

E-LEARNING DURING COVID-19 PANDEMIC: AN EMPIRICAL RESEARCH

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Abstract. The COVID-19 pandemic changed our way of life, affected many industries, and had a major impact on education. The paper presents observations and analyses of the challenges raised by the short adaptation time of the learning process and the caused technical, academic, and communication difficulties. An overview of the distinctive features of e-learning during crises, with special attention to communication, feedback and pedagogical approaches in an electronic environment, has been made. Empirical research of the opinion of students and teachers about online learning was conducted. The used research methods are survey and direct observation. Special attention is paid to the results of the survey, which are presented and discussed in detail.

Keywords: E-learning; Empirical research; E-learning in times of crisis; COVID-19 pandemic

1. INTRODUCTION

The COVID-19 pandemic has presented many challenges to higher education institutions. Perhaps most importantly, how to offer students adequate education in case of closure of higher education institutions and the inability to teach and test in class. However, this situation of teaching during crises is not new, as (Murphy 2020) recall Hurricane Katrina when multiple universities were physically destroyed or the H1N1 influenza virus pandemic in 2009 when steps had to be taken for online learning with authorities recommending digital resources, webinar support, phone conferencing, online courses, and virtual classrooms as possible ways of delivering education.

The crisis events of the past and the current pandemic lead to the need to re-think how education systems should function in such situations, and do this based on evidence gathered during the pandemic period when billions of students were involved (Toquero 2020).

Another observation from the pandemic period is that many educators are now clearly aware that distance learning is only the first step in the long journey towards offering high-quality online education, and that new tools that enable both synchronous and asynchronous learning are becoming available even in a situation of limited technical resources (Major 2020).

Finally, it is also necessary to assess the psychological impact of crises, whether on a local, national or international scale, and how the resulting anxieties that students and teachers bring to the learning process as documented in psychological, cognitive and neurological research (Chick 2013).

The purpose of this study is to highlight the distinctive characteristics of e-learning during crises and to establish how learning in a real crisis setting compares to traditional face-to-face learning.

Section 2 discusses e-learning in times of crisis, with its distinctive characteristics, modes of communication, pedagogical approaches, feedback, and Section 3 presents an empirical study conducted among students and teachers and its results.

2. STATE OF THE ART

2.1. E-learning during crises – distinctive features

In Bulgaria, e-learning has not been widespread, but the events of 2020 and 2021 provided a rather rare opportunity, namely for a hypothesis to be tested in a real situation on a large enough scale that significant parts of that hypothesis can be confirmed or denied. This is particularly difficult in the education system, as this societal system is relatively conservative and changes, and radical ones at that, are difficult to implement.

Many authors point out some advantages of e-learning such as the fact that learners and teachers participate independent of place and time, the use of multimedia tools increase motivation, teaching courses are continuously updated and immediately delivered, learners are in contact with each other, international interaction is possible (Yalçinkaya 2015).

Other authors draw attention to some disadvantages, such as decreased motivation, partly due to the need for students to organize the learning process themselves, incompatibility of the multiple platforms used, social isolation or the reliability of information (e-resources) (Srivastava 2019). According to most education researchers, the main disadvantage of distance learning is the lack of opportunity for live, direct interaction between participants.

Whether the positives or negatives are more significant, it is likely that in the future education will also be implemented in crises. To overcome these challenges in the future, one possible solution is hybrid learning, which has been applied to some students in Bulgaria. (Gleason & Greenhow 2017) points out that it can provide the great advantage of not interrupting learning in times of crisis, but can also lead to lower student engagement, achievement, and persistence in the learning process. Blended learning is also presented by Brame (2013), called Just in Time Teaching (JiTt). A teaching method is developed by Gregor Novak – students prepare for the lesson from the textbook or use other resources published on the Internet and complete assignments online. Student responses are transmitted to the teacher several hours before the lesson begins, allowing the teacher

to adapt the upcoming lesson as needed. Importantly, JiTT allows the teacher to create an interactive classroom environment that emphasizes active learning and collaborative problem-solving.

The experience so far leads to one important conclusion and that is that educational institutions were unprepared for such a rapid transition to this relatively new form of teaching and learning. A very large proportion of teachers was not trained and was not able to develop online courses to sufficiently replace face-to-face courses in terms of quality because they were encountering online learning for the first time (Farrell, Brunton & Costello 2020). To a large extent, the quality of e-learning is influenced by the level of teachers' preparation for using technology as well as their teaching style. Also, the selection of appropriate students' knowledge and skills evaluating system is of great importance (Orozova 2019). The assessment can be done using tools and systems, learners can get information from different documents uploaded in a platform (Nycz & Cohen 2007). (Hadzhikoleva et al. 2019) summarizes that e-learning and e-evaluation have a similar purpose – digitization of training and evaluation processes which optimize them and improves their quality.

2.2. Communication during online learning

Online learning not only focuses on content but also includes the full range of learning platforms and methods, genres, formats and media, such as multimedia, educational programs, simulations and games (Keengwe & Kidd 2010). (Mishra et al. 2020) lists some of the most popular online communication platforms that were used during the COVID-19 – Start.me, Neo, Classtime, Classwize, Ted-Ed, Coursera, Google Classroom, Bakpax, Pronto, Skillshare, ClassDojo, Edmodo, Blackboard Learn, Parlay, Docebo, Feedback Fruits, Udemy, WeVideo, WizIQ, Flipgrid, Codecademy, Gynzy, Adobe Captivate, Seesaw, Edx, GoGuardian, Elucidat, Kami, Plurals, G Suite, Otus, Articulate 360, Floop and many others. According to (Mahyoob 2020), apart from the most commonly used platforms Microsoft teams, Google Meet and Zoom, most students have used the WhatsApp platform during online learning. Also, mobile phones have contributed to successful online learning as most students have used their mobile phones in this context. The challenges that the students faced were accessibility, connectivity, lack of appropriate devices, social issues as established in lack of communication and interaction with teachers and peers (Aboagye et al. 2020).

2.3. Pedagogical techniques for working in an electronic environment

In our time, the traditional focus on information accumulation in learning is now shifting to the application of what is learned. These trends focus attention on active rather than passive learning. The emphasis shifts from teaching to learning, the focus falls on the learner. The role of lecturers as specialists who teach is replaced by a new role where they are advisors. Online learning has

also changed the approaches and techniques of teaching and a new horizon of challenges has opened up for teachers, who are faced with the task to adapt their ways of teaching to the new generation on the one hand, and to online learning, which has arrived suddenly, on the other. Many researchers propose such advanced pedagogical approaches and techniques for working in electronic environments. For example, (Cheung & Cable 2017) describe several principles that underlie effective online teaching, such as: encouraging contact between students and tutors, teamwork, prompt feedback, active learning, time on task - encouraging students to spend more time on tasks, high expectations - tutors need to communicate their expectations to motivate students. (Huang et al. 2020) suggests other aspects like management and development of Internet infrastructure, provision of reliable, interactive and diverse electronic resources; using social networking to build online communities for students to reduce feelings of isolation; using a variety of effective techniques such as debates or discovery and experience-based learning.

2.4. Feedback

As with face-to-face learning, feedback is very important for evaluating e-learning during the pandemic. Educators can use the built-in Feedback tools in e-learning systems such as Moodle. Students appreciated the possibility of synchronous e-learning as well as to have access to the recorded lectures (Ray 2021). Feedback is of utmost importance, some researchers report delayed feedback or help as a hindrance in e-learning because teachers are not always available at the time students need help, this is what can significantly reduce motivation to learn (Yusuf & Al-Banawi 2013).. Another important factor of insecurity and discouragement is the feeling of isolation due to the lack of physical presence of lecturers and especially fellow students. The solution to this problem as well as good e-learning performance can be achieved with self-discipline, i. e. how students manage their learning outside the university, for example at home or in public places. A study (Orozova et al. 2016) presents such a model of the process of personalization and adaptive usage of an intelligent learning environment by a trainee or user.

To look at the feedback from the other side, not only as communication between teacher and student but as getting an opinion, evaluation and even recommendation from the learners.

3. EMPIRICAL RESEARCH

3.1. Methods

A survey was conducted to analyze students' opinions about online learning. The study involved 89 students from the specialties of Informatics – 1st year, BIT (Business IT) – 3rd year, STD (Software Technology and Design) – 3rd year, full-time education at PU (Faculty of Mathematics and Informatics at

Plovdiv University Paisii Hilendarski, Plovdiv, Bulgaria) for the academic year 2020/2021.

Regarding teaching, we can also point to some of the results of a survey of the FMI at PU teaching staff (107 in total) conducted by the Faculty Quality Assurance Committee for the 2019/20 and 2020/21 academic years (Teofilova 2021).

3.2 Findings

3.2.1. Results of direct observation

The main result from direct observation is lower student engagement in both lectures and exercises. Class attendance averages about 20%. Students participate significantly less in discussions, making feedback difficult. Scores (grades) are raised to a small degree. Another finding that could be very important in the future, is the difficulty for both teachers and students to use many different online learning software tools. Instructors report difficulty communicating with students because there is an expectation of 24-hour feedback to the instructor mostly for online assignments. Although few technical barriers to meaningful online learning have been reported.

Online learning, on the other hand, has removed some of the limitations of traditional learning by enabling students to engage in classes (and other activities) when they are physically unable to attend. Alongside this, the multiple communication channels available have further facilitated the whole process.

3.2.2. Survey results

The main findings of the report of teachers are: no serious difficulties were reported in both teaching and testing; no significant differences were observed in students' results (grades) in the distance and face-to-face learning, but difficulties of a technical nature were also reported and a preference of lecturers for future use of distance form but in addition in face-to-face learning.

A survey was conducted to show students' opinions about online learning. The results are presented using diagrams (from Figure 1. to Figure 8.), each diagram shows one question and there are two open questions.

From **Figure 1.** it can be seen that traditional face-to-face learning and e-learning have significant differences in terms of working methods. 3% of the students felt that the two types of education could not be compared in terms of quality. $\frac{1}{4}$ (25%) felt that e-learning offered more advantages in this aspect, while 17% preferred face-to-face learning. 53% of respondents believe that both forms of education have advantages and disadvantages.

Students evaluate the advantages and disadvantages of both types of education, and this prevents them from giving a definite answer.

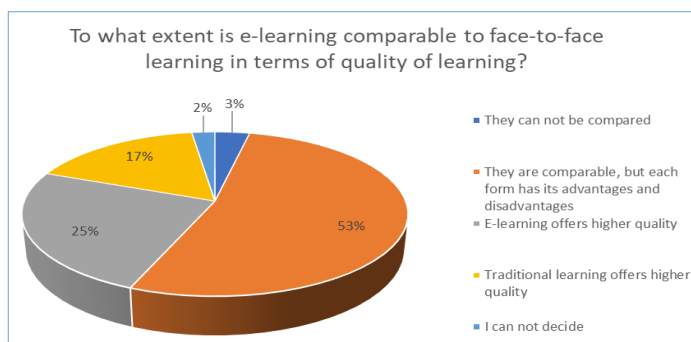


Figure 1. Comparison of e-learning with face-to-face learning in terms of quality of learning

The learning resources provided by the lecturers play an important role in the level of students' perception of the material. **Figure 2.** shows that more than $\frac{2}{3}$ (67%) of the students share that the materials provided were sufficient. 18% of learners felt that the learning resources given were a good minimum, but it would have been good to have more. For 7% the materials were not enough, and they had to look for additional ones. In this case, our primary goal is to continue to select and expand our learning resources to include those students who are not satisfied.

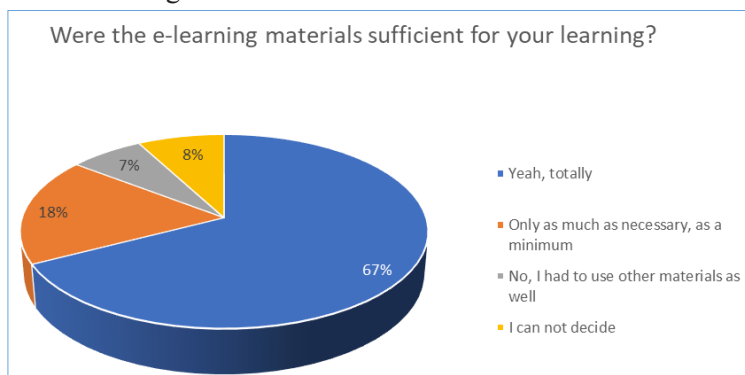


Figure 2. Sufficiency of e-learning materials

Choosing a distance learning environment is crucial to the quality of education, as each platform offers different types of features and options to work with. **Figure 3.** shows that the majority of students (84%) are satisfied with the platforms they have used in the past year (Meet, Classroom and Moodle). 14% responded that they would like the learning environments to have additional options. Only 1% of respondents disapproved of the choice of these platforms.

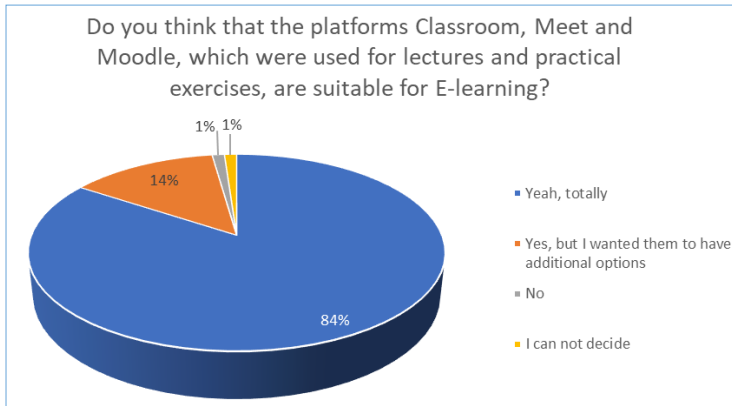


Figure 3. The use of learning platforms in the e-learning process

E-learning examinations require a more non-standard approach to achieve the most objective assessment. It is because of avoiding the traditional approach, unsuitable for distance learning, that more than $\frac{2}{3}$ (67%) of students choose online testing as a better option. 15% of respondents preferred the traditional way of testing knowledge at university. 15% did not share a preference and 3% could not decide (**Figure 4**). In conclusion, students prefer the new and non-traditional way of displaying what they have learned, which allows their knowledge to be assessed from a distance. Online testing, however, poses the danger of copying and allows unlimited access to support materials. This is why the scores are visibly higher compared to past years. This also acts as an incentive to prefer this type of evaluation.

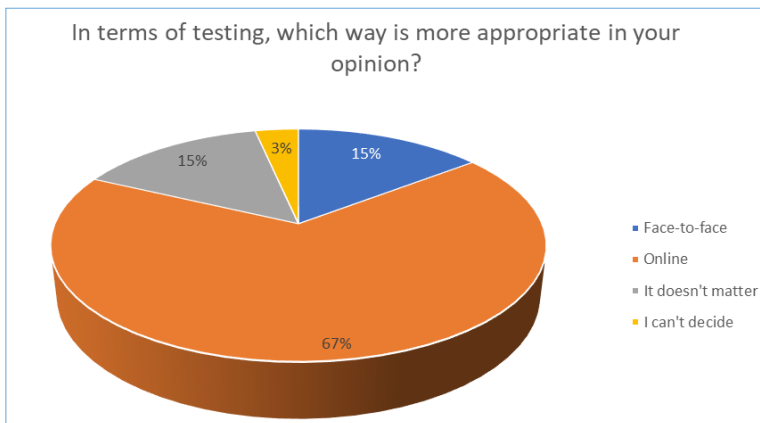


Figure 4. Assessment during e-learning

Technology is an integral and mandatory part of distance learning in an electronic environment. However (**Figure 5.**) only 8% of the respondents had repeatedly encountered technical failures. More than half of students (54%) said they had experienced single cases of technical obstruction. 38% of the respondents did not encounter any technical problems during the E-learning. These results show that distance learning in an electronic environment is trouble-free for most participants, despite the unpredictability of technique-related problems and failure cases.

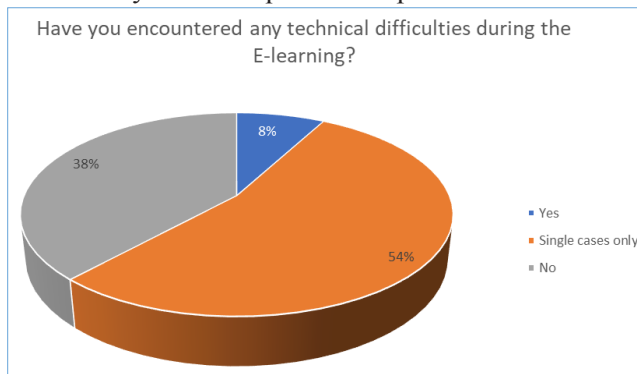


Figure 5. Technical difficulties during the e-learning

Figure 6. shows that more than half percent of the students (53%) report that their concentration during online learning is no different than in a face-to-face environment. Another proportion of respondents (32%) indicated that they sometimes get distracted during online learning. Only 15% could not concentrate at all. Each student's self-control and self-discipline, study habits and ability to concentrate when learning new information play an important role in learning.

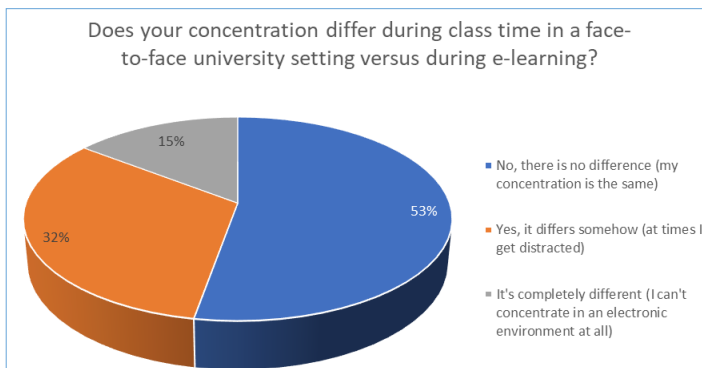


Figure 6. Comparison of concentration during traditional learning and e-learning

Results from the next question (**Figure 7.**) show that giving assignments every week, taking tests during the semester, and doing a project are preferred ways of testing and are liked by students (79% of them answered yes). From the perspective of us professors, it's also a good way to get students to study during the semester and stay on top of everything that's being taught.

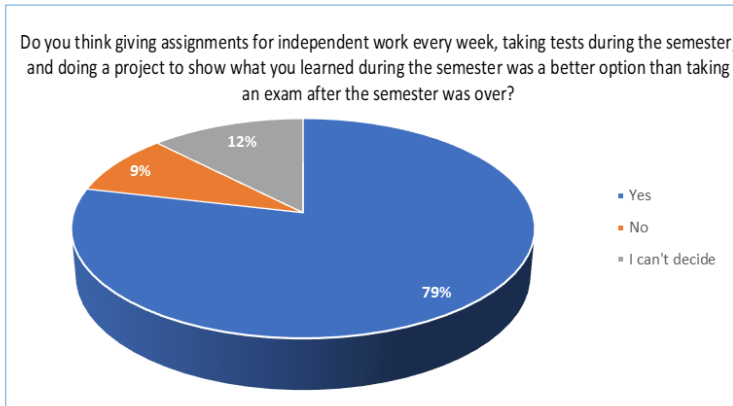


Figure 7. Mid-term assessment of learners

Figure 8. shows that the majority of students (64%) want to continue learning in an online environment after a few months spent in e-learning due to the pandemic, while the rest (36%) prefer traditional learning. After a long period of isolation, students got used to and adapted to online learning. It also gave them more freedom to allocate their own time to study, work and play.

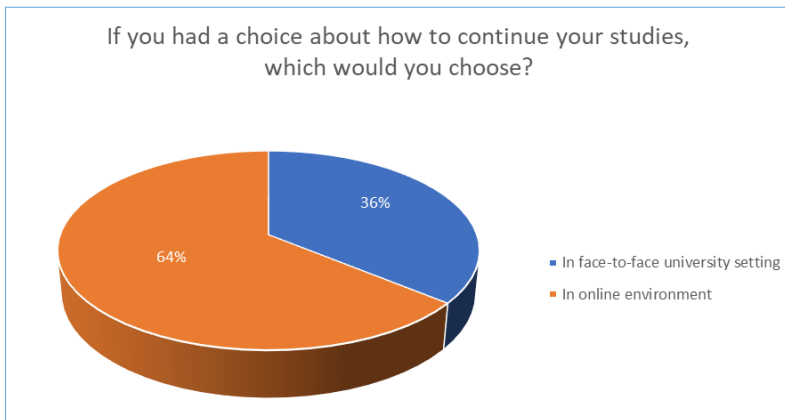


Figure 8. Preferred form of learning after pandemic lockdown

In answer to one of the open-ended questions “What did it take and what did it give you to learn in an electronic environment?”, most students said that it took away from their social contacts and time spent at university with colleagues and lecturers but gave them the freedom to allocate their daily schedule. Most students believed they studied better this way because they had uploaded materials that they could access from anywhere at any time, one of the main features of e-learning. Another group of students said that they were able to work and study this way. And a small number of them are completely frustrated that e-learning has taken a lot out of the student life, communications, friends, they have even lost the sense to continue with their studies.

On the last question, which is also open, “What did you like and dislike about your studies this semester?”, students express satisfaction that they set their own pace of learning, that once they have materials uploaded, they can be anywhere at any time and have access to these resources. Others have encountered difficulties with the software that is considered in the exercises. Another part liked everything. We teachers with these surveys on the one hand saw the students’ opinions on online learning imposed during the pandemic, and on the other hand, we received feedback on our work this semester.

4. Conclusion

The COVID-19 pandemic was a challenge for students and teachers alike. The findings of this study suggest that in a very short time, teachers, although not well prepared for e-learning, have been able to create e-learning resources suitable for online learning, to teach using new software tools, to communicate, test and assess entirely in an online environment. There was also a worrying trend of declining student engagement over the period. The anonymous surveys provide an objective assessment of comparability, both in terms of the quality of teaching and the use of modern teaching and learning methods in a real situation. Because of the findings of this study, good practices can be derived, and recommendations made to improve the e-learning process at a later stage.

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REFERENCES

- Murphy, M., 2020. COVID-19 and emergency eLearning: Consequences of the securitization of higher education for post-pandemic pedagogy. *Contemporary Security Policy*, **41**(3), 492 – 505, DOI: 10.1080/13523260.2020.1761749.
- Toquero, C. M., 2020. Challenges and Opportunities for Higher Education amid the COVID-19 Pandemic: The Philippine Context. *Pedagogical Research*, **5**(4), em0063. URL: <https://doi.org/10.29333/pr/7947>.
- Major, C., 2020. Innovations in Teaching and Learning during a Time of Crisis. Innovative higher education, 1 – 2. *Advance online publication*, 2020. URL: <https://doi.org/10.1007/s10755-020-09514-w>.
- Chick, N., 2013. *Teaching in Times of Crisis*, URL: <https://cft.vanderbilt.edu/guides-sub-pages/crisis/>.
- Yalçinkaya, D., 2015. Why is blended learning for vocationally oriented language teaching? *Procedia – Social and Behavioral Sciences*, **174**, 2015, 1061 – 1068.
- Srivastava, P., 2019. Advantages & Disadvantages of E-Education & E-Learning. *Journal of Retail Marketing & Distribution Management*, [S.l.], **2**(3), 22 – 27. URL: <http://management.nrjp.co.in/index.php/JRMDM/article/view/385>.
- Gleason, B., Greenhow, C., 2017. Hybrid Education: The Potential of Teaching and Learning with Robot-Mediated Communication. *Online Learning Journal*. **21**(4), ISSN 2472-5730, URL: <https://www.learntechlib.org/p/183770/>.
- Brame C., 2013. Just-in-Time Teaching (JiTT). *Vanderbilt University Center for Teaching*. Retrieved, 2013, URL: <https://cft.vanderbilt.edu/guides-sub-pages/just-in-time-teaching-jitt/>.
- Farrell, O., Brunton, J., Costello, E., 2020. Pivot and the pandemic: professional learning during the time of Covid-19, *OE Global 2020*, URL: https://www.researchgate.net/publication/346480780_Pivot_and_the_pandemic_professional_learning_during_the_time_of_Covid-19.
- Orozova, D., 2019, Appropriate E-Test System Selection Model. *Comptes rendus de l'Acadé'mie bulgare des Sciences*, **72**(6), 811 – 820, ISSN 1310-1331, DOI: 10.7546/CRABS.2019.06.14.
- Nycz, M., Cohen, E. B., 2007. The basics for understanding e-learning. In *Principles of Effective Online Teaching*; Buzzetto-More, N.A., Ed.; *Informing Science Press: Santa Rosa, CA, USA*. 1 – 17.
- Hadzhikoleva, S., Orozova, D., Andonov, N., Hadzhikolev, E., 2019. Generalized net model of a system for quality assurance in higher education. *AIP Conference Proceedings* **2172**, 040005. <https://doi.org/10.1063/1.5133515>.

- Keengwe, J., Kidd, T., 2010. Towards Best Practices in Online Learning and Teaching in Higher Education. *MERLOT Journal of Online Learning and Teaching*, **6**(2), June 2010.
- Mishra, L., Gupta, T., Shree, A., 2020. Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. *International Journal of Educational Research Open 1* (2020) 100012. URL: www.elsevier.com/locate/ijedro.
- Mahyoob, M., 2020. Challenges of e-Learning during the COVID-19 Pandemic Experienced by EFL Learners. *Arab World English Journal (AWEJ)* Volume 11. Number4 December 2020, 351 – 362, DOI: <https://dx.doi.org/10.24093/awej/vol11no4.23>.
- Aboagye, E., Yawson, J.A., Appiah, K.N., 2020. COVID-19 and E-Learning: The Challenges of Students in Tertiary Institutions. *Social Education Research*, **2**(1), 1 – 8. URL: <https://doi.org/10.37256/ser.212021422>.
- Cheung, C., Cable, J., 2017. Eight Principles of Effective Online Teaching: A Decade-Long Lessons Learned in Project Management Education. *PM World Journal*, **6**(7) – July 2017, 1 – 16. URL: www.pmworldjournal.net.
- Huang, R., Tlili, A., Yang, J., Chang, T., Wang, H., Zhuang, R., Liu, D., 2020. Handbook on Facilitating Flexible Learning During Educational Disruption: The Chinese Experience in Maintaining Undisrupted Learning in COVID-19 Outbreak; *Smart Learning Institute of Beijing Normal University: Beijing, China*, 2020.
- Ray, A., 2021. Teaching in times of crisis: COVID-19 and classroom pedagogy. *Political Science & Politics*, **54**(1), January 2021, 172 – 173. DOI: <https://doi.org/10.1017/S1049096520001523>.
- Yusuf, N., Al-Banawi, N., 2013. The Impact of Changing Technology: The Case of E-Learning. *Contemporary Issues in Education Research (CIER)*, **6**(2), 173 – 180. <https://doi.org/10.19030/cier.v6i2.7726>.
- Orozova D., Atanasov K., Todorova M., 2016. Generalized Net Model of the Process of Personalization and Usage of an e-Learning Environment. *Proceedings of the Jangjeon Mathematical Society 19*, 2016, No. 4, 615 – 624. SJR – 0.282.
- Teofilova, M. et al., 2021. *Report of the Faculty Quality Assurance Committee of FMI at PU* (for the period 01.11.2020 – 20.04.2021), URL: <http://fmi-plovdiv.org/GetResource?id=3884>.

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