

EdCW 2020
**International Scientific and Practical Conference Education in a Changing World: Global
Challenges and National Priorities**

**THE PEDAGOGICAL INTERACTION IN THE DIGITAL
LEARNING ENVIRONMENT**

Dmitry Boyarinov (a)*
*Corresponding author

(a) Smolensk State University, Smolensk, Russia, dmboyarinov@mail.ru

Abstract

Digital learning environment is an actual form of informatization in education. The purpose of our study is to identify and describe possible scenarios of interaction between the teacher and the student in this environment. Most authors consider scenarios of the interaction between the teacher and the student in the digital learning environment in the framework of the dichotomy, for example, synchronous and asynchronous scenarios. We consider it necessary, and this is confirmed in the results of the study, to distinguish the system from three main scenarios – Content Oriented, Subject Oriented and Interlocking. In line with the Content Oriented scenario, the interaction between the teacher and student is based on the educational material and various forms of its presentation and visualization, including educational maps. Within the framework of the Subject Oriented scenario, the interaction is based on the consideration and reflection of the personal attitudes of the student in the learning content and teaching methods. According to the Interlocking scenario, the teacher acts as an interface that connects the student, the learning group, educational material within the framework of various forms of educational activity. The system of scenarios of interaction between the teacher and the student that we have identified can serve as the basis for the design of digital learning environment and for the professional preparation of teachers for work within such environments.

2357-1330 © 2021 Published by European Publisher.

Keywords: Content oriented scenario, digital educational environment, educational maps, interlocking scenario, multidimensional knowledge integration maps, subject oriented scenario



1. Introduction

Digitalization is a long-term trend in the development of modern society and the education system. One of the main forms of digitalization in education is the digital educational environment. Its presence significantly changes many parameters of the educational process. At the same time, the main subjects of this process (students and teachers) remain unchanged. It is obvious that the digital educational environment significantly changes the nature of the pedagogical interaction of these subjects. Understanding the new nature of pedagogical interaction is necessary both at the stage of designing a digital educational environment and at the stage of its use in the educational process. This fact is the subject of reflection of many researchers. Thus, Lodge et al. (2020) indicate changes of "student-teacher dynamic" (p. 9) in all levels of education and the principal change in the methods by which higher education is being delivered (p. 7). The problem of analyzing these changes and identifying the main features of the interaction of subjects of the educational process in the digital educational environment arises, and it is the subject of this article.

2. Problem Statement

The problem of digitalization of education, digital educational environment, as a form of digitalization, is the subject of numerous studies. Lodge et al. (2020) note that technology plays the role of a mediator in learning (p. 2). These authors consider the problem of the relationship between the teacher and the learner in the digital educational environment through the prism of pedagogical technologies. Helping students develop their conceptual understanding (Lodge et al, 2020, p. 4) is a key challenge for developers of adaptive digital learning environments. Accordingly, the understanding of how students learn is the fundamental basis for the development of new learning technologies (Lodge et al., 2020, p. 5). Lodge et al. (2020) note that the teacher will not be excluded from the educational process for the foreseeable future, and we entirely share this conclusion. At the same time, the digital educational environment has a multidirectional effect on two central narratives about what learning is - acquisition and participation. Acquisition gets simpler and participation gets more difficult (Lodge et al., 2020, p. 7). We believe that supporting the participation of students is one of the key functions of the teacher in the new conditions. Lodge et al. (2020) highlight "helping students to work with technologies" as one of the key priorities for the science of learning (p. 8).

Annansingh (2019, p. 3671) identifies synchronous and asynchronous scenarios of interaction between the teacher and students, based on the simultaneity or non-simultaneity of participation of the subjects of the educational process in the dialogue. Synchronous scenario involves the exchange of information in real time; asynchronous scenario does not require this.

Casey (2013, p. 160) believes that learning should be student-centered in the context of digitalization of education. Students must be active participants in the learning process. However, they should be able to provide supportive feedback, and even assessment, to their peers. There is a "shift in the teacher to student relationship", the main driver of which is the integration of social media both in the learning process and in pedagogical theory (Casey, 2013, p. 165). What will be the roles of the learner

and the teacher in such conditions? In a study by Luckin et al. (2009) a classification of social media users was created. These authors divided them into four main groups: “researchers”, “employees”, “producers” and “publishers” (Luckin et al., 2009, p. 87).

Wu et al. (2019, p. 190) highlight the special role of electronic communication tools and the respective competencies of both teachers and students. They note the particular importance of "more personalized communication support tailored to students' personal characteristics".

Kalolo (2019, p. 347) notes that the digitalization of education creates conditions for enhancing learning, developing research learning activities in the context of remote communication and exchange of information both between students and between teachers and students.

Yen et al. (2018, p. 2142) point out that proper technology implementation can improve the quality of teacher-student interaction, enhance student interaction, and improve academic performance.

Sottolare et al. (2018, p. 140) identify authoring, instructional delivery and management, and experimentation as the main functions of a teacher.

Temerbekova (2017, p. 158) singles out network nature as the main feature of the educational process in the context of digitalization. Accordingly, the basis of pedagogical interaction is network communications.

Iatrellis et al. (2019) focus on reflecting such individual characteristics of learners within the digital educational environment, such as student competencies, their academic background, interests, needs and “personality type”. A similar approach is suggested by Romero et al. (2019).

It is possible to use student e-portfolios as a source of information for the formation of learning trajectories. This approach increases the relevance of the Big Data problem in online learning, discussed in the article of Dahdouh et al. (2018).

Karagiannis and Satratzemi (2018) suggest designing the pedagogical process based on the individual learning styles of students.

Educational material can also be considered as a basis for building a system of pedagogical interaction. This approach is implemented by Liu and Koedinger (2017). They presented the results of the development of an automated system that provides "building a cognitive model of educational material", the analysis of educational material and its structuring. The theoretical basis of the research was made by Learning Factors Analysis, based on combinatorial search in a set of knowledge components.

Blažič and Blažič (2019, p. 272) show that in a digital educational environment, only support and advice from other learners does not ensure successful adaptation of the learner in all the various situations that may arise during its functioning. The digital educational environment by itself, without the use of additional technologies, will not be able to ensure deep involvement of students in the educational process (Annansingh, 2019, p. 3685). Accordingly, there is a need for constant communication with teachers. According to Boyd and Ellison (2007) a unique feature of computer tools in education, such as social media, is that they help learners reflect on systems of their social interactions. This allows us to conclude about the special importance of the role of the teacher as a mediator and facilitator.

It can be stated that modern pedagogical surveys has accumulated a fairly extensive array of information that characterizes pedagogical interaction in the digital learning environment and allows for certain generalizations.

3. Research Questions

- What are the main scenarios of pedagogical interaction in the digital educational environment?
- What didactic tools are leading in each of the scenarios?
- How are scenarios of pedagogical interaction in a digital educational environment reflected by its subjects?

4. Purpose of the Study

In this article, we analyze the features inherent in pedagogical interaction between teachers and students in a digital educational environment. We identify the main scenarios for such interaction and for each scenario we install leading didactic tools. We also assess the reflection of these scenarios by the subjects of the educational process.

Knowledge of the features of pedagogical interaction and understanding which didactic tools primarily contribute to their effective implementation allow us to take a new look at the process of pedagogical design of the digital educational environment.

5. Research Methods

In the research the following complex methods were used: study and analysis of pedagogical literature, a comparative analysis of pedagogical interaction in the digital learning environment and interviews of students and teachers. This research is mostly a qualitative study, although some numerical data was collected. The study took place from September 1, 2016 to December 31, 2018 (Smolensk State University) with the participation of 63 master students of educational program "Teacher Education" ("Educational Management" program).

6. Findings

The results of the theoretical part of the study allow us to conclude that the main directions of interaction between a student and a teacher within the digital educational environment are divided into three groups. The first group of interactions is determined primarily by the content of the educational material. It determines the form and nature of interactions. The second group of interactions is determined primarily by the personality of the student. The individual characteristics of students (such as intelligence, motivation, current level of knowledge, social competencies) determine the nature of the educational processing this case. The third group is determined by the teacher's activity as an interlocker - the interface between students, groups of students (for example, in the process of performing collective projects) and educational material. The third group of interactions also includes the teacher's activity in organizing the collective work of students, forming a learning group for the implementation of a training project. Obviously, real interaction during learning contains elements of all three groups.

We consider it necessary, and this is confirmed in the results of the study, to distinguish the system from three main scenarios - Content Oriented, Subject Oriented and Interlocking.

According to the Content Oriented scenario, the interaction between the teacher and student is based on the educational material and various forms of its presentation, including educational maps (Cosentino de Cohen & Chu Clewell, 2015). In this case, interaction is determined by the structure, content of the educational material and its relationship with the issues already studied / subjected to further study. We believe that educational maps and multidimensional knowledge integration maps are the leading didactic tools for implementing this scenario. By a multidimensional map of knowledge integration in relation to a specific student, we mean a set of knowledge integration maps built for him at certain moments of learning during the entire period of study of the topic or subject under consideration (Boyarinov, 2018). Multidimensional knowledge integration maps allow us to track the dynamics of the formation of students' knowledge, predict and design the further course of the educational process.

According to the Subject Oriented scenario, the interaction is based on the consideration and reflection of the personal qualities, requests and attitudes of the student in the learning content and teaching methods. We suppose that the leading didactic tool for implementing this scenario is the electronic portfolio. Its main role in the digital educational environment is the development and maintenance of positive learning motivation of students, independent work skills and intellectual reflection (Boyarinov, 2018). The portfolio serves as an effective tool for assessing the progress and results of educational activities and allows us to quickly track and evaluate the individual achievements of students at all levels of the education system.

According to the Interlocking scenario, the teacher acts as an interface that connects the student, the learning group, educational material within the framework of various forms of educational activity. The teacher plays the role of a facilitator. We believe that the leading didactic tools for implementing this scenario are social networks. At the same time, individualization of the learning environment is achieved and there is an opportunity for creative self-expression in educational activities. Social networks by their nature naturally and effectively reflect the contours of existing social relationships, which contributes to the development of student motivation (Boyarinov, 2019).

In the course of the practical part of the study, students of the Master's degree in Pedagogy received a dual experience - both as a teacher and a student within the digital educational environment. In the course of the study of reflection, master students asked the following questions:

- Which of the interaction scenarios is leading?

24 respondents (38%) called Interlocking scenario; 20 respondents (32%) called Subject Oriented; 19 respondents (30%) called Content Oriented scenario.

- How often were all three scenarios implemented simultaneously during the educational process?

53 respondents (84%) answered positively; the rest answered in the negative.

- Does the use of social media in learning contribute to the development of motivation?

33 respondents (52%) answered positively; the rest answered in the negative.

- What factor is decisive in the organization of collective forms of learning?

38 respondents (60%) called the role of the instructor as an interlocker; 25 respondents (40%) called readiness of students for collective forms of learning.

- To what extent the knowledge integration maps allow to reflect the features of the theoretical material on a given topic?

62 respondents (98%) answered «as fully as possible», the rest answered «enough full».

- Does e-portfolio technology contribute to the development of independent work skills?

30 respondents (48%) answered positively; the rest answered in the negative.

The participants in the experiment demonstrated a high level of reflection, however, it turned out to be difficult to identify the features of the correlation and mutual influence of the scenarios. The solution to this problem requires a different organization of the experiment.

7. Conclusion

The three main scenarios of interaction between a teacher and students within the digital educational environment (Content Oriented, Subject Oriented and Interlocking) identified by us in this study can primarily be used in the design of such an environment. Also, the presence of these scenarios helps to better understanding the specifics of information processes occurring in the digital educational environment, and the impact of this specific on the activities of students and teachers. The questions about the correlation of the noted scenarios remain largely open so far: is it possible to conclude that any one of them is dominant, or all scenarios are equal; is there a "combined" scenario that includes all three in a certain ratio? These questions, in our opinion, should be the subject of another study. In our study, we considered only teacher-student interactions, but people-digital interactions are also relevant (Kalolo, 2019, p. 350), which also requires a separate study.

References

- Annansingh, F. (2019). Mind the gap: Cognitive active learning in virtual learning environment perception of instructors and students. *Education and Information Technologies*, 24, 3669–3688. <https://doi.org/10.1007/s10639-019-09949-5>
- Blažič, B. J., & Blažič, A. J. (2019). Overcoming the digital divide with a modern approach to learning digital skills for the elderly adults. *Education and Information Technologies*, 25, 259–279. <https://doi.org/10.1007/s10639-019-09961-9>
- Boyarinov, D. A. (2018). *Adaptive network educational environment: models, technologies, principles of construction: monograph*. Publishing House of Smolensk State University.
- Boyarinov, D. A. (2019). Social media in teacher education: organizational and pedagogical conditions of its effectiveness. In R. Valeeva (Ed.), *VInternational forum on teacher education* (pp. 25-33). Kazan Federal University. <https://doi.org/10.3897/ap.1.e0022>
- Boyd, D., & Ellison, N. (2007). Social network sites: definition, history and scholarship. *Journal of Computer-Mediated Communication*, 13(1), 210-230.
- Casey, G. (2013). Building a student-centred learning framework using social software in the middle years classroom: an action research study. *Journal of information technology education: research*, 12, 159-189.
- Cosentino de Cohen, C., & Chu Clewell, B. (2015). *Putting English Language Learners on the Educational Map. Education if Focus: Urban Institute Policy Brief*. The Urban Institute.

- Dahdouh, K., Dakkak, A., Oughdir, L., & Messaoudi, F. (2018). Big data for online learning systems. *Education and Information Technologie*, 23, 2783–2800. <https://doi.org/10.1007/s10639-018-9741-3>
- Iatrellis, O., Kameas, A., & Fitsilis, P. (2019). A novel integrated approach to the execution of personalized and self-evolving learning pathways. *Education and Information Technologies*, 24, 781–803. <https://doi.org/10.1007/s10639-018-9802-7>
- Kalolo, J. F. (2019). Digital revolution and its impact on education systems in developing countries. *Education and Information Technologies*, 24, 345–358. <https://doi.org/10.1007/s10639-018-9778-3>
- Karagiannis, I., & Satratzemi, M. (2018). An adaptive mechanism for Moodle based on automatic detection of learning styles. *Education and Information Technologies*, 23, 1331–1357. <https://doi.org/10.1007/s10639-017-9663-5>
- Liu, R., & Koedinger, K. R. (2017). Closing the loop: Automated data-driven cognitive model discoveries lead to improved instruction and learning gains. *Journal of Educational Data Mining*, 9(1), 25-41.
- Lodge, J. M., Kennedy, G., & Lockyer, L. (2020). Digital learning environments, the science of learning and the relationship between the teacher and the learner. In A. Carroll, R. Cunnington & A. Nugent (Eds.), *Learning under the lens: Applying findings from the science of learning to the classroom*. CRC Press.
- Luckin, R., Clark, W., Graber, R., Logan, K., Mee, A., & Loliver, M. (2009). Do Web 2.0 tools really open the doors to learning? Practices, perceptions and profiles of 11-16-year-old students. *Learning, Media and Technology*, 34(2), 87-104.
- Romero, L., Saucedo, C., Caliusco, M. L., & Gutiérrez, M. (2019). Supporting self-regulated learning and personalization using Portfolios: a semantic approach based on learning paths. *International Journal of Educational Technology in Higher Education*, 16. <https://doi.org/10.1186/s41239-019-0146-1>
- Sottolare, R. A., Baker, R. S., Graesser, A. C., & Lester, J. C. (2018). Special Issue on the Generalized Intelligent Framework for Tutoring (GIFT): Creating a Stable and Flexible Platform for Innovations in AIED Research. *International Journal of Artificial Intelligence in Education*, 28, 139–151. <https://doi.org/10.1007/s40593-017-0149-9>
- Temerbekova, A. A. (2017). Praktika ispol'zovaniya sotsial'nykh setey v kachestve innovatsionnogo obrazovatel'nogo resursa [The practice of using social networks as an innovative educational resource]. *Mir nauki, kul'tury, obrazvaniya* [World of science, culture, education], 1(62), 157-159.
- Wu, W., Chen, L., & Yang, Q., Li Y. (2019). Inferring students' personality from their communication behavior in web-based learning systems. *International Journal of Artificial Intelligence in Education*, 29, 189–216. <https://doi.org/10.1007/s40593-018-00173-9>
- Yen, S.-C., Lo, Y., Lee, A., & Enriquez, J. M. (2018). Learning online, offline, and in-between: comparing student academic outcomes and course satisfaction in face-to-face, online, and blended teaching modalities. *Education and Information Technologies*, 23, 2141–2153. <https://doi.org/10.1007/s10639-018-9707-5>