

# Quality Of Experience Through Online Assessment In Cloud Learning Platform

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**Abstract**—Online learning platform provides various elements to be used in learning implementation that may include assessment activities i.e: crosswords puzzles, fill in the blanks and matching words. Furthermore, learning practitioners may develop assessments activities that are suitable according to the level of education. However, the effectiveness of having assessments in cloud learning platform is not adequate due to the low maturity of cloud learning technology and difficult to be implemented due to the various issues in managing and understanding the cloud technology. Therefore, the objective of this paper is to observe the significant impact of assessment in cloud learning platform through learners' perception of quality of experiences (QoE). QoE is an approach used to indicate the satisfaction level of users towards any electronic services provided. In this research, we had identified three dimensions of QoE that will be used including learners' impressions, learning activities with the focus on assessments activities provided and network infrastructure according to cloud learning platform. The data collection for this research is gathered from questionnaires and provided to the learners at the end of the 2016/2017 semester. Therefore, we had developed the cloud-learning platform for selected course using Massive Open Online Course (MOOC), which include the continuous online assessment. From the learner's point of view, we discover that there is a significant relationship between the QoE dimensions however some of the dimensions shall be improved to positively support the cloud learning implementation regards to the assessment activities. This paper will benefit learning practitioners and institutions to embark and evaluate the improvements needed in managing the cloud learning implementation and understanding any issues that may be raised from the implementation based on the learner's point of view.

**Keywords**—cloud learning, quality of experience, online assessment, learning

## I. INTRODUCTION

The use of technology in education to support the learning practices has given benefits in various ways. One of the main benefits is the capability of learners to set up their own learning environment with the technology that will enable the learning at anytime and anywhere basis. This will create a new dimension

of learning practices with the adoption of technology. With the capabilities of Internet providers, broad wireless connection, smart devices, and various learning applications are among the factors that will empower the learning practices with the technology. The cloud technology adoption in education is still new to the education practitioners and institutions. The use of cloud technology in education will acquire transition from the current online learning environment to the new way of cloud adoption in learning implementation. With the current economy situation and the capabilities of virtual storage also the accessibility of cloud, the learning process will be more interactive and support personal learning to the learners. Regarding adopting cloud technology in learning, the term of cloud learning has been used by the education practitioners and researchers to engage with the cloud technology and learning itself. Figure 1 illustrates the engagement between the cloud and learning practices and implementation. The use of cloud learning is able to support the real-time collaboration between learners and instructors. Various elements of learning instruments such as learning resources, activities, games, and assessments will enhance the learning implementation with support for the cloud technology. The previous research work [6], [9], [11] in cloud learning platform has discovered the various impact on the adoption and use of those elements and compare the significance of implementing the cloud learning with other learning instruments capabilities. However, there is inadequate effort to investigate the effectiveness of assessment being implemented in cloud learning environment. Hence, it is important for the learning practitioners to understand the significance of assessment conducted in the cloud learning environment as the cloud technology totally depends on the network capabilities to ensure the significance acceptance by the learners. Therefore, the main objective of this paper is report the assessment implementation in the cloud-learning environment through the observation on learner experience from learners' perspective. The significance of this research will benefit the practitioners as well as learning institutions to empower the future improvements needed for the network infrastructure and capabilities for having cloud learning adoption in their learning environment.

## II. BACKGROUND OF STUDY

In education, the learning will only take place with the practitioners and learners involvement with support from either traditional way of learning conducted or supported by technology to enhance the learning implementation. By considering the new generation of learners that expose to the capabilities of smart devices, the Internet and social networking that also support their learning practices, the paradigm shift of not having the books and e-learning has to be changed to the new technology that will ensure the knowledge delivery and outcome are significantly satisfied by the learners. This satisfaction concern is related to Quality of Experience or QoE. According to [7] defined QoE as the overall acceptability of an application or services as perceived subjectively by the end-user. However, this definition is only limited to the subjective evaluation, therefore [4] has elaborate widely the QoE as measuring the performance based on both objective and subjective psychology measure of using an ICT service or product. It is clearer that QoE is a method that can evaluate the subjective and objective aspects of services that will pursue towards the performance of the services and user-related aspects that will cater the overall satisfaction of user towards services or application by adopting the wireless network or cloud network. In order to investigate satisfaction of learners in learning, various methods have been implemented and one of the significant quality observations is to investigate the experience of the learners towards the services provided in learning. Previous works [6], [9], [11], [13], [15] had shown observation study on experiences in various aspects of learning and mobile implementation and had initiated significant acceptance result. Therefore, in order to ensure the success of having technology being adopted in any aspects, measuring user satisfaction according to perceptions, acceptance and experiences are important to be measured and acknowledged [2]. To investigate the experience of learners towards the assessment in cloud learning platform, we have to identify the QoE dimensions related to the assessment activities as shown in Figure 2.

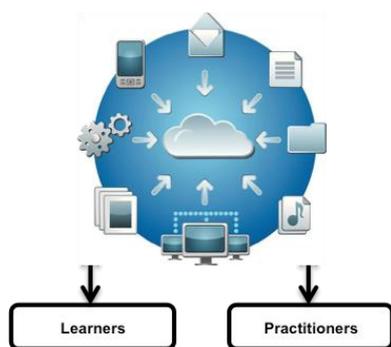


Fig. 1. Concept of cloud adoption in Learning implementation

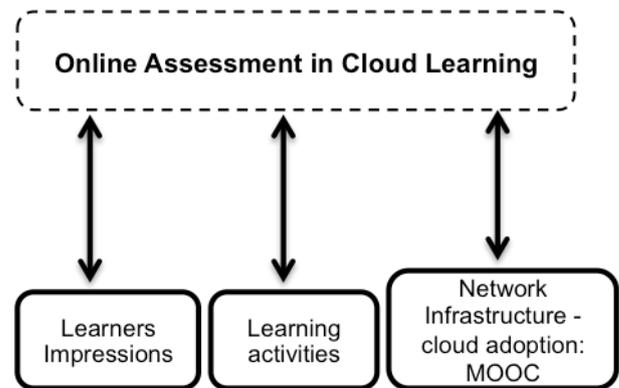


Fig. 2. Propose Quality of Experience (QoE) dimension for online assessment in Cloud Learning

## III. METHODOLOGY

In this study, we first gathered the students' demographics data which were collected within the first section of the questionnaire. The data were used to give input on gender and students' readiness in using the technology. While the second section consists of items to elicit the learner's experiences of each experience dimension. Considering the second section, we have collected data from the Student Feedback Online (SuFO) and a questionnaire. SuFO is an online evaluation information system which is administer by the university whereby the students are compulsory to complete the evaluation for their result purposes. Concerning evaluation questions in SuFO, there are in total of 8 questions are related to learner satisfaction and learning activities as mentioned in the proposed dimensions. 5 questions pertaining to the network infrastructure were derived from a questionnaire. Referring to questionnaire items for network infrastructure, the items were measured via a 4-point scale ranging from 1 (strongly not agree) to 4 (strongly agree). In order to observe the quality of experience (QoE), the Mean Opinion Score (MOS) has been used to aggregate the scores of learner's feedback. The MOS is consists of five scale ranging from 5 (excellent) and 1 (bad). Therefore, to indicate the significance between questionnaire scale and MOS scale, we build the indicator scale to link the questionnaire and MOS scale as shown in Table 1. Furthermore, we develop the assessment for online learning activities using the Massive Open Online Course (MOOC). We choose MOOC as this online learning platform support the cloud capabilities access via cloud applications using smart devices or via web-based basis. During the week 14 of the semester, students are compulsory to complete the questionnaire provided online via MOOC platform which was placed in the University Teknologi Mara (UiTM) Students' i-Learn portal. The students were briefed and asked to complete the questionnaire. Regarding the samples for the study, there are 110 respondents consisted of 77 second year and 33 first year undergraduate students enrolled in Fundamentals of Computer Problem Solving and Computer Organization offered by Department of Computer Science, UiTM during semester 1 2016/2017 academic session. The analysis of the data involved the descriptive analysis of the demographic data as well as undertaking effectiveness analysis of the scale indicator percentage analysis which is align to the Mean Opinion Score in

order to identify the rating for the identified dimensions. The radar diagram used in this study to illustrate the effectiveness of quality of experience dimension as proposed in the model is shown in figure 2.

IV. RESULTS AND DISCUSSION

A. Demographic Analysis

The demographic analysis showed that most of the respondents were female (58%) and the male was the minority (42%). The majority of the students with more than 90% (see Figure 3, competency) are competent in Internet and Information Technology which shown the ability of the learners to use the online assessment in the cloud learning environment. The demographic details of the respondents are shown in Figure 3.

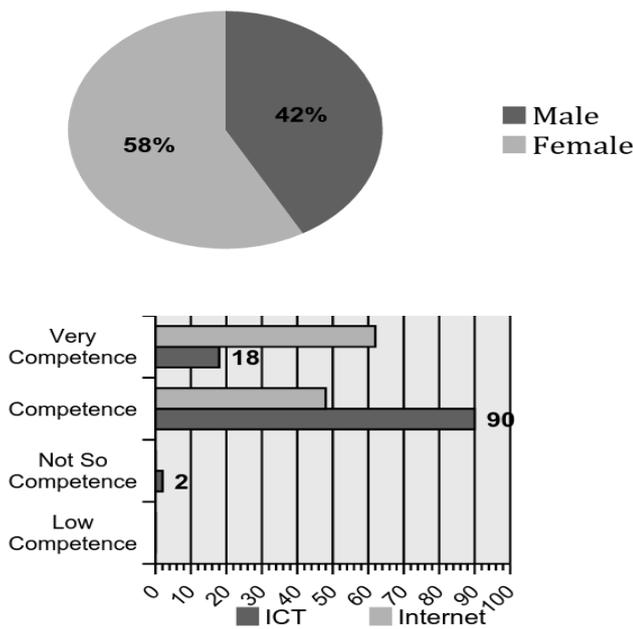


Fig. 3. The demographics details of the respondents

The reliability analysis was accomplished with the students' feedback evaluation which consists of 13 questions. selected from the total 24 questions. The reliability analysis of the questionnaire showed that the Cronbach's alpha coefficient obtained for all the items were well above the acceptance level which indicate a good internal consistency and the measurement was sufficiently reliable (see Table II). The selection of the questions and the analysis according to the assessment activities from the three qualities of experience (QoE) dimensions are shown in Table III.

TABLE I. MAPPING BETWEEN STUDENT FEEDBACK INDICATOR AND MOS RATING

Student Feedback Percentage (%) `Scale Indicator	MOS Rating	Level
90 – 100	5	Excellent
80 – 89	4	Good
70 – 79	3	Fair
60 – 69	2	Poor
Below 60	1	Bad

TABLE II. RELIABILITY OF THE QUESTIONS

Dimension	Total Questions	Cronbach's Alpha
Learner Impression (LI)	5	0.731
Learning Activities (LA)	3	0.712
Cloud Infrastructure (CI)	5	0.723

TABLE III. THE QUALITY EXPERIENCE DIMENSION AVERAGE MAPPING WITH MOS

Dimension	Items	Average (%)	MOS Rating
Impressions (LI)	LI1	95.75	5
	LI2	89.25	4
	LI3	85.75	4
	LI4	84.5	4
	LI5	97.5	5
Learning Activities (LA)	LA1	91.5	5
	LA2	76.75	3
	LA3	91.75	5
Network Infrastructure (NI)	NI1	86.25	4
	NI2	86.0	4
	NI3	76.5	3
	NI4	90.5	5
	NI5	99.0	5

B. Learners' Impression (LI)

This section investigates the learners' perception of their involvement in online assessment using cloud learning platform. Most of the items according to average in percentage has shown positive significant on the perception of learners' impression towards online assessment in cloud learning platform. From the analysis, the overall learners' impression towards online assessment in cloud learning platform has confirm with 97.5% agree (see Table IV) on the statement on having no difficulties in participating and handling the online assessment in cloud learning platform which related to [9] findings on learners' anxiety aspects in online learning. The difference between MOS and average mean for this dimension (see figure 4) show there is consistent performance for learners' impression dimension which is significant with the learning style perceive by the learners as the young learners are more keen towards the digital

technology to support their personal learning environment [10], [14].

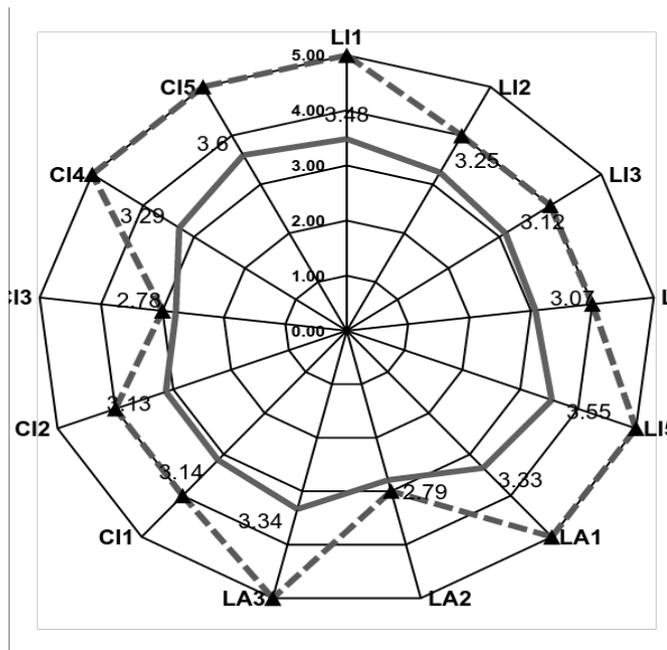


Fig. 4. Comparison between Average Mean and MOS rating according to average

### C. Learning Activities (LA)

The significant on the method of assessment and feedback given by the instructors in online assessment for cloud learning has shown positive significant with the high average for both item (LA1 and LA3) with 92.73% and 97.27% respectively as shown in Table 4. It is also significant with the differences between the MOS and average mean performance for this dimension with small differences value for both items (see Table 4 and figure 5). However, the learners' outcome finding (LA2) is not significant with the two items in this dimension with MOS rating of 3 and average mean 2.79. This situation may contribute to the learners' perception that by having the technology to navigate their assessment, the outcome may not align with the benefits of having online assessment in cloud learning platform as this method will perceived learners' experience to learn better and enhance learners confidence [1], [3], [8]. Therefore, various efforts to investigate the significant and effectiveness of the online assessment in cloud learning platform towards learners' outcome is crucial and the effectiveness shall study according to the learners' perception or their learning outcome and perhaps the differentiation between the technology used will give more navigate to understand the situation on learners' outcome.

### D. Network Infrastructure (NI)

All factors regarding cloud services are significantly positive either in percentage average or MOS value (see Table 4 and Figure 5) except for the availability of network to support the cloud during the learning or assessment being done by the learners'. This situation may contribute to various factors. One

of the main factors is on the speed of the network in campuses that need to be upgraded to higher speed in order to support the cloud services in learning activities. Regards, the requirement of Blended Learning Implementation has been emphasized on the top management that needs to observe the relevance capacity of network speed that meets the requirement of learning application used in various learning implementation. This is important to ensure the capabilities of the network to support cloud and learning application in having various learning activities include assessments will satisfy the learners' significantly towards service quality and technical aspects [5], [12], [16]. Therefore, further investigation and observation need to be pursued by the researchers to study the effectiveness of network environment in various learning implementation with data in a real time learners environment also to look for any differences occur of network capabilities to support the learning implementations.

## V. CONCLUSION

From this study, we can conclude that there is significant of all quality of experience (QoE) dimension in online assessment adoption in cloud learning platform. However, more effort and enhancement shall be considered towards the significance of learners' outcome in using the cloud-learning platform to navigate the online assessment implementation. Future work should emphasize more on the various dimension of having online assessment in learning and investigate the impact of network facilities including the requirement (delay, accessibility, error etc.) and suggest the benchmark network facilities to support the online assessment in learning. On the other hand, the improvement of network availability to support the cloud network in learning institutions shall be improved to provide faster and acceptable bandwidth for Internet connectivity to ensure the success of learning and assessment implementation in cloud learning platform. This is important as the learning requirement has changed rapidly to ensure the consistency of knowledge delivery and outcome of the learners with the use of various technologies that will bring the learning into the right path of quality assurance and globalized the learning practices as well as delivery.

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TABLE IV. THE QUALITY EXPERIENCE DIMENSION ANALYSIS OF ONLINE ASSESSMENT IN CLOUD LEARNING

Dimension	Questionnaire Item	Strongly Disagree	Disagree	Agree	Strongly Agree	Average (%)
<b>Impressions (LI)</b>	LI1: The method of assessments in this course has enhanced my learning ability.	13 (2.73%)	10 (3.64%)	34 (36.36%)	53 (57.27%)	95.75
	LI2: My knowledge is increase from the assessment provided in this course	11 (10%)	9 (8.18%)	32 (29.09%)	58 (52.73%)	89.25
	LI3: My confidence level in this course has increased.	2 (1.82%)	8 (7.27%)	75 (68.18%)	25 (22.73%)	85.75
	LI4: I am confidence to use online assessment in cloud	3 (2.73%)	6 (5.45%)	81 (73.64%)	20 (18.18%)	84.5
	LI5: I felt anxious to do online assessment submission in cloud	87 (79.09%)	7 (6.36%)	5 (4.55%)	11 (10%)	97.5
<b>Learning Activities (LA)</b>	LA1: I am satisfied with the methods of assessment in cloud learning.	3 (2.73%)	5 (4.55%)	55 (50%)	47 (42.73%)	91.5
	LA2: I am satisfied with my outcome for the course.	10 (9.09%)	12 (10.91%)	79 (71.82%)	9 (8.18%)	76.75
	LA3: I am satisfied with feedback given for each online assessment activities.	0 (0%)	3 (2.73%)	67 (60.91%)	40 (36.36%)	91.75
<b>Network Infrastructure (CI)</b>	NI1: The devices use to support the cloud online assessment is conducive.	2 (1.82%)	0 (0%)	89 (80.91%)	19 (17.27%)	86.25
	NI2: The devices I use are adequate and functioning to support cloud online assessment.	5 (4.55%)	2 (1.82%)	77 (70%)	26 (23.64%)	86.0
	NI3: I am satisfied with the availability of cloud network during assessment activities.	10 (9.09%)	25 (22.73%)	54 (49.09%)	21 (19.09%)	76.5
	NI4: I felt anxious that cloud network delay will affect my assessment activities	71 (64.55%)	12 (10.91%)	15 (13.64%)	12 (10.91%)	90.5
	NI5: I felt anxious of network error during the assessment submission in cloud	93 (66.36%)	13 (27.27%)	4 (6.36%)	0 (0%)	99.0