Transitioning from Offline to Online Learning: Issues from Computing Student Perspective

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Transitioning from Offline to Online Learning: Issues from Computing Student Perspective

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***Abstract*— Covid-19 pandemic greatly affects student daily life. Instead of physically attend classes, they need to meet the lecturer and learn the course material via online meeting platform. The transition somehow introduces some issues like the difficulty of maintaining their focus. This becomes worse for computing students given that the assessments are not limited to standard essays. They include programming and hardware-based assessments which are more difficult to complete at home as students might not have the required software or hardware. This paper reports any issues experienced by 112 computing students in terms of transitioning from offline to online learning. Our study shows that online learning forces the students to allocate more time to study and complete the assessments. Online learning also introduces other issues like higher stress level but still has a few of positive traits like spending less money to physically attend the classes. Many students argue that programming is the most difficult subject to learn in online environment. In response to the issues, some suggestions are provided for computing lecturers.**

Keywords*— *learning issues, online learning, onsite learning, undergraduate students, computing education.

I. Introduction

Due to the pandemic started in the end of 2019, daily life is drastically changed to practice physical distancing. Many employees work from home, businesses focus on online market, while face-to-face sessions in schools and universities are replaced with virtual meetings. All these adjustments primarily require internet connection [1].

In academia, these adjustments raise some issues for lecturers especially those who are not used to online learning. They typically need more time to prepare their teaching materials while the existing supporting technology might not facilitate all of their needs. Students also experience some issues like more distractions while learning at home and the difficulty to maintain their focus during the teaching sessions [2]. This becomes worse as in some universities, the lecturers are free to use their preferred supporting technologies [3], which require the students to learn those technologies at once. All these issues need to be listed and then addressed for better learning environment in academia, especially when an unprecedented event like the pandemic re-occurs. There are several studies focusing on this matter [1], [2], [3], [4], but to the best of our knowledge, none of them focus on computing student perspective.

Computing students are arguably unique as their assessments are not limited to standard essays [5]. To study from home, they typically need computers with higher specification as some assessments require the installation of advanced applications like Visual Studio, Eclipse, SQL server, Adobe Photoshop, etc. Further, they cannot rely too much on their lecturer or tutors for dealing with technical issues given that the lecturer or the assistants cannot completely view and control their computers on most occasions.

In response to the aforementioned gap, this paper reports computing student perspective regarding issues raised by transitioning from offline to online learning via a questionnaire survey. Unique to our study, the survey questions are specifically tailored for computing students (e.g., covering non-essay assessments) and they are based on our informal survey asking computing students to list their issues regarding the transition from offline to online learning (with 72 responses). The findings are expected to help educators in preparing better learning environment, especially the computing ones. The survey contains 16 questions, and it is responded by 112 undergraduate students who have experienced transitioning from offline to online learning. The questions primarily compare offline and online learning, but it also asks specific difficulties raised from such transitioning, suggestions for lecturers, and the most challenging and the easiest subjects to learn during online learning.

The paper is organized as follows: Section 2 describes the literature review; Section 3 explains the method used and details of the survey questions given; Section 4 shows the findings obtained from the survey, discussing time spent on offline or online learning, comparison between offline or online learning, and other points of view of online learning; Section 5 summarizes the result in discussion; and finally Section 6 concludes the paper.

II. Literature Review

E-learning (or online learning) can be defined as the use of internet-based technology to educate students without being constrained by time and place [6], [7]. 'E' that starts the terminology is commonly perceived as the abbreviation of 'electronic'. However, El-Seoud et al. [7] argued that it might also stand for 'evolving, enhanced, everywhere, every time, and everybody'.

Elfaki et al. [6] classify e-learning to six categories: (1) e-learning with physical attendance but without online

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communication (face-to-face); (2) e-learning without physical attendance and online communication (self-learning); (3) e-learning without both physical and online attendance, but with online communication (asynchronous); (4) e-learning with online attendance and communication (synchronous); (5) e-learning with occasional physical attendance and online communication (blended/hybrid-asynchronous); (6) e-learning with physical or online attendance and online communication (blended/hybrid-synchronous).

Regardless of the category, e-learning always has four kinds of interaction: student-teacher, student-student, student-content, dan student-technology [8]. Student-teacher interaction occurs during physical or virtual meetings; student-student interaction occurs from forum, chat, or messages; student-content interaction occurs from completing assessments; and student-technology interaction occurs when the students interact with learning management system.

According to [9], e-learning has several exclusive benefits: accessibility, flexibility, and affordability. E-learning can be accessed from anywhere at any time, offering flexible schedule for busy learners. It also offers more affordable tuition fee given no physical meeting places are required, and no additional fees for transportation and accommodation. This kind of learning can be combined with offline learning (face-to-face) to facilitate blended learning or flipped classroom, which might attract students to learn more and become long-life learner [6], [10].

Despite the benefits, some studies listed the drawbacks of e-learning, primarily based on the lack of ICT infrastructure (hardware, software, or even internet bandwidth), especially in developing countries [10], [11]. Not all students have computers with sufficient specification for e-learning. Time flexibility can act as a 'double-edged sword' for some learners due to lack of time management skill; e-learning requires the students to have self-regulation and self-discipline [12]. Some students think that e-learning is boring and lacks interaction, especially for some topics strongly related to lab activities [10], [13]. From lecturer perspective, they usually need more time to prepare the teaching materials and it can be burdensome [11].

Due to the pandemic, most universities change their offline learning, that primarily relies on face-to-face meeting, to online learning and the transition is compulsory in many countries. This results in lack of preparedness in both lecturer and student sides, which might reduce the quality of the learning process. In response to this, several studies summarize and report the potential issues, expecting those can be considered by lecturers in preparing better learning environment.

Bao [2] argued that effective online learning can be achieved by considering five factors. First, the consistency of given course material: number of assessments, difficulty, and learning session should be similar with the offline one. Second, teaching method: lecturers should be aware that it is hard for students to maintain their concentration during the online lecturer and it is important to slow down the pace. Third, supporting resources: videos or clear guideline is required to help students learning. If possible, several tutors can be allocated to help the students. Fourth, participation: lecturers need to keep the students engaged and actively participate in the learning process. Fifth, good planning: universities should support the lecturers to provide better learning environment via the implementation of a good and scalable long-term plan.

Martin [14] proposed another set of factors that should be considered for effective online learning. First, instructions: online learning should be facilitated with a clear, ordered, and comprehensive instructions to support the learning process. Second, content: lecturers should carefully prepare the content as students learn the material primarily from that. Third, motivation: students need to be motivated to actively participate in online learning. They need to have good self-management, task-management, planning, and persistence. Fourth, interaction: lecturers are expected to keep interacting with their students with any platforms possible like email and chatting. Good and frequent interaction is expected to support the students in their learning process. Fifth, mental health: if some students are not mentally healthy, they might not be able to learn properly. Supports from their close relatives are encouraged.

Kamal et al. [4] summarized student challenges while transitioning from offline to online learning. They specifically discuss about reasons for students not having full participation in online learning and disagreeing with online learning. They also compile general comments about online learning. However, the study is not specifically designed to capture the perspective of computing students, which might be different to other majors due to their unique assessments [5].

III. METHOD

This paper summarizes issues experienced by computing students while transitioning from offline to online learning as the result of an unprecedented event. A questionnaire survey was distributed to students in our faculty, and it was responded by 112 students. The survey questions were carefully tailored based on our informal survey asking: "what are the difficulties of transitioning from offline to online learning?", which was responded by 72 students.

Our survey is divided to four sections as shown in Fig. 1. The first section records personal data like GPA, total number of academic credits for this semester courses, and gender. We did not ask about name and student ID to keep the survey anonymous. The second section has four questions. These record how many hours spent to study and complete assessments in both offline and online learning. This would be used to verify whether online learning is more time consuming for students. The third section has seven questions comparing online to offline learning.

Each question covers one of these aspects: workload of assignments (C01), clarity of lecture (C02), lecturer-student interaction (C03), difficulty of student collaboration (C04), difficulty of exams (C05), strictness in grading (C06), and stress level (C07). For each question, students need to choose whether that aspect is closely aligned to online learning, moderately aligned to online learning, equally aligned to both, moderately aligned to offline learning, and closely aligned to offline learning.

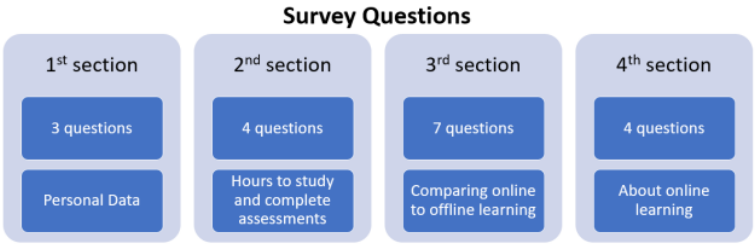

Fig. 1. Details of survey questions.

The fourth section has four questions about online learning (Q01-Q04). The first question asks the students to list any factors inhibiting their success of online learning with 15 predefined options including 'others'. The second question asks about what the lecturers can do to help students succeeding their online learning. Seven predefined options are given with one additional option called 'other'. The third question asks about the benefits of online learning with six predefined options including 'other'. The last two questions ask about the most difficult and the easiest subject to learn during online learning. It is worth noting that all predefined options in the fourth section are extracted from our informal survey. They are not explicitly listed here for conciseness, but substantial ones will be discussed in later sections.

The analysis was split to three parts. The first part is about the comparison of time spent in both offline and online learning (section 2 in the survey). The numbers of hours given by respondent for each category were averaged and the statistical significance was measured with two-tailed paired t-test with 95% confidence rate. To gain more comprehensive findings, the responses were further grouped based on data given in section 1 of the survey (GPA, academic credit, and gender), and analyzed separately. For GPA, the responses were categorized to 'lower than or equal to 2.75 of 4' (GPA LTOE 2.75) and 'greater than 2.75' (GPA GT 2.75). The former represents average students while the latter represents smart students. For academic credit, the responses were categorized to 'take up to 18 academic credits' (AC LTOE 18) and 'take more than 18 academic credits' (AC GT 18). The former represents students who take average number of credits while the latter represents students who take a lot.

The second analysis part is about qualitative comparison between offline and online learning (section 3 in the survey). Student responses for each question was summarized and described. Similar with the first part, the responses were further grouped based on GPA, academic credit (AC), and gender. The third analysis part is about general perspective about online learning, summarizing section 4 in the survey. The process is similar to the second analysis part.

IV. Findings

Among 112 respondents, 97 of them (86.61%) had GPA higher than 2.75 while 15 of them had GPA lower than or equal to 2.75. In terms of academic credit, 70 students (62.5%) took more than 18 academic credits for that semester while the rest only took up to 18 credits. Most of the respondents (90 of them) are male.

A. *Time Spent in both Offline and Online learning*

Table I shows that in general, students require more time to study in online environment. Though the increase is not quite substantial (less than one hour), it is statistically significant. The finding is somehow consistent when the students are grouped based on GPA, AC, or gender except on LTOE 2.75 and Female groups. Students whose GPA is lower or equal to 2.75 are average students and unlike the counterpart (i.e., smart students), they typically did not feel the burden to get the highest mark, resulting weaker intention to study more in response to the changing learning environment. Regarding the female group, it is unclear why the increase is insignificant.

It is expected that students who took more than 18 academic credits (GT 18) required more time to study in online environment than the counterpart (LTOE 18). They were enrolled to more courses and they should study for the whole materials.

For completing the assessments, Table II shows that transitioning from offline to online learning results in 1.6 hours more of completion time, and that difference is statistically significant according to two-tailed paired t-test with 95% confidence rate. The significant increase is consistent when the students are broken down to smaller categories based on GPA, AC, or gender except on LTOE 2.75. Students in that category did not feel the burden to get the highest mark like the counterpart (GT 2.75), and they might have weaker intention to complete the assessments as good as possible.

Students who took more than 18 academic credits (GT 18) required about 2.1 hours more to complete assessments in online environment. This is two times higher than that increase for the counterpart (LTOE 18), though the number of credits taken by the former group is not two times higher than the latter. GT 18 students might experience cumulative fatigue and that slowed down their progress of completing the assessments. This can be mitigated by providing assessments that associated one another, so that the students do not need to adapt themselves to a new context for each assessment.

TABLE I. Time Spent in Studying per Day

Categories	Offline	Online	P-Value
All	2.3 hours	3.1 hours	< 0.001
GPA LTOE 2.75	3.1 hours	3.3 hours	0.63
GPA GT 2.75	2.8 hours	3.1 hours	< 0.001
AC LTOE 18	2.3 hours	2.8 hours	< 0.1
AC GT 18	2.4 hours	3.3 hours	< 0.001
Gender: Male	2.2 hours	3 hours	< 0.001
Gender: Female	2.8 hours	3.4 hours	0.07

TABLE II. TIME SPENT IN COMPLETING THE ASSESSMENTS PER DAY

Categories	Offline	Online	P-Value
All	3 hours	4.6 hours	< 0.001
GPA LTOE 2.75	3.4 hours	4.6 hours	0.11
GPA GT 2.75	2.9 hours	4.7 hours	< 0.001
AC LTOE 18	3.2 hours	4.2 hours	< 0.01
AC GT 18	2.9 hours	5 hours	< 0.001
Gender: Male	2.9 hours	4.5 hours	< 0.001
Gender: Female	3.1 hours	5.4 hours	0.01

In general, online learning requires the students to spend more time in both studying and completing the assessments. This is expected as the interaction between the lecturer and the students is limited. This becomes worse due to lack of guidance from lecturer or tutors. Consequently, computing lecturers are advised to provide the course materials as clear as possible, especially on the assessment specifications given that the students took more time in completing the assessments.

B. Qualitatively Comparing Offline to Online Learning

Fig. 2 shows that more than three quarters of students felt that more workload of assignments was given on online learning (C01). This is consistent even though the students are categorized to smaller groups based on GPA, academic credit, and gender.

There are several justifications for this phenomenon. First, lecturers introduced additional workload to confirm the originality of the student assignments as academic dishonesty might occur. Second, a few assignments were added as 'bonus mark' to help students maintaining their academic performance in this unprecedented event. Third, students were not accustomed to completing some assignments independently given that in offline environment, these assignments had been completed in a classroom with direct supervision by the lecturers and the tutors. Fourth, students are not accustomed to effectively managing their time in online environment that is more dynamic and less strict.

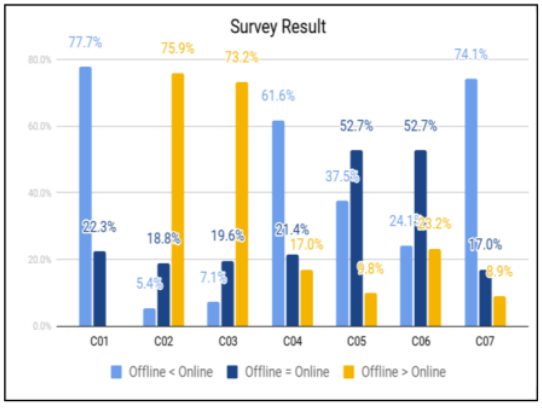

Fig. 2.Student's preferences between offline and online courses for survey question C01 to C07.

The lecture was less clear in online environment for about 75% of the students (see C02 in Fig. 2) and this is consistent when the students are broken down to smaller groups based on GPA, academic semester, and gender. This might be caused by at least two reasons. First, online interaction is far more limited than the offline one. Second, lecturers are still trying to find the best teaching method for online environment, especially for computing-specific materials like programming and algorithms. The former can be easily solved by recording the lecture and posting it online. Students who are unclear about a particular part of the lecture can play the recording. The latter is typically solved by having more experience in teaching online classes. However, to expedite the process, it is expected that the lecturers are either trained by experts or learn the teaching method from universities with online courses.

Many students felt that the interaction between them and the lecturer is far less in online environment (see C03 in Fig. 2). Again, this is consistent when broken down to smaller categories based on GPA, academic credit, and gender. Students might feel inconvenient asking questions via online platforms while the lecturers were too focused on preparing asynchronous lecture material. To compensate these, lecturers are expected to encourage students in asking questions and put more effort in synchronous lecture.

More than half of the students (61.61%) thought that if permitted, collaboration among students is more difficult in online environment. This is expected as most students were not accustomed to use collaboration platforms like Git for programming and Google Docs for text. Further, not all students used the same operating system and devices, which complicates the installation of programming environment, especially for server-oriented software. These became worse with the fact that some students were stressed due to the pandemic and could not maintain their schedule properly.

About half of the students felt that the difficulty of exams is equal in both offline and online environment (see C05 in Fig. 2), which is good since the quality of the exams was consistently maintained. However, about a third of the students felt that the online exams were more difficult. This might be caused by the lack of clarity discussed in C02 and the limited amount of lecturer-student interaction discussed in C03.

Grading is equally strict in both offline and online environment for about half of the students (see C06 in Fig. 2). Again, this is a good thing since the lecturers were able to maintain the quality of the course output despite the transition from offline to online learning. Some lecturers adjusted their assignments to compensate the sudden transition from offline to online environment, like providing longer completion period for the assignments, and focusing the grading on the completion process. However, that seems not to affect the quality of the exams and the grading.

Online learning resulted in higher stress level for about three quarters of the students (see C07 in Fig. 2). This might be caused by higher workload of assignments discussed in Fig. 2, lack of clarity discussed in C02 and the limited amount of lecturer-student interaction discussed in C03. This was worsened by at least four additional notable factors. First, students were not accustomed to independent learning. Second, internet connection problem which might be more pertinent on developing countries. Third, the difficulty of

computing-specific installation like programming IDE and server applications. Fourth, occasional errors in running lecturer-provided programs due to different operating system settings.

C. Perspective about Online Learning

Among 16 factors inhibiting the success of online learning in Q01, more than half of top-5 most prominent factors are related to interaction: limited lecturer-student interaction (ranked 1st), limited interaction among course participants (ranked 4th), and limited interaction with tutors (ranked 5th). Students were used to directly ask questions and discuss the material in person. It is expected for lecturers to encourage such interaction in online environment by promoting student participation in the lecture and providing more collaborative assignments.

Limited explanation about the course material is also a prominent issue. In online environment, the lecturer cannot freely use their way of teaching like drawing a diagram in a whiteboard or directly overriding the students' computers when technical issues occur, since some online learning platforms do not simply allow those. Lecturers need to find another way of teaching that is applicable to online learning without reducing the quality of the explanation.

One of top-5 most prominent issues is technical: poor internet connection. Some students did not have stable internet service at home. A few of them needed to go to café or other public places just to get such stable connection. This can be partly solved by providing a particular funding covering internet service cost.

To enlarge their chance of succeeding online learning (Q02), students expect the lecturers to consistently do at least two things: recording the lecture and providing live meeting sessions. The former was voted by 92 of 112 students (82.1%) while the latter was voted by 68 of 112 students (60.7%). The recording might be helpful for students as they can replay the recording if they are unclear about certain part of the lecture. In case they still need further clarification, they can ask that during the live meeting sessions.

When asked about the benefits of online learning compared to the offline one (Q03), most students thought that it is more time efficient (78.5%) as the students are not required to go to the university, which can take about one hour for some students. Online learning is also perceived as less space-constrained (76.7%) given that the lecture can be attended from anywhere including convenient places at home. Last but not least, online learning seems to be more cost-efficient given that no physical transportation is required to attend the lecture.

Students were also asked about the most difficult subject to learn in online environment (Q04). About half of the respondents (56.2%) voted for programming and its number of votes is far higher compared to other subjects (e.g., mathematic was only voted by 17.8% though it is the second highest). Programming is often perceived as a difficult subject given that it involves a lot of computational logic [15]. The difficulty becomes much higher in online environment since at home, the students might face many distractions while they cannot easily seek help from the lecturers, the tutors, or even fellow students. Technical errors while installing the IDEs (or any related software) might also complicate the learning process as sometimes, the students' computers are not compatible with the installed IDEs [16].

Mathematics and algorithms are the 2nd and the 3rd most voted for difficult subjects (with 28 and 14 respondents respectively). It is expected as both are 'learn by doing' subjects that require a lot of exercises and discussions. Given the nature of online learning, lecturers cannot provide a lot of exercises to keep student stress level low. Further, the discussions become more limited as both lecturers and students are not used to do that via online platform.

When asked about the easiest subject to learn in online environment (Q05), 65 students felt that non-computing subjects other than mathematics are the easiest since the materials were easy to understand and high grade could be achieved by just memorizing the materials. The rest of the respondents chose other subjects; they were usually good in that subject, but not in non-computing subjects other than mathematics as they were bad at memorizing. Programming was chosen by 14 respondents, followed by hardware and network subject with 13 respondents. Mathematics was chosen by five respondents and Algorithms was chosen by four respondents.

V. Discussion

Transitioning from offline to online environment can be challenging. Our study shows that students need to spend more time in both studying and completing the assessments. Further they believe that online environment results in higher workload of assignments, less clear explanation, less lecturer-student interaction, more difficult student collaboration, and higher stress level.

Lecturers are advised to use more images and videos during the teaching session to keep the students engaged while providing clearer explanation. Gamified platforms like Quizziz or Kahoot [17] can also be introduced to make the learning process more fun and hopefully mitigate the students' stress level. In terms of collaboration, online collaborative platforms like Slack [18] and GitHub [19] can be used. It is worth noting that the collaborative platforms might be misused to do collusion [20]. An automated similarity detection tool should be applied to raise suspicion of such misconduct [21].

Many students think that limited interaction (either lecturer-student, tutor-student, or student-student) is a key factor inhibiting their success in online learning. They also suggest the lecturers to record the lecture sessions and provide live discussion sessions. Online learning has a few positive traits like being more cost-efficient given that the students does not need to physically attend the lecture.

Lecturers are expected to pay more attention on programming subject given that it is quite difficult to be learned online. Technical and logical errors might discourage the students as some of them are not able to independently solve the errors. To provide better learning support, the lecturers can introduce additional tutors, use independent-learning tools like program visualization [22], setting more collaborative assessments so that the slow-paced students can learn from the smart ones [23], or using existing hands-on or learning materials specifically tailored for online learning provided by third parties.

VI. Conclusion

This paper lists issues transitioning from offline to online learning, experienced by computing students. The study involves 112 respondents via a questionnaire survey in which the questions are carefully tailored from an informal pre-survey.

Our study shows that transitioning from offline to online learning requires the students to allocate more time. Further, online learning is believed to have a few benefits like cost-efficiency. However, the benefits are not comparable to the issues like higher stress level and limited interaction. We have provided some suggestions to deal with those issues.

For future work, we plan to reconduct the survey on students from other universities and verify whether the issues can be generalized. We are also interested to compare student performance in offline and online environment to see whether the transition substantially affect student retention. Last but not least, we plan to further validate our findings via association rules.

References

[1] T. Favale, F. Soro, M. Trevisan, I. Drago, and M. Mellia, "Campus traffic and e-learning during COVID-19 pandemic," Computer Networks, 176, 2020.

[2] W. Bao, "COVID-19 and online teaching in higher education: A case study of Peking University," Human Behavior and Emerging Technologies, vol. 2, no. 2, pp. 113-115, 2020.

[3] C. Mercader and J. Gairín, "University teachers' perception of barriers to the use of digital technologies: The importance of the academic discipline," International Journal of Educational Technology in Higher Education, vol. 17, no. 4, 2020.

[4] A. A. Kamal, N. M. Shaipullah, L. Truna, M. Sabri, and S. N. Junaini, "Transitioning to online learning during COVID-19 pandemic case study of a pre-university centre in Malaysia," International Journal of Advanced Computer Science and Applications (IJACSA), vol. 11, no. 6, pp. 217-223, 2020.

[5] Simon, B. Cook, J. Sheard, A. Carbone, and C. Johnson, "Academic integrity perceptions regarding computing assessments and essays," in ICER '14: Proceedings of the 10th Annual Conference on International Computing Education Research, Glasgow: ACM, 2014, pp. 107-114.

[6] N. Elfaki, I. Abdulraheem, and R. Abdulrahim, "Impact of e-learning vs traditional learning on student's performance and attitude," International Journal of Medical Research & Health Sciences, vol. 8, no. 10, pp. 76-82, 2019.

[7] M. El-Seoud, I. Taj-Eddin, N. Seddiek, M. El-Khouly, and A. Nosseir, "E-learning and students' motivation: A research study on the effect of e-learning on higher education," International Journal of Emerging Technologies in Learning (iJET), vol. 9, no. 4, pp. 20-26, 2014.

[8] V. Nguyen, "The impact of online learning activities on student learning outcome in blended learning course," Journal of Information & Knowledge Management, vol. 16, no. 4, 2017.

[9] Di Xu & S. Jaggars, "The impact of online learning on students' course outcomes: Evidence from a large community and technical college system," Economics of Education Review, vol. 37, pp. 46-57, December 2013.

[10] S. Dhawan, "Online learning: A panacea in the time of COVID-19 crisis," Journal of Educational Technology Systems, vol. 49, no. 1, pp. 5-22, 2020.

[11] 3 Al-adwan and J. Smedley, "Implementing e-learning in the jordanian higher education system: factors affecting impact," International Journal of Education and Development using Information and Communication Technology, vol. 8, no. 1, pp. 121-135, January 2012.

[12] Di Xu and S. Jaggars, "Performance gaps between online and face-to-face courses: Differences across types of students and academic subject areas," The Journal of Higher Education, vol. 85, no. 5, pp. 633-659, 2014.

[13] S. Jaggars, "Choosing between online and face-to-face courses: Community college student voices," American Journal of Distance Education, vol. 28, no. 1, pp. 27-38, 2014.

[14] A. Martin, "How to optimize online learning in the age of coronavirus (COVID-19): A 5-point guide for educators," Sydney: School of Education, UNSW Australia, 2020.

[15] C. McDonald, "Why is teaching programming difficult?", in Carter J., O'Grady M., Rosen C. (eds) Higher Education Computer Science, pp. 75-93. Springer, 2018

[16] O. Kamalim, G. Kurniawati, S. F. Sujadi, and R. A. Nathasya, "Comparing the impact of programming assessment type: in-class vs take-home," International Journal of Engineering Pedagogy, vol. 10, no. 4, pp. 125-132, 2020.

[17] D. O. Göksün and G. Gürsoy, "Comparing success and engagement in gamified learning experiences via Kahoot and Quizizz," Computers & Education, vol. 135, pp. 15-29, 2019.

[18] B. Lin, A. Zagalsky, M. A. Storey, and A. Serebrenik, "Why developers 11 slacking off: understanding how software teams use Slack," in CSCW '16 Companion: Proceedings of the 19th ACM Conference on Computer Supported Cooperative Work and Social Computing Companion, San Francisco: Association for Computing Machinery, 2016, pp. 333-336.

[19] E. Kalliamvakou, G. Gousios, K. Blincoe, L. Singer, D. M. German, and D. Damian, "The promises and perils of mining GitHub," in MSR 2014: Proceedings of the 11th Working Conference on Mining Software Repositories, Hyderabad: Association for Computing Machinery, 2014, pp. 92-101.

[20] R. Fraser, "Collaboration, Collusion and Plagiarism in computer science coursework," Informatics in Education, vol. 13, no. 2, pp. 179-195, 2014.

[21] O. Kamalim, Simon, and W. Chivers, "Similarity detection techniques for academic source code plagiarism and collusion: a review," in 2019 IEEE International Conference on Engineering, Technology and Education (TALE), Yogyakarta, 2019, pp. 1-8.

[22] R. A. Nathasya, O. Karnalim, and M. Ayub, "Integrating program and algorithm visualisation for learning data structure implementation," Egyptian Informatics Journal, vol. 20, no. 3, pp. 193-204, 2019.

[23] M. Ayub, O. Kamalim, Risal, W. F. Senjaya, and M. C. Wijanto, "Utilising pair programming to enhance the performance of slow-paced students on introductory programming," Journal of Technology and Science Education, vol. 9, no. 3, pp. 357-367, 2019.

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