Comparative Study of Student Performance in Traditional and Online Assessments

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Abstracts

Since the World Health Organisation (WHO) declared the outbreak of coronavirus (COVID-19) as pandemic on March 11, 2020, containing its spread has been an international priority. COVID-19 is characterised by its rapid human-to-human transmission and the potential of asymptomatic cases to infect others. To reduce community spread, countries adopted unprecedented restrictions to isolate their populations to their homes - popularly termed "quarantine" or "social distancing" - and implemented social isolation measures that disrupt not only the economic sectors but also people's lives. Our life during the pandemic has changed tremendously in every aspect. Working from Home (WFH) and Fully online Learning is now the new norm. In early childhood, primary, secondary and tertiary education environments, the methods of learning have changed. Educational institutions have drastically revised and changed their teaching and learning processes. Technology is fully leveraged to ensure the process of learning continues. Ready or not, students need to embrace the changes. For Open University Malaysia (OUM), which has long been leveraging technology in its teaching and learning, COVID-19 has resulted in further changes. We have fully migrated from traditional assessment to online assessment, this to cater to the government's restriction of congregating physically. Examinations are now conducted entirely online. Learners have to answer MCQ exams or write essays for take-home-exams in the allocated time. In this aspect, we need to develop suitable exam questions to ensure the quality of assessment. Past studies have shown that these types of assessment are advantageous to adult learners. However, to what extent do these types of assessments influence student's performance? This study analyses the impact of online and traditional assessment on student performance. The results can be used to further improve the assessment method applied, leading to ensuring the quality of graduates in open and distance learning environments.

Keywords: *open and distance learning institutions, student performance, traditional and online assessments.*

1. Introduction

Coronavirus (COVID-19) is a contagious disease caused by a virus outbreak in Wuhan, China. COVID-19 has quickly spread through the national, overarching health services and has gotten worse with shelter confinement. Malaysia reported the first case of Covid-19 in early 2020, and the number of cases continues to rise until the end of 2020. This pandemic has compelled the government to impose a movement control order (MCO), also known as a partial lockdown, which represents a significant step taken by the Malaysian government to halt the spread of COVID-19 in Malaysia.

As a result of the global spread of the COVID-19 pandemic and the implementation of MCO, universities shut down their facilities and countries locked down their borders in response to lockdown measures by the government, having a devastating effect on higher education globally. Students and teachers are put under additional stress as a result of the closure of educational facilities, leading many to accept the implementation of Open Distance Learning (ODL) as the new norm. The use of the online learning approach promotes flexible learning, which in turn enhances educational activity among students (Zhang & Kenny, 2010).

The implementation of MCO has affected the focus of students in study regardless of primary, secondary or higher education institutions (Tan, 2021). Online learning during MCO showed significant differences in students' learning process and directly affects students' performance. Several disadvantages have been highlighted by some researchers about the impacts of online learning on students' performance Tan, 2021; Chung, et al., 2020)

1.1. Research Problem

Due to COVID-19, all schools, educational institutions, and universities have temporarily closed and shifted from face-to-face teaching to online or virtual classes by using effective and advanced technologies that are available in the country (Belhaj & Kingdom, 2022). Online environment has created new demands and emphasis on the development and content appropriate to the medium. In terms of assessment, they also practise assessment which suitable for the current situation such as online examination, quizzes, discussion board/blogs, video presentation, peer assessment, simulation/games, essay/report to e-portfolios, bring-your-own devices e-Exams and remote or in-house proctored e-Exam (Dawson, 2016; Fluck, 2019; Xiong & Suen, 2018).

Assessment is an integral part of the teaching and learning process that challenges teachers to consider the variety of the assessment techniques that will meet the subject's learning needs. Teachers use assessment to obtain information used to make decisions about students, curriculum, and educational policy. Assessments can enhance students' learning and motivation for learning with feedback given to students likely to encourage them to be better learners (Hernandez, 2012; Lake et al., 2017).

Different assessment procedures can assess students' knowledge in the classroom to determine whether the content taught has been understood. The institutions that adopt online assessment have to ensure issues related to online assessment elements, that are accessibility, legality, identity security and academic dishonesty.

Since 2003, there have been many research studies on the impact of online learning on students' performance. Among the early studies conducted on students' performance showed consistent results that the mode of learning did affect their learning process. However, their overall performances were not statistically significant (Ashton et al., 2003). One of the reasons is that they found the questions conducted online more difficult compared to traditional mode (Choi & Tinkler, 2002; Coon et al., 2002). Besides, according to Yang et al. (2018), Pope (2016) and Kritikha and Gg (2016), students' motivation and environment during online learning have significant impact on student performances compared to traditional mode.

1.2. Research Questions

i.   How face-to-face examinations and online examinations affect students' performance in technical courses?
ii. How face-to-face examinations and online examinations affect students' performance in non-technical courses?
iii. To what extent do the types of questions in technical courses affect students' performance?
iv. To what extent do the types of questions in non-technical courses affect students' performance?

1.3. Hypothesis

H1   There is significant difference in academic performance between face-to-face examination and online examination in technical courses

H2   There is significant difference in academic performance between face-to-face examination and online examination in non-technical courses

H3   There is significant difference in academic performance between essay type question in technical courses

H4   There is significant difference in academic performance between MCQ type question in technical courses

H5   There is significant difference in academic performance between essay type question in non-technical courses

H6   There is significant difference in academic performance between MCQ type question in non-technical courses

1.4. Significance of Study

The findings of this study will contribute to the benefit of students in improving and strengthening their capability in academic performance. It will also benefit the academicians to ensure quality of teaching and learning by preparing and enhancing the suitability of the types and level of the questions for online examinations. Other than this, the findings will also help the ODL institutions in improving their procedures in implementing online examinations. The study will help the researchers to uncover critical areas in the online examination processes and procedures.

2. Literature Review

2.1. Covid-19 and Open and Distance Learning Institutions

Covid-19 pandemic caused educational institutions to change their delivery systems to the newly emerging learning barriers. It has disturbed the regular education pattern and the standard practices we adopted and adapted for many years. In order to cater for the needs of continuous teaching and learning due to forced lockdown, which requires learners and teachers to work from home, most institutions adopt the concept of online and distance learning. Even though the educational institutions have already embedded technological tools, they had to review and revamp their existing course delivery mechanisms, learner engagement processes, and course assessment tools [16]. The challenge is beyond changing the mode of delivering instructions from face to face to online. But, the real challenge is in creating a culture that supports the adoption of innovative practices, which require different skills and competencies from the teacher, student, mentor and administrator, and at the same time maintaining the quality of the products Taylor et al. (2020).

Open and Distance Learning (ODL) refers to a way of providing learning opportunities that are characterised by the separation of teacher and learner in time or place, or both time and place; learning that is certified in some way by an institution or agency; the use of a variety of media, including print and electronic; two-way communications that allow learners and tutors to interact; the possibility of occasional face-to-face meetings; and a specialised division of labour in the production and delivery of courses [18]. The education provider (an institution) provides their learning materials through a combination of online and normal face-to-face classroom methods which is known as blended learning.

Being the first ODL institution in Malaysia, OUM is the first open university in the country that adopted a blended learning approach since its inception. This approach is commonly used by open and distance learning higher education institutions and according to Melton et al (2009), it has been found to be helpful in increasing retention rates. Since day one, OUM's mission has always been to widen access to quality education and to provide lifelong learning opportunities by leveraging technology, adopting flexible modes of learning, and providing a conducive and engaging learning environment at a competitive and affordable cost.
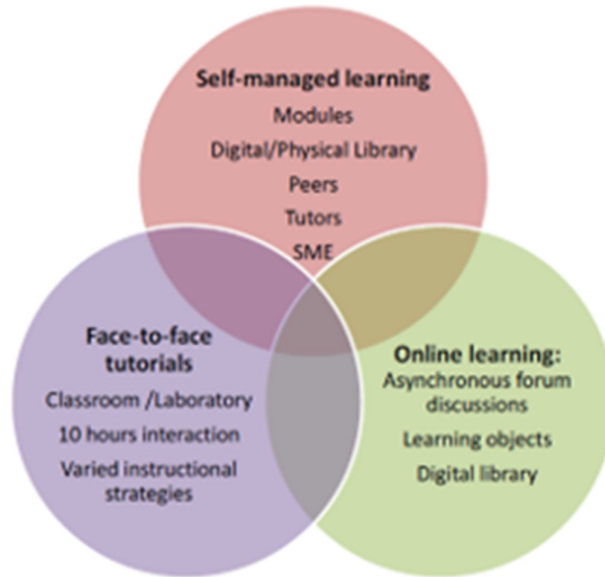
Figure 1. OUM Blended Learning Mode

Figure 1 illustrates the blended mode at OUM promotes self-managed learning supported by face-to-face instruction and online learning. Face-to-face tutorials were held bi-weekly at OUM learning centres throughout the country. Learners have the opportunity to physically meet their tutors and have discussions on the course and assessment related matters. However, due to Covid 19, even the ODL institutions including OUM have to conduct their teaching and learning activities fully online.

2.2. Fully Online Learning

While the COVID-19 crisis has obliged many conventional institutions to consider technology-led solutions, Open University Malaysia (OUM) has been delivering quality programmes online since its establishment as Malaysia's first open and distance learning institution almost 22 years ago. With the movement control order (MCO) announced by the government, OUM made the decision to implement fully online learning for all academic programmes offered by the university.

With this move, all courses were required to have e-lessons and e-tutorials. e-Tutorials are one hour online tutorial sessions conducted via Google Meet and are meant to be a substitute for the face-to-face in class tutorials used in the blended learning mode. Each e-tutorial session is recorded by the e-tutor to be shared with all the learners in the course. The learners have the flexibility of accessing and viewing the recorded sessions at any time, in case they were unable to attend the live sessions.

Figure 2. OUM Support for Online Learning

Figure 2 depicts the support for online learning at OUM. Through the use of OUM's learning management system, myINSPIRE, learners can participate in asynchronous forum discussions with their respective e-tutors and peers. Learners can access downloadable e-modules, i-lectures, e-content and are also able to link to the digital library. OUM began to introduce e-lessons in some of the courses. The objective of this weekly e-lesson is to enrich learners' learning by referring to related open educational resources (OER) videos, followed by discussion questions, and self-check quizzes pre and post e-lesson. The official mobile application, myOUM, allows instant access to latest announcements and at the same time learners are able to get information on their courses, assessment, assignment, lecture/tutorial timetable and exam timetable.

2.3.   Traditional Assessments

In education, the term assessment refers to the wide variety of methods or tools used to evaluate, measure, and document the academic readiness, learning progress, skill acquisition, or educational needs of students. Assessment is a systematic basis for making inferences about the learning and development of students. It is the process of defining, selecting, designing, collecting, analysing, interpreting and using information to increase students' learning and development Erwin (1994).

Assessment is acknowledged as a major influence on student learning in all course design and development (Boud & Falchikov, 2005). Boud and Falchikov (2005) highlighted, all assessment activities need to be examined from the point of view of what they contribute to promoting desired student learning in general and learning beyond the point of assessment in particular.

OUM implements two major components to assess learners: The Continuous Assessment (60%) and the Examination (40%). The Continuous Assessment is used to evaluate learners during the semester through assignments, project papers, and other practical sessions, while the Examination refers to the end of semester examination. Traditionally practised in OUM, examination is conducted physically where the learners have to sit for examinations in physical halls.

2.4.   Online Assessments

In line with the advancement of technology with robust optimization in market demand of related technology skills have contributed to massive acceptance in technology-based assessment in any education institutions. Technology-based assessment which is also referred to as online assessment [22] is one of the most rapidly developing research areas in educational practice. The challenges brought by the Covid-19 pandemic has prompted higher education institutions especially, to shift all educational activities to the e-learning format. According to Munoz and Mackay (2019), assessment is considered as the most challenging part in the transition process from traditional to online environment. However, other than the challenges faced in implementing and administering online assessment such as accessibility, legality, identity security and academic dishonesty, there is also the benefits of online assessment such as automated scoring, improved precision, reliability and the possibility if immediate feedback (Csapo et al., 2012; Pasztro et al., 2015), cost and time saving, immediacy of delivering assessment wherever and whenever they are needed (Akimov & Malin, 2020; Fluck, 2019).

Online Assessment can be delivered either asynchronously or synchronously. Asynchronous methods of assessment are not done in real-time, and normally in the forms of assignments and portfolios to assess students' knowledge and skills. While, the synchronous methods of assessment are implemented in real-time which usually reproduce the traditional methods of assessment in online form, such as Multiple-Choice Questions (MCQ), Open Book Exam (essay) and Objectively Structured Practical/Clinical Examination (essay, picture or video) (Khan & Jawaid, 2020; Sajjad et al., 2018). Based on review of online assessment practices done by scholars such as Rovai (2000), Robles and Braathen (2002), and Gikandi et al. (2011), written essays are the dominant form of online assessment. Most of the supporters of online assessments believe that online examinations can test students' higher-order thinking skills (Peet, 2016; Rytkonen & Myyry, 2014). In conclusion, an online assessment is considered valid if it includes 'face validity' (test what it is supposed to test), 'content validity' (covers the field being studied),

'construct validity' (underlying graduate outcomes), and 'concurrent validity' (whether performance is consistent among different tasks that measure the same learning outcome) (Akimov & Malin, 2020).

2.5. Student Performance

According to Arias et al (2018), face-to-face class students were statistically and significantly better than online class students in terms of exam average and improvement in post-test instructor questions. According to Sanjay Agal (2010), students did not appear to obtain the same amount of knowledge from online courses as they would from traditional classroom instruction. The majority of students were dissatisfied and uneasy with the online learning environment, preferring an actual classroom instructor.

Learning motivation, learning achievement, and student engagement are the three components that together make up a student's overall academic performance (Belinda, 2020). Bolliger and Martindale (2004) investigated the factors that influence student satisfaction in online courses. According to their research, when it comes to student satisfaction in an online setting, the instructor is the most important factor. Furthermore, technology and interactivity are factors that influence student satisfaction. Clearly, student satisfaction is an important variable in determining whether online teaching and learning is successful or not. Zolochevskaya et al. (2021) in their study confirmed that e-learning has a significant positive effect on academic achievement. As a result, e-learning has a statistically significant modest positive influence on students' academic success. Even though the flexibility of online learning should be considered, the main priority should be on student achievement. According to Amin and Li (2010), there are no significant differences between online and face-to-face student performance. Daymont and Blau (2011) showed that online courses can be just as effective as traditional ones. Ary and Brune (2011) and Topper (2007) showed no correlation between online and traditional students' course grades. On the other hand, Al-Mutairi (2011), Anthony (2011), Hannay and Newvine (2006), and Yukseturk and Bulut (2007) determined that course format was significant when assessing student performance.

Holley (2002) discovered that students who participate in online/E-learning earn higher grades than those who study the traditional method. This finding is consistent with previous research by Keshavarz et al., (2013), Ishmirekha (2011), and Klein, and Ware (2003), who concluded that E-learning has a positive impact on students' academic achievements. Numerous studies found that students in higher education institutions who used E-learning performed better than those who took face-to-face classes. They believed that E-learning provided valuable opportunities to higher education institutions (Ahmad & Smedley, 2012; Valentina & Abaidoo, 2015).

2.5. Research Objectives

  i. To compare students' performance in technical courses between face-to-face examinations and online examinations.
 ii. To compare students' performance in non-technical courses between face-to-face examinations and online examinations.
iii. To examine the effects of questions types in technical courses on students' performance
 iv. To examine the effects of questions types in non-technical courses on students' performance

3. Methodology

This retrospective comparative study was conducted in July 2022 at the Open University Malaysia (OUM) involving three faculties. This study sample consisted of 2200 OUM learners who have registered for 4 courses, ABCC1103 (1333 learners), BBUS2103 (222 learners), CBMA2103 (195 learners) and SBST3203 (450 learners). To compare the students' performance, the 2200 samples were gathered from one selected semester before the pandemic and one selected semester during the pandemic for all four courses.

The four courses were chosen from a pool of available courses due to the following reasons:
  i. ABCC1103 and BBUS2103 are non-technical courses which involve theories.
 ii. CBMA2103 and SBST3203 are technical courses which involve calculations and graphing.

iii. The online final examination format of ABCC1103 and CBMA2103 is multiple-choice question (MCQ) type.
iv. The online final examination format for BBUS2103 and SBST2103 is essay-type question

To minimise the disparity limitation in terms of number of samples for SBST3203 and ABCC1103, the January 2019 semester was selected as pre-pandemic semester and September 2021 was selected as during pandemic semester. For CBMA2103, May 2019 was selected as pre-pandemic semester and January 2021 was selected as during pandemic semester. For BBUS2103, September 2019 was selected as pre-pandemic semester and January 2021 was selected as during pandemic semester.

The overall performance of the learners served as the primary comparative factor in assessing performance differences between online and F2F examination. The samples were then analysed using Two-sample Unpaired Welch t-Test with significance level $\alpha = 0.05$.

4. Result and Discussion

Table 1. Students performance between online examination and face-to face examination for technical courses

Courses	Face-to-face Examination		Online Examination	
	Mean, µ	SD, σ	Mean, µ	SD, σ
CBMA2103: Discrete Mathematics	41.98	21.27	59.51	13.54
SBST3203: Elementary Data Analysis	46.26	16.42	58.11	20.03

Table 1 shows the mean scores and the standard deviation for technical courses, CBMA2103 Discrete Mathematics and SBST 3203 Elementary Data Analysis. For physical examination, the mean score for CBMA2103 is 41.98 (SD 21.27) and SBST3203 is 46.26 (SD 16.42). While for online examination, the mean score for CBMA2103 is 59.51 (SD 13.54) and SBST3203 is 58.11 (SD 20.03). The increment of the mean score indicates that students performed better in online examination as compared to face-to face examination. The reason for the improvement of the students' performance maybe due to the flexible and fully online learning mode. Students have better understanding of the subjects and increased their efforts, where they can repeatedly view the recorded e-tutorials, participate in the online activities which are embedded in the e- lessons and engage in the online forum discussions with peers and etutors. These findings aligned with Paul and Jefferson (2019) who administered comparative analysis study for online quiz performance of the sciences students.

Another reason for the improvement is the students' confidence level improved when they sit for online examinations. This is in line with the study done by Ogange et al., (2018) where their study found out that online assessment is capable of easing students' anxiety towards exams or assessment, as well as improving their confidence to sit for such exams.

Table 2. Students performance between online examination and face-to-face examination for non-technical courses.

Courses	Face-to-face Examination		Online Examination	
	Mean, µ	SD, σ	Mean, µ	SD, σ
ABCC1103: Introduction to Communication	65.06	21.23	70.69	12.46
BBUS2103: Company Law	59.83	11.17	66.90	10.68

The mean and standard deviation for the non-technical courses ABCC1103 Introduction to Communication and BBUS2103 Company Law are shown in Table 2. On the basis of the increase in the mean score, it is seen that students did better in online examinations compared to face-to-face examinations. The mean score for ABCC1103 is 65.06 with a standard deviation of 21.23 on the physical test, whereas the mean score for BBUS2103 is 59.83. (SD 11.27). In contrast, the mean online test score for ABCC1103 is 70.69 (SD 12.46), whereas the mean score for BBUS 2103 is 66.90 (SD 10.68).

Normally, students' performance in non-technical courses is better than technical courses. This is due to the fact that those who are taking an online examination will experience less anxiety as compared to those who are physically sit the exam in a hall and proctored. This finding concurs with a research by Stowell and Bennett (2010) who reported that students who normally experience high levels of test anxiety in the classroom had reduced test anxiety when taking online exams, while the reverse was true for those low in classroom anxiety. Moreover, according to research by Afacan et al. (2020), students believe that online tests are less stressful and more dependable than traditional paper-based exams.

Table 3. Mean difference between online examination and face-to-face examination

Courses	Mean Difference	t-value	df	Standard error of difference	Sig. (two-tailed)
ABCC1103: Introduction to Communication	5.63	-5.8004	976	0.97	0.000**
BBUS2103: Company Law	7.07	-4.4298	129	1.59	0.000**
CBMA2103: Discrete Mathematics	17.53	-6.6531	137	2.63	0.000**
SBST3203: Elementary Data Analysis	11.85	-6.8499	425	1.73	0.000**

Note. Two sample t-test (Welch); P<0.05

Table 3 represents the two-sample Welch t-test of the four selected courses for this study. For both the non-technical courses (ABCC1103, BBUS2103) and the technical courses (SBST3203 and CBMA2103), it is reported that the p-value for each is less than $\alpha = 0.05$., thus the null hypothesis, Ho are rejected. It means the difference between mean of the learners' performance for face-to-face and online examination for the two non-technical courses is big enough to be statistically significant.

In another perspective, we are also looking at the type of questions especially for essay type questions for this study. This involves 2 courses i.e. BBUS2103 and SBST3203. Before the Covid-19, the questions have three Parts, Part A: Short Question, Part B: Sub-structured Question and Part C: Essay. Part A involves knowledge and understanding level, Part B involves application and analysis and Part C involves synthesis and evaluation. Parallel with the implementation of online examination, the format has been changed from 3 Parts to 2 parts which only involves application, analysis, evaluation and synthesis. From the above Table, as we can see, the students' performance has improved significantly due to flexibility of duration and accessibility of the examination for these subjects. According to McLaughlin and Yan (2017), the online examination promotes the development of complex cognitive processes like self-regulation and has the potential to encourage student engagement, bolster student enthusiasm to learn, and lead to improved academic achievement. Students are given 24 hours to complete the examination for these essay courses. Study conducted by Theophilides and Koutselini (2000) found that (i) students studying for open-book exams tended to review various sources and integrated the information they reviewed; and (ii) students worked creatively and "probed deeply" into the material during the open-book exam. This is also supported by Phillips (2006) who found that open-book exams improved study skills by constructing tests with contextual clues that helped students effectively identify correct answers in the text.

5. Conclusion

Based on the discussion, it can be concluded that students perform better in online examinations compared to face to face examinations. There is no significant difference in students' performance regardless of technical and non-technical courses. The findings supported all the hypotheses developed for this study. Online examination involves complex cognitive processes which suit adult students' capability in relating the questions with their day-to-day tasks and experiences. The metacognitive skills allow adult students to be able to set goals, organise their activities, select among various approaches to learning, and change strategies if needed. Since the technology rapidly evolved, it is critical for higher education institutions to continuously evaluate the method of learning and suitable pedagogical models for an online examination. Online examination processes are beyond the direct-physical-control of the teachers. Doubts about integrity lead to the assumption that students can cheat in exams, and as a result

their performance will be higher. To further improve the quality of online examinations, it is recommended for future research to focus on time allocation of examinations in ensuring the security, reliability, and quality of the processes. One of the popular methods to ensure this is through examination proctoring. Besides, higher institutions are also wary about adopting digital evaluation systems. Changes are often implemented with proper timing, assigning the required resources, and recognising their contribution to educational quality.

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