INTEGRITY AND SECURITY IN DIGITAL ASSESSMENT: EXPERIENCES AND LESSON LEARNED

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ABSTRACT

Online learning is very much relevant in the era of digital education, especially in a hard time, such as during a pandemic outbreak where face to face learning is not possible. The digital assessment takes place, and educators face a new challenge as to how to verify that students have completed their work in the evaluation? These concerns raise issues related to academic integrity and assessment security. This paper discusses measures relevant to ensuring academic integrity and assessment security with an example of a university's final evaluation using online assessment. These include the emphasise of student awareness in honesty and trustworthy in their study and the severe consequences of malpractices. On the other hand, the assessment security involves the design of evaluation features to prevent any attempts to deceive, and practices to deal with any misconducts that had happened. Further, evaluation attempt data of 271 students in online assessment is analysed to investigate any pattern of malpractice and security issues of current online assessment implementation. It is deemed of necessity to discover these security issues in the current context of most sought assessment implementation. The measures revealed that the problems and challenges continue to persist such as difficulties to identify cheat contract, difficulties to avoid help and contacts with peers and outsiders, lack of awareness and responsibility in online learning and assessment and issues of availability of access of online content and assessment.

Keywords: Online learning, Digital Assessment, Cheating, Academic integrity, Assessment Security

1. INTRODUCTION

Online learning is very much relevant in the era of digital education, especially in a hard time, such as during a pandemic outbreak where face to face is not possible. The digital assessment takes place, and educators face a new challenge as to how can to verify that students have completed their work in the evaluation? These concerns raise issues related to academic integrity and assessment security. Both are necessary to ensure that students who obtain university degrees have met the required outcomes.

There are two related approaches in digital assessment (Dawson et al. 2020). Academic integrity emphasises on educating students with high moral and ethical conducts in their learning. Another concept, assessment security emphasises on stiffening student assessment to prevent any attempts to deceive, and on dealing any misconducts that had happened.

Among challenges for educational organizations and instructors in conducting online education include to consider technical, organizational, and pedagogical changes that need to implement to support the modified interaction style and learning strategy, whilst maintaining high quality education (Bojović et al. 2020). The digital assessment itself in online education is also challenged with the new educational paradigm.

Academic dishonesty in online assessment is pervasive, and the common belief that to cheat in online assessment is easier than in traditional examination might provoke an increased temptation for students (Martin & a 2009). On one hand the assumption could be considered as insulting to students; although on the other hand cheating should be avoidable issue in a well designed course. Such situation requires that professors have to provide a large pool of questions to avoid the pitfalls of using test banks (Golden & Kohlbeck 2020).

This paper discusses measures relevant to ensuring academic integrity and assessment security with an example of a university's final evaluation using online assessment. This paper reviews the emphasise on student awareness in honesty and trustworthy in their study and the severe consequences of malpractices. This paper also discusses the assessment security involves the design of evaluation features to prevent any attempts to deceive, and practices to deal with any misconducts that had happened

2. INTEGRITY AND SECURITY IN DIGITAL ASSESSMENT FOR ONLINE LEARNING

Due to the current pandemic outbreak, the adoption of online learning and digital assessment will continue to persist as the normal to education system. With the drastic changes to online learning, there are raising concerns about integrity and security of the assessment and strategies to deal with misconducts. Despite the new normal of digital assessment, learning institutions continue to determine to provide quality education without compromising the integrity and security issues. While academic integrity emphasises on providing necessary preparation for students following necessary ethical learning, academic security deals with strategies to combat any misconducts (Dawson et al. 2020).

To encounter integrity and security issues regarding digital assessment, best practices in teaching and tools can be deployed to help higher learning institutions. Three important stakeholders in digital assessment (higher learning institution, students, and instructor) play important roles. The responsibility of institution continues to be critical in this challenging time. As a common practice world-wide, academic integrity is a law enforced mandate that requires institutions to authenticate each student's identification using valid login and password, proctored assessments; and various technologies to verify student participation (Bane 2019). Various discussion has been made on how institutions can embrace cost-effective academic integrity solutions while maintaining the accessibility and flexibility of digital assessment (Lee-Post & Hapke 2017).

With the help of technology, institution has been able to ensure academic integrity using mainly two types of technologies with certain features (Bane 2019): 1) a certified test proctor application be connected to student's device during assessment 2) computer-algorithm based tool to observe any misconduct such as asking for help using second screen. During the assessment, the proctor uses student's webcam and microphone to remotely monitor the environment and body gesture in real time manner. The proctoring technologies serve to authenticating students' identification and legitimacy of student's response in digital assessment to avoid academic misconducts and for quality assurance purposes (Okada et al. 2019).

Likewise, emerging technologies such as surveillance systems, biometrics, and predictive analytics provide further authentication for high integrity in digital assessment (Lee-Post & Hapke 2017). The impact of proctoring technologies across various student's profile end-users are yet to be examined and understood (Okada et al. 2019). Despite the effectiveness of these proctoring technologies, they are prone to errors and invite certain risks related to violation of students' rights to privacy and reasons for disturbing their attempt to respond to the assessment (Lee-Post & Hapke 2017). Among interesting areas to research would embark on whether the use of these technologies may enhance trust on digital assessment, pattern of students' acceptance on these technologies vary across various demographical factors like gender, age and previous experiences (Okada et al. 2019). One of the findings from mixed-method analysis suggests a broadly positive acceptance of these proctoring technologies in online learning environment. Nevertheless, student's background plays significant role on students' responses: male students show smaller concern to share personal data than female students; middle-aged students display higher awareness of cheating and plagiarism implication; juniors indicate tendency to reject the technology, substantially owing to data privacy and confidentiality.

Despite focusing on the traditional way of assessing students using summative format, various suggestions emerge on how technology enhanced digital assessment by shifting the paradigms and improving the practices of assessment to ultimately benefit student learning. As an example, digital assessment for online collaborative learning groups is proposed to be implemented in collaborative learning contexts (Moneo et al. 2015).There are five focus areas where digital technologies support digital assessment particularly related to (Oldfield & Timmis 2013):

1. The use of multiple forms of representation to enable students to represent their learning in ways of their choice.
2. Develop different ways of summative assessment in different subjects
3. Develop different methods to gain learning skills, competences and dispositions as opposed to traditional assessment methods
4. Develop methods to assess peer interaction, group performance and collaboration
5. Application of learning analytics and data mining

Consistently, sole digital assessment may create some inherent problems where students express negative feelings related to fear of, or unfamiliarity with, the technology of assessment, and a lack of knowledge about the methods of digital assessment (Fluck et al. 2017). Therefore, Background Electronic assessment serves as another option of assessing student learning that offers independence of choice, in terms of the locality of the test, be able to give direct response. Students' acceptance and familiarity with digital assessment are of great concern by education provider. Digital assessment appears to be beneficial in a problematic surrounding such as in in higher education institutions in Palestine. Survey of 342 undergraduate students show that digital assessment appears to have significant benefits over face to face assessment featuring

these elements: reliable and efficient grading, effective in energy and cost (Shraim & Crompton 2015).

As part of academic security action, institutions explore ways to handle students who had been found to violate ethical conducts , such as using Academic Integrity E-Learning tutorial tool at MacEwan University, Canada (Benson et al. 2019). The institution moves from only emphasising the increased understanding and strengthened commitment of students of high moral conducts to a proactive focus with education for all students.

To enhance students' awareness on academic integrity and to secure digital assessment tasks, institution can creates an ethical learning experience among students by communicating essential information (Bane 2019). Since the digital assessment provides tremendous opportunity to attempt for cheating, there are additional challenges for institution to stimulate the right attitudes of student population and the acceptable permissiveness in the society (Kitahara & Westfall 2007). The culture requires some time and commitment among educators to keep educating and reminding students with high moral and ethical conducts in their learning good habit (Dawson et al. 2020). Students are able to avoid academic dishonesty in digital assessment given the high ethical conduct develops as a strong culture and the environment do not provoke an increased temptation for students. Students appreciate the learning experience not only about the technical content but also soft skills embed from the discipline raised in a well-designed course.

As part of instructors roles, various attempts have been reported to encounter academic dishonesty in digital assessment and instructors have been strategized many ways to minimize its effects (Golden & Kohlbeck 2020). One of the validated approaches to lessen the trial of

cheating on digital assessment applies paraphrasing. Students score better on the verbatim questions as opposed to the paraphrased questions (80.4% vs. 69.1%) which suggest that instructors to escape the pitfalls of using test banks. The findings confirm that students cannot easily find the online answer for a paraphrased test bank question due to the absent of such question in a verbatim form. Therefore, cheating should be avoidable issue in a well designed course where instructors plan for various method of assessing students using recent technologies (Oldfield & Timmis 2013). The situation also requires that instructors have to provide a large pool of questions and do not depend fully on available resources (Golden & Kohlbeck 2020).

These three stake holders definitely contribute to achievement of integrity and security of digital assessment. Figure 1 presents the model of Integrity and security in digital assessment model

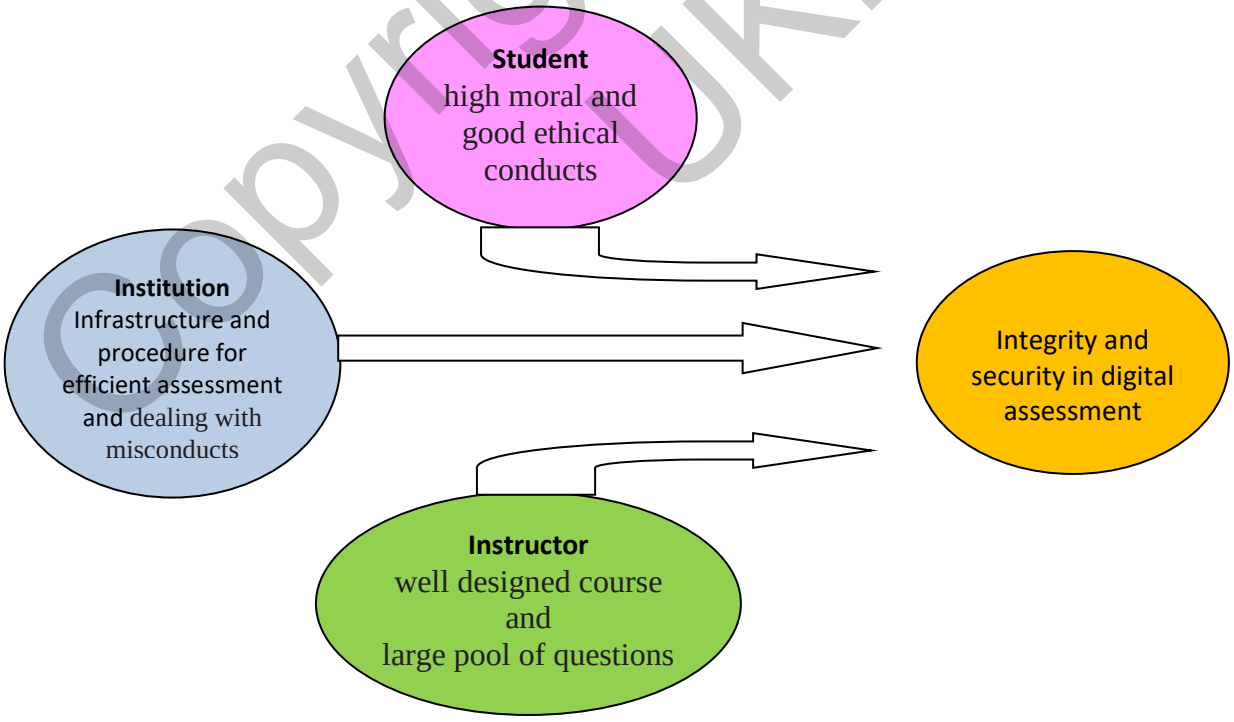

Figure 1: Integrity and security in digital assessment model

3. METHOD

A. Location

This study is implemented among undergraduate students at Faculty of Information Science & Technology (Fakulti Teknologi dan Sains Maklumat, FTSM), Universiti Kebangsaan Malaysia (UKM). These students register data analytic course and experience examination using digital assessment. Almost all courses in this faculty conduct digital assessment due to inability to implement face to face examination in the time of pandemic outbreak.

B. Sampling

The data that being analyzed for this study is considered as primary data with the respondents involved consisting of first, second- and third-year students. Altogether sample from 271 students who participate in the digital assessment provide the data for further analysis.

C. Instrument for digital assessment

The instrument comprises of 40 multiple-choice questions to be answered in one hour maximum attempt. The development of instrument follows the course proforma to fulfil the designed learning objectives at the beginning of semester. The development of instrument applies variety of question types from Bloom Taxonomy level: knowledge to analysis to assess students' overall understanding and ability in the course. The assessment is implemented using the institution learning management system (LMS), that is UKMfolio, a sister system to Moodle. The LMS provides the grading system and offers various data report including the score, log in and log out time, together with the length of responding time.

Design for instrument

The assessment applies standardised limited time of maximum one hour to answer and limits one attempt for individual student. Prior to the final evaluation, students are exposed to mock evaluation to familiarise students with the assessment setting. The digital assessment allows students to answer in a time window of two hours (students are freely set their one hour slot), once the time expires, open attempts are submitted automatically.

The instrument layout considers presenting the item in a page for one question. The setting limit only one question per page. The assessment applies sequential navigation where student must progress through the quiz in order and may not return to previous pages nor skip ahead. The question behaviour applies multiple choice question format with four choices of answer and only one answer is correct. The presentation of item considers shuffle question order to ensure each question be randomly scuffled each time a student attempts the quiz. The question does not follow the topic order. Students need to identify the particular topic for each question before they proceed to answer.

The review option for this digital assessment applies deferred feedback with certainty-based marking. Students have limited way to interact with the questions in the quiz by entering an answer to each question and then submit the entire quiz, before anything is graded or they get any feedback. Certainty-based marking (CBM) requires students not only to provide the answer to each question, but they also report their confidence in giving the response. Students are given three choices:: not very sure (66% or less confidence); fairly sure (67% or more confidence) or very sure (80% or more confidence). The grading is adjusted based on the certainty level. For the correct response, students get three mark for absolute confidence and gets an adjustment

of one to 0.33 for guessing. For the wrong response that they were very sure to answer, students get an adjusted mark from zero to negative two.

Mock evaluation

This is a trial environment to familiarise student with evaluation setting and to evaluate system efficiency. Students are given clear instructions that mimic the final evaluation. Students are required to answer all five questions in ten minutes. Each question has no mark. They have only one attempt to answer. It contains similar evaluation features that involve shuffle question order, sequential navigation of the question. This session is optional. 207 out of 276 registered students take part in the session.

Reminder calls and Non-responsive

To avoid any risks of not participating in the final evaluation, the instructors team up to contact students with non active indication. In the attempt, the instructors briefly introduce themselves and straight away remind about the final evaluation. The LMS provide non-active students of at least two hours from accessing the system. Of more than 20 phone calls made, nearly half are categorised non responded. Those who respond basically know about the session and show willingness to participate in the evaluation.

Out of the total of 276 registered students, five do not participate in the evaluation. Four of the non-participant has been recognised earlier as missing students and do not belong to any registered set. One of the students inform the instructor that he intends to withdraw from the course.

The digital assessment requires students to provide valid reasons of absence and evidence for uncompetitive of doing the assessment. Similar to the face to face final exam procedure, any

problems and issues for inability to participate in the session follow a strict procedure of second attempt. Students are required to explain the difficulty in accessing the link or to provide evidence of sick and any health issues.

Clear instructions are given to highlight important requirements in the assessment at the front page of the instrument. Students are expected to read the instruction before they start answering. These are the instruction points.

1. Answer all 40 questions in one hour.

2. Each question carries one mark.

3. You have only one attempt to answer.

4. We shuffle the question order, identify clearly the topic of each question to answer them.

5. We set sequential navigation of the question. You must progress through the quiz in order and may not return to previous pages nor skip ahead.

D. Validity

Validity of the instrument is tested using Peer Appraisal of instructors who have some knowledge on the course but do not teach the subject for the current semester. The appraisal is conducted by Quality Assurance committee to ensure that the instrument contains item that tap students' ability as planned in the proforma document.. As a result of these assessment, a few of changes in sentence structure, language and presenatations, are corrected.

E. Data Analysis

Non parametric procedure equivalent to t test method is used to analyze the data, due to small sample size for the emerging groups. This method is chosen to identify significant difference in the score of digital assessment for two groups. The data are analyzed using PSPP, an open source tool to serve as statistical software similar to SPSS.

4. Results of Response analysis

Non-parametric procedure is conducted to examine if there is significant difference in the score for two different groups: 1) submit the response earlier of the time window (the first 75 minutes). 2) submit the response later in the last 45 minutes of the time window. Note that students are given 120 minutes time window although they are allowed to answer within one hour maximum. The analysis involves two variables as the dependent variable in the comparison study: time to answer and assessment score. Table 1 provide the descriptive statistics for the variable.

For Group 1 i.e. students who submit the response earlier (the first 90 minutes), there are 254 observations, take an average 55.661 minutes to answer, the most frequent time is 60, the median is 59, the smallest time taken is 8 and the highest time taken is 60 (the time limit). For Group 2 i.e. students who submit the response later in the last 45 minutes of the time window, there are 17 observations, take an average 30.176 minutes to answer, the most frequent time is 44, the median is 31, the smallest time taken is 6 and the highest time taken is 44.

Table 1: Time to answer and assessment score

Variable	Time to answer			Assessment score		
Set	Group 1	Group 2	All	Group 1	Group 2	All
N	254	17	271	254	17	271

Mean	55.661	30.176	54.063	21.622	19.942	21.517
Mode	60	44	60	21	11	21
Median	59	31	59	22	19	22
Min	8	6	6	0	4	0
Max	60	44	60	35	33	35
Std dev	7.540	10.346	9.896	7.078	9.093	7.212

Tables 2 and 3 present the output for non-parametric procedure for each variable, respectively. In Table 2, the test statistic and probability value (Chi-square=46.29, p-value < 0.0001) suggests that there is significant difference of time to answer for these two groups. In Table 3, the test statistic and probability value (Chi-square=0.520, p-value < 0.473) suggests that there is no significant difference of assessment score for these two groups. The findings show that students who submit the response earlier take significantly longer time (mean 55.661) to answer than students who submit the response later (mean 30.176). However, there is no significant difference in the assessment score for the two groups.

Table 2: Non-Parametric Test: time to answer

Measures	Group1	Group 2
Mean	55.661	30.176
Variance	56.849	107.029
Observations	254	17
Hypothesized Mean Difference	0	
Chi square Stat	46.29	
P(T<=t) two-tail	0.000	

Table3: Non-Parametric Test: Assessment score

Measures	Group1	Group2
Mean	21.622	19.941
Variance	50.094	82.684
Observations	254	17
Hypothesized Mean Difference	0	
Chi-square Stat	0.520	
P(T<=t) two-tail	0.473	

5. DISCUSSION AND CONCLUSIONS

This paper elaborates two issues: academic integrity and assessment security with an example of a university's final evaluation using online assessment. These wo related issues concern with educating students with high moral and ethical conducts in their learning and stiffening student assessment to prevent any attempts to deceive, and on dealing any misconducts that had happened, respectively. Three main stakeholders of higher learning institution play key role in ensuring academic integrity and assessment security in digital assessment. With the help of technology, institution has been able to ensure integrity and security of digital assessment using proctoring tools to authenticate students identity and validate their response. Students are trained with high moral and ethical conducts to stimulate the right attitudes of student and awareness of permissiveness standard in the society. Consistently, instructors are required to which suggest that instructors to escape the pitfalls of using test banks.

The evaluation attempt data of 271 students in online assessment shows that students who submit the response earlier take significantly longer time to answer than students who submit the response later. However, there is no significant difference in the assessment score for the two groups. The findings oppose the expectation that students who submit the response earlier take significantly longer time to answer than students who submit the response later, but also score higher. The second group shows some indications of dishonest to be able to score as much as their counterpart although take smaller time. With the opportunities that students have in digital assessment, the reasons for the score at par could be contributed from leaked information of their peers who complete the assessment earlier. With no proctoring technologies in hand for the studied institution, not enough prevention is sought for unethical practices in digital assessment. It is deemed of necessity to discover these security issues in the current context of most sought assessment implementation. The measures revealed that the problems and challenges continue to persist such as difficulties to identify cheat contract,

difficulties to avoid help and contacts with peers and outsiders, lack of awareness and responsibility in online learning and assessment and issues of availability of access of online content and assessment.

6. ACKNOWLEDGEMENT

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