Is Information Technology boosting Creativity in Higher Education Institutions during Covid-19?

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Abstract

The global pandemic of the virus COVID-19 dramatically has impacted Higher Education Institutions (HEIs) in Bosnia and Herzegovina and worldwide. HEIs were forced to switch overnight to online lectures and exams without almost any teachers' and students' preparation and education. After one year of online classes at the University of Mostar (SUM), whether that kind of teaching impacts creativity. In order to find the answer to the research question, the authors used a questionnaire they developed and applied in 2015 to investigate students' perceptions about creativity at the University of Mostar. The research presented in this paper is limited to SUM students who have had online classes since March 2020. The primary research goal is to investigate whether there are any significant changes in students' perceptions of creativity compared to research from 2015. Namely, the authors investigate whether the enhanced use of IT and online platforms (Google Meet, SUMARUM – the University of Mostar's variant of Moodle) affected students' creativity.

Introduction

In the year 2020, the world was faced with a global pandemic caused by the virus COVID-19. That pandemic has shown fragility and unreadiness of the global economy and society for that challenge. Almost the whole world found itself in a lockdown, and the only way to overcome this situation was to work online from home wherever possible, even in education. Overnight transition to online teaching left very little or almost no time for the preparation of teachers and students for that situation.

Teachers overnight had to transform courses designed for in-person teaching into online work (Almost, 2020; Carolan, 2020; Williams, 2020). The additional problem was that online teaching must be synchronous, while in pre- COVID-19 time, online learning was mainly asynchronous (O'Flynn-Magee et al., 2021).

The fact that most online teaching during the COVID pandemic has become synchronous raised the question of how that kind of teaching and intensive use of IT impacts students' creativity. For this paper, the authors by technology imply online platforms (Google Meet, SUMARUM – SUM variant of Moodle), learning management systems (LMS), and other tools that support online learning.

Creely et al. (2019), through the reviews of the academic and practical literature, have pointed out at least five key features that online teaching and IT technologies bring to creativity:

1. Universality. Thanks to digital technology, i.e., the possibilities of instant sharing creative ideas of individuals and groups, it is easier to achieve creative universality and access these ideas through digital repositories.
2. Distributed online digital tools. Digital tools enable the connection of individuals and groups, enabling them to work as a team online, exchange ideas and experiences, all of which encourage creativity.
3. Safe spaces for trying out creativity. IT and digital tools, especially virtual environments, enable safe experimentation and testing of various creative ideas without fear of errors and costs associated with these errors, which is crucial for developing innovative solutions.
4. Enhancing the speed of creative development. The most apparent benefit of digital technology and online communication is the speed of exchanging, verifying, and evaluating ideas.
5. New learning spaces for creative work. Digital and virtual environments have expanded places of learning that have traditionally been oriented towards classrooms and educational laboratories. Thanks to virtual environments, creation, collaboration, sharing, and critical approaches are no longer centralized within educational institutions.

In this year's report – The second Report 2021, Durham Commission on Creativity and Education focused on the impact of the first COVID-19 lockdown on education. The report was based on national and international reports and one-to-one and group interviews with senior education staff, young people, and policymakers (Cohu, 2021). The report showed the following (Cohu, 2021):

1. Covid-19 has confirmed the importance of creativity and cultural experience to the quality of the lives of young people and the necessity to return students to in-school education.
2. Since the shift to online education and extensive usage of digital tools reshaped education and society, digital literacy and the creative use of technology have become essential competencies for young people.

3. Universal access to teaching for creativity is impossible without addressing the current inequity in digital access. Digital skills and access to quality digital devices are pre-condition to the considerable advantage.

This paper explores the similarities and differences in students' attitudes regarding the perception of creativity at the SUM, compared to research from 2015. Through this research, authors try to find answers to questions to what extent online teaching and enhanced use of IT and online platforms affected students' creativity.

Methodology

The research was conducted on a convenience sample of students at different faculties of the University of Mostar (SUM) in 2015 and 2021. Research participants were informed of its purpose and participated voluntarily.

The basic questionnaire was prepared for the survey in 2015. Generally, the questionnaire had two main parts. The first part contained general information about respondents (faculty, study year), while the second part contained four groups of questions/statements. The first group of questions/statements evaluated the frequency of practicing specified activities related to creativity. The second group of questions/statements evaluated the frequency of students' involvement during the class. The third group was related to expressing a degree of agreement with statements about creativity in the classroom. The fourth group of statements offered respondents the possibility to choose one or more definitions of the term creativity (Gašpar et al., 2015).

The frequency of use and degree of the agreement were scored according to the Likert scale with marks from 1 (never/ disagree) to 5 (always/strongly agree).

The questionnaire used in 2021 retained all the units and all questions from the questionnaire used in 2015. It was expanded with a set of statements about the connection between IT and creativity (10 statements). The already mentioned Likert scale was used to assess the degree of agreement with the above statements. An online survey was conducted. The questionnaire was made using Google forms, and the link to the questionnaire was shared in online classrooms. The answers were processed in Microsoft Excel. After the technical control of questionnaires, the sample consisted of 733 questionnaires - 387 completed in 2015 and 346 completed in 2021. The collected data were coded and stored in the SPSS database. Data were analyzed in IBM SPSS Statistics, version 25. Results are expressed as mean and standard deviation (M±SD).

Results

Although the methodology states that the basic questionnaire contained four questions/statements, the paper compares students' answers from 2015 and 2021 for two sets of questions/statements and the results of additional statements raised in the 2021 questionnaire.

The first group of questions/statements evaluated the frequency of application of specified activities during the class-teaching process. Students evaluated to what extent specified activities appeared during teaching classes, i.e., meaning to what extent teachers practiced them. The comparative results for 2015 and 2021 are shown in Table 1.

Table 1
Results related to the frequency of practicing specified activities during class (2015 vs. 2021)

Statement	2015		2021	
	Mean	St.Dev.	Mean	St.Dev.
Teachers appreciate the unusual questions.	2.96	1.13	3.64	1.10
Teachers appreciate imaginative and unusual ideas.	2.99	1.08	3.54	1.10
Teachers show students that their ideas have value.	3.26	1.07	3.73	1.05
Teachers are connected with the evaluation of the causes and consequences.	2.92	0.89	3.50	0.94
Teachers engage in a more detailed discussion of others' ideas.	2.92	1.05	3.40	1.09
Teachers suggested students think like them	3.35	1.12	3.59	1.10
Teachers allow students to express their creativity	3.38	1.14	3.82	1.06
Teachers use case studies from real-world as learning tools	3.28	1.09	3.90	0.95
Teachers show their creativity	3.16	1.04	3.64	1.04
Teachers encourage communication between and with students	3.04	1.16	3.66	1.14
Teachers encourage students to develop self-confidence to work in unpredictable situations.	2.90	1.15	3.35	1.24
Teachers provide learning situations in which there are no correct answers.	2.64	0.97	3.00	1.20
Teachers are friendly to different new solutions and accept different opinions.	3.10	1.02	3.59	1.06
Teachers are questioning all known in theory to encourage students on thinking.	3.07	1.06	3.47	1.15

Note: M – mean; SD – standard deviation
Source: Author's calculation

The second group of questions/statements evaluated the frequency of students' involvement during the classes. The comparative results for 2015 and 2021 are shown in Table 2.

Table 2
Results related to the frequency of students' involvement during the classes (2015 vs. 2021)

During the course, students are encouraged to	2015		2021	
	Mean	St.Dev.	Mean	St.Dev.
… participate in a constructive discussion	3.01	1.02	3.43	1.07
… express their views	3.14	1.10	3.71	1.04
… express their own ideas	3.17	1.05	3.67	1.07
… give constructive suggestions	3.05	0.98	3.64	1.04
… give new solutions of problems	3.10	1.03	3.65	1.04
… guide classes to be of interest for them	2.83	1.10	3.35	1.17

Note: M – mean; SD – standard deviation
Source: Author's calculation

As stated in the methodology in the repeated survey, students expressed their agreement with the statements that link digital technology and creativity. Table 3 shows only the degree of agreement of the students surveyed in 2021.

Table 3
Degree of agreement with the statements that link digital technology and creativity (2021)

Statement	M	SD
(s1) Digital technology has a positive effect on creativity	3.51	1.04
(s2) Students will be more creative if different technologies are used in teaching.	3.77	1.00
(s3) Digital technology will encourage creativity only in digitally literate students	3.38	1.13
(s4) All teachers should include new technologies in their teaching.	3.87	0.98
(s5) Teaching supported by technology is more creative than classical teaching (teaching without technology)	3.47	1.20
(s6) Digital technology encourages creativity	3.40	1.10
(s7) Students who attend technology-supported teaching will be more creative than students who attend classical teaching (teaching without technology)	2.80	1.26
(s8) Creativity has nothing to do with technology; it's all about the person and their characteristics.	3.90	1.07
(s9) Digital technology reduces/"kills" creativity	2.92	1.20
(s10) Only the correct application of digital technology in teaching has a positive effect on students' creativity	3.98	1.00

Note: M – mean; SD – standard deviation
Source: Author's calculation

Discussion

The results presented in Table 1 show higher grades among students surveyed in 2021. Grades of all statements for these students are higher than 3 (ranging from 3 to 4), while the results obtained for 2015 show grades lower than 3. According to the students surveyed in 2015, teachers do not value too unusual student questions, give creative examples, are not open enough to new solutions, and accept different opinions. On the other hand, the results obtained in 2021 show that these statements are better rated, which means that students agree with them more and that these activities are more common teachers' practices. However, all statements have higher scores than in the 2015 survey; the rankings of the statements show some more differences in student attitudes. While the statement "*Teachers suggested students to think like them*" was in second place in the 2015 survey, it is only in 7th place in the 2021 survey. From the above, there is progress in teachers' approach to students during classes, in the sense that more attention is paid to the attitudes and opinions of students, their ideas, and suggestions. As the results in Table 2 show, student engagement during classes has a medium grade. Most of the activities offered (Table 2) have an average score between 3 and 4. Comparing the scores obtained in the 2015 survey to 2021 for Table 2 shows higher scores in the new survey. Students rated all activities better in 2021, and the difference in average grades ranges from 0.4 to 0.6. Ranking analysis shows the difference only in the first and second place. The best-rated activity in 2015 was "*expressing their ideas*", while in 2021, it was the activity "*expressing their views*".

It should be noted that the activity "guide classes to be of interest to them" was rated the worst in both studies. However, this result can be misleading. Namely, if the obtained result is viewed in isolation, forgetting who the respondents were in the research, it could be concluded that teachers do not respect students and their needs and teach at their discretion. But if one keeps in mind the fact that the respondents were students, the result is expected. Students would likely like to

change the teaching and enrich it with topics that interest them, but teachers should implement the curriculum. Therefore, teachers have a great responsibility to assess which student interests can fit into the teaching units and the content of individual courses. What is certain is that teachers need to motivate students more to actively participate in teaching, which would undoubtedly positively affect student creativity. The results obtained by researching agreement with the statements about the connection between IT and creativity (Table 3) show that students relate these concepts. Average scores of individual claims show how students (or at least some) believe that digital technology encourages creativity. However, although the student notices a connection between IT and creativity, the results show that they associate creativity with their characteristics and abilities. Namely, they do not think that technology-supported teaching students will be more creative than students who attend classical teaching (teaching without modern technological solutions). Although students may have been expected to glorify technology and believe that technology is the solution for everything, including improving creativity, the results showed that this is not the case. Perhaps the long-term online teaching caused by the Covid pandemic led to the saturation of students with technology and pointed out the importance of direct human interaction both in class and out of class, which was confirmed by other research, i.e., by Cohu (2021).

Nevertheless, students are aware that technology positively impacts creativity, which they have confirmed by relative agreement with these statements. However, they agree that only the correct application of digital technology in teaching positively affects student creativity. Nonetheless, students find that technology-supported teaching is more creative than classical teaching (teaching without technology). However, it is essential to note that, according to students, digital technology encourages creativity only in digitally literate people, which is also consistent with other research, i.e., by Cohu (2021). Students' awareness of the importance of digital literacy so that technology can develop creativity shows that although new generations have been exposed to digital technologies almost from birth, there is still room for improvement, especially regarding equity in access to technology.

Conclusion

The obtained and compared research results in 2015 and 2021 show that, according to the students, the culture of creativity is nurtured to a certain extent at the University of Mostar. The results also show progress in the last five years (the results obtained for 2021 are better than 2015). The research confirmed that SUM students are aware of the positive impact of IT on creativity and the need for adequate integration of technology into the educational process. Namely, digital technology is not creative, and it is just a tool whose potential is limitless in the hands of a creative individual.

To get a real impression of the state of creativity at SUM, teachers should be included in future research. Teachers also participated in the 2015 survey, and their attitudes should be re-examined. Such research would be especially interesting because they are mostly the same teachers, which is not the case in the sample of students. In addition, a logical continuation of the conducted research would be to compare students' attitudes concerning faculties/studies because different study programs require different levels of use of technology.

The Covid-19 pandemic has completely changed the view of online learning. It is already clear that online learning will remain in post-pandemic times as a complement to in-class learning. Procurement and integration of online tools into the

teaching process are no longer an option but necessary. However, the amateur approach to online learning that resulted from the pressure of the COVID-19 pandemic is already becoming unacceptable. Teachers must learn how to use online tools effectively and maximize their potential to improve the teaching process and increase creativity, both for themselves and their students. Of course, this will require professional teacher training. The result of all this is increased costs, i.e., increased investments in IT infrastructure, equipment, digital tools, and training. Governments will need to provide organizational and financial support for the processes mentioned above regarding public higher education institutions. And that is what opens up space for inequality in digital access. Namely, the already existing inequality between the education systems of developed and underdeveloped countries could very easily be replicated and further increased when it comes to online learning. In this way, the inequality in the physical world would be reflected in the virtual world, thus missing an excellent opportunity for positive changes in education.

References

1. Almost, J. (2020), "The impact of COVID-19 within academic settings: A high-speed pivot ", Canadian Journal of Nursing Leadership, Vol. 33 No. 3, pp. 15-19.
2. Carolan, C. (2020), "COVID 19: Disruptive impacts and transformative opportunities in undergraduate nurse education", Nurse Education in Practice, Vol. 46, pp. 1-2.
3. Cohu, W. (2021), "Durham Commission on Creativity and Education - second report 2021", available at: https://www.dur.ac.uk/creativitycommission/report/secondreport/ (12 May 2021)
4. Creely, E., Henriksen, D. (2019), "Creativity and Digital Technologies ", in Peters, M. A., Heraud, R. (Eds.), Encyclopedia of Educational Innovation, Springer Nature, Singapore, pp. 1-6.
5. Gašpar, D., Mabić, M. (2015), "Creativity in higher education", Universal Journal of Educational Research, Vol. 3 No. 9, pp. 598-605.
6. O'Flynn-Magee, K., Straus, E. J., Dhaliwal, A., Chande, S-R., Alreffi, B., Randhawa, P., Chung, Y., Khader, S. (2021), "Creativity in a COVID-19 Virtual Learning Space", Quality Advancement in Nursing Education - Avancées en formation infirmière, Vol. 7 No. 1, pp. 1-16.
7. Williams, J. A. (2020), "Did the scramble to remote learning work? Here's What Higher Ed Thinks", available at: https://www.chronicle.com/article/did-the-scramble-to-remote-learning-work-heres-what-higher-ed-thinks (12 May 2021)

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