Technical literacy and the ability to use ICT are key conditions for the professional activity of teachers, but traditional approaches do not always take into account the rapid development of technologies, which complicates teacher adaptation.

The staged system of continuing education promotes the gradual development of professional competencies through interactive platforms and adaptive learning, which increases the level of teachers' technical and pedagogical training. However, there are still some problems of insufficient integration of digital tools, low level of technical training, and unequal access to technologies.

The research is intended to improve the training of computer science teachers in accordance with the requirements of the digital society. The integration of technical innovations into the pedagogical process will contribute to the teachers' professional development and ensure that education meets modern standards.

The aim of the study is to assess the effectiveness of staged continuing education in building of professional competencies of computer science teachers and determine its impact on the teachers' adaptation to modern digital technologies.

Empirical objectives of the study:

1. Study the impact of staged continuing education on the development of technical and pedagogical competencies of computer science teachers.

2. Assess the effectiveness of the use of digital learning platforms and adaptive educational programmes in increasing the level of teachers' digital literacy.
3. Compare the results of the control group (CG) and the experimental group (EG) to determine changes in teacher training after the implementation of the staged education system.

The results of the study will contribute to the improvement of professional training of computer science teachers, the development of effective models for integrating technical innovations into the educational process, and the creation of conditions for the long-term development of pedagogical education.

This article is structured into the following sections: a theoretical framework that outlines the conceptual basis of the study, a methodology section detailing the research design, results of the empirical investigation, a discussion that compares findings with existing literature, and final conclusions summarizing the key insights.

Literature Review

An analysis of current research on the professional training of computer science teachers demonstrates different approaches to the effective integration of technical innovations into the educational process. Martin et al. (2024) emphasize the role of facilitators in ensuring inclusivity and equity, while Kazimova (2024) focuses on a systemic approach to learning, including theoretical, practical and technical training. The author emphasizes that long-term training programmes enable teachers to gradually build their professional competencies and adapt them to technological changes.

Pavlova (2023) emphasizes the importance of a practice-oriented approach through the integration of real-world tasks into the educational process, which contributes to the development of professional skills. In turn, Vlasii (2021) emphasizes the modernization of practical training through interactive technologies, such as simulators and virtual laboratories, without which the effectiveness of learning decreases.

Li et al. (2021) emphasize the use of computerized educational systems that personalize learning and improve the academic skills of technical students. However, as Cao & Dong (2020) note, the effectiveness of these systems depends on their integration into comprehensive programmes based on professional certification, which ensures compliance with modern labour market requirements.

Goode et al. (2020) emphasize the role of professional communities in the development of computer science teachers, although they do not take into account the level of their previous digital training. Ayanwale et al. (2024) analyse the teachers' readiness for digital transformation within the framework of the Education 4.0 concept, but do not detail the mechanisms for overcoming barriers to the introduction of technologies into traditional educational structures.

Shen et al. (2022) study multi-level learning of transformative language models, emphasizing its effectiveness for learning complex topics, but do not offer practical recommendations for its adaptation for teacher training. Akhsutova et al. (2024) support this idea, emphasizing the need to combine multi-level learning with a competency-based approach, although they do not take into account the difficulties of integrating it into curricula for teachers with extensive experience.

Forné et al. (2022) emphasize the interdisciplinary approach in implementing digital technologies in open educational platforms, but do not analyse the possible challenges of such an approach in different educational contexts.

Shi and He (2021) point out the need to integrate artificial intelligence (AI) into curricula, emphasizing that the modern labour market requires specialists who have not only basic knowledge, but also an understanding of complex algorithms and technologies, such as machine learning (ML) and big data

analysis. They prove that traditional teaching methods, which mostly focus on theoretical aspects, are insufficient for the formation of competencies necessary in modern computer science.

The study by Kulikov et al. (2022) emphasizes the importance of digitalization of educational processes in the post-war economy of Ukraine, which is consistent with the need for effective models of training teachers for the challenges of the digital environment. However, the work does not sufficiently consider practical mechanisms for introducing digital technologies into the pedagogical education system, which limits its application in the context of the development of the teachers' continuing education.

Alazzam et al. (2023) analyse digital platforms in the economy, but their conclusions are also relevant for the educational sphere, as they prove the importance of digital solutions for optimizing the educational process and implementing continuous education for teachers. However, the study does not take into account the specifics of pedagogical activity, which may affect the effectiveness of integrating digital tools into teaching.

Cherniavska et al. (2023) explore the AI use in educational management, which correlates with our analysis of the impact of AI tools on improving the competencies of computer science teachers and personalizing teaching. However, the authors focus more on administrative aspects, not paying enough attention to the pedagogical component, which is key in our study.

Bachiieva et al. (2024) emphasize the importance of integrating digital technologies into curricula and the development of pedagogical tasks, which confirms the need to adapt teacher training to modern technological conditions. However, the study lacks an analysis of the long-term impact of such approaches on teachers' professional development, which remains an important aspect for further research.

Materials and Methods

The study was conducted in three stages to assess the effectiveness of staged continuing education in building of professional competencies of computer science teachers, with an emphasis on technical training, educational technologies, and digital tools. This research applied a quasi-experimental design with pre-test and post-test measurements for both control (CG) and experimental (EG) groups.

At the first stage, a theoretical analysis of academic literature on the training of computer science teachers and the implementation of digital technologies was carried out.

The second stage included an empirical study with the participation of 180 teachers, divided into the CG and the EG depending on their teaching experience. The CG studied using traditional methods, while the EG underwent a staged training programme using digital technologies. The study was conducted over a period of six months, from March to August 2024, according to a structured training schedule. Each module lasted approximately three weeks and included practical activities, digital tool training, and reflection sessions.

The third stage was data analysis to assess the impact of the programme on the development of professional competencies. The collected data were processed using SPSS software. Statistical tests included paired sample t-tests for within-group comparisons and independent sample t-tests for between-group comparisons. In cases where parametric assumptions were not met, non-parametric Wilcoxon and Mann-Whitney U tests were applied. Statistical methods were used to assess the reliability of changes and compare the effectiveness of traditional and modern approaches.

Research methods

The following methods were used to achieve the aim:

1. Survey. A questionnaire was developed to collect data on the level of technical training, teachers' readiness to introduce digital technologies into the educational process, and to assess the effectiveness of the staged education programme. The questionnaire contained both closed and open questions, allowing the collection of both quantitative and qualitative data. It included five main dimensions: digital skills, pedagogical flexibility, platform usage, perceived challenges, and readiness for integration of technologies. Each dimension consisted of 3–5 items evaluated on a 5-point Likert scale.
2. Pedagogical experiment. It was implemented by comparing teaching results in the CGs and EGs. The CGs used traditional teaching methods, and the EGs used the staged continuing education programme. The study used a quasi-experimental design without random assignment, with pre- and post-intervention testing. The study lasted 6 months, after which a comparative analysis of the results was conducted.
3. Statistical analysis**.** The data obtained during the study were processed using SPSS. Descriptive statistics were used to calculate means and standard deviations. Inferential statistics included the paired samples t-test, Mann–Whitney U-test, and Wilcoxon signed-rank test to assess the reliability of changes in the level of professional competencies of the research participants.
4. Content analysis. It was used to analyse questionnaire responses, literature sources, and assess changes in teachers' professional activities after the programme was implemented.

Sample

The study involved 180 computer science teachers from different regions of Ukraine. The sample was formed taking into account teaching experience and divided into three categories:

1. Young teachers (1-3 years of experience) – 60 people

   - 30 people – CG
   - 30 people – EG
   - The inclusion of this group made it possible to assess the impact of the programme on the development of basic pedagogical and technical competencies.

2. Teachers with experience from 5 to 8 years – 60 people

   - 30 people – CG
   - 30 people – EG
   - In this group, the improvement of professional competencies and adaptation to new technologies were studied.

3. Experienced teachers (over 10 years of experience) – 60 people

   - 30 people – CG
   - 30 people – EG
   - The adaptation of experienced teachers to digital technologies was assessed.

The division into groups made it possible to assess the effectiveness of staged education in different categories of teachers and identify the features of the integration of digital technologies into the professional activities of teachers.

The staged training programme implemented for the experimental groups lasted 6 months and consisted of four consecutive modules: (1) digital literacy and cybersecurity, (2) basics of programming (Python, Scratch), (3) implementation of STEM approaches through project-based learning, and (4) application of artificial intelligence tools in education. Each module included interactive online sessions, individual

practical tasks, and group project activities aimed at gradually building both technical and pedagogical competencies.

Research tools

The following tools were used to implement the study: the staged continuous education programme, Google Forms for collecting responses from study participants, Microsoft Excel for data systematization, SPSS for statistical processing of the obtained data, as well as educational platforms: Moodle, Microsoft Teams, Blackboard — for testing digital methods of teacher training; Kahoot, Edmodo — for evaluating interactive approaches in teaching; Articulate 360, Desmos — for creating interactive educational materials (Table 1). The study was conducted over a six-month period with a clearly defined schedule of activities for each module, ensuring the consistency and gradual accumulation of professional competencies.

Table 1.
The programme for assessing the level of digital literacy and pedagogical competencies of computer science teachers

Assessment area	Verification methods	Assessment criteria	Task Format
Digital literacy	Online testing, practical assignments	Accuracy, speed, and completeness of tasks involving digital tools	Using word processors, spreadsheets, cloud tools, and cybersecurity practices
Programming	Practical tasks, code analysis	Correctness of code, logic of algorithms	Writing basic code in Python/Scratch
STEM approaches	Evaluation of developed projects	Integration of subjects, application of technologies	Developing an interdisciplinary lesson using STEM
AI use	Analysis of the use of AI tools	Practicability of use in education	Using ChatGPT, Dialogflow to create learning content
Pedagogical competencies	Expert evaluation, peer and self-assessment	Adaptability, clarity of instruction, integration of technology	Developing an interactive lesson with digital technologies

Source: developed by the authors based on their own research.

The use of these methods and tools ensured the comprehensiveness of the research and the reliability of the obtained results. Additionally, the questionnaire included specific items aligned with each assessed area, allowing for multidimensional data collection and triangulation.

Results

The results of the study confirmed that the staged continuing education significantly influenced the development of digital literacy of computer science teachers. The implementation of a special in-service training programme allowed the EG participants to improve their technical skills and confidence in using digital platforms.

Initial analysis showed differences in the level of digital competencies among the participants: young teachers (1–3 years of experience) had basic digital skills, but lacked experience in applying them in teaching; teachers with 5–8 years of experience were better at integrating technology, but had a medium level of mastery of modern digital platforms; teachers with more than 10 years of experience had the lowest initial training.

After six months of the experiment, the level of digital literacy in the CGs increased slightly (+5–7%), while in the EGs the increase was on average 35%, and among young teachers – 41%. The best results were demonstrated by teachers with 5–8 years of experience, who effectively applied new skills in the teaching process.

The use of interactive educational platforms contributed to the increase in technical competence. Google Classroom improved the organization of distance learning, Kahoot – quick knowledge testing, and Microsoft Teams and Blackboard helped teachers to master complex digital environments. Moreover, training in cybersecurity and cloud technologies increased teachers' awareness of personal data protection and the safe use of electronic resources. To assess the statistical significance of the observed differences between CG and EG, the independent samples t-test and the Mann–Whitney U test were used, depending on the distribution of the variables. The differences were considered statistically significant at the level of $p < 0.05$.

Figure 1 presents the average value of the level of teachers' digital literacy in the CGs and EGs before and after the programme implementation.

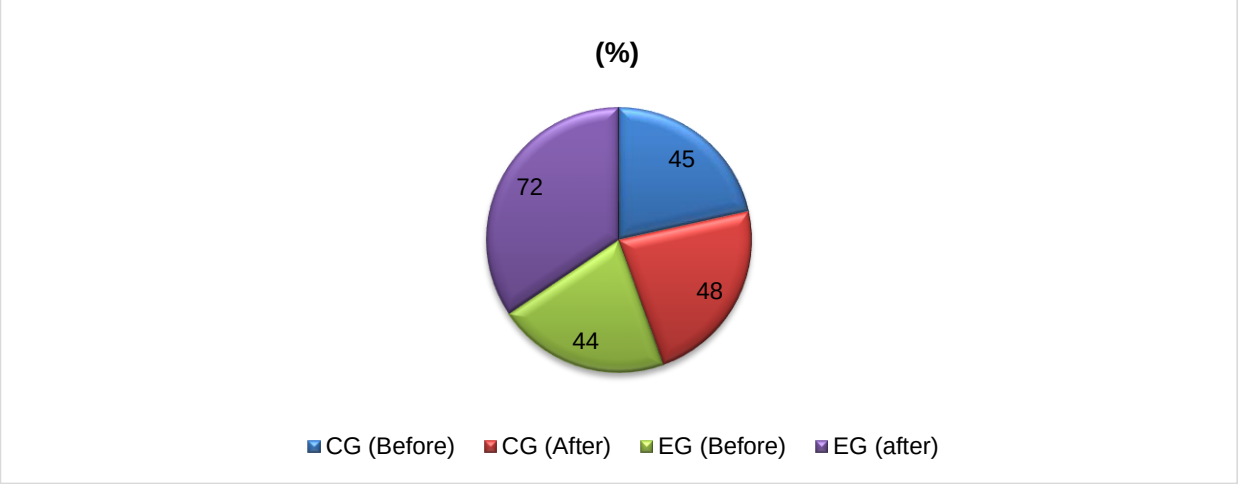

Figure 1. Comparison of the level of teachers' digital literacy in the CGs and EGs before and after the programme implementation.
Source: developed by the authors based on their own research.

The analysis of the research results revealed significant differences in the adaptive capacity between young (up to 3 years of experience) and experienced teachers (5–8 years and over 10 years of experience). Young teachers quickly mastered digital technologies, working effectively with the Microsoft Teams, Blackboard and Articulate 360 platforms. They demonstrated the fastest mastery of new tools, which allowed them to actively create interactive educational materials.

In contrast, experienced teachers (5–8 years of experience) and teachers with over 10 years of experience demonstrated higher efficiency in using digital technologies to improve teaching methods. They adapted curricula by integrating AI, VR/AR, and adaptive educational resources. Thanks to a deeper understanding of students' educational needs, they created more structured educational materials, improving the quality of the educational process through digital technologies.

Table 2 presents a comparison of the speed of adaptation to digital tools among different groups of teachers.

Table 2.
Comparison of the speed of adaptation to digital tools in different groups of teachers

Teacher group	Average adaptation time (weeks)	Usage comfort level (%)	Integration of technology into the learning process (%)
Young teachers (up to 3 years)	2	85	60
Experienced teachers (5-8 years)	4	78	85
Senior teachers (10+ years)	6	65	90

Source: developed by the authors based on their own research.

The analysis of the use of digital platforms showed that the EG teachers were more successful in integrating technology into the learning process compared to the CGs. Moodle was most effective for teachers with more than 10 years of experience, as it helped to systematize the teaching material. Young teachers preferred Google Classroom because of its integration with other digital tools. Using Kahoot helped to enhance motivation, especially among teachers with 5–8 years of experience.

Among the additional platforms, Microsoft Teams was the most convenient for interactive interaction, Blackboard was used for developing complex training courses, and Edmodo was used for communication and sharing materials. Overall, participants in the experimental groups who actively used these platforms significantly improved their level of digital competence, while the CGs demonstrated a lower level of technology integration into the learning process. The statistical significance of differences between teacher groups regarding adaptation speed and technology integration was confirmed using one-way ANOVA and the Kruskal–Wallis H test. Significant differences were observed at $p < 0.05$.

Table 3 contains data on the effectiveness of various digital platforms in training computer science teachers.

Table 3.
Evaluation of the effectiveness of various digital platforms in training computer science teachers

Digital platform	Description	Ease of use (1-5)	Teaching effectiveness (1-5)	Popularity among teachers (%)	Increase in digital competence (%)
Moodle	A platform for managing distance learning that enables creating online courses, assignments, and tests.	4,2	4,3	75	22
Google Classroom	A tool for organizing the learning process that simplifies communication between teachers and students, enabling to create assignments and tests.	4,5	4,6	80	25
Kahoot	An interactive platform for creating quizzes that increases student engagement in the learning process through gamification.	4,7	4,8	85	27
Microsoft Teams	A platform for organizing video conferences, group discussions, and collaborative work with educational materials.	4	4,1	60	18
Blackboard	A learning management system with advanced capabilities for creating interactive content, assessing and tracking student progress.	3,8	4	50	15
Edmodo	An educational social network that enables teachers to interact with students, provide materials and evaluate work.	3,9	4,2	55	17

Source: developed by the authors based on their own research.

The results of the study showed the high effectiveness of STEM approaches and adaptive programmes in developing methodological competencies of computer science teachers. The highest indicators were demonstrated by teachers with 5–8 years of experience, with the level of mastery of interdisciplinary projects increased by 34% compared to the CGs. Young teachers quickly mastered the basics of STEM methodologies, but the level of their integration of these approaches into the educational process remained lower (+27%) because of the lack of practical experience.

Teachers with more than 10 years of experience adapted to STEM methods more slowly because of the lack of previous experience working with similar technologies. In the CGs, the level of mastery of STEM methodologies increased by only 8–12%, which indicates the insufficient effectiveness of traditional methods of advanced training. The main barriers for the CGs were limited access to adaptive learning resources and lack of practice in using interdisciplinary tools, which emphasizes the importance of a comprehensive approach to training computer science teachers. To assess the statistical significance of differences between the CG and EG, the Kruskal–Wallis test and the Mann–Whitney U test were used, depending on the variable type and distribution. The improvements observed in the EG were statistically significant at $p < 0.05$.

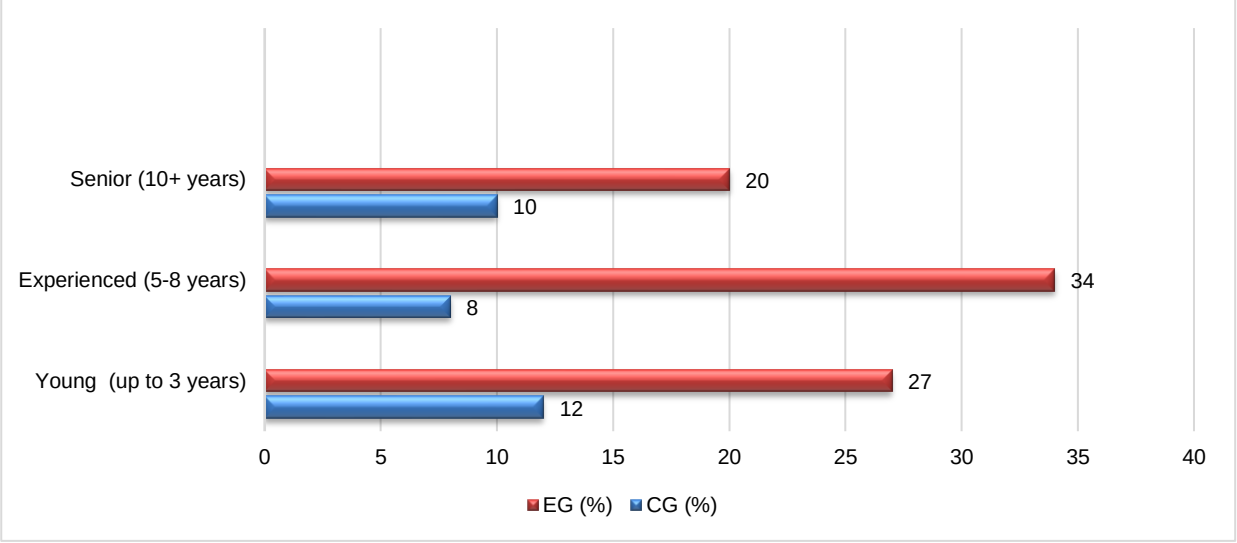

Figure 2. Percentage of mastery of STEM methods in the CGs and EGs before and after the programme implementation.
Source: developed by the authors based on their own research.

The results of studying the effectiveness of the modular programme of staged continuing education showed that teachers achieved the highest level of success in the module Digital Literacy Fundamentals, where the average increase in competencies was 42% among the EGs. This confirms the importance of developing basic technical skills to increase the effectiveness of the educational process. The module Programming for Teachers showed the greatest difference between young specialists and teachers with more experience: in the group of 1–3 years, the level of mastery increased by 38%, while in the group of over 10 years — only by 19%, which indicates the difficulty of mastering programming languages without prior experience.

The greatest difficulties were caused by the introduction of AI into the educational process - success rates among the EGs increased by an average of 25%, however, a significant part of teachers with experience over 10 years needed additional time to adapt to these technologies. STEM approaches showed moderate growth across all categories, especially among teachers with 5–8 years of experience (+34%), confirming the effectiveness of integrating interdisciplinary methods into the educational process.

The CGs did not demonstrate significant changes in any of the modules, confirming the need for systematic teachers' professional development through staged continuing education. Statistical comparison of CG and EG results was performed using the independent samples t-test for normally distributed data and the Mann–Whitney U test for non-normal data. Statistically significant differences ($p < 0.05$) were observed across all modules, supporting the effectiveness of the programme.

Table 4 presents comparative results of teacher performance across different modules of the staged continuing education programme.

Table 4.
Learning outcomes across modules of the staged continuing education programme

Programme module	Competency gains in young teachers (1-3 years), EG (%)	Competency gains in experienced teachers (5-8 years), EG (%)	Competency gains in experienced teachers (10+ years), EG (%)	Competency gains in control groups (CG, %)
Digital Literacy Fundamentals	42	40	35	5
Programming for Teachers	38	30	19	4
STEM Approach to Learning	27	34	22	8
AI use	22	25	18	6

Source: developed by the authors based on their own research

The results of the study showed a significant improvement in the pedagogical competencies of the EG teachers. The greatest increase was recorded in methodological competence, which was manifested in the active use of adaptive methods and interactive tools. Professional competence increased due to the more effective use of practical examples, and communicative competence — due to improved interaction with students. Innovative activity was significantly activated due to the introduction of digital technologies and the creation of interactive materials. The use of ICT increased, which had a positive effect on the organization of distance learning. Reflective competence improved due to the greater teachers' interest in professional development and self-improvement.

The statistical significance of the observed changes was confirmed using Student's t-test ($p < 0.05$) for normally distributed data and the Mann–Whitney U test for non-parametric comparisons between groups. These tests validated that the gains observed in the experimental groups across all modules were not due to chance and demonstrated the effectiveness of the staged programme.

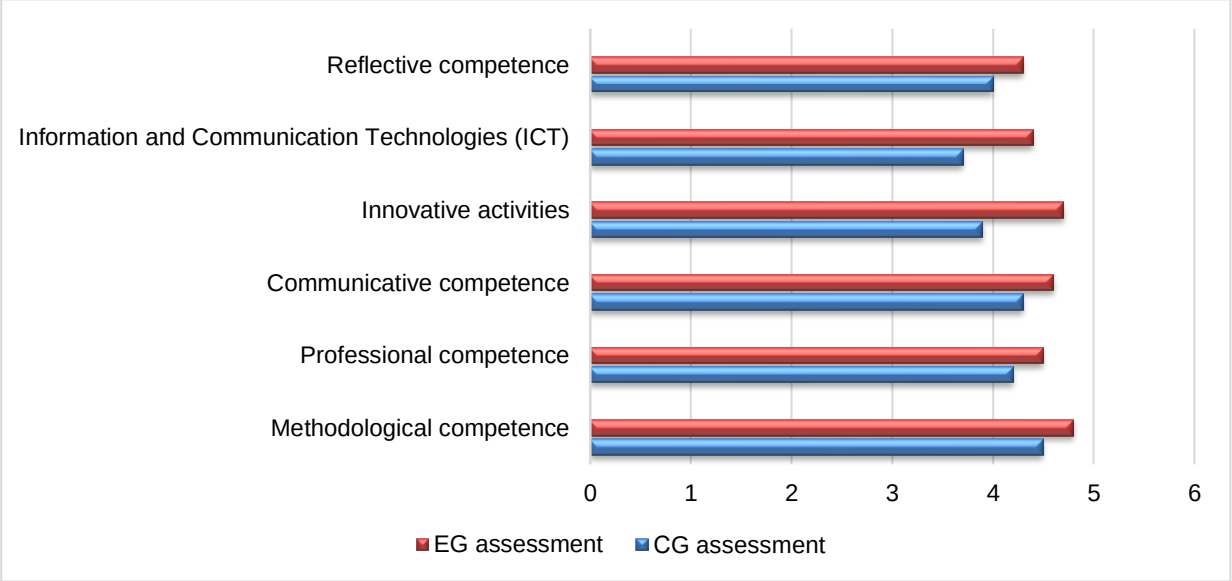

Figure 3. Assessment of pedagogical competencies of teachers of the CGs and EGs after the experiment
Source: developed by the authors based on their own research.

The results of the study showed a significant increase in the level of teachers' readiness to implement modern digital technologies after completing the staged continuing education. The highest indicators were demonstrated by teachers with 5–8 years of experience, among whom 81% of the EG participants noted an increase in confidence in using digital tools. Young specialists (1–3 years of experience) quickly adapted to new platforms, however, 27% of respondents noted that they lacked practical experience to effectively apply technologies in the educational process.

In the group of teachers with more than 10 years of experience, the level of adoption of digital technologies also increased, although the adaptation was slower. A total of 62% of the EG participants expressed full readiness to use digital tools, while this figure was only 41% in the CG. In general, among the CGs of all categories, the level of technology implementation increased by only 10%, which indicates the low effectiveness of traditional methods of professional development.

Among the EG participants, the overall level of readiness for the implementation of digital technologies increased by 30–40% depending on work experience, which confirms the effectiveness of the staged education system in preparing teachers for digital transformation. To validate these changes, the Chi-square test for independence was applied to assess differences in categorical readiness levels between groups. All reported improvements were statistically significant ($p < 0.05$), supporting the reliability of the observed effect.

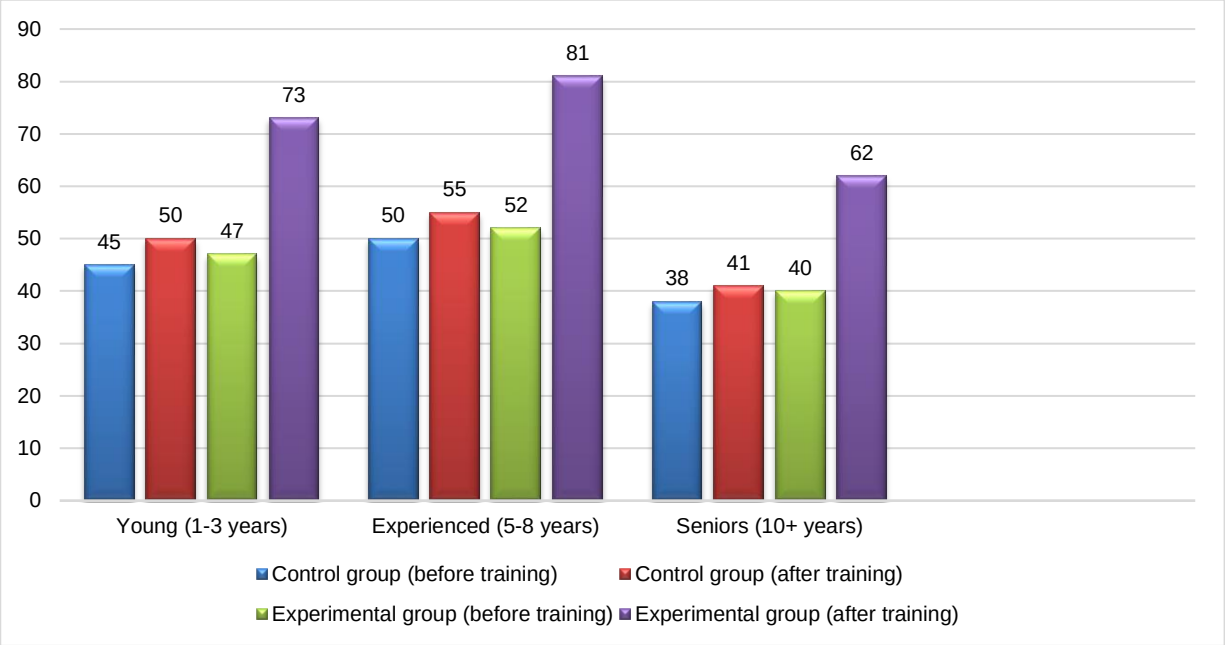

Figure 4. Level of teachers' readiness to implement digital technologies in the educational process (before and after training)
Source: developed by the authors based on their own research.

The results of the study confirmed significant differences between the CGs and EGs in key indicators of professional training of computer science teachers. The greatest increase in competencies was observed in the EGs in digital literacy (+38%), integration of STEM methods (+34%), and the use of adaptive programmes (+29%). Young specialists (1–3 years) showed rapid mastery of digital platforms, but were inferior to teachers with 5–8 years of experience in the practical application of technologies in teaching.

Experienced teachers (5–8 years of experience) achieved the highest results in the application of interactive methods and the AI use to personalize the educational process (+36%). At the same time, the group with more than 10 years of experience demonstrated slower mastery of new technologies, although the level of confidence in digital skills increased by 27% among the EG. Statistical analysis was conducted using the Student's t-test and Mann-Whitney U test to compare means between CGs and EGs. The observed differences were statistically significant at the level of $p < 0.05$.

Table 5 presents a comparative analysis of the CG and EGs by key parameters.

Table 5.
Comparison of the CG and EGs for all key parameters

Parameters	CG, %	EG, %	Growth in EG, %
Digital literacy	10	38	28
Integration of STEM approaches	12	34	22
Use of adaptive programmes	9	29	20
Practical use of technology	11	36	25
AI use	8	27	19
Level of confidence in digital skills	10	30	20

Source: developed by the authors based on their own research

In the CGs, the indicators remained almost unchanged or increased insignificantly (no more than 10–12%), which indicates the insufficient effectiveness of the traditional approach to advanced training without the use of staged continuing education. In general, the EG outperformed the CG in all key aspects, proving the effectiveness of the proposed methodology. All improvements observed in the EGs were statistically significant at the level of $p < 0.05$ according to the Student's t-test and the Mann–Whitney U test, depending on data distribution.

Discussion

The results of the study confirmed the effectiveness of the staged system of continuing education in the training of computer science teachers, especially regarding the implementation of digital platforms and adaptive educational programmes.

Liang (2022) analyses the concept of Outcome-Based Education (OBE) in the training of specialists in electronic information science, emphasizing the importance of adaptive educational programs and big data analysis. This is consistent with the results demonstrating the effectiveness of adaptive methods in the formation of pedagogical competencies. However, unlike Liang (2022) who considers the training of technical specialists, this study focuses on the teachers' adaptation to digital tools, which adds a pedagogical aspect to the overall concept of learning.

The study by Yuan et al. (2020) confirms the effectiveness of adaptive curricula in training computer science specialists. Similarly, the obtained results demonstrate the positive impact of adaptive learning on the professional training of computer science teachers. However, the main focus in the study by Yuan et al. (2020) is on technical skills only, while our research combines technical and pedagogical components, making the approach more comprehensive.

Castro & Oliveira (2022) emphasize the importance of the Kahoot and Google Classroom platforms for increasing student engagement in the learning process. The obtained data confirm that these platforms also contribute to the development of teachers' pedagogical competencies. However, unlike the study by Castro & Oliveira (2022) which focuses on programming education, this work considers a wider range of pedagogical skills.

Sherman et al. (2021) emphasize the importance of information systems in the digital educational environment, focusing on the need to integrate digital tools into professional training. The obtained results confirm the importance of this approach, but the difference with our study is that adaptive learning is additionally implemented, which ensures individualization and a more effective combination of technical and pedagogical competencies.

Yang et al. (2022) explore aspects of teacher professional development in the digital environment: the former focus on the connection between education and industry through professional certification, and the latter on the teachers' readiness to implement digital technologies in the educational process. Both approaches are partially consistent with the use of Moodle and Google Classroom platforms in professional development, but their focus on the labour market or general qualification requirements leaves out the specifics of pedagogical training, which is key in this work.

Maxkamova (2024) complements these results with an analysis of the adaptation of computer-based curricula to modern requirements, emphasizing their role in improving the educational process. However, her research mainly focuses on the technical aspects of digital tools, while this work focuses on the integration of pedagogical competencies with technological skills, which makes the proposed model more comprehensive.

Pahl (2020) and Kilbury et al. (2023) explore methods for improving pedagogical skills through active learning: the former analyses the "learning by teaching" approach, while the latter focuses on the use of

educational videos to develop teachers' practical skills. Both approaches have something in common with the findings on the integration of interactive platforms such as Kahoot and Google Classroom, however, Pahl (2020) emphasizes student interaction, without taking into account the adaptation of curricula, while Kilbury et al. (2023) only consider the narrow aspect of classroom management, while the use of digital platforms provides a comprehensive improvement of pedagogical competencies.

Serik et al. (2023) analyse a neural network-based proctoring system that demonstrates the effectiveness of technical control. However, their approach differs significantly from adaptive curricula, as it focuses on ensuring academic integrity, rather than on the development of pedagogical competencies and personalization of the educational process.

Gajdzik and Wolniak (2023) investigate the role of creativity and innovative thinking in professional training in the context of smart manufacturing, confirming the importance of developing open innovation skills in today's digital transformation. However, their research focuses mainly on aspects of employee adaptation to automated technologies, without paying attention to specific methods of training computer science teachers through the system of continuing education.

In contrast, Abar et al. (2021) analyse the implementation of computational thinking in primary education in the AI age, focusing on the teacher's role in building of digital competencies. The authors emphasize the need to update teaching approaches taking into account modern technological challenges, which is relevant in the context of studying the professional training of computer science teachers. However, although their work covers the issue of integrating AI into the educational process, it does not reveal the issue of continuous education and the formation of pedagogical skills through a system of staged training.

Sârb (2023) supports the concept of continuous improvement of teachers' knowledge, but his research focuses on artistic disciplines. In contrast, the staged education system considered in this work combines technical and pedagogical training, which allows for a more effective integration of digital technologies into the educational process.

Shan et al. (2020) and Zhou (2021) confirm the effectiveness of the phased approach in education, demonstrating its benefits in the field of health care and adapting curricula to digital realities. Although their research has different areas of application, the structured learning model remains universal for the development of both technical and methodological competencies of teachers.

Yuan et al. (2020) explore the integration of theoretical and practical skills in the training of computer science specialists, which has something in common with the concept of STEM methods and the use of digital technologies. However, their approach is focused mainly on technical training, while the focus of the considered model is also on the development of pedagogical competencies, which is critically important for computer science teachers.

The analysis of the mentioned studies demonstrates that the staged system of continuing education, taking into account digital platforms such as Moodle and Kahoot, provides the necessary integration of technical and pedagogical approaches. This increases the effectiveness of training computer science teachers to teach in a modern educational environment.

Limitations

The study is limited by the difference in the levels of technical support of schools, which influenced the implementation of the staged system of continuing education, and the insufficient adaptation of digital platforms to the specifics of pedagogical activity. Besides, the short period of the study (2 months) does not allow to fully assess the long-term impact of the programme on the teachers' professional development.

Recommendations

It is recommended to expand access to modern digital platforms and technical equipment in all educational institutions, as well as to introduce advanced training programmes for teachers focused on the integration of digital technologies into the educational process. Further studies should cover a wider sample of schools and a longer period to assess the long-term impact of the staged education system.

Conclusions

The results of the study confirmed the effectiveness of the phased system of continuous education for the training of computer science teachers, based on the integration of modern digital technologies. The use of educational platforms, in particular, Moodle, Kahoot, Google Classroom, Microsoft Teams, Blackboard and Edmodo, contributed to the improvement of the teachers' technical literacy and pedagogical competencies. The productivity of the EG participants increased by 22% compared to the CG, which emphasizes the significant potential of adaptive programmes and interactive tools in the development of professional skills.

The survey of teachers revealed a high readiness to use digital technologies, while confirming the need to improve their qualifications for the effective implementation of interactive teaching. Adaptive programmes provided a personalized approach, which enhanced the motivation and academic confidence of the participants.

The academic novelty of the research lies in the implementation of an integrated approach that combines technical and pedagogical aspects of teacher training, with an emphasis on interactivity, gamification and personalization of learning.

The practical value of the research is the possibility of applying the obtained results to improve educational programmes, implement modern digital platforms and develop recommendations for improving the teachers' qualifications. This creates a basis for training teachers who meet the requirements of a modern digital society.

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Psychological and pedagogical strategies for the formation of emotional resilience in children

Estrategias psicológicas y pedagógicas para la formación de la resiliencia emocional en los niños

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Abstract

The study investigates the role of psychological and pedagogical strategies in generating emotional resilience in children. The basic focus of the research is on integrating SEL intervention, and the research deals with increasing issues of childhood emotional and psychological challenges promoted by social, academic, and global disruptions. The purpose of this research is to examine structured and culturally sensitive approaches that could develop emotional resilience and increase children's ability to compete with stress and adversity. With the help of experimental research design, the study is based on 150 children aged 8 to 12 years and divided into intervention and control groups. Data was collected through post-intervention assessments such as emotional resilience, skills, and behavioural observations. The result of the research showed that the intervention groups of children showed a significant improvement in emotional resilience indicators. Emotional regulations increased

by 11.3%, and self-awareness increased by 16.1%, while social skills and adaptability also represented a significant improvement. These research-finding programs efficiently improve emotional resilience in children and provide essential skills to navigate adversity. The studies helped to develop a holistic approach to child development and focus on emotional well-being with the iconic success that required widespread adoption of SEL.

Keywords: emotional intelligence, psychological support, development of self-awareness, behavioural strategies, socio-emotional learning.

Resumen

El artículo analiza el impacto de estrategias psicológicas y pedagógicas en el desarrollo de la resiliencia emocional infantil. Se centra en programas de Aprendizaje Social y Emocional (SEL) para abordar los problemas emocionales y psicológicos en la infancia, exacerbados por perturbaciones sociales, académicas y globales. El objetivo es identificar enfoques estructurados y culturalmente sensibles que fortalezcan la resiliencia emocional y ayuden a los niños a manejar el estrés y la adversidad.
El estudio utiliza un diseño experimental con una muestra de 150 niños de 8 a 12 años, divididos en grupos de intervención y control. Los datos se obtuvieron mediante evaluaciones posteriores a la intervención, incluyendo mediciones de resiliencia emocional, habilidades sociales y observaciones conductuales.
Los resultados muestran que los niños del grupo de intervención presentaron mejoras significativas en resiliencia emocional. La regulación emocional aumentó un 11,3 %, la autoconciencia un 16,1 % y las habilidades sociales y de adaptabilidad también mejoraron. Estos hallazgos confirman la eficacia de los programas SEL para fortalecer la resiliencia emocional infantil y proporcionar herramientas esenciales para enfrentar adversidades. El enfoque holístico desarrollado promueve el bienestar emocional infantil y destaca la importancia de implementar ampliamente estos programas.

Palabras clave: inteligencia emocional, apoyo psicológico, desarrollo de la autoconciencia, estrategias conductuales, aprendizaje socioemocional.

Introduction

Research problem

Emotional resilience or emotional intelligence should be viewed as the child's ability to withstand pressures in his or her life (Nieto-Carracedo et al., 2024).

That being said, over recent years, pediatric cases of anxiety and depression have increased drastically due to escalating social stresses, academic pressures, unstable families, and global disruptions, including the pandemic, for example, COVID-19 (Zafiropoulou & Psilou, 2024). These factors have led to the development of children who, with proper support, cannot cope with various ailments such as anxiety, depression, and behavioural difficulties. There are more serious outcomes related to neglect of childhood emotional trauma than simple psychological problems (Gumennykova et al., 2023). Academic and social capabilities may be poorly performed emotionally, which may cause emotional problems and hinder the whole development process. This is an issue of great concern because children who have poor emotional regulations can hardly be optimal in adulthood in all areas of life, including careers. Moreover, we see that these problems affect families, educators, and communities since they fail to mitigate this growing problem. We hear more about promoting children and encouraging individuals to have emotional strength, yet ironically, there is poor implementation of research-based practices to prevent high levels of emotions in children (Wyman et al., 2010; Osuji, 2012). Although many schools and families have initiated support-demanding systems, such support is frequently informal or random to the child's development. Furthermore, cultural, economic and social differences increase the problem of inadequate interventions, primarily because all these resources are not available to all people. Mental health is affected at all stages of life, with stress and emotional challenges arising from transitions such as academic pressures in early adulthood, mid-life crises, and existential rumination in later years, highlighting the need for tailored mental

health education and support systems (Chovhaniuk et al., 2023). Another cause of the multifaceted issue is technological development with a high growth rate. Inadequacy and stress can be augmented primarily by the usage of digital media and social networking in children's lives as they are exposed to cyberbullying, unrealistic comparisons, and information overload (Reschly & Christenson, 2022; Davies & West, 2014). Diverse structures characterize modern families, shared parenting, evolving gender roles, and increasing multiculturalism, all of which contribute to emotional support and the socialization of family members. These dynamics highlight the need for educational programs aimed at helping families navigate ethical challenges and foster resilience in an era of rapid societal change (Tkachenko et al., 2023). These are the trends, on the one hand, while on the other, many traditional patterns of education and care do not reflect recent findings from developmental psychology and neuroscience that could help to overcome these difficulties. This research aims to meet this gap in the availability of structured, flexible, and culturally sensitive approaches to promoting resilience among children. Through the integration of knowledge derived from psychological theories, pedagogical principles and applications, the current study seeks to bridge the gap that exists within the theoretical and practical domains. In addition to improving individual happiness and satisfaction, such actions are necessary to raise a generation capable of overcoming adversity and creating a society that has much to offer.

Research Aim

This theory of the work consists of the research's goal, which is to find, distinguish, and assess such strategies for psychological and pedagogical approaches to emotional vulnerability in children. Coping is a therapeutic characteristic that makes it easy for kids to experience stress, fight hardship, and succeed in different facets of life, such as learning and interpersonal interactions. This work aims to identify children's needs, considering developmental psychology, cognitive behavioural theories, educational practice, and goals. The other key aim is to offer concrete suggestions for educators, childcare providers and policymakers to apply resilience-promoting practices to current environments for children. The study insists on equity in implementing the specified methods, mainly catering to the needs of culturally diverse children. The work aims to teach children how to manage emotions correctly, helping them develop skills that are important for their future stable mental health and further socio-personal development while creating the corresponding conditions for proper society and community members.

Research Questions

- Which psychological models are most suitable for developing protective factors among children?
- How can the pedagogical approaches be modified when it comes to resilience building in different developmental stages?
- What role do inclusive and culturally responsive strategies play in emotional resilience formation?

Research focus

The current research work is focused on identifying and analysing general and educational psychological approaches towards building child emotional resilience. The inclusive definition of emotional resilience is the capacity of an individual to bounce back after a stressful event and manage stress. Critics of the field contend that emotional resilience simply means the phenomenon of coping. This remains significant, especially in childhood development, because it helps in the formation of what the individual will be for the rest of their life in terms of mental health and socialisation. Seeing that psychosocial, psychosocial resistance has emerged as a powerful contributory factor to human well-being, this research will, therefore, seek to inquire further into the process of psychosocial, psychosocial construction in line with organised approaches (Jindal-Snape & Miller, 2008). The theory base of this study comprises the principles derived from developmental psychology and cognitive behavioural paradigms. These theories give information on how children manage to comprehend and react to emotional inputs in a way that would prepare them for strategy implementation in conformity to the developmental age. For example, younger children will possibly require play-based interventions of emotional self-regulation, whilst older children may only

understand and respond to reflective and problem-solving strategies. This differentiation ensures the strategies proposed here are not only good but also appropriate given the development of the students.

Moreover, the focus of this study is important for education and the concept of pedagogy, where emotional resilience is also an important factor. Children's academic environments are a very important part of children's lives; they spend most of their valuable time at school. Administrators, teachers, school counsellors, and other education professionals are in a good place to implement practices that foster resilience. Online psychological testing has emerged as an alternative format of psychological support, demonstrating its effectiveness in improving the psycho-emotional state of students and helping them overcome learning difficulties in times of socio-cultural turbulence' (Reva & Demchenko, 2024).

The proposed aim of this research is to examine how behavioural techniques can be incorporated into commonly used teaching practices, including storytelling, goal-centred discussions and resilience-based games (Cefai & Cavioni, 2015). Also paramount to the attainment of the goal is broad strategies embracement. Children from varied cultural, socioeconomic, and familial backgrounds have feelings that should not be dismissed (Tillott et al., 2024). This study focuses on culturally appropriate practices to close these gaps so that the development of resilience can be possible for all children. For example, collectivist sample methods might involve communal and familial support, which might work better than mutual methods in individualistic cultural sample methods, which comprise self-scrutiny. In the last, the concerns of the study, therefore, shift to the home setting due to the important contributions parents and caregivers make (Fried & Chapman, 2012).

It is intended to offer useful guidance for parents on how to care for their kids' emotions. By focusing on what psychological science has to offer, as well as best practices in education and culture, this research aims at defining an integrated approach to promoting children's emotional well-being.

Research hypotheses

Hypothesis 1: Psychological models that emphasize cognitive-behavioural approaches and social support systems are more effective in developing protective factors and fostering emotional resilience in children.
Hypothesis 2: Inclusive and culturally responsive pedagogical strategies significantly enhance emotional resilience in children across various developmental stages by addressing diverse social and cultural contexts.

Literature Review

Emotional resilience is a complex psycho-social resource that captures a person's ability to cope with and transform the stressors in his/her life (Konaszewski et al., 2021). When it comes to children, emotional stability is a very crucial factor as it defines their problem-solving skills, interpersonal relationships and achievements in their developmental tasks (Shamblin et al., 2016). In contrast to temperament, strength is described as a state factor in which an individual is exposed to varying practices from inside and outside, as in the external environment, including family, school, and community interplay. This dynamic nature places resilience in the limelight for intervention and development among children (Noble & McGrath, 2015). The roots of emotional resilience can be found in the theory of stress and adaptation, mapping out protective factors preventing negative consequences of adverse conditions. For example, while studying resilience, Rutter minor elements are a significant part like self-efficacy, self-regulation and, most importantly, having supportive and stable relationships in the child-building process. Such research findings have been incorporated into recent models, including DSM, Developmental Systems Theory, which underlines how molecular biology and environmental receptiveness in the early years of a child determine adaptation achievement capacity (Mota et al., 2016). The framework widely known in the discussion of resilience is Masten's 'Ordinary Magic, which states that resilience is a prosaic strength achieved through ordinary adaptive processes. Such systems embrace family adaptability, school climate, and community resources (Brunzell et al., 2019). In children, specific areas, including self-esteem, problem-solving skills,

and the capacity to develop and maintain relationships with others, are critical in protecting resilience. For instance, a child who receives a carer's emotional support is likely to develop effective strategies that help him or her deal with adverse conditions. The Ecological Systems Theory builds up the concept of resilience by studying how a child's development is affected by transactions within the microsystems, mesosystems and macro-systems (Pace et al., 2022). These comprise the social-ecological context in which resilience does not simply occur for children but also others. For example, in a school valuing principle of inclusiveness and emotional safety, the essential prerequisite to resilience is met (Wosnitza et al., 2018). Cognitive theories also have implications for understanding emotional resilience, where it, among other postulations, posits that thinking processes determine emotional responses.

Self-efficacy emphasizes identifying that children with strong beliefs in their capability to cope with such difficulties are likely to persevere in the challenges (Brunzell et al., 2016). Also, the cognitive-behavioural theories focus on the issue of helping children learn how to change their negative thoughts, as well as improve their potential for dealing with stress and any other hardships constructively (Evans et al., 2024).

Defining the educational aspect of emotional resilience has gained much attention, especially concerning social-emotional learning (SEL) initiatives. Based on developmental and educational psychology, the above programs are meant to foster values like courtesy, self-control, and peaceful conflict-solving (Anderson & Dron, 2017). SEL is best supported by the theoretical framework of Vygotsky's Social Constructivism Theory because the latter emphasizes the importance of interactions in the learning process (Miller-Lewis et al., 2013). Part-lesson arrangement of activities, reciprocal teaching and learning activities, and synchronous and interactive group discussions help build a context in which children can put into practice and promote resilience. Cultural aspects also determine a significant part of the so-called reserve in the face of stressors. Culture, as defined, plays a critical role, especially in dictating how children handle stressful events (Clausen et al., 2020; Waters & Loton, 2019). Collectivist cultures encourage interdependence and dependence on social networks so that the meaning of resilience may be anchored on these relationships. The concept of resilience for individuals of the individualist culture entails individualism by obtaining high personal accomplishment. It is for these reasons that it is important to employ strategies destined to be socioculturally sensitive in order to achieve the impact envisaged. Promoting emotional resilience in an educational context is a multi-faceted process where both what and how matter and where creating a context matters. The approach aims to create a classroom climate that promotes students' individual and collective emotional safety and fostering, which, in turn, has the potential to promote success despite adversity (Khan et al., 2024). This section focuses on how the emotionally resilient education system can be implemented through curricular and classroom approaches as well as helpful school policies. SEL (social-emotional learning) is one of the important initial contending features for fostering resilience and is a foundation for improving learning outcomes. SEL deals with teaching students skills about emotions as well as skills to control feelings and values related to interpersonal relationships (Wang & Degol, 2016; Wang & Cheng, 2020). Integration of SEL into academic content enables educators to explain issues of emotional well-being and difficulties, hence offering students structural means to overcome emotions. For instance, long play sessions that involve organized interactive drama or group talking time allow the child to learn ways of managing their own emotional states and solve practical problems in structured play. The other generic teaching method that has proven effective in learning facilitation is student-centered learning, where emphasis is placed on participation, self-reliance and teamwork (Ungar et al., 2019). This, in turn, promotes student agency and self-efficacy- two key factors in resilience that are needed when managing academic challenges. Group work, assignments, and learning tasks that involve inquiries foster children to rise to challenges, to be calm and to develop patience (Lynch et al., 2004; McDonald, 2016). For example, teachers can organize tasks that involve feedback on achievements, ensuring students learn to understand that it is possible to learn from mistakes as opposed to failure. Programs of positive reinforcement and recognition are great examples due to the strong correlation between positive stimulus and personal resilience (Christenson et al., 2012). The message which teachers who embrace effort, persistence, and creative solutions give to their students is that the students are important and that their tenacity, as well as their creativity, is worthy of appreciation (Drew & Banerjee, 2019). Appreciation of individual /group performance leads to positive thinking that helps the students perceive the challenge as a normal part of learning. Specific acts that one can implement

include complimenting on specific actions taken, promoting peer acknowledgement, and setting incentives to considerably enhance the work of strength-promoting. Other useful lessons that can be included in the school program are mindfulness and stress-coping skills. Activities such as deep breathing exercises, guided meditation, and reflection help students develop tools to avoid stress (Lereya et al., 2016).

They also not only promote concentration and control of feelings but also enable students to do appropriate things when faced with adversity. In addition to this, teachers can also continually conduct mini sessions before or after the lessons, after a break or before the break in the classroom, making it a normal routine for the students (Tillott et al., 2024). Teacher-student relationships are one of the most essential parts of social/emotional learning. Instructors who can listen and show empathy for students' challenges are able to help students find support (Drane et al., 2021). When students understand their teachers as caring and concerned with their lives, these students are more likely to look for instructions and help when they are in trouble. This trust creates a safe emotional climate and makes the student comfortable to risk, voice various concerns, or solve emerging problems (Schonert-Reichl et al., 2012). Emotional expressions in texts strongly depend on the sociocultural context, communication goals, and the relationship between communicators, emphasizing the importance of context in understanding emotional states. Real-life problems and the application of problem-solvers enhance the continuity of the topics, which builds protection for the students by allowing them to solve the problems themselves. For example, trainers can set up problem-based assignments where they recreate concrete business scenarios, and students physically discuss the possible means of a contingency (Finkelstein et al., 2005). By subjecting them to different variables or learning formats, these exercises help teach flexibility, problem-solving, and persistence. Furthermore, resilience is supported by the corrective role of peer mentoring programs. Grouping should be done in a way that students get to share experiences with other students or older students with strategies to cope with their destinies (Gullotta et al., 2003). Not only does it allow mentees to gain great insights and ideas, but it also allows mentors to construct leadership and empathy features. Schools can develop the idea of the mentoring concept as part of the co-curricular activities so that students can be supported to support other students. The more the teachers will come to know about the mental state of their students. On the other hand, the incorporation of students and cultural contexts into classroom teaching and learning practices enhances the feeling of belonging to that classroom. By adopting culturally sensitive curricula, the resilience framing created by teachers is likely to be more meaningful to the students' real-world experiences. This helps to prevent any child from feeling ignored or left out so that they can get support from within themselves, drawing on past experience (Mota & Matos, 2015).

Lastly, schools need to work towards having systematic interventions within resilience frameworks that include formulation and implementation policies fostering emotional health for students. Programs like shared hatred, coping with stress, and educating teachers on how to raise emotionally intelligent children are essential to a coherent platform. In this way, the teachers' preparation for understanding and controlling students' emotions guarantees that all the school members are afforded a proper setting regarding their emotions (Matson, 2017). Consequently, promoting emotional resilience at educational institutions is a complex process requiring both intentional educational activities and emotional support as well as supportive rules and regulations. The values of care, respect, and voice are the three caring principles that can enable students to gain resilience in their emotional aspect to be ready for challenges in current society. Such a systematic approach helps the students to achieve academic goals while at the same time helping the child cope with life challenges with ease. Cultural and environmental factors play a significant role in determining the level of emotional resilience a child acquires. The cultural imperatives and norms predispose the emotions expressed, interpreted and regulated. For instance, the collectivist culture promotes communal support and dependency, offering a sound social support system that enhances resilience (Leontopoulou, 2006).

On the other hand, individualist societies focus more on the independent responsibility of the child. Other external factors, such as socio-economic status, the safety of the environment, and resource availability, also influence childhood. Positive context, referring to securely attached relationships, safety, education and healthcare, also affects people's emotional self-resourcefulness. On the other hand, risk factors such

as poverty, violence or instability can hinder resilience if other factors, such as guardian or neighbourhood-supported programs. Similarly, schools and the community setting form other primary contexts where resilience can be grown (LaBelle, 2019). Culturally sensitive solutions make children feel wanted in society, reducing emotional issues such as low self-esteem. Culturally competent solutions give children a sense of acceptance and belonging within their society. Whenever children impute into their environment familiar patterns of identity, conventionalism and valuable systems or beliefs belonging to them, they develop good morale (Byrko et al., 2022). This also helps minimize feelings of rejection or isolation, which may lead to emotional problems such as low self-esteem. Through such inclusion, the children feel safe overcoming hurdles that challenge their emotional capacity and general mental health (Kim, 2015). This is how many hurdles faced due to social or cultural aspects are better dealt with remarkably, and the relevant strategies are proposed (O'Connor et al., 2017). Culturally and professionally, therefore, patterned causal factors form a contextual network, which either enhances or constrains a child's ability to cope and go through an ordeal in her environment (Martínez & Acosta, 2017).

Methodology

General Background

This research is focused on acknowledging and assessing psychological and pedagogical approaches to foster children's emotional literacy. Coping with stress with positive emotions and remaining stable throughout the process is receiving growing attention as an important form of resource). This study aims to examine the interventions underpinned by social and emotional learning (SEL) with an emphasis on emotional competencies, behavioural methods, and self-awareness. The evaluation of interventions to promote the resilience of children takes place according to an experiment design. Ethical considerations were upheld to the highest level: anonymous consent, anonymization of data and voluntary participation, among others. For instance, consent forms pass information concerning the study and activities, and a participant's parent or guardian and the school administration put their signature on it. Data was kept safe, and any information that could directly identify a participant was deleted in order to adhere to institutional as well as international protocols regarding research on children.

Sample

The study was administered to 150 children aged 8 – 12 in primary schools in the selected districts. The sample size was estimated via a power analysis to achieve 80% power to compare a sample of clinical levels of resilience for the identified groups. In this case, stratified random sampling was used in soliciting participants; this helped in considering the gender, socioeconomic status, and previous academic performance as requested by the objective of the study, hence the need to determine other experiences of building resilience. Participants were divided into three groups. It therefore created an Intervention Group A, an Intervention Group B and a Control Group. In the IG-A, participants underwent a rigorous SEL program for 12 weeks that entailed weekly 1-hour workshops to enhance the spread of emotional understanding, self-control, and social skills. Some of the activities included simulation, discursive activities, and breathing exercises. The traditional lesson and ordinary class work were taught to Intervention Group B, in which none of the components of SEL lessons were incorporated. Conversely, the control group maintained a standard school curriculum without mediation during the experiment. The inclusion criteria included the following: the participant must be in a primary school class, be able to speak the main language of the research study used in the study and have parental consent. Those children diagnosed with psychological or developmental disorders or those with previous experience in SEL-based interventions were excluded for purity of comparison. The SEL workshops conducted for Group A were directed to enhancing emotional regulation while participating in activities based on developmentally appropriate practice. For example, enacting roles for negotiation allowed the development of concern with others, the use of acceptable ways of handling disagreements, and the practice of staying focused and calm during stressful events. These sessions were very engaging and differed according to the age of the targeted group. The traditional practice of Group B meant daily lessons with student demonstrations of show-and-tell values and sample academic items that explicitly excluded aspects of SEL. This division

underscored how practical SEL approaches are compared to business as usual in the classroom. The formation of the groups and interventions mentioned above offered this research the necessary data for understanding the particulars of the psychological and pedagogical climate most beneficial to the growth of the child's emotional strength.

Instrument and Procedures

Various research instruments have been used, which are explained below. According to the Emotional Resilience Scale for Children ERSC, the study was altered to assess the cognitive, emotional, and social resilience reliability levels to prove Cronbach's alpha value to be 0.85. For the case of the Behavioural Observation Checklist BOC, the underlying instrument is applied to measure behavioural response towards stress, along with the social behaviour during classroom learning, While for the agenda of parental feedback forms. These tools are used to gain some understanding of the subject's emotional and behavioural changes in children observed at home. A Baseline Assessment is done in week one to achieve pre-intervention levels of emotion resilience by administering ERSC. It is also employed to gather behavioural data and parents' responses. The intervention Phase is more than eight weeks in its foundation, and in Group A, twice a week. SEL workshops include practices, constructions, and skill practices. Group B provides a basic curriculum ahead of any additional augmentation, and the last group consists of conventional class assignments without specific targeted intervention. The post-intervention assessment is better done in week eight, utilizing the same instrument to determine shifts in emotional stability and behavioural functioning. All sessions were conducted with the help of teachers and psychologists who know SEL more than mentors for sessions. The interventions are correctly developed and comply with the educational norms, and the interventions are ensured to fit in the school setting.

Data Analysis

The collected data was analyzed using quantitative and qualitative methods to ensure comprehensive analysis and provide effective interventions. In the quantitative analysis, descriptive and inferential statistics are used, and in the descriptive statistics, baseline and post-intervention ERSC scores are summarised for all groups. In Inferential statistics, the tests were paired to compare pre-and post-intervention scores in each group. Analysis of variance (ANOVA) was used to test differences between intervention and control groups. The effect sizes were calculated to ensure the magnitude of the intervention impact. The qualitative analysis is based on automatic analysis of parental feedback and observations that help understand behavioural and emotional changes. Nvivo software was used to decode themes and understand improvements in empathy, self-regulation, and peer interactions. Moreover, inter-rater reliability for BOC positive was conducted with the help of two independent observers' score behaviours and triangulation findings from ERS that enhance the validity of the research. The ERSC was selected out of the measure of resilience as it captured broad cognitive, affective, and social-mental health resilience, and the study was interested in improving the overall resilience in children. This makes the instrument highly reliable, and the internal consistency coefficient was very high. The Behavioral Observation Checklist (BOC) records actual behaviour and describes it in the context of emotional and social situations; thus, it can be used as an effective intervention measurement tool. The statements to parents were chosen to get a holistic view of parents on changes in children's behaviour beyond school. These are well established in educational and psychological research, hence this study's internal reliability and constructoflidity.

Results and Discussion

In this research section, there is a comprehensive discussion about the findings from experimental research that focus on generating emotional resilience in children using psychological and pedagogical strategies. The results align with the research objectives that provide innovative insight into the impact of structured SEL interventions (Table 1).

Quantitative Results

Table 1.
The Comparison of Emotional Resilience Score across Groups

Criterion	Control Group (CG)	Intervention Group (IG)	Percentage Difference
Emotional Regulation	23.7	35	+11.3
Self-Awareness	28.9	45	+16.1
Social Skills	42.1	50	+7.9
Adaptability	52.6	62.5	+9.9
Empathy	31.6	45	+13.4

The graphical representation is about the improvement of key emotional resilience indicators between the control and the intervention groups (Figure 1).

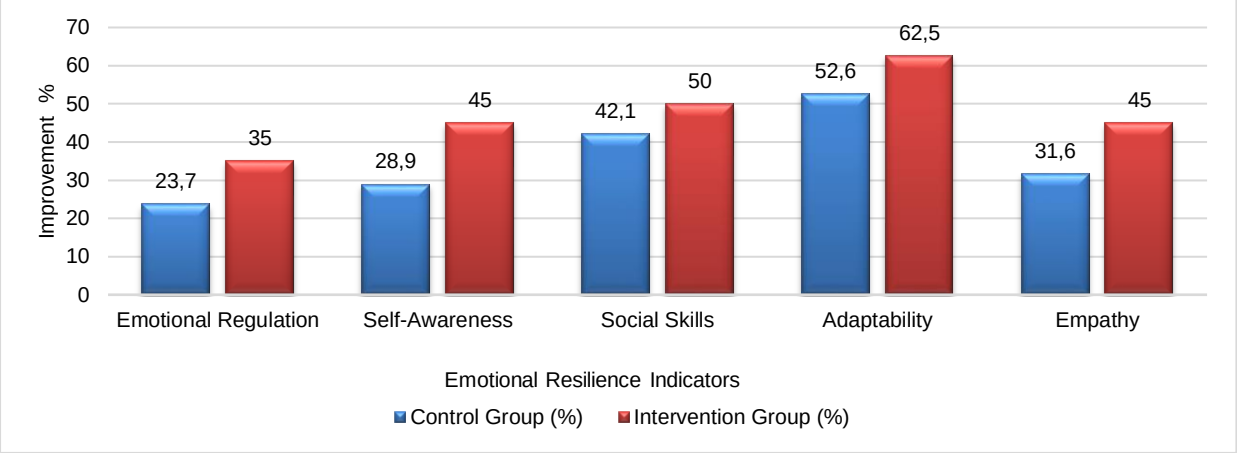

Figure 1. Improvement in Emotional Resilience Indicators: Control vs Intervention Groups.

The observations from quantitative data represent that there is a significant improvement in improving emotional regulations as the intervention group participants demonstrated an 11.3% improvement that was increased over the control group (Meng et al., 2023). It also shows improvement in empathy and social skills, and the score increased by 13.4% and social skills by 7.9%. The improvement across all the criteria is achieved with a valid SEL framework, and its efficiency generates emotional resilience (Meng et al., 2023).

Qualitative Analysis

The qualitative data is derived from parental feedback and classroom observation that represented substantial behavioural changes among children in the intervention group. Children had better control over desires during peer interactions, which represented a few conflicts. The participants actively engaged in group tasks that generated an inclusive and empathetic environment. The journals of children reflected deeper information about their emotional states, and the findings represented parental feedback about home behaviour.

Innovations in research

The inclusion of multi-model tools such as mindfulness practices and guiding discussions is helpful to ensure a well-rounded approach. The integration assessment techniques are based on a combination of quantitative metrics with qualitative feedback that provides a deeper understanding of resilience

development (Tillott et al., 2024). The integration of feedback collected from parents helps the researcher to capture behavioural changes beyond the academic environment.

Conceptual Application

The research confirms the efficacy of SEL strategies in improving resilience, specifically in designing curriculums. It represented that structured SEL could seamlessly integrate into the existing school curriculum; the teacher training highlighted the need for skilful educators and implementation as techniques, while policy implications are helpful for developing policies as a core component of the primary education system. The results are summarised as the research continuously supporting the hypothesis that structured SEL intervention could significantly improve emotional resilience in children. The experimental progress of groups across multiple indicators focuses on the requirement for schools to prefer social-emotional learning frameworks that are significant components of education. A comparison of findings in the existing research studies highlighted that different aspects of research highlight similarities and differences that provide a clear understanding of the significance of the findings (Marheni et al., 2024). The interpretation of the result demonstrated that structured intervention efficiently improves emotional resilience among children. The findings showed that the intervention groups participated in activities that resulted in a much higher improvement in emotional resilience compared to the control group, which had no specific intervention. The intervention group represented an improvement in emotional resilience components, including emotional regulation, self-awareness, social skills, adaptability, and empathy. The emotional regulation score in the intervention group increased by 11.3%, which is higher than the increase in the control group.

The SEL interventions included different techniques, such as mindfulness and emotional awareness exercises, that help manage the emotions of children (Li, 2023). The previous research studies demonstrated greater support for the idea that SEL programs have a positive impact on the emotional regulation of children. Moreover, self-awareness is closely related to emotional intelligence, which was increased by 16.1% in the intervention group. Research studies emphasize the role of self-awareness in improving emotional resilience.

In the context of social skills, the intervention group represented a 7.9% improvement, representing SEL activities focusing on interpersonal communication and cooperation in improving the ability of children to interact with others in an appropriate way. Such improvement is supported by the research conducted by Zins et al. (2007), which represents that SEL interventions generate positive peer relationships and improve communication skills. The research shows a significant increase in the intervention group related to adaptability as there was a 9.9% improvement in adaptability, which is significant for emotional resilience and helps children to navigate changes and adversity (Marheni et al., 2024). The literature highlighted the significance of adaptability as a basic component of emotional intelligence and interventions that focus on the success of helping children adapt to challenging situations. Additionally, empathy is also another key component of emotional resilience that was increased by 13.4% in the intervention group. Empathy is the ability to understand and share the feelings of others, has foundations for emotional resilience, and generates compassion and cooperation. Research has continuously shown that SEL programs could improve empathy in children, resulting in improvement in overall emotional and social development (Marheni et al., 2024). The findings of the research consistently show that there are similar research studies on SEL interventions. As Zins et al. (2007) explored, SEL programs significantly increase emotional intelligence among students, which is directly connected to emotional resilience. The current research study demonstrated that SEL interventions could generate skills related to emotional regulation, self-awareness, and empathy that contribute to better emotional and social outcomes. Moreover, Campbell et al. (2016) represented the intervention targeting emotional competencies such as self-awareness and emotional regulations that resulted in improved emotional resilience among children (Ivankov et al., 2023; Willis & Nagel, 2015). Emotional intelligence and academic self-concept were found to significantly contribute to students' achievements in mathematics, highlighting the importance of integrating social and emotional development into academic curricula (Akaneme & Metu, 2024).

Comparatively, in the research, Campbell et al. (2016) implemented a wide range of emotional competencies tools, such as parent reports and teacher observations, that validated and improved resilience. On the other hand, the current research combined behavioural observations and parental feedback that added a layer of insights into the effect of SEL interventions in different contexts. Another notable difference is identified as compared to other research studies that the scale and intensity of intervention.

Campbell et al. (2016) used an extended intervention period of 6 to 12 months; however, the current research is based on eight weeks and still represents a substantial improvement that suggests a shorter and more concentrated SEL program that could significantly impact emotional resilience. However, it is significant to note that the length of the intervention could be impactful on the changes observed and intervention code improved results (Tillott et al., 2024; Havryliuk & Balashov, 2024; Suldo et al., 2008; Ungar et al., 2019). Generally, current research findings supported the broader literature on SEL and emotional resilience; however, there are different areas where the research results are slightly different. For example, improving social skills was not considered an improvement in emotional regulation and empathy. SEL interventions are recommended to improve interpersonal interactions, peer influences, and exposure to social skills training, which plays a significant role in developing these skills. The research conducted by Li (2023), Wosnitza et al. (2018) recommended that factors beyond the classroom, such as family dynamics and relationships, could impact the development of social competencies. Another significant area related to the impact of SEL on academic performance focuses on the research. It addresses the other research studies that show that programs positively impact academic performance due to improved emotional regulation and stress management. The current study examines study outcomes and explores how emotional resilience is improved by SEL and its impact on academic success.

Study Limitations

The results of the research are promising, but several limitations should be acknowledged. Firstly, the sample size of 150 respondents, such as children, is adequate statistically, but it restricts the generalisability of research and the impact of interventions in different cultural, social, and academic contexts. Research could be conducted by considering a larger and more diverse sample size that examined the generalisability of research findings in different populations. Secondly, the research is dependent on a relatively short intervention period of eight weeks, and the duration is sufficient to observe significant improvement in emotional resilience. Research is required to analyze sustainability and its impact. The research follow-up assessment in different months after the interview provided valuable insights about the lasting impact of SEL intervention. Moreover, dependence on parental feedback is one of the basic qualitative sources that may increase bias. Although efforts were made to mitigate the errors, future studies could generate benefits by integrating more objective behaviour and reports that contribute to valid research findings. The result of the research provided strong evidence that SEL intervention could significantly increase emotional resilience among children. The intervention group represented significant improvements in emotional regulation, self-awareness, social skills, and empathy that support the effectiveness of structured SEL programs to promote these key components of resilience. The research contributes to increasing literature on SEL that represents the positive impact of the targeted intervention on the emotional resilience of children. There is a need for further research to explore the long-term impact of the SEL program and identify the role of external factors in increasing the broader applicability of this intervention in different groups. The research is based on the significance of incorporating SEL into the educational curriculum as a source of emotional resilience in children. By developing such skills, we could use the tools that are required for the challenges, which will result in healthier and more adaptive behaviours and improve overall well-being.

Conclusions

This study is based on a critical analysis of generating emotional resilience among children, specifically while facing social and academic requirements and social challenges. The research ensured that structured interventions could significantly improve the key components of emotion resilience, including emotional

regulation, self-awareness, empathy, and social skills. The research findings reinforce the value of the SEL program and highlight the significant requirement for their integration into the educational system to educate children with significant tools for navigating the adversities in life. The research results focused on providing children with the psychological and pedagogical support necessary to develop resilience and ensure they can face challenges and maintain confidence. The highlighted research questions represented that psychological theories and pedagogical strategies are also designed to fulfil the developmental needs and cultural aspects in which children are involved. The research helps develop an inclusive and culturally sensitive approach to emotional resilience. It ensures that children from different backgrounds can attain objectives from an appropriate intervention to generate unique experiences. The indication of research findings is broader as schools, policy-makers, and educators must work collaboratively to implement resilience programs beyond academic achievements and focus on emotional well-being. Educators must be trained to identify emotional challenges and develop a supportive environment; however, parents and guardians should actively participate in emotional development programs for children. Overall, the research develops paradigm changes in the mental health approach of children and the resilience to promote a holistic view of development that prepares children to thrive socially and emotionally changes. Integrating SEL into everyday educational practices helps create directions for future generations to overcome life's challenges and promote resilience and emotional strength.

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Educational policy on the quality of security of socio-cultural forms of higher education

Política educativa sobre la calidad de la seguridad de las formas socioculturales de educación superior

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Abstract

This study aims to analyze the state of modern educational policy aimed at ensuring the quality and safety of socio-cultural activities in higher education institutions and to evaluate their impact on cohesion and safety levels. The research utilized a purposive sampling method involving 81 participants: 55.6% students, 29.6% teachers, and 14.8% administrative staff, selected based on predefined criteria (three indicators for staff and four for students). The results reveal a relatively high level of respondent involvement in socio-cultural activities, reflecting significant internal engagement within educational institutions. However, these activities moderately impact cohesion levels, as evidenced by dominant average scores of 3 and 4 on the scale. Regarding safety, the physical threat emerges as a significant challenge, with the ongoing Russian aggression critically undermining the security awareness of participants. The study highlights the need to

prioritize innovative approaches to organizing and conducting socio-cultural events. Enhancing communication, adopting advanced practices, and improving the safety measures for all educational participants are critical directions for future development. These improvements are essential to creating a supportive socio-cultural environment that ensures both quality and safety in higher education institutions.

Keywords: security of the educational environment, socio-cultural activities, HEI policy, social integration, challenges.

Resumen

Este estudio analiza la política educativa moderna enfocada en garantizar la calidad y seguridad de las actividades socioculturales en instituciones de enseñanza superior y su impacto en los niveles de cohesión y seguridad. Se empleó un muestreo intencional con 81 participantes: 55,6 % estudiantes, 29,6 % profesores y 14,8 % personal administrativo, seleccionados según criterios predefinidos (tres indicadores para el personal y cuatro para los estudiantes). Los resultados revelan un nivel alto de participación en actividades socioculturales, reflejando un compromiso significativo dentro de las instituciones educativas. Sin embargo, el impacto en la cohesión es moderado, evidenciado por puntuaciones medias predominantes de 3 y 4. En términos de seguridad, la amenaza física surge como un desafío clave, mientras que la agresión rusa continua afecta críticamente la percepción de seguridad de los participantes. El estudio resalta la necesidad de enfoques innovadores en la organización de actividades socioculturales. Mejorar la comunicación, adoptar prácticas avanzadas y reforzar las medidas de seguridad para todos los participantes son aspectos fundamentales para el desarrollo futuro. Estas acciones son esenciales para establecer un entorno sociocultural que garantice tanto calidad como seguridad en las instituciones de enseñanza superior.

Palabras clave: seguridad del entorno educativo, actividades socioculturales, política de las IES, integración social, retos.

Introduction

In today's innovative space, where the speed of change requires adaptability from all social institutions, higher education institutions (HEIs) perform an important mission in forming knowledge, competencies and values for the younger generation. In this sense, educational policy to ensure the quality of the educational process and socio-cultural security deserves research attention. These features are integral to the sustainable development of society, as they determine not only the effectiveness of professional training but also the process of forming a responsible civil society (Anlimachie & Avoada, 2020). The relevance of the study is stipulated by the need to ensure the implementation of current national strategies for building a safe and effective learning environment in higher education institutions, social guarantees of the legal protection of the rights of all participants in the learning space, and the formation of high-quality and safe conditions for the provision and receipt of educational services (Buriak et al., 2023). This research is of additional importance given the study of the main conditions for the formation of educational security of socio-cultural forms of higher education institutions with a view to the social realisation of students' intellectual, individual, psycho-emotional development, as well as increasing the potential of Ukraine's socio-economic development based on sustainability. However, several contemporary scholars have pointed out that educational policy in higher education institutions is currently at the intersection of global (increased competition between HEIs, unification of standards, large-scale digitalisation) and local (economic instability, limited funding, cybersecurity issues, lack of transparent mechanisms for implementing educational policy challenges, etc. Therefore, one of the most urgent tasks is to ensure the quality of education and the security of socio-cultural forms that define the internal environment of universities.

Given the preceding considerations, the key research problem is to analyse the state of educational policy to ensure the quality and safety of socio-cultural forms in higher education institutions and to describe the quality and safety of socio-cultural initiatives in modern educational institutions. Under the influence of

globalisation, digital transformation and changes in the socio-political environment, the risk of transformation of the main socio-cultural forms is becoming noticeable. Thus, the absence of a well-formed and effective policy for the development of basic socio-cultural forms (mechanisms of interaction, HEI norms, principles that determine the behaviour of community members, etc.) may lead to a loss of cultural identity, a decrease in trust in the HEI community, and generally affect the quality of the educational process. At the same time, traditional tools often do not consider the specifics and complexity of current challenges.

Given the current challenges, including military realities that affect the functioning of higher education institutions, the main focus of the work will be on analysing the theoretical foundations of educational policy, identifying the risks associated with the transformation of the socio-cultural environment, and finding modern practical solutions to form an effective and sustainable model of educational process management. To this end, the main focus of the study will be on conducting a survey among students, teachers and university administrators on the quality and safety of socio-cultural initiatives in educational institutions to identify the main trends and problems of educational policy about socio-cultural forms.

The purpose of the study is to analyse the educational policy aimed at ensuring the quality and safety of socio-cultural forms in higher education institutions and to determine the level of quality and safety of socio-cultural initiatives (e.g., determining the scale of cultural events, the role of student initiatives and associations, charity events, etc.

Main research objectives:

1. Evaluation of the quality of socio-cultural events, determination of their potential for promoting cohesion of the educational community
2. Identification of the main effective socio-cultural activities in modern higher education institutions and description of the aspects that affect their effectiveness
3. Description of the main challenges to ensuring the educational policy of quality security of socio-cultural forms of higher education and prospects for overcoming them.

For this purpose, 2 research hypotheses have been formed that will require refutation or confirmation:
In modern educational institutions, several important socio-cultural initiatives affect the quality of educational policy implementation.

The preservation of socio-cultural forms positively impacts the quality of the educational process and increases the level of trust and interaction in the HEI community.

The study provides an overview of the academic literature on the specified issues, describing the methodological foundations of the conducted survey. The results and discussion present the data obtained from the survey and demonstrate existing scholarly concepts regarding the outlined questions. This allowed summarizing the main points confirmed through empirical means in the conclusions.

Literature Review

In the current crisis conditions, forming a safe educational environment for all participants in the educational process is a key activity of higher education institutions. This is evidenced by the works of contemporary scholars who describe the primary mechanisms for creating an effective educational environment (Bondar et al., 2023; Chernukha et al., 2021). For this reason, an important aspect of a modern, effective learning space is ensuring socio-cultural security. According to the works of contemporary scholars, socio-cultural forms correspond to the basic norms, values, traditions and practices that define the identity of the university community (Ridei et al., 2022; Anteliz et al., 2008; Enwere & Afunugo, 2024). According to other studies, they also affect the ability of a higher education institution to collaborate and innovate (Marchenko, 2023; Şafak-Ayvazoğlu et al., 2021).

As demonstrated by Wang et al. (2024), who used a longitudinal study to track the impact of internationalisation programs on students' cultural adaptation, and Tran et al. (2023), who conducted a meta-analysis of international exchange programs, the trend towards the internationalisation of education requires careful consideration. While Wang et al. (2024) found that international programs significantly improve cultural adaptability and academic performance, Tran et al. (2023) highlighted the potential risks of cultural displacement and academic homogenisation, pointing to the need for a balanced approach.

Antoshkina et al. (2023) conducted a mixed-methods study that emphasised the importance of assessing the educational system's quality through academic performance and its capacity to foster personal development and social integration. This study revealed that socio-cultural initiatives play a critical role in supporting students' psychological well-being and sense of belonging, a finding echoed by Cantwell (2021), who used ethnographic methods to explore how university culture can support academic integrity and cultural diversity.

Şafak-Ayvazoğlu et al. (2021) conducted a survey-based study highlighting the importance of a stable psychological environment in learning spaces. However, the influence of digitalisation, as discussed by Bobro (2024) in a case study on digital learning platforms, shows both the benefits (increased accessibility and flexibility) and the challenges (reduced personal interaction). Barvinok & Pudło (2023) further expanded on these challenges through a comparative analysis of traditional and digital learning environments, noting that the latter can sometimes undermine the socio-cultural fabric of educational institutions.

The issue of multiculturalism and its impact on maintaining local university culture is critically examined by Debych (2023), who used qualitative interviews to explore the experiences of international students. Hartati & Riniati (2022), through a longitudinal study, argue that mobility offers significant benefits for academic collaboration and cultural exchange. However, Islam et al. (2023) warn against the overemphasis on internationalisation, presenting data from a survey that suggests it may lead to the erosion of unique local university characteristics. Thus, while the integration of new technologies and the growth of multiculturalism present opportunities for innovation and collaboration, they also pose significant challenges to the socio-cultural integrity of higher education institutions. Addressing these challenges requires a nuanced understanding of the methodologies, results, and limitations of existing studies, as well as the ability to synthesize these findings into a cohesive strategy for educational policy.

The identified challenges in the scientific literature are related to the integration of new technologies and the growth of multiculturalism and require a rethinking of approaches to educational policy. Unfortunately, not much attention has been paid to this problem in the scientific literature, and researchers have primarily focused on certain aspects of the formation of socio-cultural space (mobility, development of student groups, etc.). However, this problem requires a systematic approach that would pay attention to the views of students and teachers on this issue. Therefore, this study will try to address this gap and characterise and interpret the opinions of all participants in the educational process regarding the state of educational policy on the quality of security of socio-cultural forms of HEIs.

Methodology

Research design

This paper is based on a cross-sectional study, which collects data from different individuals in the same period. This type of research was chosen based on key advantages, including the speed of data collection and the ability to analyse large samples. This type of research is also convenient for involving different respondents, increasing the results' validity. This study also involves different participant groups, making the results more meaningful and representative. At the same time, it should be acknowledged that this cross-sectional study involved obtaining data and observing variables without directly influencing them.

Participants

The study involved representatives of 3 key groups in the HEI educational space: students, teachers, and managers (administration). Their involvement was based on purposive sampling, which involved including participants based on their relevance to the chosen topic.

To participate in the study, respondents must meet the following criteria:

For students:

Studying at a higher education institution for any course;
Studying at a higher education institution in any specialisation;
Understanding of significant social and cultural initiatives;
Experience of participation in socio-cultural initiatives (cultural and educational events, student associations, charity events)

For teachers:

1. Work in a HEI on a permanent or contract basis.
2. Experience of participation in various socio-cultural initiatives
3. Experience of interaction with socio-cultural events (assistance in organising events, mentoring in student associations)

For the administration:

1. Work in a HEI on a permanent or contract basis.
2. Inclusion of different representatives of the administration responsible for planning and organising individual initiatives in the HEI
3. The minimum work experience is 1 year.

In this way, 95 participants were selected for the study. All participants had to consent to processing their answers and personal data. However, several potential respondents refused to give their consent, so 81 people were included. Thus, the following sample distribution was obtained: students: 55.6%; teachers: 29.6%; administration: 14.8%. Table 1 provides a detailed description of the participants.

Table 1.
Description of included participants

Participants	N	Percentage of the sample (%)	Description
Students	45	55,6	Students of different years of study and different specialisations were included. Participants were introduced to the main socio-cultural forms of interaction
Teachers	24	29,6	The study included teachers with different lengths of service (from 2 to 40 years). The teachers were also familiar with the main socio-cultural forms of interaction and had experience in conducting various initiatives.
Administration	12	14,8	Representatives of the administrative staff involved in planning, implementing and evaluating the effectiveness of socio-cultural activities in HEIs are involved.
Overall	81	100	

Source: compiled by the authors

Tools and procedure

The research procedure was a multi-stage one; in particular, the participants were first informed about the purpose and objectives of this study, and their consent was obtained. The main instrument was a survey conducted among 3 groups of respondents. It was based on both open-ended questions and questions using a Likert scale (scoring from 1 to 5). The survey covered both certain demographic data and a description of the experience of involvement in current socio-cultural initiatives of higher education institutions.

Table 2.
Survey structure

Block	Question
Information	1. Indicate your status in the university 2. Your length of service or year of study: 3. Have you participated in current socio-cultural forms of interaction?
Quality level of socio-cultural events	1. How would you rate the quality of socio-cultural events in your HEI? 2. Rate the extent to which these initiatives contribute to the cohesion of the educational community (from 1 to 5) 3. What aspects affect the quality of these events?
Identification of initiatives	4. Which socio-cultural events were the most successful?
Security of the socio-cultural space	5. Does your HEI ensure an appropriate level of security for socio-cultural events? 6. What risks have you faced while participating in socio-cultural initiatives? 7. How can the level of security of the socio-cultural space of a higher education institution be improved?
Outlook	8. What should be changed to improve the quality and safety of socio-cultural events? 9. Are you ready to continue participating in socio-cultural events?

Source: compiled by the authors

Therefore, these questions were designed to be adapted for the 3 categories of participants. Another important stage was the interview process. Semi-structured interviews were conducted with representatives of the administration in separate focus groups of 6 people. Thus, 2 focus groups were formed. These semi-structured interviews took place on the Zoom platform and lasted up to 1 hour. During this time, representatives of the administration could freely express their opinions on the specifics of implementing certain initiatives and supporting the cultural space of the university. These questions concerned the main challenges and the state of implementation of socio-cultural initiatives in HEIs.

1. What are the main challenges in planning and implementing socio-cultural initiatives in HEIs?
2. How does the administration determine the effectiveness of socio-cultural initiatives?
3. What criteria or indicators do you use to assess performance?

Data analysis

First, the data quality was checked to identify missing responses and duplicates. At the initial data analysis stage, the formats were clarified; text responses were transferred to one category, and numerical responses were transferred to a digital format. Google Sheets was used for this purpose, as this software has a wide range of basic statistics and visualisation tools.

To ensure the questionnaire's validation, pilot testing was conducted with a small sample of respondents to refine questions and address any ambiguities. Expert review was performed by professionals in the field to ensure content validity. Internal reliability was assessed using Cronbach's alpha, resulting in an acceptable reliability score.

Next, the answers were coded. For open-ended questions, the main categories were identified: quality of socio-cultural forms, successful practices, risks, and prospects. Thus, the main themes in the textual responses were identified in the qualitative data. A thematic analysis approach was utilized for qualitative

responses, involving multiple coders to enhance reliability. The coders' consistency was ensured through regular meetings and comparing coding results to resolve discrepancies. A descriptive analysis was carried out for the quantitative data, and the percentage distribution of responses was made on this basis, graphs and diagrams were created. A comparative analysis of the responses was also done to identify specific differences. Methodological limitations of this analysis include potential biases in self-reported data, the limited sample size for pilot testing, and the subjective nature of qualitative coding despite efforts to ensure consistency. These limitations were acknowledged as part of our commitment to scientific transparency.

Results and Discussion

In the current conditions of development of a globalised society, the increase in digitalisation is a certain challenge to the increase in political, economic and social challenges. In such situations, higher education institutions formulate their policies by considering the factors of proper security, quality, and inclusive solutions in the formation of socio-cultural environments. The introduction of martial law has increased the importance of such initiatives several times over, as higher education institutions in such a powerful crisis are turning into important stabilisation platforms for social functioning. In particular, creating a safe environment makes it possible to introduce innovations and new educational programmes, which will have a qualitative impact on students' overall level of education. Certain sociocultural activities allow combining existing academic and practical practices and the development of soft skills, which are valued in the modern professional market. Psychological support in times of war is also extremely important. In such circumstances, socio-cultural initiatives serve as a mechanism for stability in students' psychological state and their adaptation to the present difficult conditions.

One of the practical manifestations of this condition is the organisation and holding of socio-cultural events. First, they include organising lectures, exhibitions, charity events, volunteering, workshops, sports events, using digital platforms to discuss the creation of study groups in certain social platforms, forums and conferences for higher education students, etc. In such circumstances, it is important to consider the activity of students, teaching staff and administrative staff of higher education institutions and their involvement in the conduct and organisation of socio-cultural forms.

Table 3.
Participation in socio-cultural forms

Have you participated in current socio-cultural forms of interaction?	Number of respondents
Regularly	30 (37%)
Sometimes	25 (31%)
Rarely	19 (23%)
Disinterested	7 (9%)

Source: compiled by the authors

The respondents demonstrated a relatively high level of involvement in socio-cultural forms. This indicates active internal work in educational institutions despite martial law. Socio-cultural forms of interaction are the organisation of social, educational and cultural activities that promote joint interaction, personal evolution, and the preservation of social and cultural values manifested in a particular community. In the context of the functioning of higher education institutions, such socio-cultural forms have different manifestations: educational initiatives and their implementation, individual cultural cooperation activities, including those aimed at creating social interaction, cultural exchanges, and further personal development of students and academic staff. Most respondents (68%) indicated that they regularly or at least occasionally participate in current socio-cultural forms.

An important manifestation of this process is also identifying the quality of socio-cultural events. In particular, respondents were asked to assess the quality of socio-cultural events in higher education

institutions and determine the extent to which such initiatives contribute to cohesion in education policy on a scale from 1 to 5 (Figure 1).

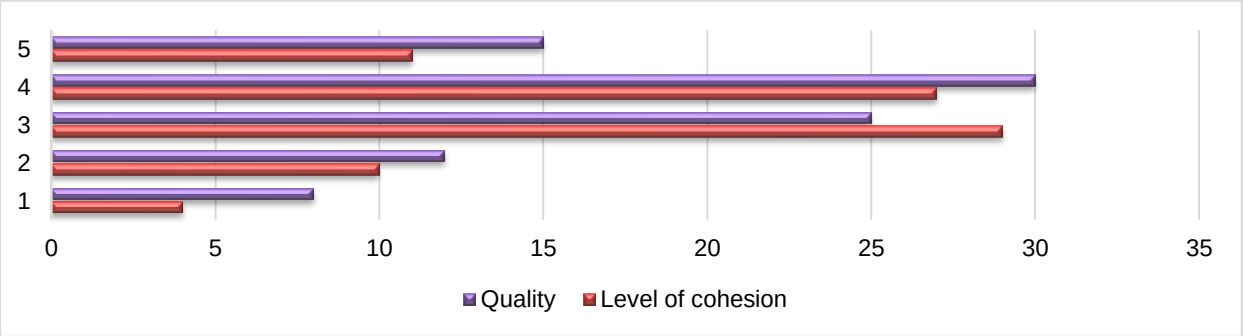

Figure 1. Assessing the quality of socio-cultural events and promoting cohesion
Source: compiled by the authors

Respondents generally emphasised that socio-cultural forms in higher education institutions contribute to a mediocre cohesion (average scores of 3 and 4 dominate). This is an average level of influence, noticeable but also insufficient. The situation needs further improvement, at least through a tool to determine which measures or initiatives are most successful for cohesion from the respondents' point of view. A method of obtaining data to improve such initiatives, such as socio-cultural forms, is also possible. Similarly, respondents rated the level of quality of socio-cultural forms of interaction in higher education institutions at 3 and 4 points on average. This is an opportunity to determine the extent to which socio-cultural forms contribute to improving higher education institutions' atmosphere and learning environment. According to the scores, respondents noted that such initiatives can significantly improve the quality of existing educational communities.

The respondents also noted the level of socio-cultural events and the aspects that influence this (see Table 4).

Table 4.
Aspects that influence the level of socio-cultural activities

What aspects affect the quality of these events?	Number of responses
Certain aspects of the organisation: - Successful planning, integration into the educational system of higher education institutions, and the level of organisation.	18 (22%)
Content elements: - Innovations, significance for cultural and social development, and relevance to interests.	32 (40%)
Information support: - Promotion of events and dissemination of information about them, activities of student self-government, scientific societies of teachers, etc.	20 (24%)
Involvement: - Working with the administration, collaboration with other external partners, active participants, etc.	11 (14%)

Source: compiled by the authors

Thus, the survey has shown that when determining the aspects that affect the quality and level of organisation of socio-cultural events, respondents primarily consider the content. These are elements such as innovation and relevance to the interests of students, teaching staff, and administrative staff of higher education institutions. Information support of events and their effective organisation are approximately the same level (20% and 18%, respectively). Among the outsiders are certain administrative aspects of work on the safety of socio-cultural forms of interaction, which were probably taken into account primarily by administrative staff.

To determine the strengths of the current educational policy on socio-cultural interaction, respondents were asked to answer the question about the most effective socio-cultural activities in their opinion (see Table 5).

Table 5.
The most effective socio-cultural events

What socio-cultural events do you consider to be the most successful?	Number of responses
Holding cultural events, weeks of culture and art events, theme nights, exhibitions, concerts	20 (25%)
Volunteering, holding charity events, providing assistance to those in need	41 (51%)
International cooperation (including participation in international projects or exchanges)	5 (6%)
Participation in sports competitions or other events with competitive participation (e.g. debate tournaments)	15 (18%)

Source: compiled by the authors

Obviously, in the context of martial law and due to the popularity of volunteering, students and teachers noted volunteering as one of the most successful forms of socio-cultural activities (51% of respondents).

Also, this form of activity is, to some extent, perceived as an investment in security, as volunteer work and support for the military and temporarily displaced persons in the current realities are certain investments in countering Russian aggression. Less popular are the organisation of various cultural initiatives and forums and sports competitions. International cooperation is in the last place. This can be partly explained by the fact that in wartime, there are serious restrictions on men travelling abroad, so such activities are possible only in the form of remote participation.

In such circumstances, it is important to assess the security of the socio-cultural space (see Table 6).

Table 6.
Security of the socio-cultural space

№	Question	Number of responses
1	In your opinion, does your higher education institution ensure an adequate level of security for socio-cultural events?	
A	Yes	61 (75%)
B	No	20 (25%)
2	What risks have you faced while participating in socio-cultural initiatives?	
A	Inadequate level of organisation of the event	8 (9%)
B	Physical threat	43 (53%)
C	Conflicts between participants of socio-cultural events, stressful situations	30 (37%)
3	How can the level of security of the socio-cultural space of a higher education institution be improved?	
A	Increase the level of physical security	38 (47%)
B	Increase the level of psychological security	26 (32%)
C	Ensuring proper information security (including information hygiene)	10 (12%)
D	Increase the level of social security (risk monitoring, etc.)	7 (9%)

Source: compiled by the authors

Respondents gave different assessments of security issues. First, most believe that their higher education institutions are adequately protected from external threats (75% of respondents). However, given the continuation of Russian aggression, the level of danger should not be misleading. The respondents partially agree with this, identifying the physical threat as one of the most obvious, even in conditions of relative security. The Russian threat is a decisive factor that negatively affects the state of security awareness. Notably, 37% of respondents noted conflicts among participants in socio-cultural events, which creates stressful situations. This indicates a lack of ethics in communication, on the one hand, but also demonstrates a certain "electrification" of society, which is ready to explode from psychological instability. Respondents also pointed to this when identifying ways to improve physical and psychological security as the most promising for further enhancing the level of protection of the socio-cultural space of educational institutions (79% of respondents in total).

The last block of questions was devoted to the prospects for the development of socio-cultural events and the assurance of their safety (see Table 7).

Table 7.
Prospects for further development of security of socio-cultural events

№	Question	Number of responses
1	What should be changed to improve the quality and safety of socio-cultural events?	
A	Innovations in events, higher level of communication	33 (41%)
B	Increase the level of security	33 (41%)
C	Improved organisational episodes, improved planning	10 (12%)
D	Inclusiveness and accessibility	5 (6%)
2	Are you ready to continue participating in socio-cultural events?	
A	Yes, but only if the overall situation improves	26 (32%)
B	Yes, without additional requirements	40 (49%)
C	No	15 (19%)

Source: compiled by the authors

The respondents pointed to the prospects for further development of security of socio-cultural events in higher education institutions. In order to further improve the security of socio-cultural events, it is important, according to the respondents, to consider innovations in the conduct of events and the need to increase the level of security. This opinion is supported by an equal number of respondents (41% each). Respondents also noted the need for improved organisational episodes, better planning, and access to inclusivity. At the same time, these requirements do not affect the respondents' overall desire to continue participating in socio-cultural events. Almost half of the respondents admitted they were ready to do so even without additional conditions. Only about one-third of respondents pointed to the need for additional security conditions. At the same time, only 19% of respondents believe they will not participate in the next socio-cultural events at their HEI. The information offered indicates the importance of such aspects in modelling the further development of the education sector. The main research problem was to determine the state of educational policy to ensure the quality and safety of socio-cultural forms in higher education institutions and to describe the safety and quality of socio-cultural initiatives in modern educational institutions. The first research task was to assess the quality of socio-cultural activities and determine their potential to promote the cohesion of the educational community. Accordingly, the results demonstrate that respondents showed a relatively high level of involvement in socio-cultural forms (almost all respondents had experience participating in or organising certain events). This indicator indicates the active internal work that is currently taking place in educational institutions. The study participants determined that the current socio-cultural forms in higher education institutions contribute to a mediocre level of cohesion (in particular, the average scores of 3 and 4 dominated).

Similarly, the participants assessed the quality of socio-cultural forms of interaction in higher education institutions with 3 and 4 points. Accordingly, these results demonstrate that such initiatives can significantly improve educational services' quality. These statements also confirmed the study's first hypothesis, which was that several important socio-cultural initiatives in the modern educational space affect the quality of educational policy implementation in general. These results also correlate with the opinions of other scholars who have pointed out that modern social or cultural events that take place at the university play an important role in building trust and cooperation in modern teams (Aba, 2019; Balsero et al., 2021; Golod et al., 2022). Also, according to other works, certain socio-cultural measures are effective only when they meet basic social and cultural needs and develop 21st-century skills (Kioupi & Voulvoulis, 2020; Oleksiyenko et al., 2023). Other scholars have emphasised the importance of conducting a long-term monitoring process of certain socio-cultural forms through the lens of inclusiveness (Lopatina et al., 2023).

At the same time, in comparison to this methodological approach, this paper focuses on a medium-term analysis, which allows us to consider not only the initial feedback but also subsequent transformations.

The next task was to identify effective socio-cultural events. Thus, it was determined that important socio-cultural forms in modern higher education institutions are the organisation of cultural events, weeks of culture and art events, theme nights, exhibitions, concerts, volunteering, charity events, international cooperation and participation in sports competitions or events with a competitive form. The analysis has shown that the greatest impact on engagement and social integration is made by activities promoting intercultural communication and those based on volunteering. This is due to the current military realities. These results partially correlate with other works. In particular, the authors point not only to introducing various forms of socio-cultural activities but also to the involvement of innovative solutions based on modern technologies (Zayachuk, 2024; Dzhym et al., 2023). Thus, other scholars' results confirmed these opinions and pointed to the importance of using digital technologies that improve the efficiency of the educational process (Devterov et al., 2024; Kumar, 2024; Mystakidis et al., 2021). Other scholars have also pointed out the limitations of traditional formats that do not always meet the expectations of the digital generation and do not correspond to the innovative labour market (Elisa Raffaghelli, 2020; Lysenko et al., 2024; Wilson et al., 2022). These statements also contribute to the confirmation of the second hypothesis, which concerns the fact that the preservation of socio-cultural forms positively impacts the quality of the educational process and increases the level of interaction in the HEI community.

The next research task was to describe the main challenges and prospects for their solution to ensure educational policy in the security quality of socio-cultural forms of higher education. Thus, it has been identified that most higher education institutions ensure adequate security for socio-cultural events (75%). The most common challenges were physical threats and conflicts between participants of socio-cultural events and stressful situations. This is because respondents identified the impact of hostilities on various events. This also correlates with the findings of other researchers who have indicated that war has significantly changed the nature of organising and conducting events in higher education institutions. During the period of hostilities, the key challenges include the restriction of physical presence due to danger, emotional and psychological stress of students and teachers, and reduced resources (Abusamra, 2024; Cogorno et al., 2023; Streitwieser et al., 2018; Antoniuk, 2023). At the same time, as other authors point out, during this period, socio-cultural activities and individual innovative solutions are becoming important tools for maintaining psychological resilience and social cohesion of academic communities (Lugovyi et al., 2023; Skoryk et al., 2024; Safarli et al., 2024). The theoretical value of the study is to identify the main prospects for further development of ensuring the safety of socio-cultural events within higher education institutions. Therefore, to further improve the security of socio-cultural events, it is important to introduce innovative solutions in the conduct of events and the system of increasing security (Tekin & Tekdogan, 2015). A notable requirement is to improve organisational episodes, the planning system, and access to inclusiveness.

The methodology used in this study has its limitations, which should be considered when working with this article's main results. The survey method reflects certain aspects of subjectivity, as respondents' experiences may differ. Accordingly, the scores they give also require careful interpretation, as some respondents' experiences and perceptions may differ from those of other respondents. As a result, we can talk about certain adjustments in the results, although the answers received are generally unambiguous. For this reason, this limitation indicates certain details, while the general trends remain quite unanimous. Likewise, the Likert scale is subjective - this applies primarily to borderline ratings, as the difference between "good" and "very good" may not be decisive for individual experiences. However, such limitations do not negate the main results; they can only be a subject for further research.

Conclusions

Therefore, the educational policy of quality security of socio-cultural forms of higher education institutions is an urgent problem given current challenges. In particular, it is also due to the Russian armed aggression, as in such conditions, universities are turning into separate institutions to stabilise the social situation, including protecting young people. The survey showed a fairly high level of involvement in socio-cultural forms, demonstrating the active internal work in educational institutions, even during martial law. The

survey found that socio-cultural forms in higher education institutions strengthen the cohesion and quality of socio-cultural forms of interaction in higher education institutions. The survey has shown that when determining the aspects that influence the quality and level of organisation of socio-cultural events, respondents primarily consider the content. Information support for events and their effective organisation are also important. At the same time, volunteer activity is popular under martial law, which is, to some extent, perceived as an investment in security. The organisation of various cultural initiatives and sports competitions is considered less important. Although higher education institutions are adequately protected from external threats, the physical security challenge of Russian aggression dominates. The study pointed to a lack of communication ethics. The majority of respondents indicated the need to increase security and improve organisational episodes, planning and access to inclusiveness. At the same time, these requirements do not affect the general desire of respondents to continue participating in socio-cultural events.

It is important to consider a certain model, which the study further confirms, for the further development of the security environment of socio-cultural projects.

In particular, it is about the formation and further modernisation of security environments (ensuring physical, psychological and information security), the development of extracurricular initiatives for higher education students and teachers, strengthening social cohesion through joint participation in events, and improving the quality of education. Taking these norms into account will allow further development of socio-cultural forms of higher education. In general, the results obtained allowed us to confirm the hypothesis that the preservation of socio-cultural forms has a positive impact on the quality of the educational process and increases the level of interaction in the HEI community.

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Civic identity and migration decisions of university students in wartime borderlands of Ukraine

Identidad cívica y decisiones migratorias de estudiantes universitarios en zonas fronterizas de Ucrania en tiempos de guerra

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Abstract

The article aims to study the youth`s life orientations in borderlands under martial law in Ukraine. The loss of territory, economic capacities, and human resources due to the destabilization of the social situation, military operations, and the occupation of several borderlands affect the potential development opportunities of Ukraine. In wartime, universities have become a center of social stability, psychological support, and national integration. Their role in forming a sense of belonging, supporting professional self-determination, activating civic position, and preventing youth migration is key to preserving the country's

human capital. Systematic support of university education is considered a strategic priority of state policy in the war period. The study results were obtained from students interviewed during the second and third years of wartime. The situation has influenced the formation of youth civic identity, and the vast majority of students feel proud to be a citizen of Ukraine. 39.9% of students plan to stay and work at the borderlands after graduation. The main reasons for migration are low wages and poor prospects for the future. Still, a very high percentage of potential migrants pursuing further education or better job opportunities, and those who have not made the decision yet are observed.

Keywords: borderlands, civic identity, migration, youth, wartime.

Resumen

Este artículo analiza las orientaciones vitales de los jóvenes que viven en zonas fronterizas de Ucrania bajo ley marcial. La pérdida de territorios, capacidades económicas y recursos humanos, causada por la guerra y la ocupación, ha limitado las posibilidades de desarrollo del país. En este contexto, las universidades han asumido un rol fundamental como espacios de estabilidad social, apoyo psicológico e integración nacional. Su función en la consolidación del sentido de pertenencia, la autodeterminación profesional, el compromiso cívico y la prevención de la migración juvenil es clave para preservar el capital humano. La educación superior se ha convertido en una prioridad estratégica para la política estatal en tiempos de guerra. Los resultados se basan en entrevistas realizadas a estudiantes durante el segundo y tercer año del conflicto. La situación ha fortalecido la identidad cívica de los jóvenes: la mayoría manifiesta orgullo de ser ciudadanos ucranianos. Un 39,9% planea quedarse y trabajar en las zonas fronterizas tras graduarse. Sin embargo, persisten factores que motivan la migración, como los bajos salarios y la falta de perspectivas laborales. Aun así, un porcentaje significativo de jóvenes desea migrar para acceder a mejores oportunidades, mientras que otros aún no han tomado una decisión definitiva sobre su futuro.

Palabras clave: fronteras, identidad cívica, migración, juventud, tiempo de guerra.

Introduction

Societal changes at the local and global levels need to be considered when studying youth as a social category. The Global Risks Report (2021, p.11) provides the top ten global risks in the short term (0–2 years) with youth disillusionment rated at the 8th position (36.4%). Among medium-term risks (3–5 years), the top ten include rupture of interstate relations (50.7%), and interstate conflicts (49.5%).

The growth of migration under the globalization influence has strengthened its role in societies actualizing the need to coordinate efforts to solve problematic situations related to migration. This confirms the growing attention to migration processes on the part of the authorities, scholars, politicians, and entrepreneurs. The globalization of social and economic processes and the war in Ukraine have become the basis for the outflow of the working population, leading to a decrease in the creative, intellectual, and innovative development potential of Ukraine's regions. The youth from the borderlands face the negative consequences of globalization and war in the form of growing inequality.

In wartime, the issue of migration becomes super important as the outflow of the most active and educated young people can significantly impact the transformations in Ukraine. New latent factors and tools for weakening national security appear. One of them is the activation of the conflict and migration potential of the border areas, which can also be used to further destabilize the social and political situation in the country.

Military conflicts and their consequences destructively impact the education system. War destabilizes the educational process, creates an unsafe environment, and causes challenges to students, educators, and society as a whole. The impact of military actions is displayed in the psychological traumatization of educational process participants, disruption of social ties, migration, and forced resettlement. The full-scale war of russia against Ukraine has significantly transformed all spheres of public life, including the higher

education system. In the face of constant security threats, economic instability, and humanitarian crises, universities have acquired a new meaning – not only as academic institutions, but also as an environment of social support, national consolidation, and strategic development.

Thus, of particular interest is obtaining an answer to the question of the life orientations of the youth at borderlands in martial law conditions. In light of these factors, this study focuses on the migration potential of the student youth in the borderlands of Ukraine.

The hypothesis is based on the assumption that the borderlands (in our case, the western borderland of Ukraine) can accumulate significant destabilization potential, in particular, for migration. Accordingly, constant monitoring of migration stability in the region is a necessary component of ensuring national security in terms of threats preventing or overcoming.

Literature review

According to the KOF Globalization Index (2021), Ukraine is not a powerful subject of globalization and is mentioned among the peripheral states due to both the level of its social and economic development and the role of the state within the cutting-edge world political "game of events and influences" (Friedman, 2012). Nevertheless, the war against Ukraine has tragic consequences for the global economy. It creates extremely negative messages for interaction and has a particular negative impact on the security of supply (Organisation for Economic Co-operation and Development, 2024).

Social transformations, political conflicts, wars, demographic growth, technological changes, etc. have always been accompanied by the displacement of people. Yuskiv (2009, p.7) argues that next to such defining spheres of human activity as financial, investment, and information globalization strengthened and changed, an important place is occupied by international migration, primarily labor.

Bobyr (2018), Khilkevych & Kudlai (2023), Riznyk et al. (2024) single out the complex consequences of the impact of globalization on Ukraine in wartime conditions, namely: the increase in labor migration of the population of Ukraine following the military actions on the territory of the state, the decrease in the competitiveness of domestic products at the international market, and the substitution of the development of certain branches of the national economy in favor of imported supplies.

Ukrainian borderlands are administrative territories along the state border of Ukraine with 7 states: russia (Donetsk, Luhansk, Kharkiv, Sumy, and Chernihiv regions), Belarus (Chernihiv, Kyiv, Zhytomyr, Rivne, and Volyn regions), Poland (Volyn, Lviv, and Zakarpattia regions), Slovakia and Hungary (Zakarpattia region), Romania (Zakarpattia, Ivano-Frankivsk, Chernivtsi, and Odesa regions), and Moldova (Chernivtsi, Vinnytsia, and Odesa regions). The rhythms of the borderland population significantly differ from central regions. Residents of the borderlands are socially mobile and enterprising.

Cross-border integration and mobility are usually explained through the number of cross-border interactions and concentrate mainly on physical borders. Two types of cultural processes are localized on the borderlands: crystallization of oppositions and mutual adaptation of interaction practices. Addressing these issues requires better governance of border regions, wider application of place-based approaches, removing mental and administrative barriers, and mainstreaming the territorial cooperation agenda into other programs (European Commission, 2022).

Novotný & Böhm (2022) claim that it is extremely important to keep border regions as attractive areas, sometimes people stay there just because they have a chance to work on the other side of the border or profit from the proximity of neighbors in a different way.

In the conditions of military operations in the border regions, the centripetal movement of the human and social capital of young people to the centers of gravity (megacities of neighboring countries) takes place.

At the same time, a particular social portrait of young people is shaped in such peripheral regions in the new frame of social interaction and the use of social resources built on multiculturalism, and cross-border movements. Hvozdetska et al. (2022) claim that this can be reflected in a new frame of multiculturalism (in the intensification of the study of Czech, Hungarian, Polish, Romanian, Slovak, and other languages; in a different light presentation of historical and cultural events important in neighboring countries), and within the cross-border financial practices. A critical number of young individuals leave Ukraine in search of way better employment possibilities, high wages, good medicine, and education. Thus, Ukraine loses an able-bodied population capable of working for its benefit.

The military operations against Ukraine have significantly accelerated all these processes. The migration of the intellectual elite takes place, leading to the destruction of the intellectual potential of the nation. These elements of the social portrait of Ukraine's population on the borderlands require much attention. Ignoring such trends can lead to negative and irreversible processes for Ukrainian statehood, and national security. The levers of young people retention in the Motherland are to be formed by high living standards and attractive working conditions, opportunities to grow and develop.

Under conditions of war, mechanisms of effective social-pedagogical activity in the educational environment require a comprehensive approach to functioning, namely a combination of psychological, pedagogical, and social support; flexibility and adaptability of activities with the possibility of changing curricula depending on the situation. Thus, social-pedagogical activity is reoriented on mental health recovery, social adaptation, and leveling up cohesion in the educational environment. Cohesion in the educational environment becomes the basis for a stable, safe, and supportive educational environment, contributing to the adaptation, development, and preservation of the mental health of educational process participants.

Thus, we are in favour of view of Bybyk & Savelchuk (2023), who identify the following main aspects of cohesion in the educational environment: (i) psycho-emotional support, which creates an atmosphere of trust, mutual assistance and security, reduces the level of stress, anxiety and fear; (ii) prevention of social isolation or inclusion in learning and socialization of people who have experienced trauma, lost their homes, or loved ones; (iii) formation of values of cooperation and responsibility through joint activities, e.g., volunteering, collective events, trainings, allowing educational process participants to learn to support each other, participate in community affairs, and develop a civic position; (iv) strengthening self-governance, as collective participation in solving of various issues in the activity of an educational institution through student self-government activates a sense of involvement, and responsibility; (v) community restoration as cohesive educational teams can become centers of local community renewal, organizing assistance to those in need, educational work, and cultural initiatives.

Methodology

In 2022, with the beginning of the invasion of Ukraine, the main task of Ukrainian higher education institutions was to provide security, assistance, and support to their students. Drohobych Ivan Franko State Pedagogical University is located in the Western part of Ukraine, namely in the Lviv region, a rear area with no active hostilities, however, hit by missile attacks with significant destruction of infrastructure.

The study results were obtained from a large sample database of students interviewed under a sociological study entitled "Sociological portrait of a Ukrainian first-year student in wartime: a comparative analysis". The online anonymous individual questionnaire involved first-year students of five faculties of Drohobych Ivan Franko State Pedagogical University (Lviv region, borderland of Ukraine): Faculty of Physics, Mathematics, Economics, and Innovation Technologies; Faculty of Ukrainian and Foreign Philology; Faculty of History, Pedagogy and Psychology; Faculty of Primary Education and Arts; and Faculty of Human Health and Natural Sciences.

Interviews took place during the second and third years of wartime in Ukraine: February 25th – March 12th, 2023, and February 20th – March 5th, 2024. The specific research tasks

addressed the study of identity issues of freshmen, the dynamics of their plans after completion of studies, and the migration attitudes over a time interval of one year.

General 2023 population: 619 freshmen. The 2023 sample size involved 410 respondents, in particular: 74.8% females and 25.2% males all aged 17 – 18 years; 71.4% of budgetary and 28.6% of contract form of education. General 2024 population: 566 freshmen. The 2024 sample size involved 338 respondents, in particular: 74.4% females and 25.6% – males all aged 17 – 18 years; 72.3% of budgetary and 27.7% of contract form of education. Method of sample formation: random.

We tried to understand the students` moods and feelings, their involvement in public and political life, as well as to assess how much students were capable of adapting to the learning process in war conditions, and their migration attitudes.

Quantitative monitoring research was conducted using an online survey using the Google Forms tool. The tool was chosen based on the prevailing conditions since the educational process took place in a mixed form - online and offline. The questionnaire consisted of an introductory part with the message on the purpose and instructions for filling out the questionnaire, as well as guarantees and assurances regarding the anonymity and confidentiality of the survey. It was noted that the system did not collect or record the email addresses of survey participants, the data obtained would be used only in a generalized form for research purposes, and the answers were valuable for developing a strategy to support students. The questionnaire included the following blocks of questions: adaptation and the learning process; public and political block; feelings and moods of students; plans and migration moods. The survey met the requirements of complete anonymity of the study, as the questionnaire did not contain questions on any personal information that could potentially identify students. It ensured complete confidentiality and contributed to providing honest and unbiased answers. Students were informed of the right to refuse to participate in the survey or to answer.

Results and Discussion

The answers to the question "Who do you feel you are first of all?" illustrate a critical increase in 2024 within the rate of those who consider themselves as citizens of Ukraine, namely from 42.6% in 2023 to 65.4% in 2024. At the same time, there is a critical diminish in the reactions concerning the feeling of being a representative of one's nationality (Table 1).

Table 1.
Who do you feel you are first of all? (%).

	2023	2024
A representative of the ethnic group, nationality	52.1	17.2
A citizen of Ukraine	42.6	65.4
A resident of the region I live in	2.2	2.9
A citizen of Europe	0.3	0.8
A citizen of the world	2.2	3.4
Other	0.6	10.3

During the war, an increase in the respondents' feeling of belonging to Ukraine as an independent state and, accordingly, a decrease in national belonging takes place. This is an unambiguously positive dynamic that speaks of a marker of the unity of the state and the preservation and regaining of its territorial integrity. The war is the main crystallizer of Ukrainian civic identity and other variants of territorial or national identity occupy a marginal or auxiliary place. The main markers of civic identity are language (mandatory use of it in the official sphere, in the system of education and activities of mass media, etc.), state symbols (anthem, flag, coat of arms of Ukraine), calendar of holiday dates (which commemorate significant events in the history of Ukraine, its outstanding persons), the Armed Forces (military actions in the country contribute to

the self-organization of individuals, unite belonging to one state as "we", thereby support a single system of values, beliefs, ideas on the state, one's country, oneself as a member of the political and social community, relegating national identity to the background with its ethnic content).

The answers to the question "Has war influenced the formation of your civic identity?" demonstrate a 4% decrease in feeling proud to be a citizen of Ukraine. 21% of 2024 respondents do not feel any changes in belonging to their civic identity (Table 2).

Table 2.
Has war influenced the formation of your civic identity? (%).

	2023	2024
I do not feel any changes in belonging to my civic identity	8.3	21
I feel less proud to be a citizen of Ukraine	0	1.3
I feel more proud to be a citizen of Ukraine	91.7	77.7

In 2021, the first response to the question "What does a Ukrainian currently think about Ukraine?" was "sadness". That is, the war brought the society not even from a passive, but from a depressed state. Today, such emotions as indifference and shame toward Ukraine are practically absent. Feeling of sadness and fear for the state's future explain the slight decline in feeling proud to be a citizen of Ukraine among young people. Nevertheless, despite the constant tension and negative emotions, young people feel pride in their native country and retain faith in victory and a bright future. That undoubtedly leaves a big mark on the national portrait of Ukrainians and will become the basis for the further transformation of society.

Practically, there are no significant changes in the students' responses regarding their plans to stay working in the borderland region after graduation. Still high percentage of students (43.4%) cannot decide on a strategy for the plans (Table 3). Part of them, potentially, consider a scenario of moving abroad. Here the duration of the war, the conditions of its course, and possible consequences for the border regions are to be taken into account. The picture and prospects of the plans can change depending on numerous factors, but the main one is the war.

Table 3.
Do you plan to stay and work in your region after graduation? (%).

	2023	2024
Yes	42.5	39.9
No	15.3	16.8
Don't know	42.2	43.3

The percentage of respondents willing to migrate permanently has decreased by 2.4% (Table 4).

Table 4.
After graduation do you plan to migrate abroad in pursuit of further education or better job opportunities? (%).

	2023	2024
Yes, I plan to migrate abroad permanently	7.9	5.5
Yes, I plan to migrate for a longer period, but I don't want to live abroad permanently	16.5	16.3
Yes, I plan to migrate for a shorter period	15.6	16
Don't know	47	46.2
I don't want to	13	16

Respondents who have decided to migrate after graduation provide the following reasons for it: low wages, no prospects, and no possibility for professional development (Table 5). Within the answers to this question,

there are more financial prerequisites for relocation, though the survey takes place during wartime. It appears that some kind of getting used to the war has taken place. The respondents become more worried about economic issues.

Table 5.
Reasons for migration (%).

	2023	2024
Low wages	20.6	18.9
No perspectives for the future	14.3	16.4
No possibilities for professional development	10.5	8.4
Insufficient chances for a decent standard of living	9.2	8.8
Lack of job opportunities	8.6	5
No possibilities for personal development	7.0	10.9
Everyone migrates	3.5	4.2
Provinciality prevails	2.9	2.1
Lack of entertainment, feeling bored	2.9	1.7

Among those respondents who plan to migrate to other countries, the USA predominates. This implies long-term migration, i.e. at least a year or more, possibly leading to the respondents' non-return. Poland is selected as the second-rated country for migration (Table 6). With Poland, this is where the shared historical, national, and cultural traditions of the borderland come into play.

Table 6.
The country of possible migration.

#	Country	%
1	the USA	16
2	Poland	8
3	Germany	5.5
4	Czech Republic	5
5	Canada	4.2
6	Italy	3.8
7	Great Britain	3.4
8	Spain	2.9
9	France	1.3
10	Israel, Slovakia, Lithuania, Japan, Hungary, Croatia, South Korea, Turkey	....

Bartosh (2021) claims that student age is a period of character formation and stabilization, of the most dynamic development of moral and aesthetic feelings, mastery of the full complex of social roles of an adult: civil, professional, and labor, etc. It is amid this period the economic activity of an individual, the inclusion in independent production activity, and the beginning of a labor story begin.

Gurba (2008) contends that student age is one of the foremost imperative life periods, being the age of an individual's social maturity prime.

Student years are also characterized by an intensive transformation of motivation, the entire system of value orientations, and the formation of special abilities in connection with professionalization. Therefore this age becomes the central period of the formation of character and intelligence. In general, student age is characterized by the achievement of the highest, "peak" results based on all previous processes of biological, psychological, and social development.

The issue of migration of young people is important, especially in Ukraine. The military operations against Ukraine significantly accelerated migration processes. Since the beginning of the war in Ukraine, more than 14

million Ukrainians (almost a third of the country`s population) have left their homes. 3.7 million remain internally displaced persons and more than 6.5 million Ukrainians are scattered around the world as refugees (The International Organization for Migration, 2024).

Security dangers proceed to pressure on Ukrainians, who live permanently in a state of forced search for a possible country for migration. In addition, the critical rearrangement of the procedures for crossing the border and getting the status of temporarily displaced persons from Ukraine influences the demographic situation in Ukraine.

Although 4.5 million have returned home from either abroad or displacement within the country in the cases of circumstance escalation, still 18% of Ukrainians may choose to migrate abroad for the period of the war (Gradus Research Company, 2024). As for youth aged 18–24 years:

- 22% consider such a possibility;
- 48% won't consider such a possibility.
- 30% – would like to, but there are restraining factors (lack of money to move; social obligations; lack of stable work and income in the desired country of relocation; unfamiliar language; unfamiliar environment; lack of acquaintances, and connections in the desired country of relocation; can't leave a relative/partner, etc. of military age; personal or family members health issues; lack of travel skills).

The probability of youth aged 18–24 years moving to another country permanently is the following: 21% consider such a possibility, 22% – would like to, but there are restraining factors, and 57% won't consider such a possibility (Gradus Research Company, 2024).

Kyiv International Institute of Sociology (2022) conducted the all-Ukrainian public opinion survey "Omnibus". By the indicators of national and citizen Ukrainian identity, the vast majority of the population consider themselves first of all as citizens of their country (Table 7; Table 8).

Table 7.
Who do you feel you are first of all? (distribution by regions, %).

	West	Center	South	East
A resident of the village, district, or city you live in	2.6	5.5	5.4	6.3
A resident of the region you live in	2.3	1.0	0.2	2.0
A citizen of Ukraine	85.6	84.1	86.3	80.7
A representative of the ethnic group, nation	7.0	2.6	1.4	1.5
A citizen of the former Soviet Union	0.1	0.8	1.3	2.3
A citizen of Europe	1.2	1.6	1.9	1.5
A citizen of the world	0.8	2.2	2.3	5.2
Other	0.0	1.1	0.6	0.5
	0.4	1.1	0.6	0.0

Table 8.
Who do you feel you are first of all? (distribution by age, %).

	18-29	30-39	40-49	50-59	60-69	70+
A resident of the village, district, or city you live in	5.0	4.1	2.4	7.3	5.4	5.0
A resident of the region you live in	1.6	0.7	1.5	1.8	1.5	0.7
A citizen of Ukraine	81.7	85.9	89.9	85.9	84.0	78.1
A representative of the ethnic group, nation	5.1	3.9	2.4	1.0	1.1	7.1
A former Soviet Union citizen	0.0	0.5	0.0	0.6	2.1	3.2
A citizen of Europe	2.5	1.3	2.0	1.1	1.1	1.3
A citizen of the world	3.7	2.2	1.6	1.6	3.5	0.9
Other	0.4	0.6	0.2	0.3	0.7	1.5
Don't know	0.0	0.9	0.0	0.4	0.7	2.3

The results of the survey "Independence Day of Ukraine: the path to victory, the identity and value of the state against the war background" conducted by Ilko Kucheriv Democratic Initiatives (2023a) demonstrate that if the referendum on Ukraine's state independence is to be held today, the absolute majority of Ukrainians (82%) will stand for Ukraine's independence, in particular – 94% in the West of the country, 68% and 70% – in the South and East, respectively. Against – 3% in the country as a whole, with less than 1% in the West, and about 7% in the East. Support for independence has reached its highest point. The absolute majority of Ukrainians (almost 89%) feel proud of their citizenship with 95% in the Western, 90% Central, and 89% Southern macro-regions, slightly less in the East of Ukraine (76%).

Rating: Sociological Group (2023) researches Ukrainians' opinions on their feelings, patriotism, attitudes towards the language, and the vision of Ukraine`s future. Among the main feelings, the respondents specify: pride (74%), sadness (43%), fear (17%), outrage (13%), joy (10%), shame (7%), interest (5%), and indifference (1%). The respondents, residing in Ukraine, feel more proud. The displaced people overseas feel pity and fear. Pride is felt more by the older respondents, pity and fear – by middle-aged individuals. The respondents, who speak Ukrainian or two languages, mention more often the feeling of being proud. Sorrow is noted more often by those who speak Russian.

Concerning the feelings of patriotism, the interviewees choose to speak Ukrainian (45%), donate, and volunteer (46%). Approximately a third understand patriotism as being on the front, residing and working in Ukraine, and more than a quarter – being fascinated by the history of Ukraine. Buying Ukrainian goods, consuming Ukrainian content, and engaging in public activities are chosen by 9-14% of respondents, attending Ukrainian church – 6%, knowing the anthem – 4%, wearing Ukrainian symbols – 3% (Rating: Sociological Group, 2023).

The respondents currently residing in Ukraine choose to stay, work, and do business in Ukraine. Displaced people abroad, on the opposite, choose the alternatives to donate and volunteer, to be engaged in social activities, and to consume Ukrainian goods and content. Communicating in Ukrainian is considered similarly patriotic for both interviewees in Ukraine and refugees overseas (Rating: Sociological Group, 2023).

For the younger generation, patriotism is performed in donating and volunteering, serving at the front, being fascinated by the history of Ukraine, and being engaged in social activities. For the middle-aged – to work and do business in Ukraine, and for the older ones – to stay and reside in Ukraine. Ukrainian-speaking interviewees more regularly specify communication in Ukrainian as a sign of patriotism whereas Russian-speaking interviewees more regularly mention working and doing business in Ukraine (Rating: Sociological Group, 2023).

The survey on the "Results of 2023: public opinion of Ukrainians" (Ilko Kucheriv Democratic Initiatives Foundation, 2023b) demonstrates that war affects the daily life of the absolute population majority (95%), 61% of whom define this influence as decisive. War defines the lives of people regardless of their age. Only among young people (18–29 years old), the share of those strongly impacted by war is lower than in other age groups. But even among young people, this indicator reaches 54%.

The integrity of the state of Ukraine and its future advancement to a great extent depends on the young people as tomorrow they will take a driving part in social processes. Young individuals, having high mental potential, and the capacity to see the future in new paradigms, characterized by mobility and adaptability, can impact the social processes, and determine the future trajectory of social improvement.

The borderlands of Ukraine are characterized by intense contact between ethnic groups, which produces unique identities and identification practices – it is an environment of double and complex identity. At Ukraine's peripherality, dual identity at the local level turns into dual loyalty. Zhurba and Shkilna (2023) claim that the formation of civic identity among the student youth becomes an urgent task of modern education, aimed at involving young people in nation-building processes and active public life. The civic

identity of an individual is an important determinant of its semantic horizon, which is determined by identification with the civic community, the state, culture, and language. Important characteristics of civic identity in the vertical plane is the level of respect and trust in authorities. In the horizontal plane – in fellow citizens, as well as pride in the country, a sense of national dignity and patriotism, and readiness to defend the country.

Civic resilience reflects national character and solidarity in everyday life and within the conditions of war and post-war times, the ability to stand up for hostile ideology and informational impacts. In this way, the formation of civic identity among higher education students is to be based on: civic values, historical truth and historical memory, national self-awareness and national dignity, democracy, self-organization, and patriotism.

The results of our survey, conducted at the western borderland of Ukraine correlate with the results of nationwide surveys.

Universities in times of crisis serve as a safe environment where students can find academic and psychological support. Joint activities within volunteer initiatives, project activities, and cultural events, develop a sense of belonging to the academic and national community. A sense of belonging is closely related to the concept of identity, and therefore to the ability to withstand challenges and maintain internal motivation to act. The cohesion of the academic community is manifested in supporting internally displaced persons and organizing the educational process in crisis conditions. Universities, as an environment for interpersonal interaction, contribute to the integration of students from different regions and social groups. Universities launch mentoring programs, career counseling, and internships in the public sector or public organizations. Thus, an active citizen, capable of contributing to the country's restoration, is formed. Universities actively involve students in volunteering, supporting the Armed Forces of Ukraine, organizing information campaigns, holding public hearings, and conducting debates. This position has a long-term impact, laying the foundations of a democratic society. In addition, universities offer training according to the "glocal" model – globalized education with an orientation to local needs, which contributes to the retention of youth in the regions (Kremen, 2023).

Youth migration intentions are often associated with the loss of a sense of security and prospects. A university that ensures the continuity of the educational process, access to international programs, psychological support, and social guarantees is a powerful means of reducing the risks of educational and labor migration (UNESCO, 2023). In times of war and new challenges, Drohobych Ivan Franko State Pedagogical University implemented important humanitarian initiatives. In the first days of military aggression, students and educators set up a volunteer center, which coordinated the organization of international humanitarian aid (receiving, sorting, and distribution of food and hygiene products); the collection of funds and medicines for the needs of the Armed Forces of Ukraine; the weaving of camouflage nets and production of trench candles; the provision of psychological assistance to internally displaced persons; the training in providing first aid; the joint activities with the Drohobych community; the organization of information support. Educators, ensuring cohesion in the educational environment, were focused on preventing psychological traumatization of educational process participants, preventing social ties disruption, migration, and forced resettlement. (Drohobych Ivan Franko State Pedagogical University, 2022; Drohobych Ivan Franko State Pedagogical University, 2024c). Participants of the scientific circle "Student Volunteer Practices in the Educational Environment" became the initiators of the event "Box of Warmth for the Armed Forces of Ukraine" aimed at collecting necessary things for soldiers, in particular: coffee, tea, socks, dry gels for hands and feet, energy drinks, sweets, cookies. The most valuable items in the boxes of warmth were handmade postcards and letters from students with gratitude to soldiers (Drohobych Ivan Franko State Pedagogical University, 2024a). By their initiative, the students implemented the charitable project "Franco-drone" to purchase FPV drones to support the Armed Forces of Ukraine (Drohobych Ivan Franko State Pedagogical University, 2024b).

Conclusions

It is difficult to underestimate the social significance and importance of the study results since the preservation of social and political stability is one of the key national interests of any state, and even more so of Ukraine, which is in a state of war de facto. The loss of territory, economic capacities, and human resources due to the destabilization of the social and political situation, military operations, and the occupation of several border regions affect the potential and development opportunities of the Ukrainian state.

Identifying potential and real risks of destabilization of the social and political situation in the borderlands, prevention, and reduction of the level of conflict in society also impact the social and economic dimension. Social stability improves the investment attractiveness of the region, relieves social tension, contributes to the development of the tourism industry, and a stable flow of funds to the state treasury. It prevents the mass outflow of the labor force abroad.

The functioning of the border is a valuable source for research. Social, ethnic, electoral, and, in particular, migration factors can be used to destabilize the situation not only at the borderlands. They can also lead to a full-scale war with global consequences. The arsenal of hybrid means of destabilization includes inciting interethnic enmity, the language issue, interfering in the election process, initiating separatist movements, manipulating public consciousness, and creating an atmosphere of uncertainty and fear. Therefore, the monitoring of the impact of the specified factors on the national security of the state should be carried out constantly, based on relevant scientifically based tools.

In wartime, universities as academic institutions also become a center of social stability, psychological support, and national integration. Their role in forming a sense of belonging, supporting professional self-determination, activating civic position, and preventing youth migration is key to preserving the country's human capital. Systematic support and modernization of university education is considered a strategic priority of state policy in the war and post-war periods.

The results of the study are based on a sample database of surveyed students of a higher education institution during the second and third years of the continuing war in Ukraine. According to the study results, the vast majority of students have a strong feeling of being citizens of Ukraine, and there is a significant decrease in the responses regarding the feeling of being a representative of one's nationality. The war in Ukraine has influenced the formation of youth civic identity and the vast majority of students feel proud to be a citizen of Ukraine. 39.9% of students plan to stay and work in the borderland region after graduation. Among the main reasons for migration are low wages and poor prospects for the future in the borderland region. Still, a very high percentage of those who plan to migrate abroad in pursuit of further education or better job opportunities for a longer or shorter period, and those who have not made the decision yet are observed.

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