



KAPITEL 1 / CHAPTER 1 ¹
**FUNDAMENTAL CONCEPTS AND METHODS FOR INTEGRATING
DIGITAL EDUCATIONAL TECHNOLOGIES IN THE LEARNING
PROCESS**

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**1.1. The implementation of digital educational technologies in both theoretical
and practical aspects of education**

Over the past few decades, the rise of digital technologies has completely transformed the way people live, work, and learn. With the proliferation of smartphones, tablets, and computers, people are constantly connected to the internet and have access to vast amounts of information and knowledge. This has led to the emergence of digital educational technologies that have the potential to revolutionize the way we teach and learn.

The implementation of digital educational technologies in both the theoretical framework and practical aspects of education has become increasingly popular in recent years. Educational institutions worldwide are leveraging these technologies to enhance the quality of education and provide students with an engaging and interactive learning experience. These technologies include e-learning platforms, digital textbooks, educational apps, online resources, and virtual classrooms, among others.

The benefits of digital educational technologies are numerous. They allow students to learn at their own pace, provide access to a wealth of information, enable interactive and collaborative learning, and enhance student engagement and motivation. These technologies also provide teachers with a powerful tool to manage their classrooms effectively, monitor student progress, and provide personalized learning experiences.

Bykov (2019) argued that the use of digital educational technologies in the classroom could enhance the learning experience and improve student outcomes. Bykov suggested that digital technologies can help students develop critical thinking skills, increase engagement and motivation, and provide access to a wider range of educational resources. However, Bykov also acknowledged that there are challenges to implementing digital technologies in the classroom, including the need for teachers

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to develop new skills and the potential for technology to be a distraction rather than a tool for learning.

Digital educational technologies have been integrated into the theoretical framework of education in various ways. For instance, online courses and Massive Open Online Courses (MOOCs) have provided new opportunities for learners to acquire knowledge and skills from a wide range of subjects and topics. Moreover, digital educational technologies have made it possible for educators to create engaging and interactive learning experiences for students, using multimedia resources and tools. According to Dicheva et al. (2015), online learning platforms can improve student engagement, retention, and learning outcomes, as well as offer personalized learning experiences based on student needs and preferences.

The initiative to introduce the format of open universities belongs to the Massachusetts Institute of Technology (MIT), which launched the Open Course Ware project in 2001. The project aimed to provide free access to educational course materials from the university. Other universities supported this initiative and made their educational and scientific programs available to a wide audience. The result of such innovations was the emergence of the concept of online education.

According to Polat (Polat et al., 2004), online education is a form of distance education that uses internet technologies to enable controlled interaction among teachers and students while preserving all components of the educational process, such as goals, content, methods, and organizational forms. Teachers create distance courses that are structured information products designed to help students acquire the content and skills needed in specific academic disciplines. Overall, Polat's definition emphasizes the use of technology to facilitate learning and interaction between teachers and students who are geographically separated.

In Ukraine, the implementation of distance or online learning is carried out by the Constitution of Ukraine, the Laws of Ukraine "On Higher Education" (2002), Laws "On the National Program of Informatization" (1998); "On Copyright and Related Rights", "On Information", "On Amendments to Certain Legislative Acts of Ukraine on Legal Protection of Intellectual Property"; the resolution of the Cabinet of Ministers of Ukraine dated 23.09.2003 № 1494, "On Approval of the Program for the Development of Distance Learning System for 2004-2006"; the Regulation on Distance Learning (approved by the Order of the Ministry of Education and Science of Ukraine in 2013). According to the National Strategy for the Development of Education in Ukraine for 2012-2021, the use of Internet access tools and educational



platforms, and electronic educational resources in the educational process is an important and essential component of the effective work of higher education institutions (2012).

Bykov identified three levels of online distance learning courses in 2008, as follows: (1) computer-based learning, which is designed for frequently repeated tasks where the system determines the answers, (2) artificial intelligence systems, which enable expert interaction between students and teachers to correct learning, and (3) obtaining educational information from high-quality modern lectures or courses developed by leading scientists using modern communication tools. Recognizing the fact that developing students' ability for self-development and continuous learning is a leading task of higher education, the use of digital educational technologies is seen as an effective means of practically implementing this task.

The strategic direction of information modernization of the education system in Ukraine is enshrined at the legislative level and reflected in a number of normative legal documents, namely: the National Program of Informatization (1998); the National Doctrine of Education Development (2002); the State Program "Information and Communication Technologies in Education and Science" for 2006-2010 (2005); the Law of Ukraine "On Basic Principles of Development of the Information Society in Ukraine for 2007-2015" adopted on January 9, 2007, under No. 537-Y; the Decree of the President of Ukraine "On Measures to Ensure Priority Development of Education in Ukraine" (2010); the State Targeted Program "100 Percent" (2011); the National Project "Open World" (2012); the National Strategy for the Development of Education in Ukraine for the period up to 2021 (2013); Order of the Ministry of Education and Science No. 466 of April 25, 2013; On approval of the Regulation on distance learning (2013); the resolution of the Cabinet of Ministers of Ukraine of May 15, 2013, "On Approval of the Strategy for the Development of the Information Society in Ukraine"; the draft Concept of the Development of Education in Ukraine for the period from 2015 to 2025 (2014); the "Roadmap of Educational Reform (2015-2025)" (2015); the resolution of the Verkhovna Rada of Ukraine "On Recommendations of Parliamentary Hearings on the topic: "Reforms of the Information and Communication Technology Sector and Development of the Information Space of Ukraine" (Official Gazette of the Verkhovna Rada, 2016, p. 191).

Thus, at the legislative level, the expediency and necessity of the process of informatization of modern Ukrainian society have been declared. It is possible to identify key trends in the informatization of education in Ukraine: creating conditions



for the development of digital critical competencies and media literacy, ensuring free access for each person to digital educational resources according to their needs, introducing distance education, developing modern digital teaching tools, promoting individualization and autonomy in the learning process through the creation of individual modular programs based on specific capabilities and needs, developing methodological support for the effective implementation of digital technologies and criteria for evaluating the quality of tools, creating a system to increase the level of digital competence of teachers, and ensuring the development of a national global network of education and science.

The scientists identified the following advantages of using digital resources (Andreyko, Skarlupina, 2019):

- Variability and diversity of information and reference resources for optimizing information search and meeting the educational and professional needs of each student;
- Presentation of information in various multimedia modes: video, audio format, hyperlinks;
- Interactivity of digital tools;
- Motivation to learn by adapting resources to the interests and level of knowledge of students;
- Providing objective evaluation through automated quality control of task performance;
- Development of systematic, critical, and creative thinking;
- Time-space unlimited access to resources;
- Creating conditions for simultaneous group and individual work;
- Creating a virtual authentic language and cultural environment for practicing language skills;
- Developing digital critical competencies when evaluating the quality of information resources.

Among the shortcomings of traditional foreign language teaching, researchers have identified the dependence of teachers on textbooks that do not always meet the real needs and interests of students. Digital educational resources provide an opportunity to address this issue and allow students to choose resources independently. The comprehensive use of various foreign language learning tools promotes the expression of students' individuality. The openness and accessibility of learning products that students download on the network or online platforms contribute to the



development of responsibility for the quality of the educational product.

Information and communication technologies create conditions for universities to form a comprehensive system of universal knowledge, skills, and competencies. They open the way for the individual to search for information and learning activities based on an individual educational trajectory. Therefore, the use of digital technologies in the process of individualization of learning is a purposeful process of changing the content, methods, and organizational forms of learning. However, this process changes not only the forms but also the personalities of both students and teachers, as the integration of digital technologies is not only a technological but also a didactic process, associated with conceptual changes in the preparation of initial methodological support, development of an assessment system, and updating of the content of learning. Studies by scientists confirm that the use of digital technologies significantly affects the improvement of pedagogical activities and academic performance.

Having reviewed scientific works and analyzed the research results on the integration of technology for self-learning, a group of scientists led by Fang (Fang et al., 2012) proposed a model of integrating web resources (see Fig. 1.1) into the self-learning process. The main focus of this study is to examine the effectiveness of self-learning grounded in web-based environments. According to the model, the web environment offers the student an unlimited number of resources and informational messages. Resources provide either individual work mode or work with partners or with a teacher. As we can see, the main tasks for students are to analyze their technical tools, make the right choice of resources, and work mode, and choose the type of interaction. During the self-learning process, students usually search for an educational platform on the Internet with a wide selection of resources. Learning through web technologies, although well-established, is still a problem for students. Compared to traditional formal learning, students' readiness to accept and use web resources depends on their level of digital competence. The use of Internet learning sources is mandatory for blended learning contexts. Otherwise, obtaining the desired learning outcome is impossible. As mentioned above, the use of digital educational technologies affects the learning outcomes of students differently, which can be caused by contextual and cognitive factors.

Individual self-learning using web resources has a positive impact on motivation to learn, meaning that more self-directed students demonstrate an active approach towards tasks that involve technology and are more motivated to adopt online learning strategies and achieve their learning goals.



To explore the potential of web resources, there is a need to study the typology of free learning web technologies (Bower, Torrington, 2020), which offers educators 226 technologies categorized into 40 types and 15 clusters. Analyzing web resources allows us to evaluate trends in online learning technology development over the past five years, such as marketing, and the trend toward using integrated platforms and tools.

To be classified within the typology, resources must satisfy specific conditions, which are as follows:

1. They need to be available without charge or have a version that is freely accessible for ongoing use.
2. They must be accessible via a standard web browser.
3. They should allow for the personalization of content to meet individual requirements and enable sharing of content.
4. They must have educational and instructional features.

It is imperative to undertake an analysis of several suggested resources.

1. Synchronous text discussion: the mentioned resources allow users to exchange text comments in real time. Examples of such resources are Twitter (<http://twitter.com>) which allows users to publish short public text comments; Chatzy (<http://chatzy.com>) and Backchannel Chat (<http://backchannelchat.com>) which allow users to create private chat streams on the Internet that can be shared through a URL; Slack (<https://slack.com>) which offers synchronous text tools for collaborative work that allow groups of users to send instant messages, plan, and share information.

2. Discussion forums: promote asynchronous text discussions among groups of users. This is useful for reflective conversations where real-time interaction is not necessary. ProBoards (<http://proboards.com>) or ReadUps (<http://readups.com>) are social platforms where users can read a book together and post text comments. Separate discussion forums can be integrated into more elaborate sets of tools (such as learning management systems).

3. Tools for creating notes and documents allow groups of users to collaborate with authors in real-time and view each other's changes. Evernote (<http://evernote.com>) provides a sophisticated web interface for creating notes including inserting images and file management but only allows for viewing, not simultaneous writing. Google Keep (www.keep.google.com) is a service for creating notes, including text, lists, images, and audio, accessed through a Google account. Microsoft Word Online (<https://www.office.com/launch/word>) allows for publishing, editing, sharing, and collaborative work on Word documents through OneDrive. Zoho

Writer (<http://zoho.com/docs>) is an alternative to Google Docs. Canva (<https://www.canva.com>) provides convenient manipulation of images.

4. Creating online books: Websites for creating online books allow users to create stories based on images and text and share them through a URL or repository. StoryJumper (<http://www.storyjumper.com>) and Tikatok (<http://tikatok.com>) allow students to create and publish e-books by uploading their images and text. StoryBird (<http://storybird.com>) offers a wide selection of artistic themes, templates, and graphics to structure a story. Mixbook (<http://mixbook.com>) is a website for creating books based on uploaded photos, allowing for collaborative authorship and sharing. Bookcreator (<https://bookcreator.com>) provides a convenient interface for combining text, images, audio, and video to create, read, or publish books.



Fig. 1.1. Classification of web resources (Bower, 2015)

In the process of integrating web resources, it is important to adapt and optimize the online and offline design of educational courses to reduce barriers for students in learning technologies and to enhance their internal motivation to learn. The development of individual characteristics is achieved through the encouragement of



critical reflection, creativity, and personal initiative. This is in line with the idea of collaborative, democratic, and decentralized learning, which is of great importance in fostering student autonomy.

The main idea of enhancing the educational space with technology is not just to use technology for the sake of implementing it, but also to promote pedagogical strategies and improve educational paths to enhance the perception and understanding of learning information, as well as to develop students' metacognitive abilities such as reflection and self-reflection, which increases learning effectiveness and motivation. In modern education systems, teaching and technology should synergize and complement each other. Successful implementation of technology in the learning process requires a new constructive way of thinking, which is associated with increasing demands for digital competence of teachers, but not limited to them.

One of the problematic issues is determining the effectiveness of technology implementation in the learning process. Information technologies should be carefully integrated and combined with the content of teaching and pedagogical tools, complementing the methods and forms of educational strategies, rather than replacing them. According to Paul Fyfe (2015), “Simply integrating technologies into the learning process without a thought-out didactic system of developing the initial process is not enough. Educators must think holistically and change the functions of a modern teacher in the realities of digital life in both academic and non-academic settings” (Fyfe, 2015, p. 263).

The concept of Technological Pedagogical Content Knowledge (TPCK) combines technology, teaching, and content to offer a tool that suggests ways to consciously choose and coordinate pedagogical strategies with technologies. Initially proposed by Lee Shulman in 1986, it was later supplemented by Mishra and Koehler in 2006. They emphasized the importance of implementing technology as it enables teachers to develop personalized and authentic materials and teaching strategies. Researchers note that students' digital learning products (blogs, videos, Internet reviews, etc.) visualize and personalize knowledge perception and demonstrate the quality of the applied teaching strategies. However, teachers need skills and knowledge to select and critically evaluate the effectiveness of educational technologies according to planned educational goals. The key idea of the concept is the interrelation of the three didactic components of teaching: knowledge content (what to teach), pedagogy (how to teach), and technology (tools and resources).

The pedagogical and content components are the basis for the teacher's ability to



effectively carry out pedagogical activities. It is necessary to know why and how to teach, as well as to be competent in the subject being taught. The “technology knowledge” component involves knowledge of modern teaching technical means, such as the ability to work with an electronic board, knowledge of the possibilities and limitations of chat, how to use LMS to optimize students’ learning activities, and so on.

The TPACK model is a framework that aims to explain the complex interactions between technology, pedagogy, and content knowledge. It is represented graphically as an intersection of three planes: Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Pedagogical Content Knowledge (PCK) (see Fig. 1.2).

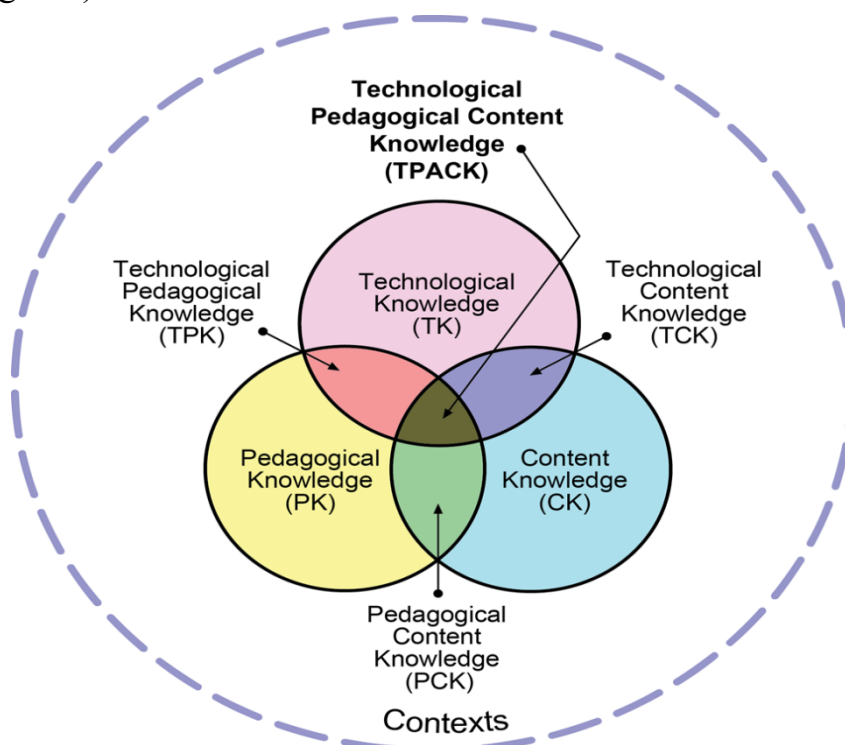


Fig. 1.2. Models of integration of digital technologies. TPACK model

The TCK plane refers to the knowledge of how to use specific technologies and tools in a given content area. TPK refers to the knowledge of how to use technology to enhance teaching and learning. PCK refers to the understanding of how to teach a specific content area.

The intersection of these three planes at the center creates the TPACK plane, which represents the ability to integrate technology effectively into teaching and learning practices while considering the content and pedagogical objectives. The TPACK model provides a holistic view of technology integration in education and



emphasizes the importance of considering the interplay between technological, pedagogical, and content knowledge.

An important issue is the development of criteria for evaluating the acquired knowledge and skills of integrating ICT according to the TPACK model. Scientists (Harris, Grandgenett, and Hofer, 2010) have developed a methodology for assessing key TPACK concepts based on four criteria, each with four levels of development (see Table 1.1). The reliability and validity of the model have been proven. The authors note that the rubric for evaluating technology integration in the educational process will help teachers more accurately assess the effectiveness of using ICT in their professional activities and promote integration into educational programs.

Several recent studies have focused on the relationship between TPACK knowledge and teachers' characteristics, particularly their professional self-efficacy. In this context, it is important to mention the research by Sahin, Akturk, and Schmidt (2009), who demonstrated a positive correlation between TPACK knowledge and teachers' self-efficacy levels. These results are consistent with other studies (Abbitt, 2011) that have shown that technology knowledge increases self-efficacy levels in ICT integration. Among the factors that influence the use of technology in the educational process are beliefs in one's efficacy, pedagogical knowledge, and cultural context.

Before selecting a technology, it is recommended to determine the problem and goal that the teacher is focused on when planning the lesson. The next step in planning is to search for a technology that meets the goal. The final step is to evaluate the accessibility and quality of the technology. One of the guidelines is to identify students' learning needs related to content in combination with teaching activities and appropriate educational technologies. We propose an algorithm for integrating educational technologies by the TPCK concept (see Fig. 1.3).

In addition to the successful implementation of digital didactics in education, a change in the thinking style of teachers towards constructive or design thinking is noted as a necessary condition. This transformation is possible with the presence of the following professional skills:

1. Creating an adaptive learning environment in which students freely determine the purpose, content, and learning strategies, and control and evaluate their personal learning progress.

2. Designing interactive content by choosing and designing tasks, problems, projects, and events using digital resources to promote student learning and creativity.



Table 1.1. Categories for assessing the degree of technology integration into the learning process.

| Criterion | 4 | 3 | 2 | 1 |
|---|---|---|---|--|
| Program goals and technologies | The selected ICT fully corresponds to the program's goals | The selected ICT corresponds to one or several program goals | The selected ICT partially corresponds to the program goals | The selected ICT does not correspond to the program goals |
| Teaching technologies | Using ICT optimally supports the implementation of teaching strategies | Using ICT supports the implementation of teaching strategies | Using ICT minimally supports the implementation of teaching strategies | Using ICT does not support the implementation of teaching strategies. |
| Choice of technology selection (alignment with objectives and teaching methods) | The technology chosen fully meets the program's objectives | The technology chosen meets one or several of the program's objectives | The technology chosen partially meets the program's objectives | The technology chosen does not meet the program's objectives |
| Content, combined with methods and technologies | The content, learning strategies, and technology choices align perfectly with each other within the educational program | The content, learning strategies, and technology choices align with each other within the educational program | The content, learning strategies, and technology choices partially align with each other within the educational program | The content, learning strategies, and technology choices do not align with each other within the educational program |

3. Applying alternative or authentic forms of assessment according to the goals and content of learning; using assessment to intensify learning.

Thus, by creating an innovative and meaningful educational environment, teachers ensure measurable learning outcomes that meet the expectations of all stakeholders in the educational process.

However, the implementation of such an environment is possible only if students are provided with high-quality and reliable educational resources. In our opinion, the ability to evaluate the quality of digital resources should be developed not only in

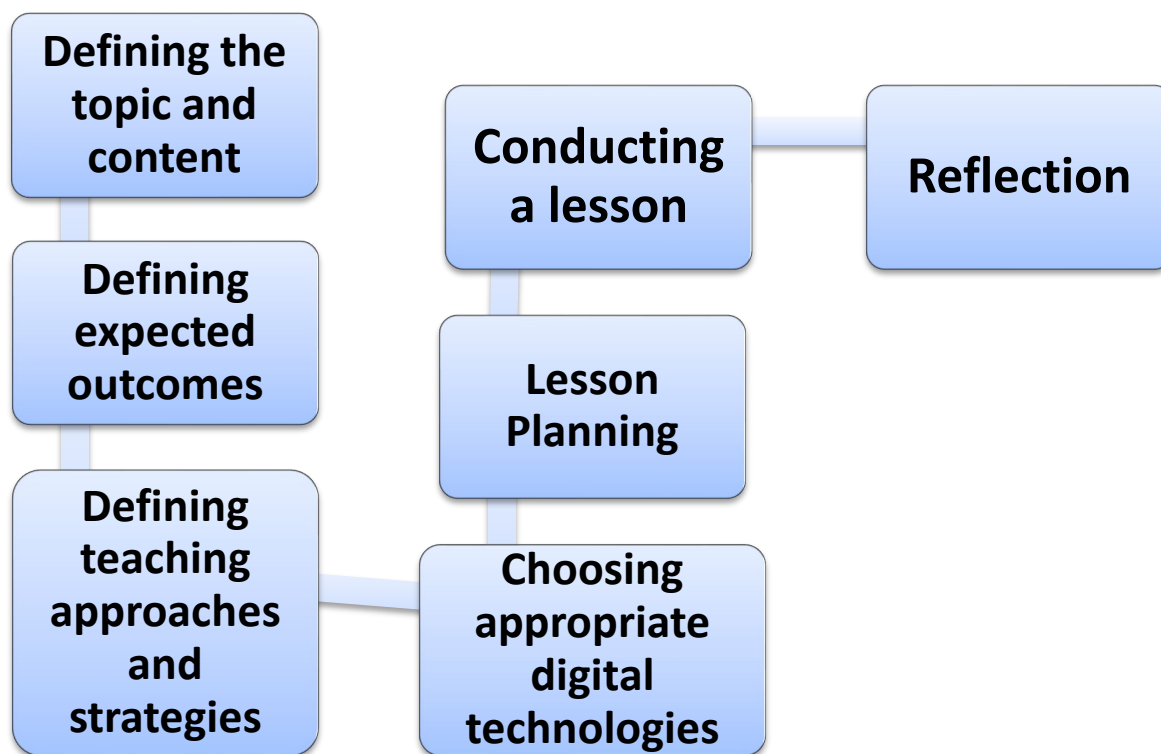


Fig. 1.3. TPCK Algorithm

teachers but also in students. To achieve this, it is important to teach students digital literacy and critical thinking skills for finding and evaluating the quality of the information provided on the Internet. The main skill of students is to find a website related to the topic and copy or paste the text, while the ability to select sources, critically interact with the content, and consider the value of the information provided remains beyond the learning process. On the other hand, students are offered a plethora of digital resources to choose from, but the reality is that there are too many resources, and students find it difficult to find a high-quality and effective platform or application because they do not know the criteria for selecting resources and the principles of using these resources.

1.2. Strategies for developing digital and media literacy

A large number of pedagogical research emphasize the benefits of developing media and information literacy skills, which are related to critical thinking skills, and emphasize the need to integrate strategies for mobile and e-learning into the educational process (Kim, Shumaker, 2015). This is a strategy that goes beyond simply



checking a website for the necessary information. UNESCO's concept defines the competencies of a modern professional that combines:

Information literacy – the ability to find, summarize, and analyze information;

Media literacy – the ability to access resources and create content;

Digital literacy – the ability to use information technologies according to their capabilities and specifications.

According to the definition by the Association of Higher Education in the United States (Information Literacy Competency Standards for Higher Education, 2000), information literacy is the ability to find, access, evaluate, and use information that encompasses all disciplines, all learning environments, and all levels of education. Academic research on the development of information literacy in higher education reveals problems of mismatch between understanding the importance of information and media literacy skills and the realities of their formation in the educational process. DaCosta (2010) states that “There is an obvious gap between the information literacy skills that instructors want their students to have and those that they actively support and develop” (p. 218). Therefore, media and information literacy are not separate skills and abilities that students can develop independently and as needed, but a continuous and systematic process that should be planned and integrated into educational programs and components.

To develop the mentioned skills and create a comprehensive system for integrating digital educational technologies into the learning process, an experimental study was conducted. Since our research aims to find practical ways and solutions, it combines data collection and analysis to ensure an in-depth study of the effectiveness of e-learning. Was collected quantitative data through surveys about students' problems and skill levels before the experiment, and we checked the quality of the research results through individual interviews with students and instructors after the experiment. Testing was provided to determine the level of skill and knowledge formation. After information literacy classes, to obtain feedback, we conducted individual surveys with students regarding the topics, necessity, and effectiveness of such classes.

During the preparatory stage, we conducted a survey of students regarding the most problematic issues related to learning with digital technologies. Students were asked to choose from a list of problem questions and add their options based on personal experience, including:

- ✓ Determining keywords for the search



✓ Differentiating between peer-reviewed and non-peer-reviewed journals as sources of scientific information

✓ Evaluating the quality of information sources

✓ Evaluating the validity of information

✓ Differentiating between popular and scientific resources

✓ Types of articles and databases, and tools for working with them.

The second questionnaire related to the level of ability to evaluate the quality of information. We adapted and used survey tools developed by Lisa Beutelspacher, a researcher in the Department of Information Science at Heinrich Heine University in Düsseldorf, Germany (Beutelspacher, Henkel, Schlögl, 2015). The main advantages of the evaluation tool are its objectivity, informativeness, and appropriateness for students' abilities and skills to self-assess the results of their activities. We adapted the list of questions according to the research purpose and the context of our educational environment.

1. What are some examples of search engines you are familiar with?

- Google
- Bing
- Yahoo
- Other
- I am not familiar with any search engines.

2. What are the primary indicators of a website's quality?

- Design
- Image quality
- Language
- Authorship
- Number of ads
- Types of articles
- Audience
- All of the above criteria.

3. When researching an unfamiliar topic, what are the best sources to begin with?

- Journals
- Encyclopedias or dictionaries
- Library catalogs
- Websites
- I don't know



4. Which statement is true regarding research on the Internet?

- One should check as many websites as possible
- Only one search engine should be used
- Different websites should be compared
- Only information that confirms your personal opinion should be sought
- I don't know

5. If you need to write a comparative document on the latest innovations in engineering in Ukraine and the USA, what keywords would you use to search for information?

- Ukraine, USA, innovations
- Ukraine, USA, engineers
- Ukraine, engineering
- USA, innovations
- I don't know

6. In which types of publications are scientific research findings typically first published?

- Books
- Encyclopedias
- Scientific journal articles
- Conference papers
- Manufacturer websites
- I am not sure

7. What criteria can be used to assess the quality of a Wikipedia article?

- Presence of bibliographic references
- Comments on the article discussion pages
- Number of images in the article
- Length of the article
- I am not sure

8. Where can one find the summary of a scientific article?

- Abstract
- Bibliography
- Conclusion
- Introduction
- I am not sure



9. What is the meaning of the term “peer review” in scientific publishing?

- The article has been reviewed and revised by the author's friends and colleagues
- The article has been reviewed by experts who proposed changes
- The article has been edited by the publisher
- I am not sure

10. How can one determine which scientific articles have generated the most attention in the scientific community?

- By the number of times they have been cited in other articles
- By the number of times they have been mentioned in the media
- By the number of comments they have received on social media
- By the length of the articles
- I am not sure

Our research involved 47 students from two academic groups in their second year of study when they begin to familiarize themselves with conducting research for their qualification works. The control group consisted of 22 students, and the experimental group consisted of 25 students. Both groups were asked to conduct independent internet research on the topic of “Implementation of Sustainable Development Goals in Ukraine” and prepare a presentation in English. During practical classes, teachers used digital technologies (Kahoot, Quizlet, Google Classroom, etc.), so students had experience with mobile devices and resources in class. The research lasted for two months, during which students had eight classes: five classes on information literacy using mobile learning tools for the experimental group and three classes on conducting and presenting research for both the control and experimental groups. Only students in the experimental group (n = 25) had integrated classes in English language and media and information literacy education. In these classes, students learned the basic topics of searching for and evaluating information sources. To assess the results of the study, we developed a rubric consisting of two parts: presentations (content, layout, language used) and quality of sources.

Therefore, the main goal of the research was to teach students basic rules of media and information literacy using critical thinking skills to evaluate the originality, reliability, and credibility of information. To identify problems that students could not solve independently during web research, we asked them to fill out a questionnaire, the results of which are presented in Table 1.2.

**Table 1.2. Problematic issues**

| | Problem Content | Percentage |
|---|---|-------------------|
| 1 | Definition of key terms | 53% |
| 2 | Distinguishing between reviewed and non-reviewed publications | 77% |
| 3 | Evaluating the quality of information sources | 83% |
| 4 | Distinguishing between scientific and popular sources | 80% |
| 5 | Types of articles and how to differentiate them | 64% |

Regarding the results of the second survey on information literacy, we observed that the majority of students (96%) turn to Internet resources to search for scientific information, while only 4% of students visit libraries to find reliable scientific sources because they do not trust the information provided on the internet. During the study, 54% of students used only one search engine and referred to sources that are easily accessible, free, and understandable in terms of language and content; 37% of students checked all proposed pages and chose one source based on its popularity and number of visits. Only 8% of students compared websites and chose based on their content, while 92% of students considered various types of Wiki-encyclopedias and manufacturer websites to be the most credible and reliable sources because, according to students, books and encyclopedias are outdated and contain a lot of additional information. “Wikipedia articles provide all the necessary information with a large number of reliable references”, students commented on their answers to the 6th and 7th questions during the interview. Regarding the selection criteria for the source, 43% chose the number of references as the key criterion, 37% paid attention to comments, and 20% of students used links proposed in the Wiki-encyclopedia. Answers to the 10th question about the validity of the article varied significantly: 75% of students chose the date as the main criterion, 20% chose the source, and 5% chose the author. No one chose the number of citations or the length of the article.

The primary conclusions of the survey results indicated a lack of knowledge and a low level of critical thinking skills in both groups. The results of the summary interview with the students from the experimental group were more positive, and comparing the results of the research from both groups, teachers, as well as participants, were convinced of the difference in the quality of the material presented by the experimental and control groups. Both groups tried to find reliable sources and accurate information, but the control group spent more time searching for information, could not find data based on factual information, and about 35% of their references



were unreliable. In contrast, students in the experimental group demonstrated significant facts with reliable data and sources in a shorter period and with less effort. All respondents agreed that the experiment was useful and productive, and they wanted to improve their knowledge and skills in information literacy in the future.

Analyzing the strategies, measures, and digital educational technologies used during the experiment, we propose a brief overview of the most useful and interesting tools for students. To improve critical analysis skills, we suggested that students choose programs such as Google Keep, Evernote, or Seesaw, which help integrate data from mobile devices, visualize information using infographics, help identify patterns and key ideas, edit, annotate, search for evidence to evaluate information. These tools allow students to create digital portfolios of their work, allowing teachers to monitor the dynamics of the learning process, and control and direct search and learning activities.

To help students develop the skill of identifying keywords, the following digital educational resources were suggested: Google Trends, Keywords Everywhere, and Keyword Shitter. The characteristics of popular and scholarly articles, as well as reviewed journals, were explained using examples provided in the resources of the company EBSCO, which creates and publishes scientific databases. Students were given explanations regarding the key characteristics of articles they should pay attention to when searching for articles: content, author, audience, language, infographics, structure, methodology, and bibliography. Table 1.3 presents a brief description of the proposed learning strategies for developing the ability to evaluate the quality of information.

Students create mind maps for proposed topics using resources such as Mindomo, MindMeister, or MindMup.

One of the advantages of using digital educational technologies is the ability to individualize the learning process and adapt it to the capabilities and needs of students. Therefore, we offer students more than one application or platform for completing tasks, as this diversifies their experience, helps them find their learning style, and improves their media and information literacy skills.

Developing information literacy is an extremely important skill for university graduates, as it helps them grow professionally and achieve self-realization. In summary, we will outline several recommendations for the successful implementation of the learning process with the support of digital educational technologies:

- The expected learning outcomes should be clear and understandable to students



Table 1.3. Learning Strategies

| Goal | Strategy | Task |
|--|----------------------------------|---|
| Creating a mind map to identify keywords | Collaborative learning strategy | Students create mind maps for proposed topics using resources such as Mindomo, MindMeister, or MindMup |
| Teach the basic rules for evaluating the quality of information | Cooperative learning strategy | Students search for reliable sources of information on a topic assigned by the teacher and develop criteria for evaluating the quality of information |
| Evaluate the quality of information through critical analysis | Individualized learning strategy | Students are provided with criteria for evaluating the quality of information and samples of information sources. Using critical analysis methods, students must determine high-quality sources. We recommend using the platform www.exploratree.org.uk , which provides instructions for structuring the process of analyzing the quality of information |
| Teaching to distinguish between popular and scientific articles | Situational learning strategy | Students are given articles of different genres and characters, and using the EBSCO platform, they determine the type of article |
| Providing knowledge about the peculiarities of article reviewing | Peer assessment | Students create content, develop criteria for peer assessment, and review each other's works |

for activity planning.

- Feedback from the teacher should be timely and constructive.
- Learning strategies should take into account individual capabilities and needs, learning styles, and motivation by integrating different types of digital educational technologies.
- The choice of resources, study time, and level of complexity should be flexible to personalize learning.



The analysis of learning strategies allows us to conclude that the features of the development of knowledge and skills in information and media literacy justify the growing need for teaching students critical analysis of digital content and resource quality. Privacy and security rules are also components of information literacy that should be part of the educational content, promoting the prevention of internet bullying and personal information loss. To effectively implement the described learning process, it is necessary to create an innovative learning environment with subject-to-subject communication in universities, where students and teachers have the opportunity to experiment with digital educational technologies, learning strategies, and materials according to the needs and capabilities of all subjects involved.

We offer a list of resources for learning foreign languages:

VOA Learning English offers real-time news stories to engage students who are learning English. The website contains reading content on various topics for students with different levels of language proficiency, including world news, politics, culture, business, science, social studies, life in the USA, and pop culture. Some articles may also include short audio clips and videos (most limited to approximately 1,500 words). News broadcasts are also read at a third slower than normal speed, making them easier to understand. The main role of VOA is to provide programs for radio, television, and the internet outside the US in English and other languages.

PodBean is a podcast app and player for finding, downloading, and listening to your favorite podcasts, audio broadcasts, FM, radio, and audiobooks anywhere and anytime. The app allows you to listen to over 50 million episodes of podcasts from around the world, with content ranging from news, comedy, education, sports, and more.

Quizlet is an online learning tool that saves time by helping students prepare for tests with interactive tools and games. In Quizlet, information is organized into “study sets” that users, such as teachers or students, add to their accounts. When using Quizlet, students log in and select the appropriate set of terms to study, which may be created by the teacher or other users. Due to its accessibility and flexibility, Quizlet can be used for students at any level of knowledge.

The Corpus of Contemporary American English (COCA) is the only large, genre-balanced corpus of American English. It is the most widely used corpus of English, linked to many other English corpora, which offer an unprecedented understanding of English language variation. The corpus contains over a billion words of text (25+ million words annually from 1990-2019) from eight genres: popular



magazines, newspapers, academic texts, television, movie subtitles, blogs, and other web pages.

Grammarly is a writing and grammar checker designed to help writers correct their mistakes. The resource can be used on the internet, as an application for Windows or Mac, or as an extension for Chrome, Safari, Edge, or Firefox. After authors create a rough draft of the text, they can paste or upload it, and suggestions for improvement and correction appear, and users can choose to make changes on the spot or delete the suggestions. Users can also access advanced error logs. Grammarly is free to download and use for basic grammar and spelling checks, but there is a Premium version that adds features such as goal setting, plagiarism detection, and advanced feedback (especially for readability).

YouGlish is a simple way to learn the correct pronunciation of words by hearing them pronounced in YouTube videos. This tool uses YouTube to play back the commonly spoken pronunciation of words in different languages by native speakers. YouGlish is very user-friendly, and thanks to its YouTube base, YouGlish is accessible from any device with a web browser.

“ToPhonetics” is an online converter that transforms English text into phonetic transcription or the International Phonetic Alphabet (IPA). Simply insert or type the English text into the text field and press the “Show transcription” button. The educational potential includes the choice between British and American pronunciations. When the British variant is selected, the sound [r] at the end of a word is pronounced only after a vowel. The structure of the text and sentences (line breaks, punctuation, etc.) is preserved in the phonetic transcription, making it easier to read. Words in all caps are interpreted as abbreviations, and if a word is not found in the database, the transcription will show hyphens between the letters.

“Lingro” is a free website that helps students learn languages and offers additional features. It has a standard dictionary that translates words into 11 languages, as well as a web browser that allows you to upload a webpage and then click on any word to get an immediate translation. Users can also download a browser plugin that does the same thing but has a wider range of features. Users can create and categorize word lists, which can be used in learning and games. There is also an option to add a mini-dictionary icon to your website, allowing others to translate it. To add a word to the dictionary on the site, click on the dictionary builder, and then select the language. A list of words that have not yet been translated by the user community will appear, then select a word from the list and add your translation.



The “**HotPotatoes**” package includes six programs that allow you to create interactive exercises with multiple choice, short answer, mixed sentences, crossword, matching, and ordering exercises, as well as exercises to fill in the blanks. HotPotatoes is free and can be used for any purpose and any project.

GoogleForms is a web application that allows you to collect information from users through personalized surveys or quizzes. Then the information is collected and automatically connected to an electronic spreadsheet. The electronic spreadsheet is populated with answers to surveys and tests. This is a simple and one of the easiest ways to save data directly in an electronic spreadsheet.

ProProfs platform is the easiest online software for creating quizzes and tests. There is also access to a library of over 100,000 ready-made questions of 10 different types, including fill-in-the-blanks, multiple choice, and more using the quiz-making tool. Images, presentations, and videos can be added to make the quiz interactive. Quizzes work well on all types of devices, including desktops, laptops, and mobile phones. After publishing the quiz, it can easily be shared via email, embedded on a website or blog, or even shared with private groups, with each user having their login credentials. There is also the ability to create quizzes in over 70 languages using our online quiz tool.

Padlet provides opportunities for creating and collaborating through interactive multimedia bulletin boards. It is a website and app that allows students to organize information on virtual bulletin boards using a simple drag-and-drop system. Students can start with a template or a blank page and add text, links, images, videos, and documents. Padlet boards can be shared with others via email or social media or embedded on a website. Padlet is ideal for brainstorming, collaboration, research projects, and presentations.

Flipgrid is an innovative educational tool that allows educators to create engaging and interactive video-based discussions for their students. It has a wide range of abilities that can be used for teaching various subjects, including language learning.

One of the key abilities of Flipgrid is its ability to promote active learning. In language learning, students need to practice speaking and listening skills, which Flipgrid enables through its video discussion feature. Teachers can create topics related to language learning and have students record their responses in the target language. This allows students to practice speaking and listening skills in a low-pressure, asynchronous setting, while also promoting self-reflection and critical thinking. Another benefit of Flipgrid is its ability to provide opportunities for peer feedback and



collaboration.

Quibblo is a social networking and quiz-making website that can be used as a tool for teaching various subjects, including language learning, geography, history, and literature. It allows teachers to create quizzes, surveys, and polls that students can take either in the classroom or remotely. Quibblo's quiz-making tool allows teachers to create quizzes with multiple choice, true/false, and short answer questions. They can also add images, videos, and audio files to the questions to make them more interactive and engaging for the students.

Microsoft Project is a powerful project management tool that can be used to teach project management concepts to students. With its wide range of features and capabilities, Microsoft Project can help students learn about scheduling, budgeting, resource allocation, task management, and much more.

Evernote is a powerful note-taking application that can be used as a valuable tool in teaching. It allows users to create notes, organize them, and access them across multiple devices.

Popplet is a user-friendly and intuitive digital tool that allows users to create visually appealing mind maps, concept maps, and diagrams. It is a versatile tool that can be used in various educational settings, including classrooms, online courses, and self-directed learning. One of its primary abilities of Popplet is its capacity to enhance learning and teaching by enabling students to create and organize their ideas clearly and engagingly. With Popplet, students can develop their critical thinking skills by analyzing and synthesizing information from various sources and constructing visual representations of their understanding. Teachers can also use Popplet to present information in a visually appealing way, making it more accessible and engaging for learners.

Schoology is a cloud-based learning management system (LMS) that is designed to help teachers and students manage their academic activities in a centralized platform. It is a user-friendly platform that offers a wide range of features that simplify the management of various aspects of the teaching and learning process. One of the key features of Schoology is its ability to provide teachers with a platform to create and manage courses. This includes the ability to create assignments, assessments, and learning materials such as videos, presentations, and documents. Teachers can also use Schoology to track student progress and provide feedback on assignments. Another feature of Schoology is its ability to facilitate communication between teachers and students. Teachers can use Schoology to send announcements, messages, and



reminders to students, while students can use it to ask questions and seek help from their teachers.

Blogger is a popular blogging platform that allows users to create and publish blogs for free. It was created by Pyra Labs in 1999 and was later acquired by Google in 2003. Blogger is a user-friendly platform that requires minimal technical knowledge, making it a popular choice for bloggers who want to start their blog without having to worry about the technical aspects of web development. One of the key features of Blogger is its simplicity. Users can easily create a new blog by selecting a template and customizing it to their liking. Blogger offers a wide range of templates that users can choose from, or they can create their custom templates using HTML and CSS. This makes it easy for users to create a professional-looking blog without having to hire a web designer.

WordPress is a popular content management system (CMS) that is widely used for creating blogs, websites, and online portfolios. It is a versatile platform that is used by individuals, businesses, and organizations of all sizes. WordPress has many abilities that make it a valuable tool for students in various educational settings. WordPress has a simple and intuitive interface that allows students to create and manage their blogs and websites without needing any technical skills. This makes it an ideal platform for students who want to showcase their work or create a digital portfolio. Another ability of WordPress for students is its flexibility. WordPress can be used to create a wide range of websites, including blogs, e-commerce sites, and online forums.

LiveJournal is a social networking platform that was launched in 1999. It is a blogging platform that allows users to create and share their blogs, as well as read and comment on other users' blogs.

Twitter is a social media platform that allows users to post short messages or “tweets” of up to 280 characters. While Twitter is often associated with casual use and social networking, it also offers several abilities for teaching, including microblogging, real-time communication, hashtags, and authentic learning experiences.

Tumblr is a microblogging and social media platform that was launched in 2007. It allows users to create and share multimedia content in the form of short blog posts, photos, videos, and other types of media. While Tumblr is often used for personal blogging and social networking, it also offers several abilities for teaching. Tumblr offers a flexible platform for students to express their ideas and creativity. Teachers can use Tumblr as a tool for assignments such as creative writing, visual storytelling, or multimedia projects. Students can also use Tumblr to showcase their work and



receive feedback from their peers.

ScoopIt is a content curation platform that allows users to discover, curate, and share content across various topics and industries. It is a powerful tool for content marketers, researchers, and social media managers looking to stay up-to-date with the latest trends and news in their respective fields. With ScoopIt, users can easily create their content hubs and curate content from around the web to share with their audience.

An **ePortfolio** is a digital collection of evidence that showcases an individual's learning, achievements, and professional development over time. In the context of teaching, ePortfolios can be a valuable tool for teachers to reflect on their practice, track their professional growth, and showcase their accomplishments to potential employers. By using an ePortfolio, teachers can document their teaching philosophy, lesson plans, student work, and other evidence of their effectiveness as educators.

A **wiki** is a collaborative website or platform that allows users to create, edit, and share content in real time. In the context of teaching, wikis can be a valuable tool for promoting collaboration, knowledge-sharing, and critical thinking among students. By using a wiki, students can work together to create and edit content, share resources, and engage in ongoing discussions and debates.

WebQuest is a structured, inquiry-based learning activity that uses the Internet as a primary source of information. In the context of teaching, WebQuests can be a powerful tool for engaging students in authentic, real-world learning experiences that promote critical thinking and problem-solving skills. By using WebQuest, students are presented with a real-world problem or challenge and are tasked with using the Internet to research and develop a solution.

TED Talks are a series of engaging and informative presentations that cover a wide range of topics and disciplines. In the context of teaching, TED Talks can be a valuable tool for enhancing student learning and promoting critical thinking skills. By incorporating TED Talks into their lesson plans, teachers can expose students to new ideas and perspectives, and inspire them to explore topics in greater depth.

MOOCs, or Massive Open Online Courses, are online courses that are designed to be open and accessible to anyone with an internet connection. MOOCs offer a wide range of courses and disciplines, and they can be valuable tools for teaching and learning. By using MOOCs, teachers can provide students with access to high-quality, engaging course materials from leading universities and experts from around the world.

The increasing use of digital technologies and social media in daily life has led to the need for individuals to be proficient in digital and media literacy. The ability to



access, analyze, evaluate, and create media content has become an essential skill for success in the 21st century.

Strategies for Developing Digital and Media Literacy:

1. Teaching Digital Citizenship: Digital citizenship education aims to help students become responsible digital citizens by providing them with the knowledge, skills, and attitudes needed to navigate the digital world safely and effectively. This includes understanding online privacy, cyberbullying, and digital footprints.

2. Project-Based Learning: Project-based learning is a teaching method that emphasizes active learning, critical thinking, and collaboration. It allows students to develop digital and media literacy skills through real-world projects that require them to research, analyze, and create digital content.

3. Media Creation: Media creation involves students in creating their own media content, which requires them to develop digital and media literacy skills. Students can create videos, podcasts, blogs, and other digital content that allows them to develop their creativity, critical thinking, and communication skills.

4. Collaboration: Collaboration is essential in developing digital and media literacy skills. It allows students to work together to solve problems, analyze media content, and create digital content. Collaboration also promotes communication, critical thinking, and teamwork skills.

The use of digital educational technologies has gained significant attention in the field of education, both in theory and practice. Educators are exploring new ways to integrate these technologies into the learning process to improve student engagement and enhance learning outcomes. This monograph provides an in-depth examination of the fundamental concepts and methods for integrating digital educational technologies into teaching practice. The various types of digital educational technologies, such as hardware, software, and online tools, are discussed, along with their potential benefits and limitations. The TPACK model is also explored as a framework for effectively incorporating technology into teaching practice. The successful integration of digital educational technologies requires a deep understanding of the technology and its impact on the learning process. It is crucial for educators to continuously learn about the latest digital educational technologies and stay up to date on best practices for their integration into teaching practice to prepare students for success in the digital age.