Quiz in MOOC: An Overview

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Abstract - *Quiz is a one of the primary elements of Massive Open Online Course (MOOC) used for evaluating the knowledge of the learner. A quiz provides feedback as correct/incorrect response or grades that help the learner in designing their own learning paths. In this paper, an overview of the MOOC quiz is provided by covering various aspects of quiz including the users of quiz and types of quiz, basis for selection of quiz type, and different assessment methods used in MOOC. Also, there are several tools and service that helps in offering quiz in MOOC. Here, some of the most common tools and services are explained with the suggestions for future direction in improving the quiz services in MOOC.*

Key Words: MOOC, Quiz, Quiz Types, Assessment Method, Automatic Assessment, Authoring Tool, QTI

1. INTRODUCTION

The fusion of education with technology is considered as most promising development in learning space. Online learning uses technology for delivering the education. With technology globalization, the concept and methodology of learning, and teaching has undergone a tremendous change. Technological usage in education provides the global learning environment that allows accessing the course material anytime, anywhere, connect other learners, and get access to the content without considering any geographical boundary. The significant changes in use of technological in online education have contributed to the emergence of the concept of Massive Open Online Course (MOOC).

Nowadays, MOOC is the popular way to offer online courses, and used globally by educational organization or institutions. MOOC uses web-based tools and environments to deliver education [1]. It provides online courses for unlimited (logically) participation. It has gained lot of popularity since the time of its development in 2008. As of December 2016, approximately 58 million students are registered for the MOOC courses, offered by more than 700 universities and approximately 6850 courses [2]. MOOC courses are offered by various providers. Some of the popular MOOC providers are Coursera[1], edX[2], Udacity[3], iversity[4], FutureLearn[5], NovoEd[6].

Generally, a MOOC course is structured in several learning units, where each unit having content in form of lecture video, text books, tutorial notes, blog post, and many more. The content is followed by the assessment activities that are delivered as quiz, assignment, or exam.

Quiz is one of the key elements of assessment in MOOC. Several studies show that the inclusion of quiz has positive impact over certain learning related factors, such as, attentiveness of the learners [3] and learning outcomes [4]. Quiz in MOOC is delivered mainly to perform two functions – evaluation of the overall learning outcome and performance of the learner; and, to provide feedback for learner's responses. Quiz responses by the learner are evaluated using the assessment method such as, self, peer, or automated assessment supported by a platform. Though each quiz evaluation method has its pros and cons, an automated assessment with grading is commonly used in MOOC. However, learner prefers mix of all assessment methods due to variety of activity they are used for.

In this paper, the focus is on providing an insight of quiz used in MOOC. Firstly, an introduction of quiz in MOOC is given with a brief of MOOC quiz, its use, benefits, and how a learner uses it. The author explains various aspects of quiz in context of MOOC. It includes the discussion of users of quiz, types of quiz used, and services required for quiz, in MOOC. Author has classified the type of quiz used in MOOC in several categories, depending on different parameters. For example, based on the purpose of quiz to be used for, quiz is categorized as- a) *Performance based Quiz* and b) *Practice based Quiz*; based on the integration mechanism used quiz is of two types- a) *Independent Quiz* and b) *Embedded/In-Video Quiz*; and depending on the grading mechanism used quiz can be - a) *Graded Quiz* and b) *Non-Graded Quiz*. Also, there are some specific tools or services required in order to support the quiz in MOOC. In order to cover this dimension, some of the commonly used tool and services are explained with a brief introduction, their use, current state in relation with the MOOC platform with the suggestions for their improvement.

In this paper, Section 2 provides an overview of quiz in MOOC. Section 3 explains the users of the MOOC quiz. Various types of quizzes used in MOOC are discussed in Section 4. Section 5 describes the quiz support system

provided in the form of tools or services in MOOC. Section 6 states the conclusion.

2. QUIZ IN MOOC

MOOC delivers well-structured courses. The courses are divided into a list of lecture units, where each unit comprises of the lecture content provided in different forms (video, pdf, ppt, etc.) followed by various assessment activities including quiz, assignment, homework, walkthroughs, lab work, final project and exam. Primarily, MOOC uses the video lecture and quizzes as the instructional methods [5] for their course. Moreover, quiz is the basic method used for assessment by most of the MOOC providers.

Various studies [6][7][8] in MOOC considered the quiz as basic contributing course activity that helps in appraising a number of factors such as, drop-out rate [6], engagement [7], usefulness, and many other. Therefore, consideration of quiz as a useful metric clearly shows its significance in MOOC. Moreover, the magnitude of quiz forced providers to work towards improvement of quiz in different ways. For example, providing more interactive and better responsive question types, support for better assessment methods, delivering mechanism etc. However, there are some characteristics and properties commonly found in MOOC quizzes.

Quiz comprises of set of questions of several types like, MCQ, True/False, descriptive, numerical, image based, activity based that are delivered with the objective of evaluating learner. The quiz is evaluated using an assessment method such as, self-assessment, peer assessment, automated assessment, based on the method accepted by the course designer (Instructor). Commonly, the mix of different assessment method is recommended to be used.

A learner participates in MOOC quiz usually after completing some of the course lessons like, watching videos, completing readings. A learner can also choose to attempt quizzes even before having any course lessons (in case learner have prior knowledge) by skipping certain lessons and jump directly to quiz, supporting the self-paced learning. Learner can also skip some of the quizzes itself. In response to the questions asked in the quiz the learner register their reply by giving answers or responses. These responses or answers will be evaluated on the basis of assessment method (self, peer, or automated) and grading policy used by the course provider. Considering a simple case, the answers given will be evaluated online. System records the responses of learner and compared with the answers contained in the database of the MOOC. In some quizzes, learner needs to complete the quiz within a time frame, decided by the course providers.

Sometimes, to enhance the interactivity in the course, quiz is embedded inside video lecture that are titled as "embedded or in-video quiz". It allows the learners to test their level of understanding even while watching a video lecture. Learner can rewind or go back to a particular video frame for reinforcement of learning. Inclusion of in-video quiz provides several benefits from increase interaction level of learner with their course content to the long retention rate [8]. Embedded quizzes are predominantly important in MOOC as learners interact mainly with videos.

3. USERS OF QUIZ

The MOOC courses along with course content and various learning activities are delivered via a MOOC platform, a specially designed software package offered by the provider. Primarily, the users either use the MOOC platform to deliver a course or to learn from the course. Here, we focus on the users who use the features offered by the MOOC providers.

In MOOC, there are several kinds of users who interact with quiz. For example, learner uses the quiz for the learning purpose. We have identified two main users of the quiz in MOOC, which are as follows-

- *Instructor* is a person who is responsible for designing and delivery of the course to their learners. Instructor is also liable to control the tools, features, and activities in a course. So, instructor is sometimes called as administrator of the course. The instructor manages users specific to the course, defines various settings and parameters of the tools, assessing learners. For example, while designing a quiz in MOOC, instructor defines the type of questions, question itself, grading policy, assessment method, and other required parameters for the quiz. Instructor also plays a role of a passive coordinator whose task is to monitor some of the learner's activities.

- *Learner* is a person who simply uses the features offered as lesson units, activities, tools etc., by the instructor or course provider. In quiz sometimes, learners are allowed to assess their peers, provide feedbacks on their assessments, participate in discussion over specific question or quiz. Learner in quiz can be a single person or a group of learners based on the type of quiz defined by the instructor.

4. TYPES OF QUIZ IN MOOC

MOOC supports various types of quiz and each one of them serves a different purpose. Depending on different basis used for quiz, it can be divided into several categories.

Generally, quiz is used basically used for two reasons; first is for evaluating performance of a learner, secondly for practice purpose to facilitate learner's to check their level of understanding from the MOOC course. So, based on the use the quiz, it can be divided into two types.

- *Performance based quiz* helps in evaluating the performance of the learner in the form of score or marks as the learning outcomes.

- *Practice based quiz* used for practice purpose mainly to provide instant feedbacks to the learner

for self evaluation, without worrying about the effect of their score on final outcome.

Moreover, in order to serve for these two different reasons, nature of quiz as well as integration mechanism may also vary. A quiz can be incorporated in MOOC courses either as an independent course activity that needs to be completed to attain their learning objectives or incorporated within the video lecture [9]. Therefore, based on the integration mechanism used quiz can be of two kinds.

- *Independent Quizzes* are the self sufficient course activity consists of a set of questions of numerous types, supporting wide range of question types. Fig. 1 showing an independent quiz that is supporting MCQ as question type.

- *Embedded/ In-Video Quizzes* have questions (Set) sandwiched in between a video lecture (as shown in Fig. 2). It supports a limited question types due to the complexity of integration and assessment method that will work from within the integrated activity.

Quiz can also be categorizes based on the grading or evaluation policy they are supporting. Based on the support of evaluation practice, a quiz can be of two types.

- *Graded Quiz* provides grades for each response or answer given by the learner depending on the grading policy used. As a leaner successfully attempts a graded quiz, at the end marks/grades will be calculated that will sum up in final grade of the learner. Fig. 1 showing a graded quiz that will give 1 mark for the correct answer and learner can attempt it maximum 3 times.

- *Non-Graded Quiz* does not provide any grade for the responses of the learner. These quizzes do not participate in the final grading of the course and let the learner attempt the quiz without worrying about their final grading. Fig. 2 showing a non-graded quiz giving correct/incorrect as the response feedback.

Though there are different types of quizzes as explained above, still each one of them is related with other. So, it is not possible to categorize MOOC quizzes into independent categories. The relation and dependency among them is explained as follows-

- Generally, the independent quizzes are used for performance evaluation as in performance based quiz, while the embedded/ in-video quiz are used for self-evaluation or practice purpose only.

- Independent quizzes can be graded or non-graded. Whereas in-videos quizzes are mainly non-graded. Sometimes automatically graded in-video quizzes are also used in MOOC.

- For evaluating performance of the learner using performance based quiz, graded quizzes are used. However, non- graded quizzes are used to serve for

the practice purpose mainly by providing feedback to learners to check their current learning and performance status after learning from the course.
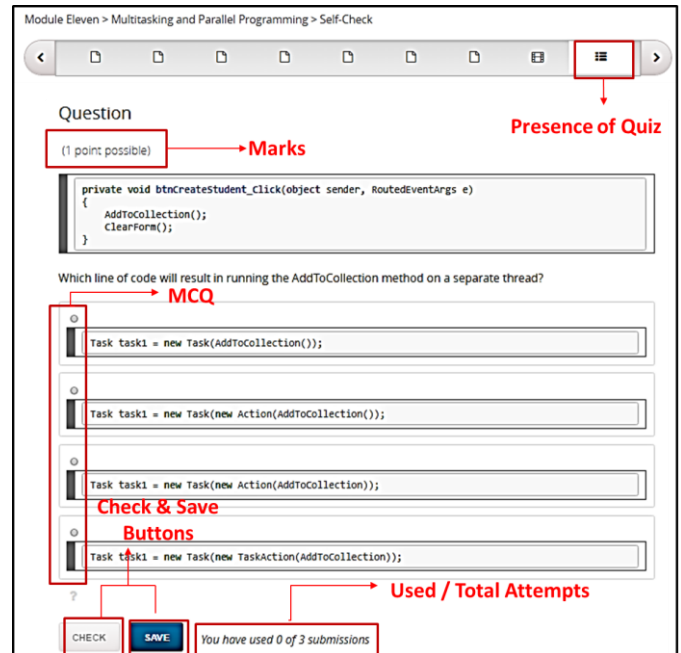

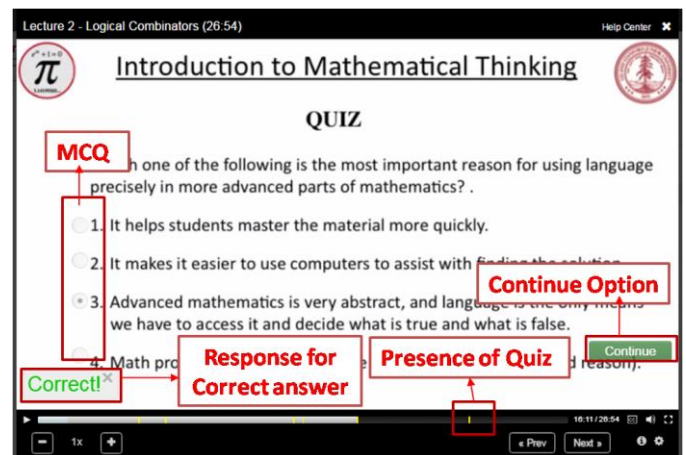**Fig -1**: Example of Independent Quiz in edX.

Fig-2: Example of an embedded quiz in Coursera [14].

For computing the grades, different type of assessment methods are used. Three basic assessment methods are- 1) *Self assessment*: done by learner itself (based on rubrics); 2) *Peer assessment*: get assessed by colleagues (based on rubrics); and 3) *Automated assessment:* where the evaluation is done by some machine learning mechanism (based on specially designed grading tool or algorithm). The simplest assessment method captures the learner responses and compare with the answers in the database for exact match. Each of the assessment types has their own benefits and serves for a different learning purpose. A proper combination of all assessment types can help in creating a better learning environment for engaging the learners.

5.   QUIZ SUPPORT SYSTEM

MOOC courses are delivered using the MOOC platform that itself covers a range of tools assisting in the process of delivering various features including quiz, to the learner. However, different MOOC platform have different set of features and services for their components like, quiz. There are some specific services required for the quiz in MOOC, discussed as follows-

5.1 Authoring Tool

These are specialized tool for designing and delivery of course content, as well as course related activities. It places the course elements, such as, text, graphics, and questions, and turn individual screens into a complete course with pages, navigation, menu and buttons.

Other than designing a quiz, an instructor have to perform several task such as, checking learners progress, ensuring availability of quiz, provide feedback to learners questions, moderating course activities. Moreover, various complex course activities like, a quiz with activity based questions are also introduced make authoring process difficult for the instructor that needs some special assistance methods.

Authoring tools are used to make the authoring process easier and make it possible for the course instructors to create complex question types in MOOC quiz. It helps and assists the course instructor to design and implement the quizzes with ease. Generally, MOOC platforms provide authoring tools. For example, Open edX provide authoring tool named as "studio" for designing MOOC course.

5.2 Automatic Quiz Generation

It is the process of creation of quiz automatically using different methods, like, semantic based [10], sentence formation [11] etc. For instance, identify some course related attributes from the plain course content and then the quiz sentences are automatically formed [12].

A learning system like MOOC can get benefited with support of such method as it will free an instructor from creating questions for the quiz. As, it automates some of the authoring tasks, it saves a lot of time of instructor that can be constructively used for other course related tasks.

Commonly, MOOC platforms do not comes up with integrated automatic quiz generation system systems. But the platforms need to be improved and developed to provide such features as done in [10] for AMOL platform.

5.3 Automatic Assessment Support

It is one of the assessment methods that automatically measure performance of learner using different techniques of machine learning, artificial intelligence, synaptic method. It provides opportunity to the learners to applying their learning and get instant responses as correct/incorrect

answer. Most of the learners prefer automated assessment methods as reported by [13].

Quiz is one of the assessment components in MOOC. The process of assessing massive audiences is a very complex task where complexity even increases if the complex quizzes are used in the course. Due to massiveness and complexity of the course activities (including quiz) in MOOC, automatic evaluation of the learners can be the best suitable solution.

Some of MOOC platform supports the automatic assessment method. For example, automatic assessment for the programming exercises in MOOC [14]. Though various methods are already available for automatic grading, yet, there is lot more that need to be developed for the same.

5.4 Learning Analytics Support

Learning analytics are the tools designed to use the data collected from different sources (can be quiz in MOOC) in order to measure different learning processes, like, success/failure, most engaging content, most active learners

MOOC courses are complex to design and deliver due to massiveness of audiences. But due to large participation in a course, huge data is generated from the actions of the participants, like, attempt quiz (skip question, check answer, number of tries), interaction with the video lecture (pause, play, resume, skip) etc. Numerous studies [6] [7] [15] [16] have used quiz as the useful metric for identifying some learning or course related factors. The MOOC providers also gather and process this data generated from course activities including quiz, and extract some valuable information to help in delivering better learning environment.

Learning analytics is not yet supported by all MOOC platforms, but the systems are being developed and enhanced to provide feature of learning analytics. For example, in September 2015, Open edX added a module named "insight" especially for learning analytics, some other efforts also done to extend the architecture of khan academy [17], Open edX [18] to include learning analytics.

5.5 Question and Test Interoperability (QTI)

IMS[7] organization provides a standardization specification as QTI standard, for questions and tests of any digital test content. It describes a "data model for the representation of question (assessment Item) and test (assessment Test) data and their corresponding results reports" [19].

Due to the standardization of the tests and questions, the data can be exchanged with other system like, LMS, CMS, VLE, learning analytics, authoring tool, and many others. Therefore, QTI specification supports the interoperability and reusability to the content that is in the form of questions.

Therefore, in order to provide interoperability to the quizzes in MOOC and make them suitable to exchange with

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[7] https://www.imsglobal.org/

multiple learning systems, the questions should be designed according to the QTI specifications. Although many systems does not supports QTI specifications but now various learning system including MOOC platform, are designed and developed to support the QTI standards along with the other standardization methods.

6.   CONCLUSIONS

MOOC has become common means for offering online courses worldwide. Primarily, it uses the quiz as the assessment activity with the other course content.   An instructor offers the quiz by defining several properties such as, defining questions, type of questions, answers for checking, grading policy, and assessment method. To set up a ground for understanding the MOOC quiz, a discussion is provided in detail for the kind of users in quiz, different types of quizzes, basis for selection of type of quiz, and different assessment methods used in MOOC. Furthermore, for delivering the quiz by defining the properties, the instructor needs to use some specific services or tools like, authoring tool. As there are many tools and service available, a discussion of the basic ones is provided here. We shall see further disruption as well as innovation in terms of the type of quiz supported, their question type, assessment method to support more complex problems in the quiz in future.

REFERENCES

[1]   Voss, B.D., 2013. Massive Open Online Courses (MOOCs): A Primer for University and College Board Members. Association of Governing Boards (AGB) of Universities and Colleges.

[2]   Class Central, MOOC Stats, 2016, https://www.class-central.com/report/mooc-stats-2016/

[3]   Desouza, E. and Fleming, M., 2003. A comparison of in-class and online quizzes on student exam performance. *Journal of Computing in Higher Education*, *14*(2), pp.121-134.

[4]   Wilder, D.A., Flood, W.A. and Stromsnes, W., 2001. The use of random extra credit quizzes to increase student attendance. *Journal of Instructional Psychology*, *28*(2).

[5]   Yuan, L., Powell, S. and CETIS, J., 2013. MOOCs and open education: Implications for higher education.

[6]   Onah, D.F., Sinclair, J. and Boyatt, R., 2014. Dropout rates of massive open online courses: behavioural patterns. *EDULEARN14 Proceedings*, pp.5825-5834.

[7]   Anderson, A., Huttenlocher, D., Kleinberg, J. and Leskovec, J., 2014, April. Engaging with massive online courses. In *Proceedings of the 23rd international conference on World wide web* (pp. 687-698). ACM.

[8]   Koller, D., 2012. MOOCs on the Move: How Coursera Is Disrupting the Traditional Classroom (text and video). *Knowledge@ Wharton Podcast.* Roediger, H.L. and Butler, A.C., 2011. The critical role of retrieval practice in long-term retention. *Trends in cognitive sciences*, *15*(1), pp.20-27..

[9]   Chauhan, J., & Goel, A., 2016. An analysis of quiz in MOOC. In *Contemporary Computing (IC3), 2016 Ninth International Conference on* (pp. 1-6). IEEE.

[10]   Miranda, S., Mangione, G.R., Orciuoli, F., Gaeta, M. and Loia, V., 2013. Automatic generation of assessment objects and Remedial Works for MOOCs. In *Information Technology Based Higher Education and Training (ITHET),* (pp. 1-8). IEEE.

[11]   Kulkarni, C., Wei, K.P., Le, H., Chia, D., Papadopoulos, K., Cheng, J., Koller, D. and Klemmer, S.R., 2013. Peer and self assessment in massive online classes. *ACM Transactions on Computer-Human Interaction (TOCHI)*, *20*(6), p.33.

[12]   Jain, S., 2015, August. Automated generation of programming language quizzes. In *Proceedings of the 2015 10th Joint Meeting on Foundations of Software Engineering* (pp. 1051-1053). ACM.

[13]   Papathoma, T., Blake, C., Clow, D. and Scanlon, E., 2015. Investigating learners' views of assessment types in Massive Open Online Courses (MOOCs). *Lecture Notes in Computer Science*, *9307*, pp.617-621.

[14]   Staubitz, T., Klement, H., Renz, J., Teusner, R. and Meinel, C., 2015, December. Towards practical programming exercises and automated assessment in massive open online courses. In *Teaching, Assessment, and Learning for Engineering (TALE), 2015 IEEE International Conference on* (pp. 23-30). IEEE.

[15]   Ruby, A., Perna, L., Boruch, R. and Wang, N., 2015. Are There Metrics for MOOCS From Social Media?. *Online Learning*, *19*(5).

[16]   Bote-Lorenzo, M.L. and Gómez-Sánchez, E., 2017, March. Predicting the decrease of engagement indicators in a MOOC. In *Proceedings of Seventh International Learning Analytics & Knowledge Conference* (pp. 143-147). ACM.

[17]   Ruipérez-Valiente, J.A., Muñoz-Merino, P.J. and Kloos, C.D., 2013. An architecture for extending the learning analytics support in the Khan Academy framework. In *Proceedings of the First International Conference on Technological Ecosystem for Enhancing Multiculturality* (pp. 277-284). ACM.

[18]   Ruiz, J.S., Díaz, H.J.P., Ruipérez-Valiente, J.A., Muñoz-Merino, P.J. and Kloos, C.D., 2014, October. Towards the development of a learning analytics extension in open edX. In *Proceedings of the Second International Conference on Technological Ecosystems for Enhancing Multiculturality* (pp. 299-306). ACM.

[19]   IMS Question and Test Interoperability, 2005. Retrieved May 2015, from https://www.imsglobal.org/question/qtiv2p2/imsqti_v2p2_oview.html