

# The Effectiveness of using Information Verification Services in the Training of Future Teachers

SVITLANA GERGUL<sup>1</sup>, LARYSA GORODNYCHA<sup>2</sup>, MARYNA OLKHOVYK<sup>3</sup>,  
VALENTYN PANCHENKO<sup>4</sup>

<sup>1</sup>Foreign Philology and Educational Technologies Department, Faculty of Philology,  
T.H. Shevchenko National University “Chernihiv Colehium”,  
Hetmana Polubotka str., 53, Chernihiv,  
UKRAINE

<sup>2</sup>Foreign Languages Department, Faculty of Philology,  
T.H. Shevchenko National University “Chernihiv Colehium”,  
Hetmana Polubotka str., 53, Chernihiv,  
UKRAINE

<sup>3</sup>Philosophy and Culturology Department, Faculty of Philology,  
T.H. Shevchenko National University “Chernihiv Colehium”,  
Hetmana Polubotka str., 53, Chernihiv,  
UKRAINE

<sup>4</sup>Department of History of Ukraine, Archeology, and Local History,  
O.M. Lazarevsky Educational and Research Institute of History, Social Sciences and Humanities,  
T.H. Shevchenko National University “Chernihiv Colehium”,  
Hetmana Polubotka str., 53, Chernihiv,  
UKRAINE

*Abstract:* - The ability to effectively use media resources and critically assess their informational content for reliability is gaining particular relevance in the current realities of socio-economic interactions. The article aimed to determine the effectiveness of information verification services in training future teachers and improving their subject knowledge, critical thinking, and problem-solving skills in the digital space. The research used empirical methods such as experimentation, testing, surveying, quantitative assessment, and qualitative analysis. The educational experiment was implemented using Microsoft Teams, Zoom, and Telegram. The participants in the experimental training tested digital tools, services, and platforms for verifying media information. Educational training had a qualitative effect on the results of students' studies in the main course. The final exam grade of students in the experimental group (EG) was 10.5 points higher than those in the control group (CG). An interactive media literacy test was developed based on the Digital and Media Literacy (DML) Skills Test scale, which was implemented using a mobile application on the SkillzRun platform. The results of the student survey confirmed the effectiveness of training programs on the development of critical media skills among the EG students for deepening knowledge of the main subject and improving the memorization of the main material (93%), increasing general interest and motivation to study course materials (87%), increasing learning effectiveness in general (93%). Research prospects are to identify the factors influencing the elements of media literacy on the effectiveness of student learning and to conduct a comprehensive analysis of the impact using the qualitative comparative analysis method fsQCA.

*Key Words:* - media literacy, information reliability, fact-checking tools, critical thinking, problem-solving skills, future teachers.

Received: May 26, 2024. Revised: December 27, 2024. Accepted: January 28, 2025. Published: April 28, 2025.

## 1 Introduction

In the current reality, social Internet platforms have taken a leading position in the information market,

playing the role of intermediaries between news content creators and consumers. Disinformation is widely distributed in today's digital ecosystem,

where information is increasingly consumed through social networks, [1]. In this regard, fact-checking, or verification, which includes processes and methods for checking the veracity of information distributed through media channels, is particularly important. This relevance is observed both at the level of individual information consumption and at the level of national interests of the countries of the world, which increasingly focus political initiatives around information and media literacy development. For example, in Ukrainian realities, the key reasons for the concentration of political and educational initiatives around national media literacy are countering disinformation and information propaganda of hostile narratives. Digital media are closely integrated into all spheres of social relations, so their influence on public opinion dynamics is tangible, manifested in forming and disseminating public attitudes in social Internet networks, [2]. According to Ukrainian researchers, [3], social reality is actively shaped within the online network space through the use of hate speech. It influences identity formation, international communication, moral and legal relationships, and societal tolerance levels and serves as a marker of xenophobia and aggression. According to Indian researchers, [4], fake news threatens democratic societies and political systems by stirring hatred through various means, including fake and manipulated content. It is important to raise the image of a digital media literacy culture to stop the spread of unreliable media data. The negative effects of hostile information and psychological influence can be mitigated by cultivating a critical thinking approach, and fostering reflective and evaluative mental processes to reshape one's worldview, explore life values, and establish hierarchy, [5]. According to [6], enhancing public awareness through media literacy and critical thinking initiatives is essential for creating a more informed society.

Research into integrating digital tools into educational content for developing students' digital, information, and media literacy—key competencies of the 21st century—has become increasingly relevant. This is because the nature, speed, and success of innovation across various fields heavily rely on the effectiveness of educational advancements, [7]. Educational practices supplemented with the functions of digital services have a huge educational potential, which can be fully revealed only through the implementation of educational programs for the development of media literacy.

There are concerns in academic discourse that generative artificial intelligence (Gen AI) can negatively affect students' critical thinking skills, [8]. This concern emphasizes the relevance and importance of expanding educational programs with additional educational initiatives to develop students' metacognitive thinking skills of a higher order and master digital and information literacy. With the growing accessibility of AI tools, it is essential for universities to offer training that focuses on developing skills for their responsible and sustainable use. Both teachers and students need to understand the benefits and limitations of AI tools to ensure their effective and ethical application. Incorporating the responsible use of AI tools and database platforms while fostering critical thinking and information evaluation should be a key focus in digital and media literacy educational programs, [9].

Media literacy and fact-checking are becoming key skills for a modern teacher who applies innovative approaches to teaching, such as problem-based, practical, and active discussion learning. The integration of these methods requires teachers to be able to incorporate relevant media content into the educational process.

A teacher must have a high level of digital and media literacy to ensure the reliability and trustworthiness of educational data. This includes the ability to effectively interact with digital information, media platforms, and various tools and applications, which allows for the successful integration of media into the educational process.

Critical is the ability to assess the reliability of the information, recognizing fake news and manipulation in the media. Teachers must know how to verify the authenticity of media content using digital fact-checking tools, which helps ensure high-quality information used in teaching.

These skills are especially relevant in instructional design when teachers adapt the educational program to modern realities. This makes learning more interesting and meaningful for students, promoting their engagement and developing critical thinking. Ultimately, developing media literacy in teachers enriches the educational process and forms the necessary competencies in students for successful functioning in the information society.

The aim of the article is to study the effectiveness of information verification services in training future teachers to improve their subject knowledge, critical thinking, and problem-solving skills in the digital environment. The aim involved the fulfillment of the following research objectives:

- analyze the possibilities of digital tools and services for the verification of media information to improve educational activities, namely: 1) tools for the verification of media messages (ClaimBuster, TruthNest, Hoaxy, Factmata, WeVerify, Sentinel), 2) tools for detecting plagiarism, checking the originality of content and detecting content created by AI (ZeroGPT, AI Copyleaks); 3) tools for checking images and videos for authenticity (TinEye, InVID, Google Reverse Image Search); 4) online services and resources for the verification of media information in Ukraine (Lead Stories, FactCheck.org);

- evaluate the effectiveness of the educational approach to the development of critical media analysis skills in improving learning outcomes;

- develop an interactive test of the level of media literacy based on the Digital and Media Literacy (DML) Skills Test scale and test the level of development of media literacy skills among students using a mobile application on the SkillzRun platform;

- Carry out a comparative assessment and analysis of the level of development of media literacy among the EG and CG students after the end of the educational experiment;

- assess the feasibility of implementing additional educational activities on media literacy for students of pedagogical majors.

## 2 Literature Review

Information literacy helps teachers to make optimal decisions in their work, while digital literacy opens up new opportunities for pedagogical creativity and improving pedagogical effects. But the issue of information quality and reliability comes to the fore, especially at the stage of making pedagogical decisions in view of the modern realities of the development of the networked Internet space. Making effective data-driven decisions requires high-quality data. Unfortunately, data from the media space is often incomplete, contradictory, or inaccurate. A sufficient level of scientific credibility is achieved through their careful analysis and evaluation, [10]. The data quality issue becomes more important in the era of AI development when such models as ChatGPT, Midjourney, and SlidesAI can generate information content at the user's request, [11]. Developments in the field of GenAI can radically change the approach to information and media literacy, [12].

The widespread dissemination of misinformation has increased the demand for fact-checking, which is the evidence-based evaluation of

the truth or falsity of a statement, [13]. This has contributed to developing and improving fact-checking resources covering different formats and content, functionalities and purposes, geographic perimeters, and scales. The key task of verification is to assess the reliability of factual statements based on reliable data and background knowledge. Fact-checking helps to identify misinformation and curb its spread. According to [14], the fact-checking principles are usually grounded on transparency, neutrality, impartiality, fairness, and openness, but the approaches and methodology used for fact-checking are always diverse. The multimodal aspect of digital information poses new challenges in the fact-checking procedure, with the need to include more complex and sophisticated approaches. Various methodologies lead to using multifunctional services, platforms, and fact-checking tools. Validation tools tend to have a more specialized function and target professional users, while the open platform and validation services already provide claim analysis and evaluation, being more accessible to the general public.

Advances in the development of AI technologies have led to improved automated fact-checking (AFV) models that combine the conditions of interpretability, accuracy, and reliability, [15]. Automatic fact-checking tools have recently gained popularity among various research communities. Many researchers are exploring the possibilities of automating fact-checking using natural language processing, machine learning, and databases to automatically evaluate the truth of statements, [16]. Researchers in [17], believe that academic fact-checking using modern digital tools helps researchers test their hypotheses, discover evidence, facilitate research work, and contextualize new scientific discoveries. According to [18], automation can make fact-checking work using specialized digital services more efficient. This can qualitatively contribute to solving the multidimensional social problem of information chaos, realizing the prospect of joint work between people and digital technology.

Researchers in [19], emphasize that fact-checking is a complex and multi-step process that involves exploring the media, identifying claims that require verification, and drawing conclusions about their truth or falsity. Researchers suggest that automated fact-checking systems can assist fact-checkers in various ways i) in identifying claims within a vast information landscape; ii) in pursuit of previously validated facts regarding claims; iii) in search of corroborating evidence; iii) in summarisation of relevant messages, articles, and

documents, etc. But the researchers point out that one of the reasons why automated fact-checking poses significant challenges is that a statement often has multiple interpretations that must be analyzed and critically evaluated. Besides, new claims and evidence regularly appear. According to [20], preliminary fact-checks can be useful, but they can eventually become outdated and potentially misleading, so the fact-checking process must be systematic and evolutionary. Authors in [21], argue that semantic similarity systems are an effective tool for recognizing paraphrases in political discourse. They also indicate that the combination of semantic search systems and classifiers can increase the efficiency and effectiveness of statement matching, leading to more accurate information verification. In a study on multimodal automated fact-checking, authors, [22], emphasize the importance of focusing on four modalities in real-world fact-checking: text, images, audio, and video. The researchers believe that the validation of multimodal content is becoming more relevant because multimedia spreads faster and attracts more attention than text publications. They note that visual content creates the effect of photo-realism, and recent advances in the field of GenAI models significantly simplify the process of creating multimodal disinformation.

Today, digital information verification tools are actively used in professional media. These tools are primarily designed for journalists rather than teachers, students, or the general public. The global community calls for educational action when facing the problems of information chaos and the infodemic. Implementing professional fact-checking tools in educational activities may have little effect if the benefits of using these tools are not sufficiently studied and understood, [23].

## 3 Research Methods

### 3.1 Research Design

As part of the format training in the courses “Methodology of Education”, “Pedagogical Management”, “English Language”, “Methods of Teaching the English Language”, and “General Education Disciplines”, a 6-month online training was conducted from January to June 2024 “Fact-checking and media literacy in the teacher’s work” using problem-oriented situational group training. In developing the design of the training course “Fact-Checking and Media Literacy in the Work of Educators,” the moderators emphasized the universality of the teaching algorithms, focusing on fostering students’ media literacy and fact-checking

skills. This approach allowed for the integration of the training into various pedagogical disciplines and the adaptation of educational content to meet the specific requirements of each discipline.

During 6 months, students had the opportunity to practice their fact-checking skills using online verification services (Appendix A, Table A.1) and improve their critical thinking skills and ability to solve problems in the digital environment. The training course consisted of 20 modules, each including a research project assignment with step-by-step instructions for their implementation. The research projects that students worked on varied according to the curricula of their core disciplines. The training course aimed not to identify fake news but to teach students how to effectively use digital online verification services. This work allowed students to improve their subject knowledge, and develop critical thinking and problem-solving skills in a digital environment. The students were tasked to analyze media resources of various formats (texts, images, video materials) for credibility (10 to 20 media messages) according to the following criteria: true, mostly true, half true, mostly false, false, using various online information verification services. Each project had consistent instructions for working with the proposed verification tools and services. The individual work of each subgroup member consisted of checking the authenticity of media resources using the selected verification tool. The students independently chose the services and reported their choice to the group curator, who ensured that all the proposed tools were included in the work on the project. At the next stage, students submitted their reports in a working group and together, comparing different opinions, looked for additional information, and derived a unified understanding of the thematic situation. Educational interaction of subgroups was carried out on the joint work platform — Microsoft Teams, [24]. The result of completing each module was a research summary, which was presented to the entire study group. Research projects had deadlines from 3 to 5 days, and upon completion of work on each project, weekly joint discussions were held on the Zoom platform, [25], on the research topic. A group was created in Telegram, [26], to present resumes and student communication.

### 3.2 Research Sample

The educational experiment involved 180 students (Table 1, Appendix B), who were divided into two groups – experimental (EG, 90 people) and control (CG, 90 people) by the method of random selection using the online service Random Group Generator,

[27]. The EG students were divided into subgroups of 9 people, making 10 educational subgroups.

### 3.3 Methods

The research used such empirical methods as experiment, testing, survey, quantitative assessment, and qualitative analysis. The educational experiment provided for the implementation of online training, in addition to the main training course. The quantitative and qualitative assessment and analysis methods were used in the process of systematizing the learning outcomes of the main course.

A quantitative and qualitative analysis of the academic performance of the participants of the EG and CG in the main courses “Methodology of Education”, “Pedagogical Management”, “English Language”, “Methods of Teaching the English Language”, “General Education Disciplines”, were carried out. The next stage was assessing the level of media literacy among students participating in the educational experiment, as well as their critical thinking skills and ability to solve problems in the digital environment. Students were offered situational tasks developed based on the Digital and Media Literacy (DML) Skills Test scale, [28]. The test for the level of media literacy included 30 situational tasks, which were aimed at assessing the level of development of various key components of media literacy, namely: 1) the ability to use media technologies, interact with digital information, media platforms, tools, and applications; 2) the ability to analyze and evaluate the credibility of media messages from a critical point of view, to recognize fake news and manipulation in the media; 3) the ability to verify digital content (text, images, video) and the authenticity of media messages using digital fact-checking tools; 4) a critical socio-cultural understanding of the impact of the media on culture, society, and the behavior of individuals; 5) knowledge and skills of security and protection of personal information in the digital environment. The ECTS grading scale was used to evaluate the test results: A (90-100) – excellent, B (82-89) – very good, C (75-81) – good, D (67-74) – satisfactory, E (60- 66) – sufficient, FX (35-59) – unsatisfactory, F (1-34) – unsatisfactory. Harman’s single-factor test was used to check the systematic error of the common method. The variance of the first factor was 38.14% (less than 50%), confirming the absence of significant common method bias in this study.

Student testing was developed and conducted using a mobile application on the SkillzRun platform, [29]. The obtained data were analyzed and

processed using statistical methods and WPS Office software.

The survey method was implemented after the completion of the training. The students were asked to provide reasoned feedback about their studies. All feedback was analyzed by moderators, summarised, and presented in the form of 8 statements. The students were asked to rate the statements with which they agreed and which are characteristic of them in the Telegram group.

### 3.4 Research Limitations

The main limitation of this study is the narrow geographical characteristics of the sample, as its participants were students of only one HEI. The educational experiment was conducted in order to identify the feasibility of implementing additional training educational projects for the development of students’ media literacy, critical thinking, and problem-solving skills in the digital environment.

## 4 Results

This research confirmed the need for additional educational activities for the development of media literacy among higher school students in response to the needs of the modern educational environment, where it is important not only to learn facts but also to be able to critically analyze and understand information coming from various sources.

The educational training in Fact-checking and media literacy in the teacher’s work, which involved the EG students, had a qualitative effect on their final results in the main courses. In particular, the exam score of the EG students was 10.5 points higher than that of the CG students (Figure 1, Appendix B).

Summarising the feedback of the EG students after the training showed that most participants (96%) were satisfied with the quality of their educational results. The majority of students (91%) agreed that critical thinking skills and the ability to solve problems in the digital environment are important and a priority for them (Figure 2, Appendix B).

According to the EG participants, the experience gained in working with digital tools, platforms, and digital content verification services is necessary and valuable for them both for further studies and professional development. Students perceived the approach proposed by the training course as effective for deepening knowledge of the main subject, improving the memorization of the material, and enhancing learning motivation.

Interaction with project partners was also an important factor, which contributed to increasing general interest and responsibility to colleagues.

Assessment of the level of media literacy among students participating in the educational experiment, critical thinking, and the ability to solve problems in the digital environment is presented in Table 2 (Appendix B).

The EG students surpassed the CG students' ability to use media technologies and interact with digital information, media platforms, tools, and applications by 9 points. They also achieved better results by 9 points in the ability to analyze and evaluate the credibility of media messages from a critical point of view, to recognize fake news and manipulation in the media. The EG participants demonstrated 19 points better results in verifying digital content (text, images, video) and verifying the authenticity of media messages. The results of the EG students were 11 points better in having a critical socio-cultural understanding of the influence of the media on culture, society, and the behavior of individuals. However, there were identified components of media literacy that did not reach the planned level of development, the development of which is worth directing additional attention and efforts on the part of teachers. In particular, neither CG nor EG students have sufficient knowledge and skills in the security and protection of personal information in the digital environment. The EG students demonstrated 4 points better results for knowledge and skills of security and protection of personal information in the digital environment (Figure 3, Appendix B).

A comparative assessment of the media literacy level among the participants of the educational experiment is presented in Figure 4 (Appendix B). The EG students excelled in the task of developing critical media skills, receiving high scores in areas such as finding evidence of unreliability of information and evaluating the authenticity of media messages. They also demonstrated a high level of ability to systematize and analyze digital information and predict the consequences of media influence on society and culture. The CG students did not perform excellently in the tasks, which may indicate the need for additional support and training in this area.

The EG students showed some deficiencies in the performance of critical media skills development tasks, although the overall level of performance was satisfactory. They have successfully assessed the quality of information and its sources and skilfully combined various digital tools for finding and using information for educational purposes. The students

could also recognize fake news and the manipulated nature of information, analyze the social, political, and economic consequences of media messages and evaluate their completeness and accuracy. However, shortcomings were identified in identifying potential threats in the digital environment, safe interaction with Internet resources, and the use of anti-virus software.

The EG students did well with the tasks but with a significant number of shortcomings in developing such skills as creating and managing secure passwords for online accounts and using encryption to protect personal data and communications. These results emphasize the importance of further educational work and support for students in mastering cybersecurity principles. A better understanding and effective application of these principles is key to protecting and keeping their personal information safe online.

In general, the evaluation results showed an improvement not only in the level of student's knowledge of the subject but also in the level of critical thinking skills, information, and media literacy.

## 5 Discussion

The results obtained by, [23], showed that digital fact-checking tools effectively combat misinformation in educational programs. Teachers from France, Romania, Spain, and Sweden agreed that raising the media literacy level should be done in two directions. The first is improving practical skills using digital fact-checking tools and the second is developing critical thinking skills, [23]. In our study, the EG participants had the opportunity to test media information verification services by performing tasks with clear instructions. A total of 93% of students confirmed that research work on projects with clear instructions and execution schedules allowed them to focus on the main thing and significantly increased the effectiveness of their studies. The results of the educational experiment demonstrated that interaction with digital fact-checking tools promotes the development of critical thinking and leads to improved memorization of educational materials.

Learning motivation plays a key role in achieving academic performance. It determines student progress and influences pedagogical strategies to achieve teaching goals in various educational environments, [30]. The results of our research demonstrated the increased students' interest in acquiring knowledge in joint work on information verification and report generation

projects. Students' involvement in multitasking educational activities and actualizing the group aspect of educational communication made it possible to achieve better knowledge levels of the EG students compared to the CG students. This led to the conclusion that using purposeful gamified approaches to learning, combined with digital technologies and group interactions, leads to improved memorization, and assimilation of knowledge. This approach also contributes to increasing the motivation of future teachers to achieve professional mastery. The training tasks offered to the EG students in our study aimed to organize high-quality student interaction to implement a joint research project. In the opinion of 94% of students, joint work on research projects intensified responsibility towards project colleagues and had a qualitative impact on the final result. In addition, it had a qualitative effect on learning motivation and the desire to achieve educational goals.

Integrating digital technologies into the educational process requires students to analyze, evaluate, and interpret information from various digital sources, [31]. The results of a study conducted by a Kenyan scientist, [32], showed that using GenAI tools can be both a danger and an incentive for developing critical thinking. Critical thinking skills can be developed through consistent in-depth analysis of AI-generated results. The results of our study suggest that implementing additional educational initiatives in media literacy can reduce the risks of negative media effects on students, providing their safe interaction with the online environment. In addition, using problem-oriented and project-based learning, based on advanced AI tools, promotes the development of students' critical thinking and improves the quality of their educational projects according to the reliability criteria, structure, and content. The results of our study highlight the importance of mastering the skills of using digital verification tools in the activities of future teachers, especially in the context of integrating innovative teaching methods such as problem-based, practical, and active discussion learning, which requires teachers to effectively include relevant media content in their educational practice.

Media literacy education courses should focus on teaching students to critically evaluate the flow of fake information and identify scientifically grounded and verified facts. The results of a study involving students from the National Taiwan Normal University showed that using AI-based verification systems significantly increased the

participants' knowledge of media literacy, positively affecting the participants' attitudes, confidence, and motivation to achieve media literacy, [33]. The results from Ukrainian researchers, [34], highlight the necessity of enhancing the practical social and communicative dimensions of media literacy for future professionals. The researchers stressed the importance of developing a specialized educational environment that can effectively leverage digital media to fulfill academic objectives. Additionally, it is essential to engage students in project-based activities, which encompass researching, selecting, and presenting pertinent data, as well as analyzing and interpreting that information. The results of a study conducted by researchers from Indonesia showed that a pedagogical model based on a problem-oriented approach can promote the enhancement of critical thinking and problem-solving abilities, [35]. Integrating it into educational joint activities is advisable to achieve maximum efficiency in achieving educational goals, [36].

The study's results by, [37], showed that using GenAI tools allows students to dive deeper into complex scenarios, thereby improving their analytical skills. Learning interactions with AI tools improve students' basic skills and enhance cognitive abilities by stimulating deeper and more meaningful engagement with learning materials and concepts. This is consistent with the results of our research, in particular, 91% of students confirmed that critical thinking skills and the ability to solve problems in the digital environment are extremely important and a priority for them.

Our study confirmed the effectiveness of using information verification services in training future teachers and improving their subject knowledge, critical thinking, and problem-solving skills in a digital environment.

## 6 Conclusions

The creation of educational conditions for developing critical media skills is an important step toward forming high-quality and professional personnel capable of consciously, rationally, and effectively using the latest digital developments in professional activities. Our study confirmed the need for the development of key media literacy skills among students, namely: 1) the ability to use media technologies, and interact with digital information, media platforms, tools, and applications; 2) the ability to analyze and evaluate the credibility of media messages from a critical point of view, to recognize fake news and manipulation in the media; 3) the ability to verify

digital content (text, images, video) and the authenticity of media messages using digital fact-checking tools; 4) a critical socio-cultural understanding of the impact of the media on culture, society, and the behavior of individuals; 5) knowledge and skills of safety and protection of personal information in the digital environment.

The experiment's results confirmed the appropriateness of implementing additional training courses aimed at developing students' digital, information, media literacy skills, critical thinking skills, and the ability to safely interact with the digital environment. A total of 97% of students confirmed that the educational work on detecting fakes in the media environment was exciting and benefited their studies in general. According to 95% of students, interaction with a digital media resource can make learning interesting, current, and practical. Students perceived the approach proposed by the training course as effective for deepening knowledge of the main subject, improving the memorization of the material, and enhancing learning motivation.

So, digital verification tools play a key role in developing modern pedagogy, allowing teachers and students to confidently navigate the complexities of the modern media space. The study's results demonstrated the impact of media literacy skills on students' educational outcomes. The article may be of interest to practicing teachers looking for ways to improve the effectiveness and efficiency of education by integrating digital services of media analysis into educational practices and developing students' critical thinking skills.

#### **Declaration of Generative AI and AI-assisted Technologies in the Writing Process**

During the preparation of this work the authors used Grammarly for language editing. After using this service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

#### *References:*

- [1] P. Jerónimo and M.S. Esparza, Local journalists and fact-checking: An exploratory study in Portugal and Spain, *Comunicação e Sociedade*, Vol. 44, pp. 1-18, 2023, [Online]. <http://journals.openedition.org/cs/9881> (Accessed Date: July 29, 2024).
- [2] T. V. Valyukevych, O. Z. Zinchenko, Y. O. Ishchenko, V. Artemov, and L. G. Nechaiuk, Research-oriented framework of training

philology students' research skills based on Corpus analytical software. *European Journal of Educational Research*, Vol. 10, No. 2, pp. 671-680, 2021, <https://doi.org/10.12973/eujer.10.2.671>.

- [3] L. Gorodnycha, M. Olkhovyk and S. Gergul, Linguistic analysis of Slavic media text containing hate speech, *EUREKA: Social and Humanities*, Vol. 6, pp. 40-46, 2020, <https://doi.org/10.21303/2504-5571.2020.001540>.
- [4] K. Soni and R. Shelke, Fake data and AI: Debunking fake news to educate and enhance media literacy – A study, *ICAMIDA, ACSR*, Vol. 105, pp. 201-213, 2023, [https://doi.org/10.2991/978-94-6463-136-4\\_20](https://doi.org/10.2991/978-94-6463-136-4_20).
- [5] M. Bilotserkovets, Y. Lushchyk, T. Fomenko, and T. Klochkova, Encouraging students' critical thinking skills in the midst of information wars, *Tréma*, Vol. 60, pp. 1-14, 2023, <https://doi.org/10.4000/trema.8565>.
- [6] F. Fusco, Artificial intelligence and fake news: Criminal aspects in Pakistan and Saudi Arabia, *Pakistan Journal of Criminology*, Vol. 14, No. 4, pp. 19-33, 2022, [Online]. <https://www.scribd.com/document/670964316/2-Artificial-Intelligence-and-Fake-News> (Accessed Date: July 29, 2024).
- [7] Y. Zhuravlova, Y. Kichuk, O. Yakovenko, V. Miziuk S. Yashchuk and N. Zhuravska, Innovations in education system: Management, financial regulation and influence on the pedagogical process, *Journal of Curriculum and Teaching*, Vol. 11, No. 1, pp. 163-173, 2022, <https://doi.org/10.5430/jct.v11n1p163>.
- [8] X. Zou, P. Su, L. Li and P. Fu, AI-generated content tools and students' critical thinking: Insights from a Chinese university, *International Federation of Library Associations and Institutions*, Vol. 50, No. 2, pp. 1-14, 2023, <https://doi.org/10.1177/03400352231214963>.
- [9] J. Scott-Branch, R. Laws and P. Terzi, The intersection of AI, information and digital literacy: Harnessing chatGPT and other generative tools to enhance teaching and learning, *IFLA*, pp. 1-10, 2023, [Online]. <https://repository.ifla.org/items/2949672d-e481-453a-af16-f0571336c68b> (Accessed Date: July 29, 2024).
- [10] A. Maloku, R. Maliqi, O. Gabela and E. Maloku, Collection of data in the process of scientific research of security phenomena

- using basic techniques of testing methods, *Pakistan Journal of Criminology*, Vol. 16, No. 2, pp. 703-718, 2024, <https://doi.org/10.62271/pjc.16.2.703.718>.
- [11] N. Tang, C. Yang, J. Fan, L. Cao, Y. Luo and A. Halevy, VerifAI: Verified generative AI, *Computer Science*, Vol. 1, paper 02796, 2023, <https://doi.org/10.48550/arXiv.2307.02796>.
- [12] P. Tiernan, E. Costello, E. Donlon, M. Parysz and M. Scriney, Information and media literacy in the age of AI: Options for the future, *Education Sciences*, Vol. 13, paper 906, 2023, <https://doi.org/10.3390/educsci13090906>.
- [13] J. Kim, S. Park, Y. Kwon, Y. Jo, J. Thorne and E. Choi, FactKG: Fact verification via reasoning on knowledge graphs, In A. Rogers, J. Boyd-Graber and N. Okazaki (eds.) *Proceedings of the 61st Annual Meeting of the Association for Computational Linguistics* (pp. 16190–16206). Association for Computational Linguistics, Toronto, Canada, 2023, <https://doi.org/10.18653/v1/2023.acl-long.895>.
- [14] A. Monnier, J. Dandois, A. Filipczyk, E. Konstanta, A. Losa-Jonczyk and C. Mourlas, A typology of fact-checking resources from false/true verification to information literacy, *Questions de Communication*, Vol. 1, No. 44, pp. 297-316, 2023, <https://doi.org/10.4000/questionsdecommunication.31530>.
- [15] M. Vallayil, P. Nand, W.Q. Yan and H. Allende-Cid, Explainability of automated fact verification systems: A comprehensive review, *Applied Sciences*, Vol. 13, paper 12608, 2023, <https://doi.org/10.3390/app132312608>.
- [16] P. Patwa, S. Mishra, S. Suryavardan, A. Bhaskar, P. Chopra, A. Reganti, A. Das, T. Chakraborty, A. Sheth, A. Ekbal and C. Ahuja, Benchmarking multimodal entailment for fact verification, In *CEUR Workshop on MultiModal Fact Checking and Hate Speech Detection, collocated with AAAI 2022* (pp. 1-11). Vancouver, Canada, 2022, [Online]. <https://ceur-ws.org/Vol-3199/paper19.pdf> (Accessed Date: July 29, 2024).
- [17] J. Vladika and F. Matthes, Scientific fact-checking: A survey of resources and approaches, In A. Rogers, J. Boyd-Graber and N. Okazaki (eds.) *Findings of the Association for Computational Linguistics* (pp. 6215–6230), Association for Computational Linguistics, Toronto, Canada, 2023, <https://doi.org/10.48550/arXiv.2305.16859>.
- [18] L. Dierickx, C-G. Lindén and A.L. Opdahl, Automated fact-checking to support professional practices: Systematic literature review and meta-analysis, *International Journal of Communication*, Vol. 17, pp. 5170–5190, 2023, [Online]. <https://ijoc.org/index.php/ijoc/article/view/21071/4287> (Accessed Date: July 29, 2024).
- [19] P. Nakov, D. Corney, M. Hasanain, F. Alam, T. Elsayed, A. Barron-Cede, P. Papotti, S. Shaar and G. Da San Martino, Automated fact-checking for assisting human fact-checkers, In Z.-H. Zhou (ed.) *Proceedings of the Thirtieth International Joint Conference on Artificial Intelligence* (pp. 4551-4558). IJCAI, Montreal, Canada, 2021, [Online]. <https://www.ijcai.org/proceedings/2021/0619.pdf> (Accessed Date: July 29, 2024).
- [20] Z. Guo, M. Schlichtkrull and A. Vlachos, A survey on automated fact-checking, *Transactions of the Association for Computational Linguistics*, Vol. 10, pp. 178–206, 2022, [https://doi.org/10.1162/tacl\\_a\\_00454](https://doi.org/10.1162/tacl_a_00454).
- [21] Larraz, R. Míguez and F. Sallicati, Semantic similarity models for automated fact-checking: ClaimCheck as a claim matching tool, *Profesional de la Información*, Vol. 32, No. 3, paper 320321, 2023, <https://doi.org/10.3145/epi.2023.may.21>.
- [22] M. Akhta, M. Schlichtkrull, Zh. Guo, O. Cocarascu, E. Simperl and A. Vlachos, Multimodal automated fact-checking: A survey, *Findings of the Association for Computational Linguistics: EMNLP*, pp. 1-18, Singapore, 2023, <https://doi.org/10.48550/arXiv.2305.13507>.
- [23] T. Nygren, D. Frau-Meigs, N. Corbu and S. Santoveña-Casal, Teachers' views on disinformation and media literacy supported by a tool designed for professional fact-checkers: Perspectives from France, Romania, Spain and Sweden, *SN Social Science*, Vol. 2, paper 40, 2022, <https://doi.org/10.1007/s43545-022-00340-9>.
- [24] Microsoft Teams, 2024, [Online]. <https://support.microsoft.com/en-us> (Accessed Date: July 29, 2024).
- [25] Zoom, 2024, [Online]. <https://zoom.us/> (Last Accessed Date 29 July 2024).

- [26] Telegram, 2024 [Online]. <https://web.telegram.org/k/> (Accessed Date: July 29, 2024).
- [27] Random Group Generator, 2024, [Online]. <https://www.classtools.net/random-group-generator/> (Accessed Date: July 29, 2024).
- [28] R. Hobbs, *Media Literacy in Action: Questioning the Media*. Rowman & Littlefield, 2021.
- [29] SkillsRun platform, 2024, [Online]. <https://skillzrun.com/> (Accessed Date: July 29, 2024).
- [30] M. Järvis, L. Ivanenko, I. Antonenko, T. Semenenko, A. Virovere and T. Barantsova, Application of the integration model in the system of inclusive education, *Journal of Curriculum and Teaching*, Vol. 11, No. 1, pp. 35–44, 2022, <https://doi.org/10.5430/jct.v11n1p35>.
- [31] M. Lionenko and O. Huzar, Development of critical thinking in the context of digital learning, *Economics & Education*, Vol. 8, No. 2, pp. 29-35, 2023, <https://doi.org/10.30525/2500-946X/2023-2-5>.
- [32] M. M. Thiga, Generative AI and the development of critical thinking skills, *IRE Journals*, Vol. 7, No. 9, pp. 83-90, 2024, [Online]. <https://www.irejournals.com/formatedpaper/1705580.pdf> (Accessed Date: July 29, 2024).
- [33] T.H.C. Chiang, C.-S. Liao and W.-C. Wang, Impact of artificial intelligence news source credibility identification system on effectiveness of media literacy education, *Sustainability*, Vol. 14, paper 4830, 2022, <https://doi.org/10.3390/su14084830>.
- [34] N. Haidur, V. Kornieiev, I. Pohrebniak, A. Yatsenko, K. Horska and E. Kryvka, Applied social and communication aspects of the media literacy development in future specialists, *Journal of Curriculum and Teaching*, Vol. 11, No. 1, pp. 174-184, 2022, <https://doi.org/10.5430/jct.v11n1p174>.
- [35] F.F. Amanda, S.B. Sumitro, S.R. Lestari and I. Ibrohim, Enhancing critical thinking and problem solving skills by complexity science-problem based learning model, *Multidisciplinary Journal of Educational Research*, Vol. 14, No. 1, pp. 96-114, 2024, <http://dx.doi.org/10.17583/remie.9409>.
- [36] M. Zhylin, A. Tormanova, Y. Poplavska, M. M. Chernov and O. Druz, Study of digital approach in education and psychology among selected users in Ukraine. *Multidisciplinary Reviews*, Vol. 6, paper e2023spe007, 2023, <https://doi.org/10.31893/multirev.2023spe007>.
- [37] A. Essien, O.T. Bukoye, X. O’Dea and M. Kremantzis, The influence of AI text generators on critical thinking skills in UK business schools, *Studies in Higher Education*, Vol. 49, No. 5, pp. 1-18, 2024, <https://doi.org/10.1080/03075079.2024.2316881>.
- [38] ClaimBuster, 2024, [Online]. <https://idir.uta.edu/claimbuster/> (Accessed Date: July 29, 2024).
- [39] TruthNest, 2024, [Online]. <https://www.truthnest.com/> (Accessed Date: July 29, 2024).
- [40] Hoaxy, 2024, [Online]. <https://hoaxy.osome.iu.edu/> (Accessed Date: July 29, 2024).
- [41] Factmata, 2024, [Online]. <http://factmata.com> (Accessed Date: July 29, 2024).
- [42] WeVerify, 2024, [Online]. <http://weverify.eu/tools/> (Accessed Date: July 29, 2024).
- [43] Sentinel, 2024, [Online]. <https://thesentinel.ai/> (Accessed Date: July 29, 2024).
- [44] ZeroGPT, 2024, [Online]. <https://www.zerogpt.com/> (Accessed Date: July 29, 2024).
- [45] AI Copyleaks, 2024, [Online]. <https://copyleaks.com/> (Accessed Date: July 29, 2024).
- [46] TinEye, 2024, [Online]. <https://tineye.com/> (Accessed Date: July 29, 2024).
- [47] InVID, 2024, [Online]. <https://www.invid-project.eu/> (Accessed Date: July 29, 2024).
- [48] Google Reverse Image Search, 2024, [Online]. [www.images.google.com](http://www.images.google.com) (Accessed Date: July 29, 2024).
- [49] Lead Stories, 2024, [Online]. <https://ukrainian.leadstories.com/factcheck/> (Accessed Date: July 29, 2024).
- [50] Fact Check.org, 2024, [Online]. <https://www.factcheck.org/issue/ukraine/> (Accessed Date: July 29, 2024).

## APPENDICES

### Appendix A

Table A.1. Information Verification Services Used by Students in Research Projects

| Categories  | Online verification tools        | Characteristics   |
|---|----------------------------------|---|
| Media message verification tools  | ClaimBuster [38]                 | A tool for automatically detecting and classifying statements made in public speeches, political debates, news, and other media sources. ClaimBuster analyses the credibility of claims made in text or audio-visual materials under different categories such as fact, opinion, promise, stereotype, etc. This helps to understand what type of information is most often provided in a certain context. |
|   | TruthNest [39]                   | TruthNest is a tool that uses AI to analyze texts and verify their authenticity. This service identifies misinformation, fact-check, and provide users with tools for critical thinking and information analysis.   |
|   | Hoaxy [40]                       | The service tracks the spread and popularity of certain statements on social networks and identifies potentially inaccurate information. The tool analyses tweets and links to reveal the popularity and spread of certain informational claims on Twitter  |
|   | Factmata [41]                    | Factmata uses AI to analyze news articles and identify fake news and misinformation. Factmata’s algorithms analyze articles’ text to identify questionable or unverified statements.  |
|   | WeVerify [42]                    | A website with a variety of tools to assist in the validation and analysis of media data such as photos, videos, and textual materials. WeVerify’s tools analyze and contextualize social media and web content, and detect fabricated content through cross-modal content verification, social network analysis, and micro-targeting.  |
|   | Sentinel [43]                    | The system allows users to upload digital media through its website or API, which are then automatically analyzed for authenticity. Sentinel generates a “manipulation visualization” report that explains why the video was flagged as a deepfake.   |
| Tools for detecting plagiarism, verifying content originality, and detecting AI-generated content | ZeroGPT [44]                     | A text recognition tool that uses AI technology to help users distinguish between the AI-generated content and content created by humans.   |
|   | AI Copyleaks [45]                | A plagiarism detection tool that uses AI. Its main features include text analysis for uniqueness and comparison with other sources. The tool automatically detects similar or copied text fragments in documents or web content. It compares texts with a large number of sources, including web pages, databases, scientific articles, etc.  |
| Tools for checking images and videos for authenticity   | TinEye [46]                      | An online image search tool finds similar images and determines their authorship  |
|   | InVID [47]                       | The tool reverses image and video searches on the Internet, analyse footage to identify objects and logos, checks metadata, and quickly verifies content posted on social networks for authenticity.  |
|   | Google Reverse Image Search [48] | The tool provides information about the source of the image, and determines its authenticity and source. It identifies images that may be protected from copying or unauthorized use. Google Reverse Image Search finds images that are similar in structure or content to further investigate their origin and authenticity.   |
| Online services and resources for verification of media information in Ukraine                    | Lead Stories [49]                | The online service focuses on identifying and debunking viral fake news and mixed facts.  |
|   | FactCheck.org [50]               | FactCheck.org is an independent website that specializes in fact-checking political statements, advertisements, and other publicly important statements.  |

*\*developed by the author*

### Appendix B

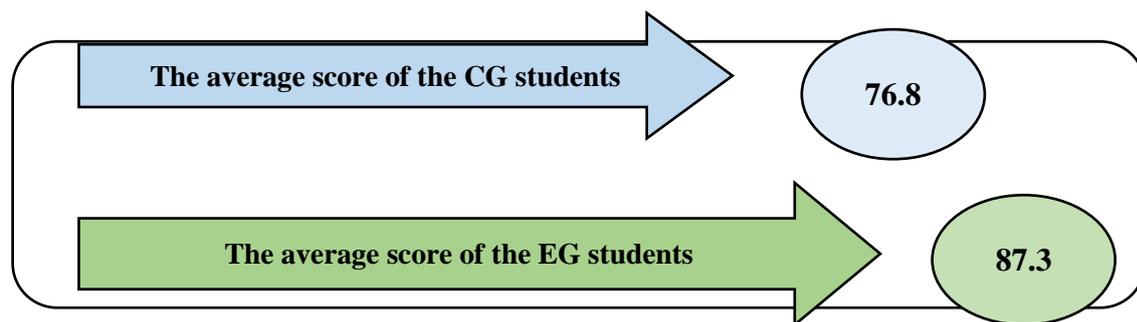


Fig. 1. The Results of the Examination Assessment of Students in the Main Educational Courses (*developed by the author*)

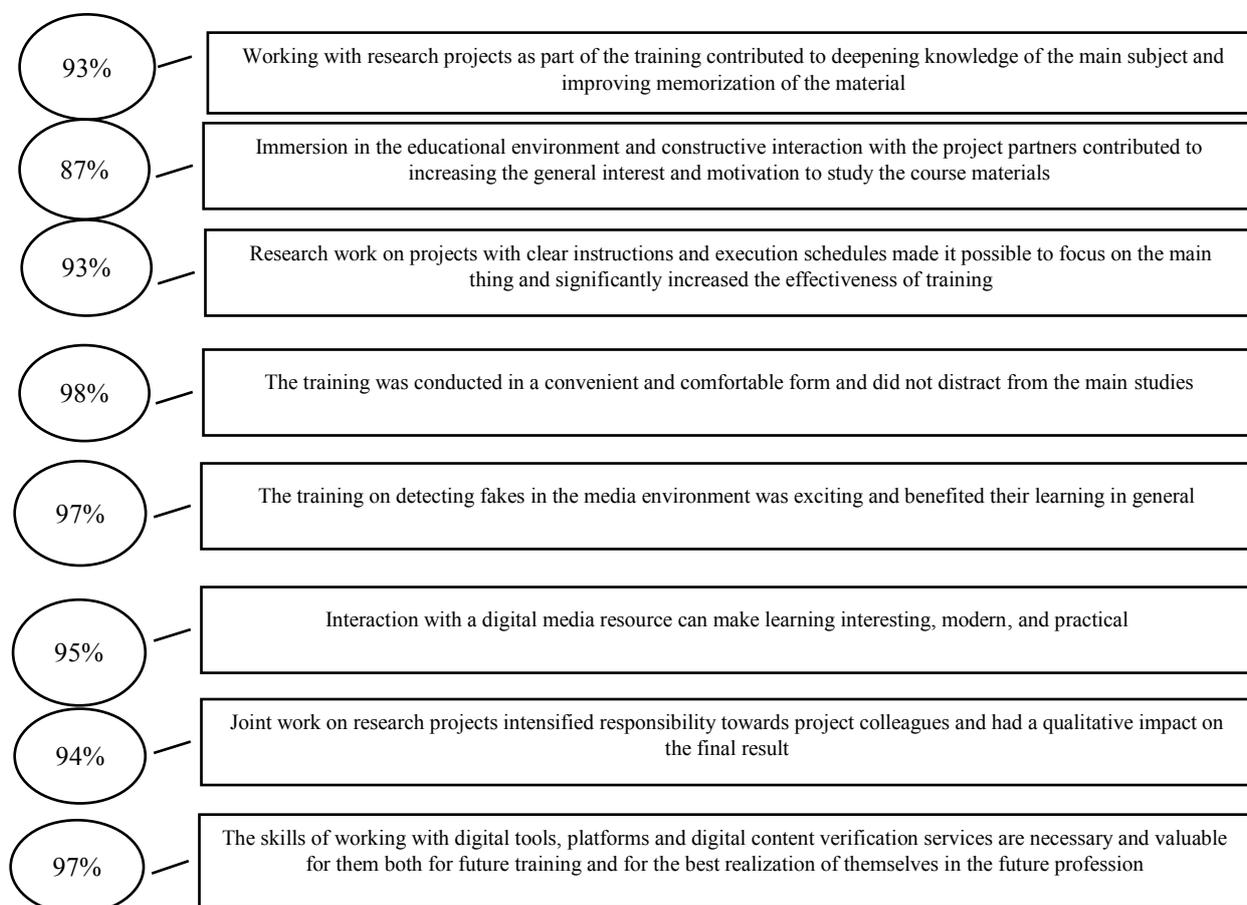


Fig. 2: Feedback from the EG Students about the Experience of Participating in the Training  
*\*developed by the author*

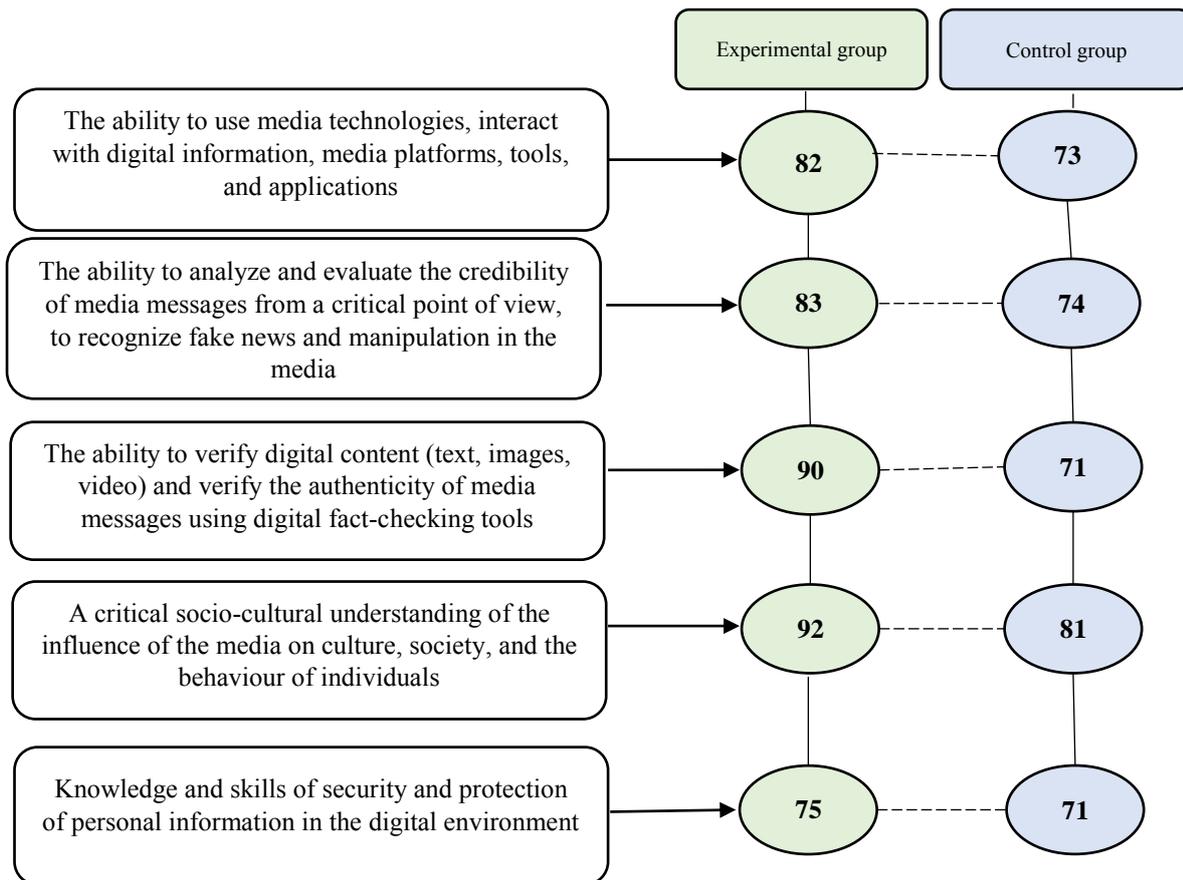
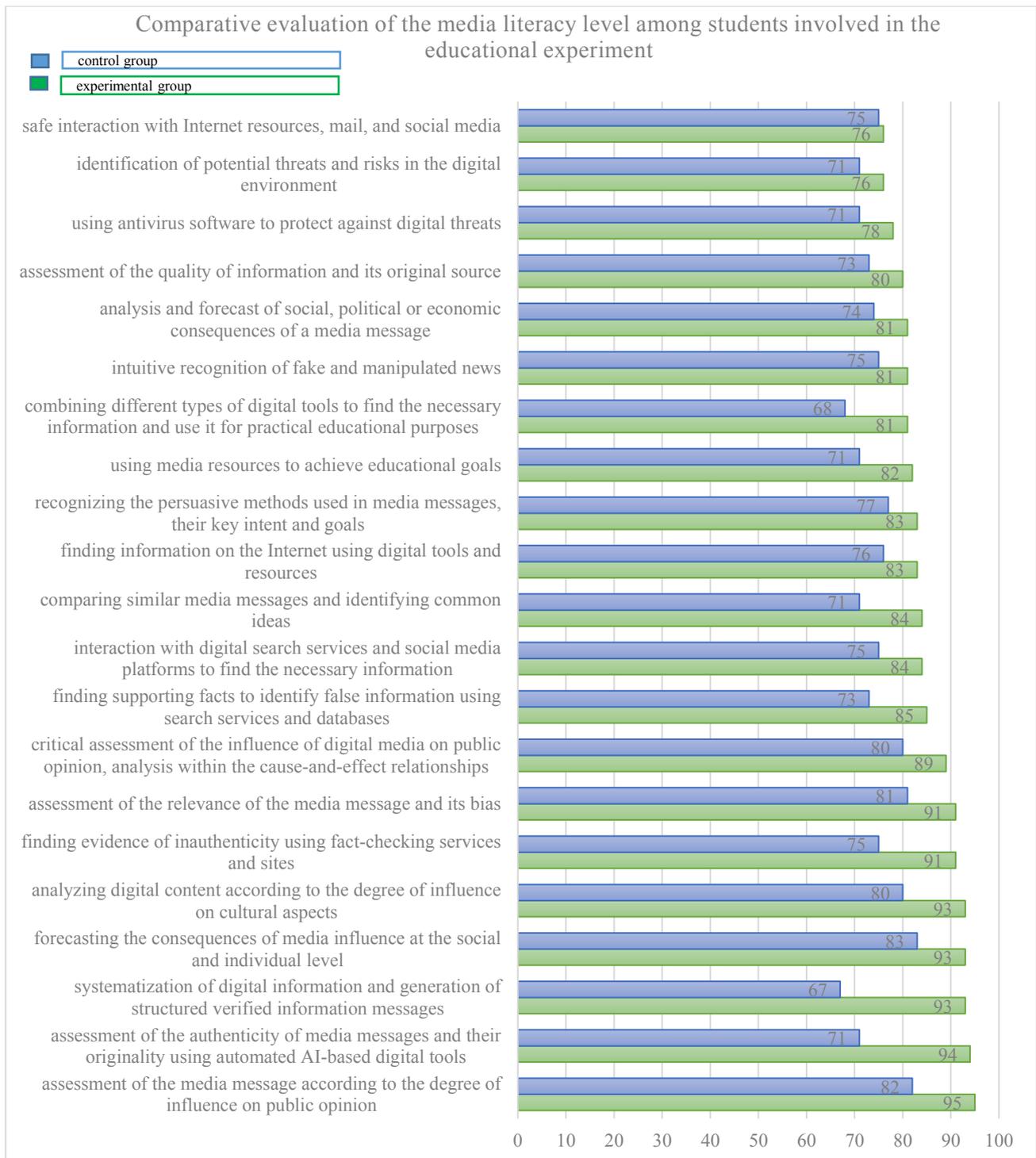


Fig. 3: The Results of the Assessment of the Media Literacy Level among Students Participating in the Educational Experiment, Critical Thinking, and the Ability to Solve Problems in the Digital Environment  
*\*developed by the author*



**Fig. 4: Comparative Characteristics of the Media Literacy Level among the Participants of the Educational Experiment**  
*(Developed by the author)*

Table 1. Participants of the Educational Experiment

| Number of students (people) | Age   | Major   | Main course  | Higher education institution (HEI)                  |
|-----------------------------|-------|---|--|---|
| 40                          | 18-21 | Secondary Education, English teachers, Ukrainian teachers, Faculty of Philology | Pedagogical Management                                 |   |
| 44                          | 18-21 | Secondary Education, English teachers, Ukrainian teachers, Faculty of Philology | Methodology of Education                               | Shevchenko National University "Chernihiv Colehium" |
| 47                          | 18-20 | Secondary Education, English teachers, Ukrainian teachers, Faculty of Philology | English Language, Methods of Teaching English Language |   |
| 49                          | 18-19 | Professional Education  | General Education Disciplines                          |   |
| Total: 180                  | 18-21 |   |  |   |

Table 2. Results of the Assessment of the Level of Media Literacy, Critical Thinking, and the Ability to Solve Problems in the Digital Environment

| Item No. | Elements of the score   | Average score |    |
|----------|---|---------------|----|
|          |   | EG            | CG |
|          | The ability to use media technologies, interact with digital information, media platforms, tools and applications   | 82            | 73 |
| 1        | The ability to find information on the Internet using digital tools and resources   | 83            | 76 |
| 2        | The ability to assess the quality of information and its primary sources  | 80            | 73 |
| 3        | The ability to interact with digital search services and social media platforms to find the necessary information   | 84            | 75 |
| 4        | The ability to use media resources to achieve educational goals   | 82            | 71 |
| 5        | The ability to combine different types of digital tools to find the necessary information and use it for practical educational purposes                   | 81            | 68 |
|          | The ability to analyze and evaluate the credibility of media messages from a critical point of view, to recognize fake news and manipulation in the media | 83            | 74 |
| 6        | The ability to intuitively recognize fake and manipulated news  | 81            | 75 |
| 7        | The ability to find supporting facts to identify false information using search services and databases  | 85            | 73 |
| 8        | The ability to recognize persuasive techniques used in media messages, their key intent, and goals  | 83            | 77 |
| 9        | The ability to analyze and predict the social, political, or economic consequences of a media message   | 81            | 74 |
| 10       | The ability to compare similar media messages and identify a common idea  | 84            | 71 |
|          | The ability to verify digital content (text, images, video) and verify the authenticity of media messages using digital fact-checking tools               | 90            | 71 |
| 11       | The ability to verify media information in various formats (text, images, video) using automated digital fact-checking tools                              | 89            | 74 |
| 12       | The ability to find evidence of inauthenticity using fact-checking services and websites  | 91            | 75 |
| 13       | The ability to assess the authenticity of media messages and their originality using automated AI-based digital tools                                     | 94            | 71 |
| 14       | The ability to assess the completeness and accuracy of a media message  | 81            | 68 |
| 15       | The ability to systematize digital information and generate structured verified informational messages  | 93            | 67 |
|          | A critical socio-cultural understanding of the influence of the media on culture, society, and the behavior of individuals                                | 92            | 81 |
| 16       | The ability to critically assess the impact of digital media on public opinion, to carry out an analysis within cause and effect relationships            | 89            | 80 |
| 17       | The ability to predict the consequences of media influence at the social and individual level   | 93            | 83 |
| 18       | The ability to assess the relevance of a media message and its bias   | 91            | 81 |
| 19       | The ability to evaluate media messages according to the degree of influence on public opinion   | 95            | 82 |
| 20       | The ability to analyze digital content according to the degree of influence on the cultural aspects of the nation   | 93            | 80 |
|          | Knowledge and skills of security and protection of personal information in the digital environment  | 75            | 71 |
| 21       | The ability to identify potential threats and risks in the digital environment such as phishing attacks, viruses, spyware, etc.                           | 76            | 71 |
| 22       | The ability to create and manage secure passwords for online accounts   | 71            | 70 |
| 23       | The ability to use encryption to protect personal data and communications   | 73            | 69 |
| 24       | The ability to safely interact with Internet resources, mail, and social media  | 76            | 75 |
| 25       | The ability to use antivirus software to protect against digital threats  | 78            | 71 |

*\*developed by the author*

**Contribution of Individual Authors to the Creation of a Scientific Article (Ghostwriting Policy)**

The authors equally contributed in the present research, at all stages from the formulation of the problem to the final findings and solution.

**Sources of Funding for Research Presented in a Scientific Article or Scientific Article Itself**

No funding was received for conducting this study.

**Conflict of Interest**

The authors have no conflicts of interest to declare.

**Creative Commons Attribution License 4.0 (Attribution 4.0 International, CC BY 4.0)**

This article is published under the terms of the Creative Commons Attribution License 4.0

[https://creativecommons.org/licenses/by/4.0/deed.en\\_US](https://creativecommons.org/licenses/by/4.0/deed.en_US)