Blended learning in the context of digitalization

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Abstract

The realities of digitalization require changes in strategies for choosing educational technologies. The modern educational process is not possible without the use of digital technologies. Digital technologies have led to the arising and development of blended learning. However, its effectiveness is determined not only by technology. The human factor receives special attention in this direction. Analysis of the World Development Report 2016: Digital Dividends allows us to identify digital competence as a necessary condition for the successful use of digital technologies, and hence blended learning. Learning interactions designing in the process of implementing blended learning requires timely diagnosis of the level of digital competence. A popular tool for this is the Digital Competence Framework for Citizens. To clarify the peculiarities of its use was made an analysis of the experimental implementation results of blended learning in the industrial training in sewing for intended masters. During the research, it was revealed that the most important digital competence areas for the variable learning establishment in the training of future professionals are Information and data literacy, Communication and collaboration and Problem solving. In addition, competence for area Problem solving conduce to increase the level of competence for all other areas. The level of digital competence of the subjects mainly coincide to the characteristics of basic and secondary levels. The obtained data clarified the reasons for the difficulties, decrease motivation and cognitive activity that occur among students using distance courses-resources learning designed for blended learning. Thus, the use of the Digital Competence Framework for Citizens at the initial stage of implementing blended learning can make a rational choice of strategies for combining face-to-face and distance learning technologies.

Keywords

informatization, education, digitalization, blended learning, professional training, digital competence

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1. Introduction

The origin of innovation in the modern world is characterized by considerable rapidity. Most technological innovations are related to the development of digital technologies. They involve all socionomic spheres, changing society, contributing to the goals of sustainable development, creating new and changing existent technologies and products, producing new and modernizing traditional knowledge [1, 2]. Digital technology is associated with tools for collecting, storing, analyzing and exchanging information in digital format. The Internet and mobile phones have a significant impact on the development of modern society. Although the World Development Report 2016: Digital Dividends [3] has already outlined perspective areas for the use of digital technologies such as 5G, artificial intelligence [4], robotics [5], autonomous vehicles, the Internet of Things [6], 3D printing [7]. In addition, augmented and virtual reality has a prominent place in the research of new digital technologies [8, 9]. Under these conditions, the mission of education in the context of global digitalization is to prepare citizens for life and activity in the digital world. The most perspective way to implement educational activities in the modern world is the strategy of choosing educational technologies involving the active use of digital technologies.

1.1. Background

The current direction of innovative changes in education nowadays is the implementation of blended learning concept [10], which allows a symbiosis of pedagogical and digital technologies. Note that among the prerequisites for the emergence and development of blended learning (conceptual, technological-instrumental, financial and economic), influencing the content of the phenomenon, its components, characteristics, implementation conditions and opportunities for accumulation experience [11] is of particular importance integration of digital technologies into education process.

Many studies have been devoted to the problems of educational digitalization [12, 13]. Among the most significant should be noted the scientific achievements of Valeriy Yu. Bykov [14], Mariya P. Shyshkina [15], Natalia V. Morze [16], Oleg M. Spirin [17], Vladyslav Ye. Velychko [18], Myroslav I. Zhaldak [19] etc. Particular note for the results of comprehensive and collective development research, covered in the collective monograph "Theoretical and methodological principles of educational informatization and practical implementation of information and communication technologies in the educational sphere of Ukraine" [20], which ensured the development of theoretical basis of target, content, scientifically-organizational and normative-legal components of educational informatization implementation of ICT in a wide educational practice.

A significant contribution to the development of the theory and practice of blended learning in Ukraine has been made by Olga V. Bondarenko [21, 22], Kostiantyn L. Buhaichuk [23], Volodymyr M. Kukharenko [24, 25, 26], Svitlana H. Lytvynova [27, 28, 29], Oksana M. Markova [30], Iryna S. Mintii [31], Natalya V. Rashevska [32], Hanna M. Shalatska [33], Mariya P. Shyshkina [34], Oleg M. Spirin [35], Nataliia P. Volkova [36] etc. They proved the relevance and feasibility of implementing this innovation in the system of domestic education based on foreign experience and the results of their own practical activities. It is obvious that the implementation of blended learning requires a certain level of digital competence of trainers and learners that contributes

its improvement in the implementation process.

The importance of digital competence in professional activities and the possibility of diagnosing the levels of its formation using the Digital Competence Framework for Citizens (abbreviated name DigComp) investigated by Oksana P. Buinytska [37], Artem O. Zaika, Vasyl I. Kovalchuk, Valerii V. Soroka [38], Tetyana V. Zaporozhets [39], Irina V. Ivaniuk [40], Oksana V. Mnushka [41], Oksana V. Ovcharuk [42], Natalia V. Soroko [43], etc.

Certanly, the involvment of digital technologies into the educational sphere is inevitable and necessary. However, they are not able to solve all urgent problems.

1.2. Statement of problem

In the process of studying the World Development Report 2016 research, we have identified a number of theses, the analysis of which allows us to outline the direction of our study.

1. The use of technologies lags behind the broad potential of their development opportunities [3]. Usually, technological innovation developers and users have a significant gap in the level of digital competence. It takes time for technological developments to become widely used. In our opinion, the reduction of time for the implementation of relevant innovations can be achieved by paying due attention to the development of digital competence by educational institutions.
2. Digital technology allows you to perform routine operations much cheaper, faster and more convenient. But in most tasks there is an aspect that cannot be automated and requires judgment, intuition and human reasoning (making decision) [3]. It means for us that although the functionality of digital technologies is constantly growing over time, they are not able to completely replace humans. This is especially clear in the field of education. Technology certainly can facilitate a significant number of actions in the learning process. However, the choice of technology for use, place, time, method belongs to the subjects of learning.
3. Technology can make workers more productive, but not when they lack the know-how to use it [3]. This thesis fill up the previous ones, asserting the truth that technology is not used for the sake of technology itself. They are made to increase the efficiency of work, which is achieved through perfect mastery of technological tools. Achieving accomplishment requires digital competence and constant practice.
4. “Access to the Internet is critical, but not sufficient” [3]. Most modern digital technologies require a reliable connection to the Internet. However, besides high-performance network technology requires the ability to use it effectively.
5. The best technology is one that people already have, know how to use and can afford [3]. As it was mentioned, to use technology, you need to have knowledge and ideas about it. In addition, the physical presence of process equipment is obvious. Over and above, the cost of such equipment and a license to use the relevant software is quite high. Therefore, we agree that the choice of technology should be justified not only in terms of functionality but also in terms of cost.
6. The success of the technology use in educational projects is achieved by: focusing on the “guided use” of technology, and not just providing tools for public use; providing

relevant curricular materials; sharing devices in educational establishments; adherence to the basics of didactics, pedagogical support and development; using technologies for practical significance; implementation of non-standard evaluation mechanisms [3].

7. Lack of clear ideas about the implementation of “technological"” solutions in educational practice can lead to a move in the wrong direction. However, this is not a failure of technology, but is the result of improper planning, inability to learn from failures and adapt [3]. This statement once again aver that the human factor is crucial in the process of using technology. Digital competence, readiness for continuous improvement, ability to think critically, analyzing of the situation, making decisions – are important factors in the effective use of technology.

Thus, the proper preparation of citizens for life and activity in the digital world requires the development of appropriate educational standards. To this end, the Digital Competence Framework for Citizens (DigComp 2.0: Digital Competence Framework for Citizens) [44] and an updated version of DigComp 2.1 (DigComp 2.1: Digital Competence Framework for Citizens) [45] have been created. It is used for developing strategy of using digital skills, reviewing and creating curricula, developing digital competence of teachers and supporting employment opportunities [42].

The purpose of the article is taking into account the main provisions of the Digital Competence Framework, researching how its structural elements are correlated with the requirements for implementation of blended learning in the training of future professionals.

2. Results

According to DigComp 2.1, the component composition of digital competence is formed by five areas (figure 1), each of which also has its own structure (figure 2). Eight levels of knowledge for each competence are defined on the basis of learning outcomes (using action verbs, following Bloom’s taxonomy).

The first and second levels of literacy are determined by the ability to perform simple tasks by remembering and measures up to the basic level. Moreover, level 1 DigComp 2.1 is characterized by the need for guidance, and for level 2 – its occasional. The third and fourth levels – Intermediate are united by the cognitive domain of understanding. Furthermore, the third level is determined by the ability to independently perform standard and simple problems tasks, and the fourth – to perform depended and independent tasks with well-defined and non-routine problems.

Level 5 and 6 are intermediate. The fifth level is characterized by such a cognitive domain as understanding, the ability to solve various tasks and problems, guiding others. Instead of it the sixth level already requires the ability to perform tasks that require finding the most appropriate solution through evaluation, demonstrating the ability to adapt to others in difficult situations.

Seventh and eighth levels are highly specialized and united by the cognitive domain of creation. But if at the seventh level requires the implementation of tasks with limited solutions, while being characterized by the ability to promote cooperation in professional activities, leadership of others, then the eighth resolve complex problems with many interacting factors, proposing new ideas and processes to the field.

Figure 1: Five areas of digital competence

Observations of the digital levels manifestations of competence were carried out in the process of trial testing of the blended learning introduction in the masters industrial training in the field of sewing. Starting from 2018, students of the Vocational College of Oleksandr Dovzhenko Hlukhiv National Pedagogical Univerisity were offered distance learning courses-resources: “Fundamentals of clothing composition” (FCC), “History of costume design and material culture” (HCDMC), “Equipment and automatization of garment production” (EAGP), which were developed on the Moodle platform for blended learning.

The logic of making distance resource courses provided for the solution of the following tasks:

1. Providing students with a mandatory minimum of educational information.

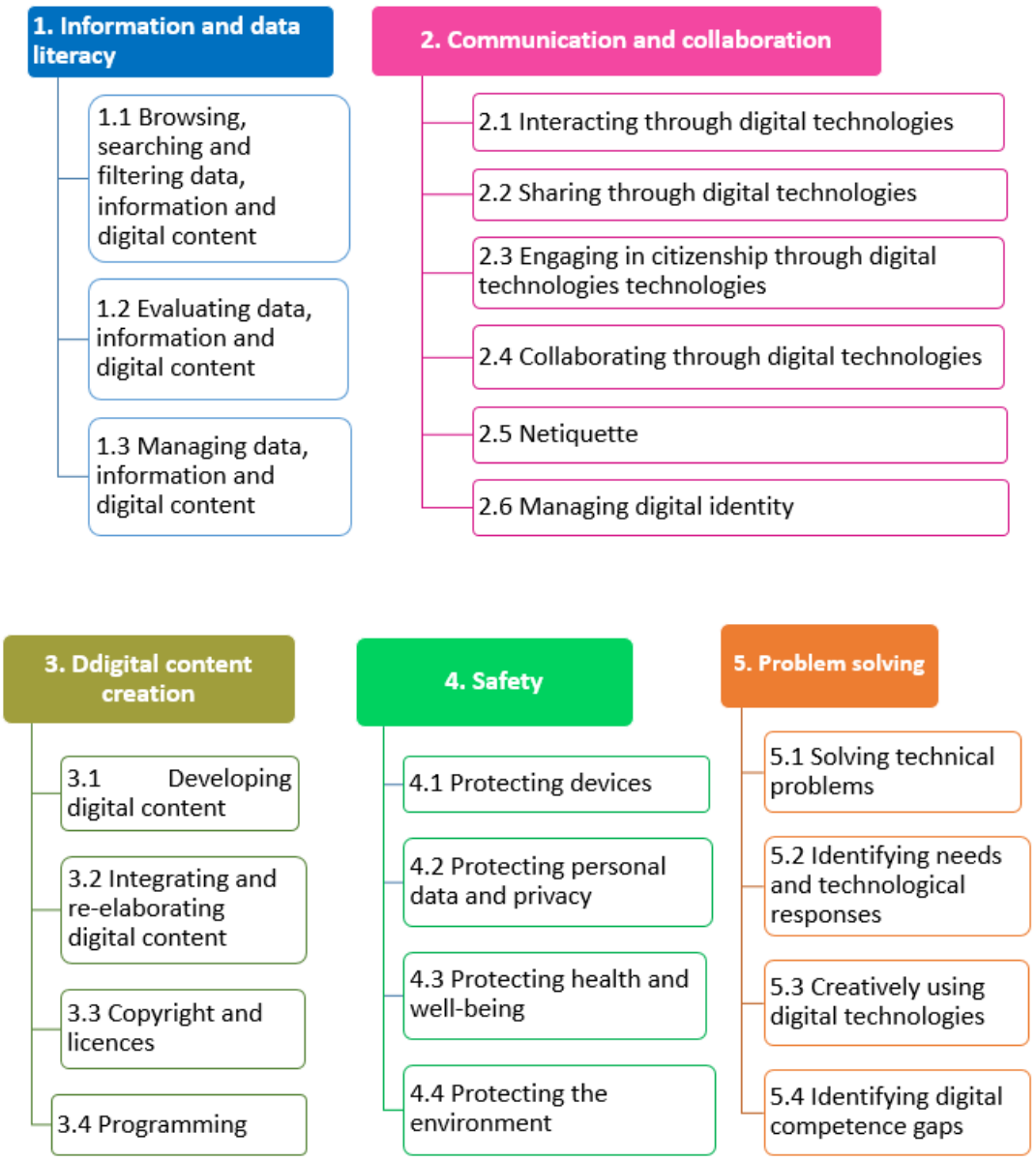

Figure 2: Areas of competences

2. Formulation of the purpose on separate subjects aimed at result.
3. Submission of a task list that contribute to the goal.
4. Providing the necessary instructions to perform tasks and identify the level of adequacy of their performance.
5. Ensuring the ability to follow learning progress, improving learning outcomes.
6. Providing opportunities for communication with classmates and teachers.

We should mentiion that only registered students in distance courses-resources have access to full functional potential. To complete the registration, students were required to form a digital competence in the area of 1 – Information and data literacy and 2 – Communication and collaboration, demonstrating the level of their competence.

For successful use of educational materials of distance courses-resources it is enough for students to have Basic level of digital competence in the field of 1. Information and data literacy.

Understanding the logic of goal setting within the thematic sections of the course requires students to demonstrate a level of digital competence not lower than Intermediate in areas 1 – Information and data literacy and 5 – Problem solving. Particularly relevant components of the fifth area in this aspect are: 5.2 Identifying needs and technological answers, 5.3 Creative using of digital technologies, 5.4 Identifying digital competence gaps.

The process of performing practical tasks makes special demands on the level of digital competence. The structure of tasks in resource courses was developed according to Bloom's taxonomy [46, 47]. Taking to the account that in the context of traditional learning, the differentiation of tasks is usually paying attention to the levels of cognitive activity (reproductive, interpretive and creative levels) by Tatyana I. Shamova [48], and their interpretation by Olena V. Sobaieva [49], we will assume that tasks of the reproductive level are tasks of the level in the cognitive sphere of "Knowledge""; interpretive tasks – "Understanding" and "Application"; creative level tasks – "Analysis", "Synthesis", "Evaluation".

Completion of tasks requires the following manifestations of digital competence in all five areas: for the reproductive level – not below the basic, optimally average; for interpretive level tasks – not below average, optimally Advanced; for the creative level – not lower than Advanced, optimally High.

The necessary stage of the tasks is self-control of their sufficiency in quantitative and qualitative indicators, we can follow the progress of learning, if it is necessary to refine it. As the key verbs of the relevant actions are analysis and evaluation, for their successful implementation, students must have formed a digital competence not lower than the extended level. It becomes especially relevant on this digital competence in the field of 1. Information and ability to work with data, 2. Communication and cooperation, 5. Problem solving. An important condition for successful learning is communication. From the level of digital competence in area 2. Communication and cooperation depends on the success of learning and the ability to increase the level of digital competence in all other areas. It is desirable that at the entrance to blended learning students have formed a level of competence in this area not below average, optimally – expanded.

59 students of different ages were involved in the study. The distribution of the number of people by age is given in the diagram (figure 3).

Depending on the needs and capabilities, future masters of industrial training in sewing had the opportunity to choose classroom (performance and defense of practical work in the classroom), distance lesson (performing tasks with remote reporting in the distance course or e-mail) or mixed (tasks using the materials of the distance course-resource with further protection of the results of practical tasks in the classroom) the format of practical tasks of these courses.

After providing information to students about the peculiarities of the use of distance course resources and the ability to choose auditorium, distance lessons or modified format of execution

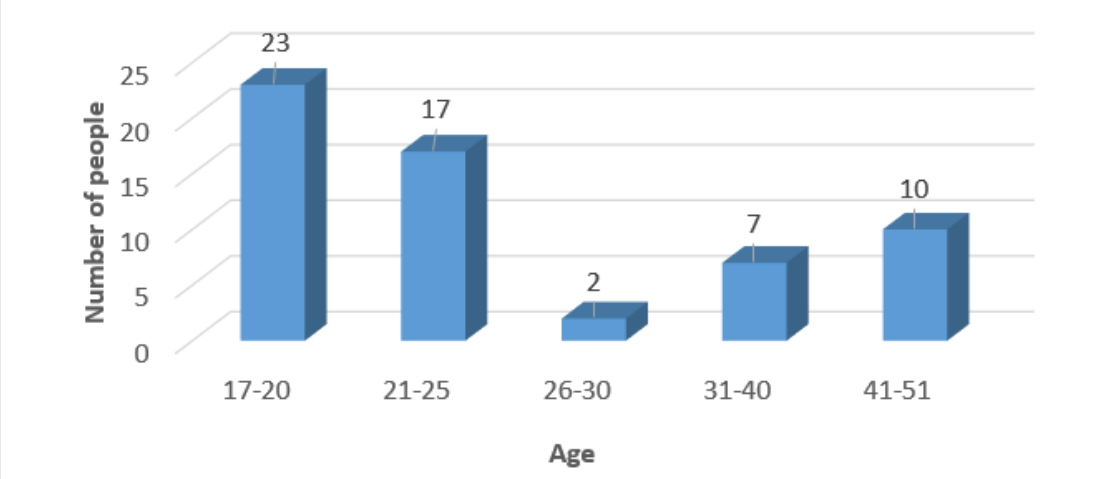

Figure 3: Averaging participants according to their age

and defense, 40% decide to work with the traditional audit method, 10% – distance studying, 50% – agreed the use blended format. The choice of student methods of implementation is mainly influenced by: social circumstances (health, ability to work, marital status), desire for independence, availability of digital devices and access to the Internet.

The first problem to the use of distance resource courses was registration. Despite the fact that students were provided with step-by-step illustrated instructions on how to complete the registration procedure by sending a link via Facebook (in 2018) and Viber (in 2019), only 8 people were able to register independently, 15 – used additional assistance, 7 – refused from registration and the idea of using distance learning course resources. These statistics allow us to state that at least 8 out of 30 people (26.6%) at the initial stage of entering blended learning met the criteria of the third level of DigComp in the areas of 1. Information and data literacy and 2. Communication and collaboration, and 15 (50%)) – the second, the rest (23.4%) – not higher than the first.

Due to the fact that out of 36 people who did not register for distance learning courses for various reasons, most of them in the learning process had a need to access the educational content of distance learning courses, along with the option "Self-registration" was added "Guest access". The combination of these methods provided all interested students with the opportunity to use electronic textbooks, presentations, infographics, useful links and etc. to prepare for practical tasks and their defense. According to a survey of students, it was found that 50% (18 people) of students regularly, and another 10 people occasionally use "Guest Access". This gives reason to believe that the Basic level of digital competence in area 1. Information and data literacy at the beginning of training is inherent for at least 51 out of 59 people (86.4%).

The level of logical understanding of goal setting within the thematic sections of the courses was traced by the results of students' performance of level practical tasks. The average percentage of tasks on the reproductive level of cognitive activity with the use of distance course resources was 37.98%, on the interpreter – 34.53%, creative – 21.78%. The appropriate percentages show that at least 18 people demonstrated the level of digital competence in areas 1, 2, 5 not

lower than the average, 11 people not below the extended, 22 – not below the basic. Progress of distance learning in distance courses is available for students to view in the Moodle module "Grades". Furthermore, the teacher and classmates had the opportunity to leave feedback on the posted reports by students in specially organized forums. If the results of the assessment did not match the expectations, some students eliminated the identified shortcomings. Positive results of presenting tasks of interpretive and creative nature, taking into account the refinement, were regularly demonstrated by 9 people. According to the information given above, the level of their competence in the areas of 1. Information and data literacy, 2. Communication and collaboration, 5. Problem solving can be considered not lower than the extended level.

The process of blended learning certainly involves a variety ways of oral and written communication in the face-to-face meetings and communication through digital technology. In the process of learning to communicate on social networks with the help of mobile applications, 100% of students were reached. In addition, 40 students (41.6%) were involved in the process of pedagogical communication by e-mail, and 20 students (20.8%) were involved in forums among distance learning resource resources. After the termination of face-to-face meetings during the quarantine period related to the epidemiological situation in Ukraine and around the world, 14 students (14.5%) used the opportunity to communicate using the Google Meet service (9 of them (9.3%) went on video communication using a smartphone. Such results allow us to state that the basic level of digital competence in area 2. Communication and collaboration is typical for all subjects. In addition, the study found that five students systematically organized assistance to classmates using digital communications. This gives reason to believe that these 5 students (9.8%) have digital competence in area 2. Communication and collaboration at the advanced level.

3. Conclusions

The most popular areas of digital competence that allow students to join blended learning are areas 1. Information and data literacy, 2. Communication and collaboration and 5. Problem solving. In addition, competences in areas 1. Information and data literacy and 2. Communication and collaboration are mostly required, and possession of competencies in area 5. Problem solving allows successful increasing the existing level of competence in all other areas, achieving the desired results. Students who participated in the experimental study in these areas more often demonstrate Basic level (from 23% to 100%) and Intermediate (average) (from 27% to 35%) levels of competence in performing different types of educational activities. Only 10% to 22% of students demonstrated an Advanced level. Relevant indicators allow explaining the causes of possible difficulties, reduced motivation and cognitive activity of students in the process of blended learning.

According to the results of the study, we can say that the Digital Competence Framework has a significant number of tangents to the conceptual requirements for the implementation of blended learning. Therefore, diagnosing in time of the digital competence level of students based on its level structure at the initial stage of introduction of blended learning can form the basis for choosing strategies to combine face-to-face learning technologies and distance technologies. In our case, special training sessions were initiated. They are aimed at informing

the participants of the educational process about the peculiarities of the implementation of blended learning, the use of available means of joint productive activities.

A perspective area of research is to establish the proper levels of digital competence of teachers, providing the process of blended learning, features and requirements of students in order to expand the possibilities of educational interactions that will stimulate mutual increase of levels of digital competence.

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