Check for updates

DOI: https://doi.org/10.46502/issn.1856-7576/2025.19.03.6

Cómo citar:
Shanina, O., Melikova, K., Boichuk, V., Stryzhakov, A., & Filimonova, T. (2025). The impact of information technologies on the personal and professional maturity of students. *Revista Eduweb*, *19*(3), 89-107. https://doi.org/10.46502/issn.1856-7576/2025.19.03.6

The impact of information technologies on the personal and professional maturity of students

El impacto de las tecnologías de la información en la madurez personal y profesional de los estudiantes

Olha Shanina
Candidate of Philological Sciences, Associate Professor at the Department of Social Sciences, Odesa National Medical University, Ukraine.
https://orcid.org/0000-0001-5435-171X
olga.shanina@onmedu.edu.ua
ResearcherID: MCK-3526-2025
Kateryna Melikova
PhD Student, Taras Shevchenko National University of Kyiv, Ukraine.
https://orcid.org/0009-0006-5755-3329
katerina.bk9999bk@ukr.net
ResearcherID: NJT-1573-2025
Vitalii Boichuk
Doctor of Pedagogical Sciences, Professor, Professor of the Department of Digital Technologies and Vocational Education, Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, Ukraine.
https://orcid.org/0000-0002-1082-3962
boichuk1974@ukr.net
ResearcherID: F-6242-2019
Artem Stryzhakov
PhD in Pedagogics, Doctoral Student, Volodymyr Vynnychenko Central Ukrainian State University, Ukraine.
https://orcid.org/0000-0003-1407-939X
sao-84@ukr.net
ResearcherID: ITT-0216-2023
Tetiana Filimonova
Candidate of Pedagogical Sciences, Associate Professor at the Department of Primary Education, Admiral Makarov National University of Shipbuilding, Ukraine.
https://orcid.org/0000-0002-6722-6333
tatiana.filimonova15@gmail.com
ResearcherID: ABG-1107-2021

Recibido: 05/07/25
Aceptado: 26/08/25

Abstract

The content focuses on students' personal and professional maturity and the key qualities that can help future specialists succeed in modern opportunities. It highlights basic principles of information technologies, including their functions and structural components, in applying computer learning technologies to develop students' maturity in higher education. Virtual reality is introduced as a new technology for non-contact information interaction, allowing students to experience the illusion of direct presence in real time through a multimedia environment presented on a stereoscopic "screen world". The results from the initial phase

of the study confirmed the need to incorporate well-founded pedagogical conditions and a comprehensive system to foster students' personal and professional maturity through the use of information technologies, creating better conditions for development in higher education. Across all criteria, the levels of personal and professional maturity among students in the experimental group, who used information technologies, were significantly higher than those in the control group. This supports the effectiveness of the proposed pedagogical conditions and the system designed for developing students' maturity through information technology integration.

Keywords: development of personal and professional maturity of students, higher education, information technologies, virtual reality, system for the development of personal and professional maturity of students.

Resumen

El contenido se centra en la madurez personal y profesional de los estudiantes y en las cualidades clave que pueden ayudar a los futuros especialistas a alcanzar el éxito en las oportunidades actuales. Destaca los principios básicos de las tecnologías de la información, incluyendo sus funciones y componentes estructurales, en la aplicación de tecnologías de aprendizaje computacional para desarrollar la madurez de los estudiantes en la educación superior. Se introduce la realidad virtual como una nueva tecnología para la interacción de información sin contacto, que permite a los estudiantes experimentar la ilusión de presencia directa en tiempo real a través de un entorno multimedia presentado en un "mundo de pantalla" estereoscópico. Los resultados de la fase inicial del estudio confirmaron la necesidad de incorporar condiciones pedagógicas sólidas y un sistema integral para fomentar la madurez personal y profesional de los estudiantes mediante el uso de las tecnologías de la información, creando así mejores condiciones para el desarrollo en la educación superior. En todos los criterios, los niveles de madurez personal y profesional de los estudiantes del grupo experimental que utilizaron tecnologías de la información fueron significativamente superiores a los del grupo de control. Esto respalda la eficacia de las condiciones pedagógicas propuestas y del sistema diseñado para desarrollar la madurez de los estudiantes mediante la integración de las tecnologías de la información.

Palabras clave: desarrollo de la madurez personal y profesional de los estudiantes, educación superior, tecnologías de la información, realidad virtual, sistema para el desarrollo de la madurez personal y profesional de los estudiantes.

Introduction

Through the lens of self-realization and personal self-awareness features, changes are occurring due to globalization in almost all areas of human life – society, politics, culture, and economy. The rapid growth of information and communication technologies, rethinking human existence, information warfare, and intense socio-political conflicts demand versatility and adaptability from individuals, aligned with modern transformations. In contemporary higher education, there are issues impacting the development of students' personal and professional maturity. Many educational institutions focus solely on transmitting academic knowledge, which can result in insufficient emphasis on developing social and emotional intelligence, critical thinking, leadership, and problem-solving skills. Students often have limited ability to concentrate on personal growth, and some universities lack the resources to nurture each student's personality development. Competition for ratings sometimes diverts attention from self-development, and some institutions cling to traditional teaching methods that do not foster active personality growth. Educational programs tend to emphasize academic achievements while neglecting values, qualities, and skills necessary for the well-rounded development of students. At the same time, higher education needs to incorporate key qualifications and competencies – new meta-educational constructs – into the professional training of specialists. From the definition of key competencies and qualifications, and their structural features, it’s clear that, besides skills, abilities, and knowledge, they should also include cognitive qualities, personality traits, and professional behavior patterns (Montalvan et al., 2024).

In all spheres of development of society, a powerful tool for accelerating progress is modern information technologies, which make it possible to provide effective ways of presenting information, to create, store, and process professional information, which determines the competitiveness of an industry, region, country, educational institution, or individual organization. In the process of using and creating information technologies, an important role belongs to the higher education system as a powerful base of applied and fundamental scientific research, as the main source of highly qualified personnel. The specificity of higher education is that it is an active producer and consumer of information technologies, with the help of which the personal and professional maturity of students in higher education develops (Soares & Martins, 2020). The insufficient scientific elaboration and relevance of the problem of developing personal and professional maturity of students in higher education through the introduction of information technologies, its theoretical and practical significance, determined the choice of the topic of our study.

Literature Review

Pavai et al. (2021) at the university, pedagogical specialists during the training of specialists, revealed the features of the development of personal and professional maturity in future teachers. The scientist considers personal and professional maturity as a systemic, multidimensional formation that ensures the self-organization of the individual's professional and life path, the establishment of constructive relationships with others, and the achievement of inner harmony.

In vocational and technical educational institutions, the solution to the problem of developing students' personal and professional qualities in the process of their preparation for professional activity is shown. Through the development of students' personal and professional qualities, the process of preparation for activity is implemented, which will contribute to the successful career development of the student's personality, success, and self-realization in life. Personality is considered a carrier of personal and professional qualities. The blocks of leading personal and professional qualities of a future specialist are described, and the criteria for personal and professional development of a student are provided. In the process of professional training of a future specialist, a program for developing personal and professional qualities of a student is presented for use in the training of students of vocational and technical educational institutions (Campaña-Jiménez et al., 2019).

Casimiro Urcos et al. (2019) proves that the leading direction of development of personal and professional maturity of students in higher education should be providing assistance in mastering a certain professional position through the introduction of information technologies; assistance in overcoming standards, forms of relationships, types of activities, which in the process of professional training is appropriate, but negatively affects the process of professional activity. It is emphasized that in the process of training future specialists in the future, work should be carried out to develop personal and professional maturity of students in higher education through the introduction of information technologies to prevent the negative impact of professional activity.

Human maturity – social and personal maturity – is considered by Głowacka et al. (2020) as a deep psychological formation. The scientist identifies the following psychological features of a mature personality: developed high self-esteem, positive self-acceptance – self-concept; value-meaningful sphere of a person's life – understanding of what "I want"; full social adaptation to life, developed social intelligence; ability to establish feedback social connections in the structure of interpersonal communication and interaction; ability to make choices, make decisions, bear responsibility for one's own actions; ability to see one's own mistakes, ability to introspect, overcome life crises; presence of developed creative abilities, striving for creative potential, self-actualization; openness to experience, self-knowledge, formed worldview, etc.

The socio-pedagogical maturity of a teacher is the subject of Kaslow et al. (2022) research. Social maturity is an indicator of the level of formation of the teacher's personality, which is manifested in social responsibility, in an active life position, which is expressed in social self-determination, in social activity in the performance of basic social functions; it characterizes the orientation towards socially significant goals

of the student's personality, which indicates the degree of coincidence of personally significant motives of activity with the motives necessary in society. The scientist analyzes the state of personality development in which social qualities of a person are formed, which arise as a result of achieving a level of development, which, in the aggregate, reveal the social essence of the personality itself.

In the conditions of a pedagogical college, de Frutos-Belizón et al. (2020) studied the development of personal and professional maturity of students in higher education, the formation of the self-concept of a future teacher, and identified factors and psychological mechanisms of its formation, where the nature of the teacher's relationship with students plays an important role. The scientist developed methods and means of forming a positive "self-concept" of a future teacher.

The study of Manske & Staffen (2021) is devoted to the study of the process of professional formation of the personality of a future teacher, the main trends of the relationship, and the study of the peculiarities of reflection and self-reflection of the pedagogical activity of future teachers. The author proves that "an important component of the formation of a professional teacher is the development of his pedagogical self-awareness through the development of the ability to reflection, which also acts as a basic feature in the system of professional qualities of a teacher".

The content and importance of digital competence of future specialists in professional and educational activities were revealed by Lima et al. (2022). The content is revealed, and the practical application of the scientific database DigCompEdu, which can be adapted to the implementation of educational programs, is shown. The tasks and levels of digital competence of students are considered, and the role of personal and professional maturity of students in higher education is shown. The researchers “identified the principles of designing a digital educational environment and the principles, approaches, functions, and levels of forming the digital competence of a future specialist”.

However, the analysis of scientific sources has shown the absence of special studies in the process of professional training of specialists on the development of personal and professional maturity of students in higher education. Therefore, the Identification of the features of the development of personal and professional maturity of students in higher education through the introduction of information technologies became the subject of our study.

Purpose of the research – to develop and prove the effectiveness of the proposed pedagogical conditions and the developed system for the development of personal and professional maturity of students through the introduction of information technologies.

Methodology

To achieve the goal of the study, a complex of empirical and theoretical research methods was used: **theoretical** – analysis of psychological, pedagogical, methodological and philosophical literature in the field of education in order to clarify the essence of personal and professional maturity, mechanisms and basic approaches to its development; analytical method using generalization and comparison techniques, interpretation in order to analyze research sources; systematization and classification of approaches to personal and professional maturity of students; **empirical** – methods of self-assessment, content analysis, observation, questionnaires, interviews to determine the level of personal and professional maturity of students; a formative experiment was used to verify the effectiveness of the developed pedagogical conditions and the developed system for the development of personal and professional maturity of students in higher education through the introduction of information technologies; statistical methods were used to verify the reliability of the results and quantitative analysis of the obtained experimental research data. Research work during 2023-2024 was carried out in stages.

At the theoretical stage, psychological and pedagogical sources were analyzed on the research problem, and the practice of personal and professional training of future specialists in higher education institutions

was studied; the purpose of the study was specified, the materials of the empirical study were systematized and generalized; the methodology of the experimental study was developed, the criteria, indicators, and levels of personal and professional maturity of students were determined.

At the diagnostic stage, the state of formation of students' personal and professional maturity was checked; scientific and methodological support for the process of students' personal and professional maturity was developed; methods of empirical research were specified; a formative experiment was prepared.

At the experimental stage, a research and experimental verification of the pedagogical conditions for the development of students' personal and professional maturity was carried out; intermediate results of the study were analyzed; scientific and methodological support was adjusted.

At the final stage, the results of the formative experiment were summarized, conclusions were formulated, and prospects for further research were determined.

To diagnose the level of students' personal and professional maturity during the experimental study, certain criteria, indicators, and levels were used. We analyzed, classified, systematized, and compared the general results based on the data obtained.

Using the results of the diagnostics, at the beginning of the experiment, we identified the levels (high, medium, low) of personal and professional maturity of students in the control and experimental groups, confirmed the absence of statistically significant differences, and conducted the necessary comparison with the levels in the distribution of students by each criterion (motivational, personal).

Based on the comparison of empirical indicators and levels of personal and professional maturity of students in the control and experimental groups, the reliability of the conclusions drawn was assessed by testing our assumption using the Pearson consistency criterion (χ^2).

The ascertaining stage of the experiment was aimed at determining the initial state of formation of students' personal and professional maturity, during which the traditional organization of the educational process was carried out.

The ascertaining section covered 68 respondents.

We focused on the previously identified criteria and indicators when assessing the initial level of students' personal and professional maturity.

The results of the ascertaining stage of the study confirmed the need to introduce into the educational process substantiated pedagogical conditions and a developed system for the development of students' personal and professional maturity through the introduction of information technologies, which would provide more favorable conditions for the development of students' personal and professional maturity in higher education through the introduction of information technologies.

An analysis of the results of the experimental verification of the effectiveness of substantiated pedagogical conditions and a developed system for the development of students' personal and professional maturity through the introduction of information technologies, which would provide more favorable conditions for the development of students' personal and professional maturity in higher education through the introduction of information technologies, was conducted and presented. Assessing the effectiveness of substantiated pedagogical conditions and the developed system for the development of students' personal and professional maturity through the introduction of information technologies, we focused on certain criteria that comprehensively reflect the main aspects of the specified phenomenon: motivational, personal. We conducted two diagnostic sections for the purpose and plan of the experimental work: at the beginning and after the completion of the formative stage. The final diagnosis of the levels of personal and professional

maturity of students in the experimental group and the control group was carried out using a set of methods that were used at the ascertaining stage of the study.

Experimental verification of the effectiveness of substantiated pedagogical conditions and the developed system for the development of students' personal and professional maturity through the introduction of information technologies was carried out throughout 2024.

In order to conduct the formative stage of the experiment, two groups were formed – an experimental group (35 people) and a control group (37 people). We involved 4th-year students in the formative stage of the study.

At the beginning of the study, an initial check of the homogeneity of the experimental group and the control group was carried out, and the absence of statistically significant differences between the groups in terms of the personal and professional maturity of future specialists was proven. We used a non-parametric (Pearson χ^2) consistency criterion to implement this task.

To confirm the initial absence of statistically significant differences between the control group and the experimental group in the distribution of the levels of personal and professional maturity of future specialists, a null hypothesis (H0) was formulated: the differences between the levels identified during the first diagnostic section of the development of students' personal and professional maturity are random in the experimental and control groups.

The statistical significance level $\alpha = 0.05$ chosen by us is considered sufficient for pedagogical research.
A mandatory condition for use at the next, formative stage is the proof that at the initial stage, the control group and the experimental group did not differ at a statistically significant level in the levels of development of personal and professional maturity of future specialists.

In the experimental group, justified pedagogical conditions were implemented. A system for developing personal and professional maturity of students was developed through the introduction of information technologies, information technologies, innovative forms, techniques, and methods of educational professional activity were used. Pedagogical support for the professional and personal development of future specialists was provided.

The training of students in the control group was carried out using traditional methods.

Since, according to all criteria, the levels of development of personal and professional maturity of students in higher education institutions through the introduction of information technologies in the experimental group turned out to be significantly higher than in the control group, this gives grounds to assert the effectiveness of justified pedagogical conditions and the developed system for developing personal and professional maturity of students through the introduction of information technologies. Thus, the results of the experiment confirmed the effectiveness of substantiated pedagogical conditions and the developed system for the development of students' personal and professional maturity through the implementation of information technologies.

Results and Discussion

The content of students' personal and professional maturity and the main qualities that will provide modern opportunities for a future specialist, and contribute to the development of students' personal and professional maturity in higher education.

Professional training of future specialists should be aimed at developing personal qualities of the individual, at developing personal and professional maturity of students in higher education, and not only at mastering skills and professional knowledge. The ability to establish constructive relationships between students in

the pedagogical process and support their personal development depends on this. An indispensable tool for educational influence on students is the personality of a teacher in higher education. A personally immature teacher, as studies show, can have a destructive effect on their formation and subconsciously transfer their own problems to students. Such a teacher cannot help a student develop harmoniously. The development of personal and professional maturity of students in higher education through the introduction of information technologies should become one of the main tasks of their professional training. It is necessary to help students self-define professional values and life values, form a professional identity, develop their own professional position, form a readiness for self-regulation of professional activity and reflection, and develop professionally important personal qualities (Rocha & Salvi, 2017).

In the modern explanatory psychological dictionary, maturity is defined as the longest period of ontogenesis, which is characterized by a tendency to achieve the highest development of the physical, intellectual, and spiritual abilities of the individual. This is the period when a person shows endurance, inner harmony, and stability, which allows them to function effectively in various spheres of life. Maturity includes the development of emotional stability, the ability to self-organize, moral values, and social skills. This is a state when a person reaches the peak of social development and the peak of development of their psychological state (Acosta Herrera et al., 2018).

Personal and professional maturity of students in higher education is considered a systemic multidimensional education of a future specialist, as a qualitative characteristic of a personality that ensures self-organization of the professional path and life path, the establishment of constructive relationships with other people, and the achievement of inner harmony (Rodríguez-Abitia et al., 2022).

Modern post-industrial society is a society of information technologies, unlike the industrial (late 19th – mid-20th centuries) society, which is much more interested in its citizens being able to flexibly adapt to changing living conditions, make decisions, act actively and independently, and have developed personal and professional maturity.

Let's name the qualities that can provide such modern opportunities for a future specialist and contribute to the development of personal and professional maturity of students in higher education:

- Involving each student in active cognitive activity, an active cognitive process, and not in passive mastering of knowledge.
- Involving each student in applying knowledge in practice and a clear understanding of the purpose of applying this knowledge.
- Wide communication with peers from other universities in the world, other regions of the country.
- Identifying appropriate communicative skills for cooperation in solving various problems.
- Constant testing of one's moral, intellectual, and physical strength to solve emerging problems, performing various social roles, and the ability to solve them through joint efforts.
- Free access in the information centers of higher education to the necessary information in scientific, information, and cultural centers around the world, and not only in one's own educational institution, to form one's own reasoned and independent opinion on a particular professional problem.

Higher education must create conditions for the development of personal and professional maturity of students in higher education who possess the above-mentioned qualities. This task can be solved by innovative learning technologies, not by the content of education. Currently, there is a need for distance education based on modern information technologies, and not only in face-to-face education. Electronic means are increasingly used as sources of information, and telecommunication global networks, the Internet, play a great role in providing students with information.

The information approach is aimed at improving the means of mastering communication technologies and information flow in the process of developing the personal and professional maturity of students in higher education.

The use of computer learning technologies in the process of developing the personal and professional maturity of students in higher education aims to:

1. Prepare the individual for life in the information society.
2. Develop students' skills to work with information to develop the personal and professional maturity of students in higher education.
3. Increase the volume of educational material for students to use in practical activities and creative mastery of professional knowledge.
4. Develop the skills to make optimal decisions and research skills, etc. (de León Sigg et al., 2023).

Fundamental principles in information technologies, functions, and structural components in the application of computer learning technologies in the process of developing the personal and professional maturity of students in higher education.

Let us name the principles that are fundamental in information technologies:

- Adaptation (adaptation of the computer and computer technologies of education to the individual characteristics of the student).
- Controllability (when developing the personal and professional maturity of students in higher education, the teacher can correct this process).
- Dialogic nature of the development of the personal and professional maturity of students in higher education.
- Diverse interaction of the student with the computer and computer technologies (object-subject, subject-subject, subject-object).
- Optimal combination of group work and individual work.
- Unlimited development (content of the personal and professional maturity of students, its interpretation and addition).
- Support of a state of psychological comfort when communicating with the computer.

When using computer learning technologies in the process of developing students' personal and professional maturity in higher education, the teacher mainly performs the following functions:

- Organizes the educational process in a group to develop students' personal and professional maturity in higher education (draws up a schedule of the educational process, carries out final control, and external diagnostics).
- Coordinates and activates students' actions, manages the local network, provides instruction, etc.
- Provides individual assistance to higher education applicants in the development of personal and professional maturity, observes students, and establishes personal contact with students.
- Prepares components of the information environment for work (software systems and tools, etc.), ensuring the connection between the development of students' personal and professional maturity and the subject content of the educational course (Leal Uhlig et al., 2023).

Informatization of learning in order to develop students' personal and professional maturity requires teachers and students to have computer literacy, which is a special part of the content of information technologies (Jorente, 2012).

Virtual reality is a new technology of non-contact information interaction in the development of personal and professional maturity of students, which realizes the illusion of direct presence in real time using a multimedia environment in a stereoscopically presented "screen world". Among the objects of the virtual world, the illusion of the user's location in such systems is continuously created. Glasses-telemonitors are used instead of a conventional display, which continuously show changing pictures of events in the virtual world (Ninamango Santos et al., 2023).

Let us highlight the structural components of the personal and professional maturity of students in higher education:

- Self-concept − attitude towards oneself (satisfaction with one's knowledge, skills and abilities, temperament, character, one's abilities, confidence in one's capabilities, high demands on oneself, adequate self-esteem).
- Motivation for achievement (the desire for complete self-realization, the orientation of the individual's activities towards independence, significant life goals, the desire for leadership, initiative, achieving high results).
- Life attitude (the predominance of the rational over the emotional, understanding of the relativity of the meaning of life, prudence, emotional balance).
- Sense of civic duty (interest in socio-political life, patriotism, sense of professional responsibility).
- Ability to psychological closeness with other individuals (empathy, goodwill towards people, the need for spiritual closeness with other people, the ability to listen) (Colorado-Aguilar & Edel-Navarro, 2015).
- A positive attitude towards the world, positive thinking – an integral basic component that determines a positive view of the world (Monteiro & Façanha, 2025).
- Responsibility is what distinguishes a socially immature personality from the average norm.
- Tolerance is sensual and dispositional.
- Self-development and self-actualization are difficult to live with and be an ideal person (Cortés et al., 2019).

Organization of the study.

Research work during 2023-2024 was carried out in stages.

At the theoretical stage, psychological and pedagogical sources were analyzed on the research problem, and the practice of personal and professional training of future specialists in higher education institutions was studied; the purpose of the study was specified, the materials of the empirical study were systematized and generalized; the methodology of the experimental study was developed, the criteria, indicators, and levels of personal and professional maturity of students were determined.

At the diagnostic stage, the state of formation of personal and professional maturity of students was checked; scientific and methodological support for the process of personal and professional maturity of students was developed; methods of empirical research were specified; a formative experiment was prepared.

At the experimental stage, a research and experimental verification of the pedagogical conditions for the development of personal and professional maturity of students was carried out; intermediate results of the study were analyzed; scientific and methodological support was adjusted.

At the final stage, the results of the formative experiment were summarized, conclusions were formulated, and prospects for further research were determined.

To diagnose the level of personal and professional maturity of students during the experimental study, certain criteria, indicators, and levels were used. We analyzed, classified, systematized, and compared the general results based on the data obtained.

It was necessary to verify the statistical reliability of the identified changes, which are due to the proposed system for developing the personal and professional maturity of students.

The effectiveness of personal and professional maturity of students will be proven if the studied qualities of respondents in the control and experimental groups do not differ statistically at the beginning of the experiment, and after the implementation of pedagogical conditions at the selected level of significance,

differ statistically according to the specified indicators and criteria. Therefore, in the process of our study, using mathematical statistics methods, we conducted two diagnostic sections of the levels of personal and professional maturity of students in the control and experimental groups: at the beginning of the experiment (when the indicators do not differ statistically in both groups) and at the end (when changes in the indicators make it possible to assess the implemented innovations, efficiency through the implementation of information technologies).

Using the results of the diagnostics, at the beginning of the experiment, we identified levels (high, medium, low) of personal and professional maturity of students in the control and experimental groups, confirmed the absence of statistically significant differences, and conducted the necessary comparison with the levels in the distribution of students by each criterion (motivational, personal).

A comparison of the results of personal and professional maturity of students in the control and experimental groups obtained by each criterion after the implementation of the developed pedagogical conditions and the innovative system will show changes in the levels of personal and professional maturity of both groups of students.

In the experimental group, compared to the control group, in the case of a statistically significant increase in the number of students with a high level of personal and professional maturity of students and a simultaneous decrease with a low level according to the specified criteria, there will be justified grounds to conclude about the positive impact of the developed pedagogical conditions and the innovative system on the dynamics of the levels of personal and professional maturity of students.

Based on the comparison of empirical indicators and levels of personal and professional maturity of students in the control and experimental groups, the reliability of the conclusions drawn was assessed by testing our assumption using the Pearson consistency criterion (χ^2).

Results of the ascertaining stage of the pedagogical study.

The ascertaining stage of the experiment was aimed at determining the initial state of formation of students' personal and professional maturity, during which the traditional organization of the educational process was carried out.

The ascertaining section covered 68 respondents.

We were guided by the previously identified criteria and indicators when assessing the initial level of students' personal and professional maturity.

According to the identified criteria, the study was conducted in four stages.

The ascertaining stage showed that in 31% of respondents, the orientation towards activity is dominant, which is manifested in an increased interest in mastering professional skills and knowledge, a sense of the need for professional self-realization, and a desire to master modern techniques and methods in future activities.

In 39% of respondents, self-affirmation, orientation towards oneself, and achieving personal success were dominant. For such self-directed students, the desire for leadership, the developed ability to produce new ideas, creative imagination, motivate others to implement them are inherent. At the same time, they are characterized by the desire for professional self-affirmation and self-improvement.

For 30% of respondents, the leading factor is the formation of partnership relations and positive relationships in the team, cooperation.

Generalization of the results of the ascertaining experiment by the motivational criterion indicates the prevalence among respondents of the average level, 43% and the low level, 29% of personal and professional maturity of students in higher education institutions.

A high level of personal and professional maturity of students in higher education institutions, by this criterion was found in 28% of respondents.

We determined the level of personal and professional maturity of students in higher education institutions according to the personal criterion. In particular, at the ascertaining stage, we assessed the formation of such personal, professionally important qualities in the respondents as tolerance, subjectivity, identity, reflexivity, internality, and empathy.

The achieved status of personal and professional maturity of students, their professional identity, and the ability to holistically and specifically imagine their future profession are characteristic of 25% of students.

23% of students are characterized by an unformed professional position, fragmented ideas about future professional activities, and unstable professional plans.

22% of respondents have a status of professional predetermined identity, who made the choice of profession not independently, but under pressure from parents or other influential people. Such respondents, who are satisfied with their status and do not intend to change anything in their lives, have stable ideas about future activities, but these ideas were formed not as a result of their own reasoning, but as a result of the perception of external influences.

30% of respondents were diagnosed with a moratorium status – uncertainty of their professional position, as a result of which their self-esteem is somewhat reduced, and they feel the need for self-improvement.

Generalization of the results of the ascertainment experiment by personality criterion shows that the ability to empathize, sympathize, and emotionally respond to the feelings of colleagues was most developed among respondents (Fig. 1):

- 20% of respondents had a high level of development of this quality.
- 59% had an average level.
- 21% had a low level.

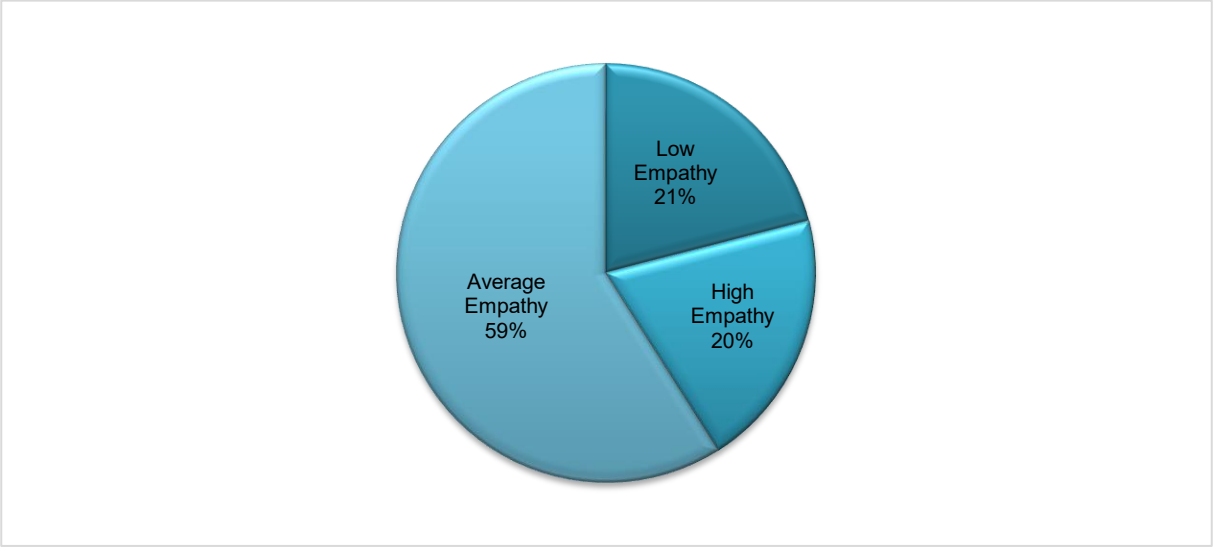

Fig. 1. Distribution of Empathy Levels Among Respondents.

Relatively high indicators of formation among respondents are tolerance, readiness for constructive interaction with other people (Fig. 2):

- 23% of respondents are characterized by a high level of development of this quality.
- 40% – an average level of development of this quality.
- 37% – a low level of development of this quality.

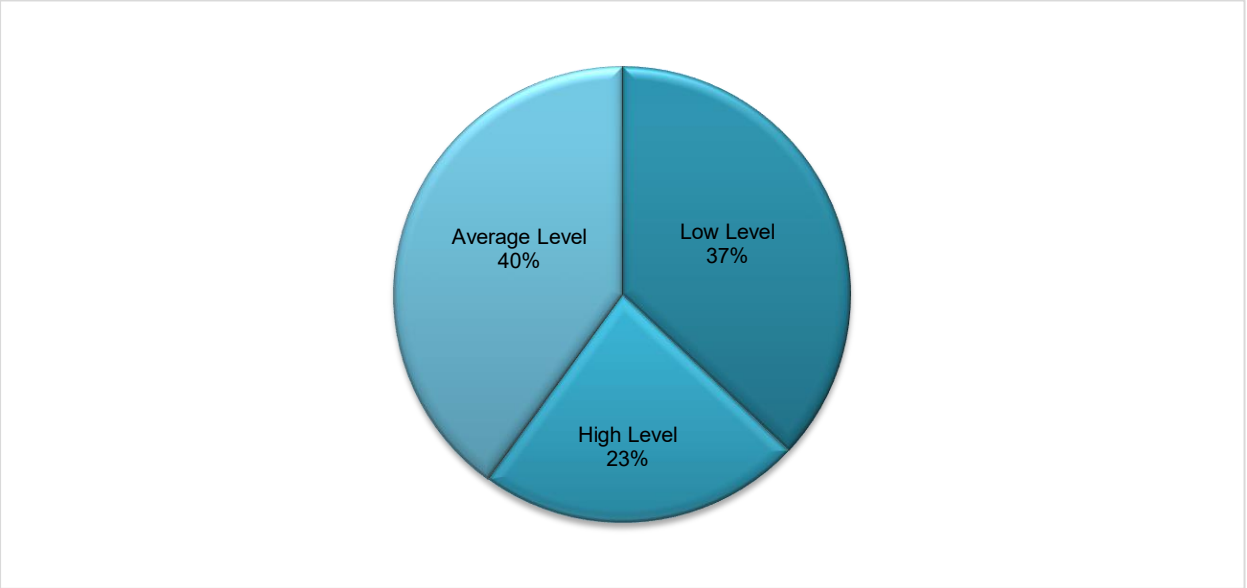

Fig. 2. Distribution of Tolerance and Constructive Interaction Levels.

The generalization of the results of the ascertaining experiment indicates a relatively low level of development of the internal locus of control – internality among students (Fig. 3):

- 20% of respondents demonstrate a high level of development of this quality.
- 43% – average.
- 37% – low.

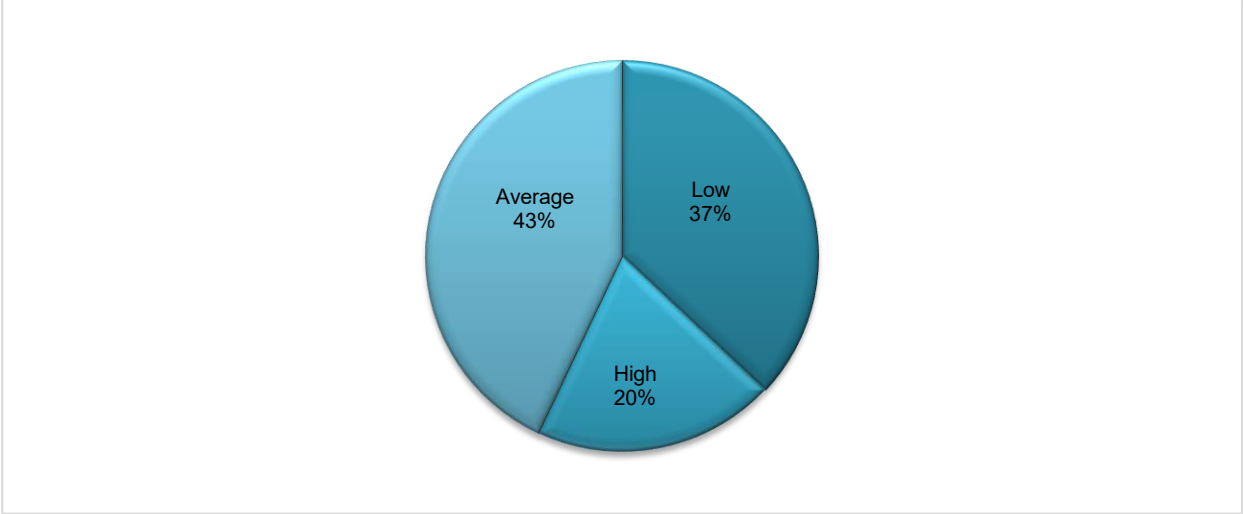

Fig. 3. Distribution of Internal Locus of Control Among Students

Students with a low level of internality tend to interpret all events and do not feel able to control the development of events, which influences their lives.

Thus, the results of the ascertaining stage of the study confirmed the need to introduce into the educational process substantiated pedagogical conditions and a developed system for the development of students' personal and professional maturity through the introduction of information technologies, which would provide more favorable conditions for the development of students' personal and professional maturity in higher education through the introduction of information technologies.

Based on the specifics of students' professional training and the generalization of the research results, the pedagogical conditions for the development of students' personal and professional maturity through the introduction of information technologies in the higher school environment were substantiated.

The first pedagogical condition is associated with the formation of an educational, creative information environment, which helps to introduce opportunities for students to demonstrate subjective forms of activity into the educational process. At the same time, the higher school environment acts as a creative and autonomous general profiling factor in the development of future specialists, contributes to their personal and professional maturity, and creates a single information space of all educational components, which is formed by combining the autonomous position of self-government subjects and the creative position of students.

The second pedagogical condition for the development of students' personal and professional maturity is associated with the activation of reflective processes, which ensure the formation of an active, transformative attitude towards oneself, the objectification of personal qualities, and methods of activity. At the same time, the implementation of this very condition in order to activate students' personal and intellectual reflection involves the use of methodological techniques that stimulate critical analysis, self-knowledge of one's own activities and personality, and provide feedback on value orientations.

The third pedagogical condition for the development of students' personal and professional maturity includes the dialogization of the pedagogical process through the introduction of information technologies in the higher school environment, which takes place in the form of a professional partnership between students and teachers, oriented to the individual experience of teachers, their self-determination, self-organization, and self-realization.

Analysis of the results of experimental testing of the effectiveness of substantiated pedagogical conditions and the developed system for developing students' personal and professional maturity through the introduction of information technologies, which would provide more favorable conditions for the development of students' personal and professional maturity in higher education institutions through the introduction of information technologies.

Assessing the effectiveness of substantiated pedagogical conditions and the developed system for the development of students' personal and professional maturity through the introduction of information technologies, we focused on certain criteria that comprehensively reflect the main aspects of the specified phenomenon: motivational, personal. We conducted two diagnostic sections for the purpose and plan of the experimental work: at the beginning and after the completion of the formative stage. The final diagnosis of the levels of personal and professional maturity of students in the experimental group and the control group was carried out using a set of methods that were used at the ascertaining stage of the study.

Experimental verification of the effectiveness of substantiated pedagogical conditions and the developed system for the development of students' personal and professional maturity through the introduction of information technologies was carried out throughout 2024.

In order to conduct the formative stage of the experiment, two groups were formed – an experimental group (35 people) and a control group (37 people). We involved 4th-year students in the formative stage of the study.

At the beginning of the study, an initial check of the homogeneity of the experimental group and the control group was carried out, and the absence of statistically significant differences between the groups in terms of the personal and professional maturity of future specialists was proven. We used a non-parametric (Pearson χ^2) consistency criterion to implement this task.

To confirm the initial absence of statistically significant differences between the control group and the experimental group in the distribution of the levels of personal and professional maturity of future specialists, a null hypothesis (H0) was formulated: the differences between the levels identified during the first diagnostic section of the development of students' personal and professional maturity are random in the experimental and control groups.

The statistical significance level $\alpha = 0.05$ chosen by us is considered sufficient for pedagogical research. A mandatory condition for use at the next formative stage is the proof that at the initial stage, the control group and the experimental group did not differ at a statistically significant level in the levels of development of personal and professional maturity of future specialists.

In the experimental group, justified pedagogical conditions were implemented, and a system for the development of personal and professional maturity of students was developed through the introduction of information technologies, information technologies, innovative forms, techniques, and methods of educational professional activity were used, and pedagogical support for the professional and personal development of future specialists was provided.

The training of students in the control group was carried out using traditional methods.

After the completion of the formative stage, a final diagnostic section was carried out according to the criteria already approved during the ascertaining stage – motivational, personal.

Diagnosis of the levels of personal and professional maturity of respondents for each criterion of the control group and the experimental group provided for a final check: at the beginning of the experiment, the first cut, after the end of the experiment, the second cut.

Analysis of the dynamics of the level indicators of the development of personal and professional maturity of future specialists of both groups became possible after the completion of the formative stage of the experiment and determination on this basis of the effectiveness of substantiated pedagogical conditions and the developed system for the development of personal and professional maturity of students through the introduction of information technologies.

Let us show the changes that occurred in the experimental and control groups in the levels of personal and professional maturity of respondents by the motivational criterion.

Between both groups at the beginning of the formative experiment, in the levels of development of personal and professional maturity of students by the motivational criterion, there were no significant differences. It should be noted that the average and low levels prevailed.

After completing the formative stage of the study in the EG, as a result of the application of justified pedagogical conditions and the developed system for the development of personal and professional maturity of students through the introduction of information technologies, we observe in the EG students (Fig. 4):

- 48% – high level of personal and professional maturity according to the motivational criterion.
- 45% – average level of personal and professional maturity according to the motivational criterion.
- 7% – low level of personal and professional maturity according to the motivational criterion.

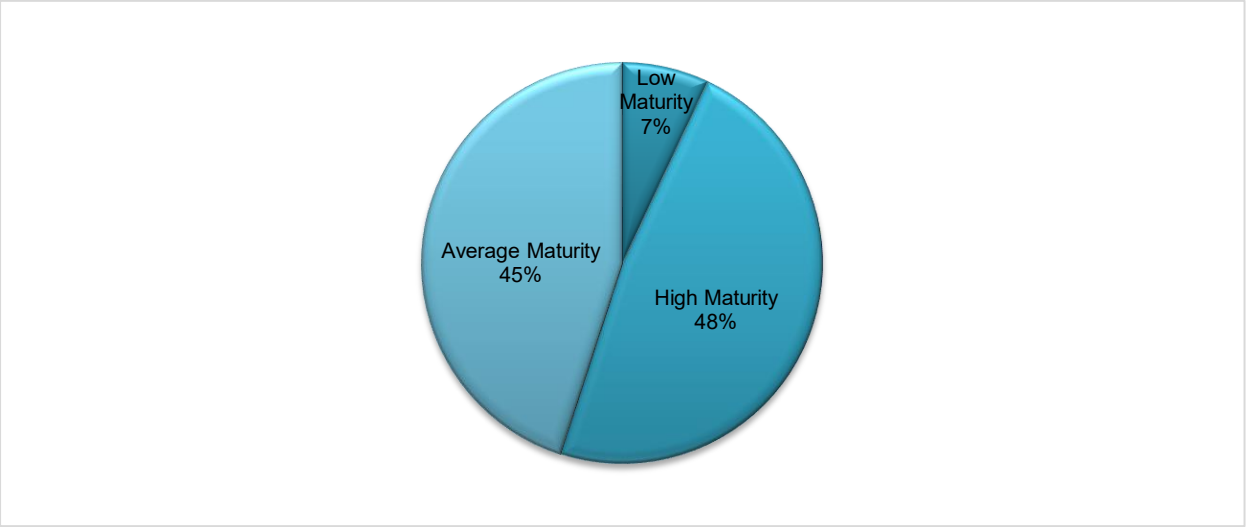

Fig. 4. Distribution of Personal and Professional Maturity Levels in EG Students.

After the completion of the formative stage of the study in the CG, where our innovations were not implemented, we also observed certain positive changes in the development of students' personal and professional maturity according to the personal criterion, but not as significant as in the EG at the final stage. The following were recorded (Fig. 5):

- 21% − high level of personal and professional maturity according to the personal criterion.
- 58% − average level of personal and professional maturity according to the personal criterion.
- 21% − low level of personal and professional maturity according to the personal criterion.

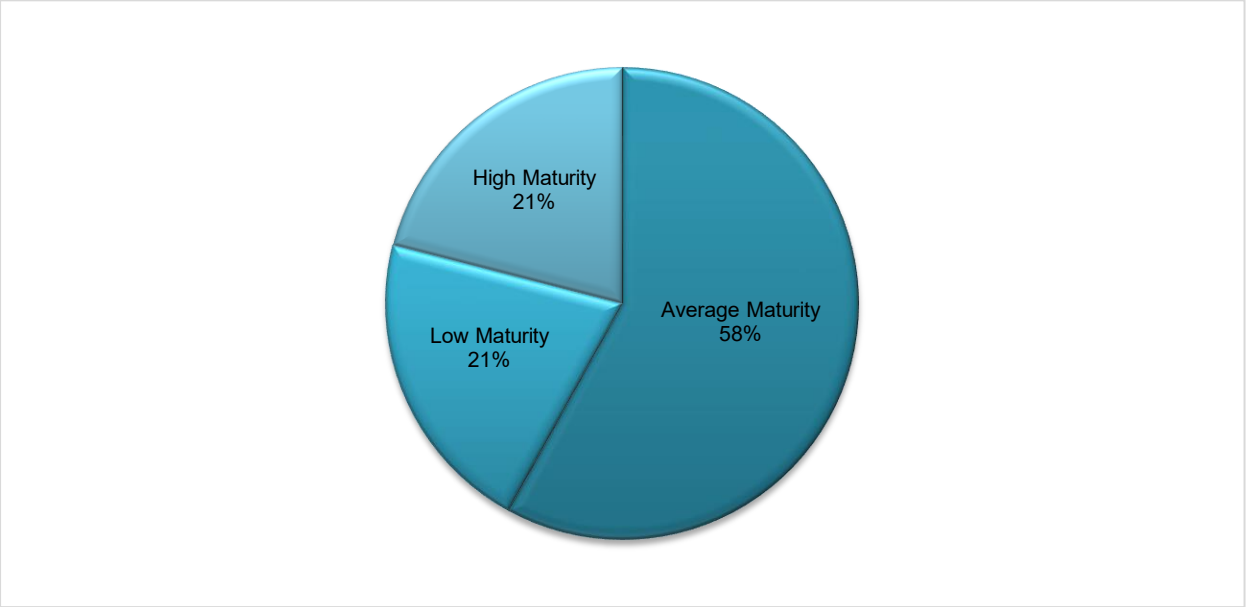

Fig. 5. Distribution of Personal and Professional Maturity Levels in CG Students.

Using the Pearson χ^2 consistency criterion, the statistical significance of the changes was checked.

Let us put forward (H0) the statistical hypothesis that the differences between the identified levels of development of personal and professional maturity of students during the first diagnostic section of the control and experimental groups by the motivational criterion are random and (H1) the alternative hypothesis to it – the differences by the studied characteristic between the groups (CG and EG) are non-random.

At the significance level α=0.05, we will use the Pearson χ^2 consistency criterion, with a reliability of the results of 95%.

We calculated the empirical statistics of the χ^2 criterion by substituting our numerical indicators into the formula.

Since χ^2e (0.5450) turned out to be less than χ^2 0.05 (5.991), there are no grounds at the ascertaining stage of the study of the randomness of the differences between the levels of development of personal and professional maturity of respondents in the experimental group and the control group for rejecting the null hypothesis both by the motivational and personal criteria at the initial stage of the experiment. Thus, the validity of the null hypothesis at the beginning of the experiment about the insignificance of the differences in the distribution of respondents in the experimental and control groups by the personal criterion of personal and professional maturity was proven; the differences between the indicators of the control group and the experimental group were statistically unreliable.

After the completion (second cut) of the formative stage of the experiment for the significance level α = 0.05, the empirical value of the criterion χ^2e was 9.0455, which is greater than the critical χ^2 0.05 (5.991). Therefore, we rejected the null hypothesis and say that in the distribution of levels at the final stage, the differences in the personal and professional maturity of the respondents of the control group and the experimental group are statistically significant according to all criteria.

Since, according to all criteria, the levels of development of personal and professional maturity of students in higher education institutions through the introduction of information technologies in the experimental group turned out to be significantly higher than in the control group, this gives grounds to assert the effectiveness of substantiated pedagogical conditions and the developed system for the development of personal and professional maturity of students through the introduction of information technologies.

Thus, the results of the experiment confirmed the effectiveness of substantiated pedagogical conditions and the developed system for the development of personal and professional maturity of students through the introduction of information technologies.

Statistically significant qualitative and quantitative changes occurred according to all diagnostic criteria in students of the experimental groups, which manifested themselves in the positive dynamics of the general levels of their personal and professional maturity through the introduction of information technologies.

The results obtained give grounds for concluding that the implementation of pedagogical conditions and a well-founded innovation system in the educational environment of the university activates the development of personal and professional maturity of students through the introduction of information technologies and provides a significant positive dynamic of their professional development than the traditional practice of training specialists in higher education.

Conclusions

The content of students' personal and professional maturity and the main qualities that will provide modern opportunities for the future specialist and contribute to the development of students' personal and

professional maturity in higher education are revealed. The fundamental principles in information technologies, functions, and structural components in the application of computer learning technologies in the process of developing students' personal and professional maturity in higher education are described. Virtual reality is represented by a new technology of non-contact information interaction in the development of students' personal and professional maturity, which realizes the illusion of direct presence in real time using a multimedia environment in a stereoscopically presented "screen world".

The results of the ascertaining stage of the study confirmed the need to introduce into the educational process substantiated pedagogical conditions and a developed system for the development of students' personal and professional maturity through the introduction of information technologies, which would provide more favorable conditions for the development of students' personal and professional maturity in higher education institutions through the introduction of information technologies.

An analysis of the results of the experimental verification of the effectiveness of substantiated pedagogical conditions and the developed system for the development of students' personal and professional maturity through the introduction of information technologies was conducted and presented, which would provide more favorable conditions for the development of students' personal and professional maturity in higher education through the introduction of information technologies.

We conducted two diagnostic sections according to the goal and plan of the experimental work: at the beginning and after the completion of the formative stage.

At the beginning of the study, an initial check of the homogeneity of the experimental group and the control group was carried out, and the absence of statistically significant differences between the groups in terms of indicators of personal and professional maturity of future specialists was proven. We used a non-parametric (Pearson χ^2) consistency criterion to implement this task.

In the experimental group, justified pedagogical conditions were implemented, and a system for developing students' personal and professional maturity through the introduction of information technologies was developed. Information technologies, innovative forms, techniques, and methods of educational professional activity were used, and pedagogical support for the professional and personal development of future specialists was carried out.

The control group students were trained using traditional methods.

Since, according to all criteria, the levels of development of personal and professional maturity of students in higher education through the introduction of information technologies in the experimental group turned out to be significantly higher than in the control group, this gives grounds to assert the effectiveness of justified pedagogical conditions and the developed system for developing students' personal and professional maturity through the introduction of information technologies. Thus, the results of the experiment confirmed the effectiveness of justified pedagogical conditions and the developed system for developing students' personal and professional maturity through the introduction of information technologies.

Further research is needed to develop methodological recommendations for the development of personal and professional maturity of students in higher education.

Bibliographic references

Acosta Herrera, R. A., Martínez Vázquez, Á. B., Salazar Sánchez, M. E., Sánchez Soto, M. A., & Albán Navarro, A. D. (2018). Reflexiones sobre el impacto de la tecnología en el proceso aprendizaje en la Educación Superior. *Revista Dilemas Contemporáneos: Educación, Política y Valores, 6*(Edición Especial), 29. https://dilemascontemporaneoseducacionpoliticayvalores.com/index.php/dilemas/article/view/754

Campaña-Jiménez, R. L., Gallego-Arrufat, M. J., & Muñoz-Leiva, F. (2019). Estrategias de enseñanza para la adquisición de competencias en formación profesional: perfiles de estudiantes. *EDUCAR, 55*(1), 203–229. https://doi.org/10.5565/rev/educar.876

Casimiro Urcos, C. N., Casimiro Urcos, W. H., & Casimiro Urcos, J. F. (2019). Desarrollo de competencias profesionales en estudiantes universitarios. *Revista Conrado, 15*(70), 312–319. Recuperado a partir de https://conrado.ucf.edu.cu/index.php/conrado/article/view/1143

Colorado-Aguilar, B. L., & Edel-Navarro, R. (2015). La usabilidad de TIC en la práctica educativa. *Revista de Educación a Distancia (RED), (30)*. https://revistas.um.es/red/article/view/232611

Cortés, J., García, S., Ortega, J., Torres, A., & Zamorán, M. (2019). Development of digital competencies for professional performance in university students. In *Proceedings of the 11th International Conference on Education and New Learning Technologies* (pp. 7605–7609). Palma, Spain. https://doi.org/10.21125/edulearn.2019.1838

de Frutos-Belizón, J., Fernández-Pérez de la Lastra, S., García-Carbonell, N., Guerrero-Alba, F., Martín-Alcázar, F., Perea-Vicente, J. L., Ruíz-Martínez, M., & Sánchez-Gardey, G. (2020). Enhancing the required skills and abilities of the human resources university master's student for the HR department of an organization. In *Proceedings of the 14th International Technology, Education and Development Conference* (INTED2020) (pp. 2599–2603). https://doi.org/10.21125/inted.2020.0785

de León Sigg, M., Villa Cisneros, J. L., Solís Recéndez, B. E., & Castañeda Ramírez, C. H. (2023). Percepción y actitud sobre el trabajo en equipo entre estudiantes de tecnologías de información. *Journal Educational Innovation/Revista Innovación Educativa, 23*(93), 10–27. https://acortar.link/po8zUQ

Głowacka, E., Kisilowska, M., & Paul, M. (2020). Patterns of differentiation of students' competencies: A comparative study. *College & Research Libraries, 81*(7), 1061–1079. https://doi.org/10.5860/crl.81.7.1061

Jorente, M. J. V. (2012). Impacto das Tecnologias de Informação e Comunicação: cultura digital e mudanças sócio-culturais. *Informação &Amp; Sociedade: Estudos, 22*(1). https://periodicos.ufpb.br/index.php/ies/article/view/12672

Kaslow, N. J., Farber, E. W., Ammons, C. J., Graves, C. C., Hampton-Anderson, J. N., Lewis, D. E., Lim, N., McKenna, B. G., Penna, S., & Cattie, J. E. (2022). Capability-informed competency approach to lifelong professional development. *Training and Education in Professional Psychology, 16*(2), 182–189. https://doi.org/10.1037/tep0000392

Leal Uhlig, E. F., Garza León, C., Cruz Vargas, X., Hernández Franco, S., & Portuguez-Castro, M. (2023). Lëttëra web platform: A game-based learning approach with the use of technology for reading competence. *Frontiers in Education, 8*, 1180283. https://doi.org/10.3389/feduc.2023.1180283

Lima, M. A. M., Maciel, I. M. de O., Vasconcelos, S. O. S., Coelho, N. S., & Pereira, A. B. de Q. (2022). A percepção dos docentes do PARFOR sobre a aprendizagem no ensino remoto: Avaliação do uso das tecnologias. *Revista on Line De Política E Gestão Educacional, 26*(00), e022124. https://doi.org/10.22633/rpge.v26i00.15766

Manske, G. S., & Staffen, L. W. (2021). A influência das tecnologias da informação nas experiências vivenciadas no espaço da educação infantil. *Educação, 46*(1), 1–16. https://doi.org/10.5902/1984644447099

Montalvan, R. A. V., Neto, A. A., & Neumann, C. (2024). Developing soft skills in the business classrooms of industrial engineering students in Brazil. *Journal of International Education in Business, 17*(2), 304–318. https://doi.org/10.1108/JIEB-11-2023-0092

Monteiro, J. C. da S., & Façanha, L. da S. (2025). As TIC no centro da (re)configuração social do século XXI. *Texto Livre, 18*, e56501. https://doi.org/10.1590/1983-3652.2025.56501

Ninamango Santos, N. J., Medina Coronado, D., Llanos Castilla, J. L., Castillo Silva, E. V., & Ramos Moreno, J. M. (2023). Desarrollo de la competencia argumentativa mediada por tecnologías para el aprendizaje. *Universidad Y Sociedad, 15*(4), 403–412. Recuperado a partir de https://rus.ucf.edu.cu/index.php/rus/article/view/3993

Pavai, P. S., Geetha, K., Vigneshwari, J., & Suganthi, L. M. (2021). Investigation of relation between decision making and self-actualization. *Materials Today: Proceedings, 37*(S1, Part 2), 785–788. https://doi.org/10.1016/j.matpr.2020.06.002

Rocha, M. A., & Salvi, R. F. (2017). Principles of significant critical learning on continued teachers' formation. *Geosaberes, 9*(17), 1–14. https://doi.org/10.26895/geosaberes.v9i17.627

Rodríguez-Abitia, G., Sánchez-Guerrero, M. de L., Martínez-Pérez, S., & Aguas-García, N. (2022). Competencies of information technology professionals in Society 5.0. *IEEE Revista Iberoamericana de Tecnologías del Aprendizaje, 17*(4), 343–350. https://doi.org/10.1109/RITA.2022.3217136

Soares, A. B., & Martins, H. P. (2020). Adaptabilidade de carreira, maturidade para escolha profissional e habilidades sociais na adaptação à universidade em estudantes universitários. *Conhecimento & Diversidade, 12*(26), 9–23. https://doi.org/10.18316/rcd.v12i26.5420