

An Interactive Design Tool for Assessing Student understanding in Digital Environments

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Abstract

Various e-tools and interactive media have improved and enhanced the teaching and learning in higher education. For example, flipped teaching pedagogy encourages the students to engage in the various in-class activities rather than just to be a passive learner by listening to the lectures. On the other hand, newly joined students have trouble understanding the key modules since they don't know the fundamental concepts related to the modules. This paper illustrates how online quiz creators and education tools might improve the student performance in academic setup. The online quiz creator has numerous styles, including photo quizzes, team quizzes, one-page quizzes, image quizzes, memory games, and match games for dynamic, energetic, and passionate student engagement. Students may self-assess their progress using ICT-based online quizzes. This platform assists with student engagement and learning to make them active learner. Students are greatly motivated by various learning styles and technology that suits them. This also has helped the students to avoid a random online tool and join a safe environment to enhance their learning. Supporting multiple learning styles is one of the techniques that should be implemented in every module delivery. The effectiveness of using these practices in teaching is measured through student feedback. Based on their responses, it is concluded that many benefits are found by adapting these practices, such as students' increased interest in their modules, improved understanding skills, and relational abilities.

Keywords Learning, Technology, Quiz, Online, Assessment, FOSS

1. Introduction

Technological advances have improved social and educational environments. Using e-tools and interactive media, flipped teaching has improved education technology [1]. Students prefer class activities over one sided knowledge transfer through faculty lectures. Students preference for learning in a class are grouped by VARK [Visual (V), Auditory (A), Read/Write (R), and Kinesthetic (K)]. Biggs and Tang's article [2] suggests that students concentration on a topic can't exceed 15

minutes. To keep the students engaged and meet the requirement of various type of learners in the class, the instructor must include them in live in-class activities by the introduction of e-tools and activities like Jigsaw in group discussions [3-4]. Flipped teaching plays a vital role in overcoming such issues and enhancing the student performance to create a healthy learning environment [5]. According to the author of [6], Kobo Toolbox is a FOSS for gathering data and feedback on phones, tablets, paper, and computers. The students use this tool to collect the data for their assessments and research. It is similar to Google Forms and Survey Monkey applications but used if the internet is inconsistent.

MEC has adopted the flipped learning approach to promote the active learning and student centred learning across the various disciplines. This initiative enhances the student learning experience through applied practices by the use of various tools such as google padlet, socrative, jig saw, titan pad, Flubaroo, QR codes, etc. The traditional teaching methods are not effective One of the problems with these methods is that the students cannot give direct feedback to the teacher about the pace of teaching or learning style. Also, the student's level of understanding is not evaluated at each stage. Hence, to meet the present needs of students and to improve their participation in learning environment, engaging students in the classroom is the only measure to ensure that the learning has taken place. This situation and consideration have inspired the authors to develop an online educational quiz assessment tool with hypertext preprocessor (PHP) language to facilitate effective feedback. This also yields us to know student unpreparedness and learning imbalance in the flip teaching method. The online tool design has several features which empowers the teachers in collaborative learning and student engagement in the classroom. The other quiz tools like Socrative have various disadvantages, such as a limit of signed-in users (50), classroom code being a must, not compatible with low-end android phones, not being available to work outside the classroom, and wireless connectivity being a must. Padlet also has some disadvantages, such as the account details are not secure, teachers cannot control what students post, and computer virus protection can block the access. The formative educational assessment learning tool effectively measures student understanding through grading and results.

The perception of this innovative practice is designed with a fun-filled, active learning method with different templates and various content. This innovative practice aims to identify students' attitudes towards the taught modules and engage in learning activities designed to fit the present modern needs. An online quiz is a feasible tool with several features in the form of a picture quiz, team quiz, one-page quiz, image quiz, memory game, and match game which enables the users to access through smartphone/pc for live results in the teaching and learning process. This innovative practice has helped in professional development and it is also used to build an extended learning environment beyond the classroom for the faculty members. This practice also builds a better future for broader economies and societies while stimulating students with versatile environments.

It is believed that innovative practice is the backbone for success in teaching and learning. It sets the learner in active mode and be a quick learner. This practice aspires to face the challenges in three key aspects: professional development, utilization of Information and communication technology (ICT), collaboration, and contribution to society.

- An online quiz platform is a unique way to conduct flexible and open learning experiences. This approach helps create possibilities for student-centric learning outside and inside the classroom. In addition, this online Educational Assessment helps to provide critical feedback to students.
- The online quiz practice design is quite enjoyable, active, and energetic for the enthusiastic participation of students.
- Student collaboration and engagement through formative educational assessment.
- According to one of the survey statistics, the online quiz is an effective way to monitor the assessment activities and student performance frequently.

2. Methodology

It was a great challenge to move from the traditional teaching and learning to online teaching mode despite the COVID-19 outbreak for the continual learning process. However, the steps initiated by the college and the module leaders have made the teaching and learning design process during this period more interactive and engaging. As a result, the learning process structure involved and carried out during the semesters was in three different phases, as shown in Fig 1.

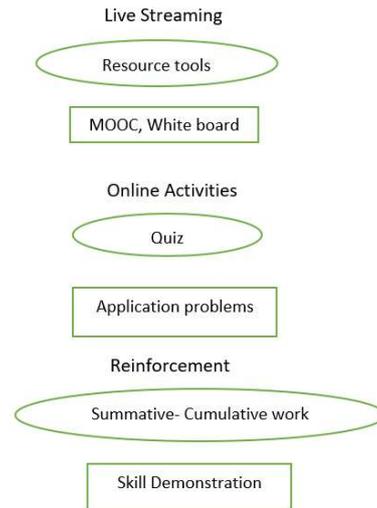


Fig.1: Design Process of the proposed methodology

The online quiz maker was designed as a formative assessment with multiple formats like picture quiz, team quiz, one-page quiz, image quiz, memory game, and match game for the active, energetic, and enthusiastic participation of students with the web link <http://asifquizmaker.net/index.php>.

The fig.2 shows the main screen of the online quiz maker.



Fig. 2: Online quiz maker designed using PHP.

The online quiz has the following features:

- The online Interactive quiz format is a ready-to-use template for drafting questions and answers for the increased engagement of students.
- The designed online quiz maker has different readymade templates such as multiple choice questions, one-page assessments, fill-in-the-blanks, drag or drop sort, exercises with timed options, picture quizzes, memory games, and TEAM quizzes.
- Students can report any lost items during the class timings, or if found, that Information can be sent online to the Module Leader.
- Feedback is provided for the online quiz assessment conducted to make the students learn from their mistakes.
- The fun-filled features of the quiz help in engaging and monitoring the student performances and also student metacognition.

- The interactive quiz assesses the students' progress in the module content covered each week.

Online quiz practice uses Information and Communication Technology (ICT) to provide students flexible access to self-assess their progress. This online technology is designed with features on a single platform which helps in continuous student engagement and overall learning experience. As a result, students are highly motivated with learning styles and facilitated through the latest technological developments. This practice has helped the students to avoid online tools and join a secure environment with multiple choices. In practice, supporting the needs of students with different learning styles is helpful. Furthermore, automated feedback was provided to the students to know their exact mistakes for the choices made.

The feedback from the students on the effectiveness of the learning activity is observed. A questionnaire was given to the students (i.e., 117 students) to know their experience with the learning practice and the tool utilization.

Questions:

How was the learning experience using an online quiz maker in the current semester?

Do you think the same tool can also be used next semester? Students have to choose from the choices given.

The fig. 3 shows the survey results.

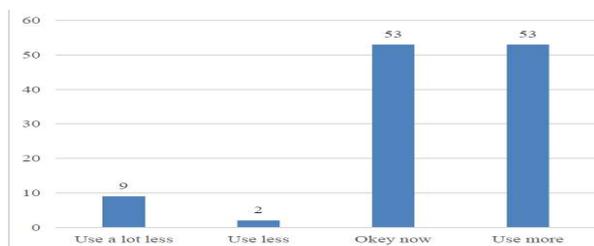


Fig 3: Survey result

The student feedback summarized that, this platform is one of the best approaches as it gives an instant feedback with grades, and it is relatively intuitive to create a good interaction between the students and the teachers. Simply put, it acts as a base where the solutions to various problems can be solved. With this platform, the student can work remotely for any instructional difficulty. It provides the students with fast access to their current progress and the level of understanding of the module content.

The student performance from their learning is measured to achieve the best from the practices. Understanding the student's cognitive ability to learn new concepts is difficult. The best way to evaluate and to know the students learning better is through an assessment that

happens in and out of the classroom, such as in blended learning pedagogy. These practices assess the mind appropriately, simplifies the teaching, and amplifies the learning. This online tool is designed with various features and online content to encourage active student participation with different features based on the individual need.

The resources used in the design are:

1. PHP scripting
2. Web domain and Hosting (pricing)
3. HTML and CSS coding
4. Deployment and tool testing (Manual Testing-use case)

Additional resources are programming knowledge and training support, and professional development.

The Online quiz maker is a formative educational Assessment designed to use available resources from college premises. This innovative practice defines its usage and flexibility for each resource available. Firstly, Wi-Fi technology is one free resource for all MEC students and staff, which quickly helps to access the internet and log in to our designed online quiz maker. Secondly, the projector and laptop are teaching resources provided by MEC. They are used in the class to show or demonstrate the procedure for online quiz questions and discuss their solutions or give instant feedback. In addition, this resource helps display and explain the procedures involved in the assessment provided. Thirdly, it can also be used to know, how the students use the e-library resources effectively and understand their needs or explore their knowledge from e-library activities. Lastly, the resource for this online quiz activity at MEC is the tables or seating arrangement in the class that is made appropriately to conduct practical learning activities such as team quizzes or collaborative engagement. Again, however, the MEC class room setup helps to optimize the resources for the designed online quiz assessment.

The innovative practice designed is an opportunity to attempt new ways of doing things to overcome challenges from existing quiz practices. The online design is made for assessing the student level and keeps the faculty's expertise up to date. Online quiz assessment is the best approach for solving the students' learning difficulties and helps them to succeed progressively in teaching and learning. Formative assessment is a key to survival and is the best tool to evaluate student level of understanding. This process of learning can be improvised through feedback in different instants.

The online quiz maker can be used for all the departments of MEC for formative assessment. The effectiveness of the student practices was evaluated by conducting different types of the quiz for the Multimedia communication systems and IoT and Microwave communication systems modules.

- Multimedia communications systems & IoT and Microwave communication systems is a vast and puzzling module that requires students' extensive support of mathematical, problem-solving, and analytical skills.
- The concept of educational tutoring through the virtual classroom can bring revolutionized world for students to explore a better life for a better tomorrow, and it also enhances their cognitive skills among each other.
- The continuous feedback support of the students can develop capabilities of independent learning. In addition, problem-solving skills can be enhanced by providing the student progress of the module to achieve the learning outcomes of each module better.
- This work aims to identify students' attitude towards the module and engage them in learning activities using online quiz maker technology as an academic performance indicator.

This study was conducted at Middle East College, Muscat, where the online quiz maker was used to find the students' preparedness. The class strength was 49 students overall, but only 24 students took part in answering the questions. All the students were between the ages range from 18 to 28. Different sets of quizzes conducted for the above modules are shown below in Figures 4-9.

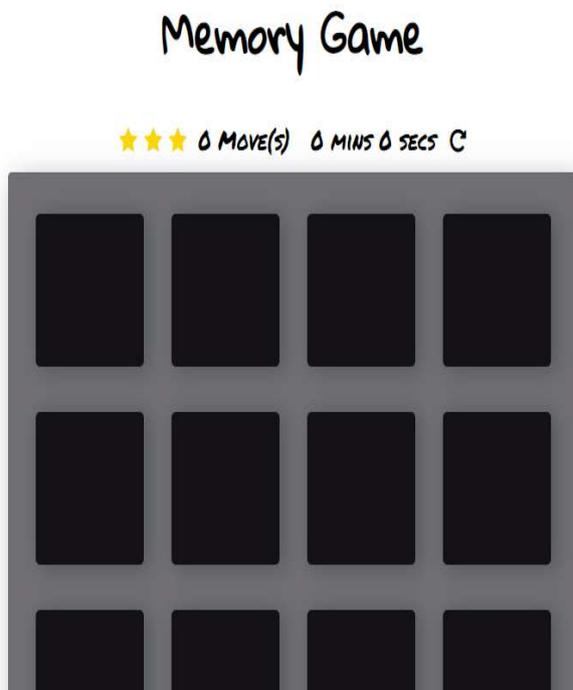


Fig 4: Memory quiz through online quiz maker

TEAM Quiz!			
People	Names, logos and mascots	Licenses	Misc
100	100	100	100
200	200	200	200
300	300	300	300
400	400	400	400
500	500	500	500
Team 1 0			Team 2 0

Fig 5: Team quiz through online quiz maker

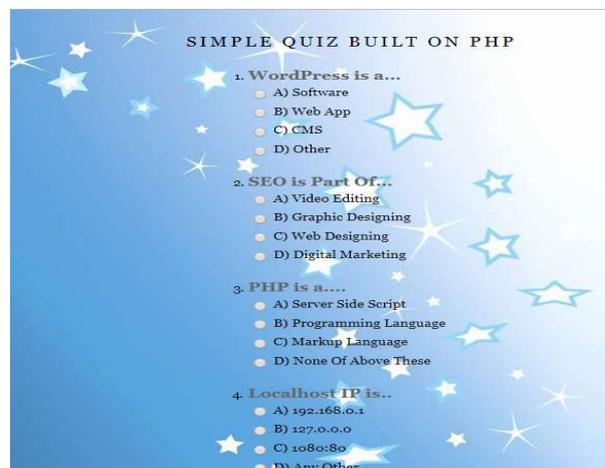


Fig 6: One-page quiz through an online quiz maker

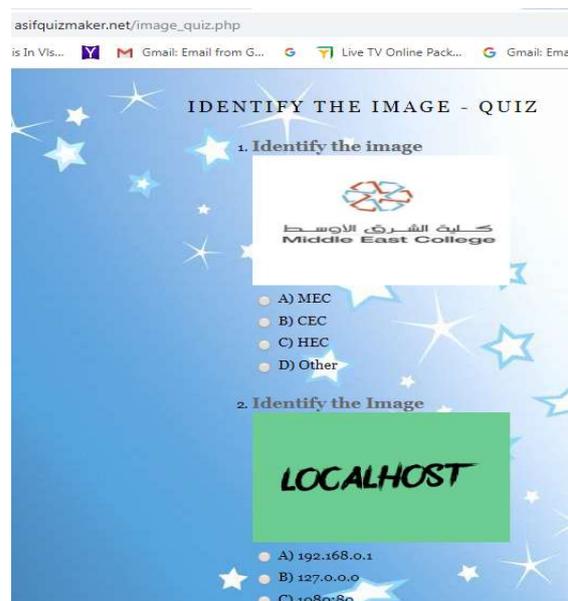


Fig 7: Image quiz through online quiz maker



Fig 8: Match game quizzes through online quiz maker

This study is conducted to evaluate the students learning in the module. This survey was conducted for five classes simultaneously with ten questions, and students used a smartphone to answer. This study was conducted only with an online quiz maker tool, and the total process was virtually observed online. The quiz results were recorded and downloaded through online quiz maker tool reports. In addition, the details can be downloaded from the teacher's room in excel format showing the formative assessment for the quiz.

The online quiz maker is the best potential networking site to assess students' attitude and provides a better peer review in posting the work for better feedback and critiques. Feedback for the Socrative tool was satisfactory, conducted through google forms and shared through email. It also helped in writing project reports and language practice to encourage students for participating in the professional development workshops. Finally, the mobile learning App of online quiz maker is used to make learning interactive at anytime and anywhere.

Student Name	Student ID	Score	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
SAPCHAD	88	21	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
AARIE	79	19	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
JADE ANNE	82	22	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
SHI	82	22	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
DAVE	82	22	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
SHARON	82	22	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
KEVIN	82	22	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
W	88	21	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
MILLER	8	8	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
ROSELYN	82	22	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
ROBERT	88	21	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
JADEL	82	22	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
JOSEPH	88	12	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Average student Score	88	21	100%									

Fig 9: Formative assessment for the online quiz conducted.

The results in the end exam of the microwave communication systems module have drastically improved from Fall 18 to Spring 19, where 48 students were registered, and none of the students failed. Hence there is a percentage improvement from 5.6% in Fall18 to 100% in spring 19. Whenever a quiz is scheduled or conducted in the module as per MIG, all the students have participated in the learning process. Instant feedback for each of the question and relevant explanations were given as well. The online quiz practice is a fun way of engaging students and helps them easily map the content through their learning material. This online quiz practice design can involve many participants (1000 +), and questions can be randomized and different types of quiz formats for the interactive response. The timer can also be set for unsupervised time-constraint learning. The instant results are obtained for the quiz conducted. From the Department statistics in Spring 19, there was a massive improvement in pass percentage and CW Assessments.

The learning process structure involved and carried out during the semesters was in three different phases.

Live streaming and tool-based autonomous learning

In the first phase, the Module information guide was revised to align and match the topics per the learning outcomes. Similarly, a MOOC relevant to the module was selected and provided in e-links to ensure that students can efficiently complete the course to gain significant knowledge about the module. The Microsoft team tool was used as an example of Live streaming and online education, and the MOOC was to update students with current trends in the module. This teaching environment created a chance to be interactive, and students grasped the classroom rhythm in a spiraling state. The online activity environment allowed the students to have an online Q & activity, real-time sharing, and a whiteboard to solve the numerical and recording of the class. Autonomous learning was also involved in discussing the module's forthcoming announcements and posting a quick video to clarify any misconceptions about the topics.

Online exercise and activities

In the second phase, a few online activities were conducted to judge the student's understanding and stimulate their learning ability to go further. The online quiz using socrative, google form, and Kahoot platforms were used to test the students learning. The other activities involved were e-library, referring to solving numerical by providing sample and illustrative examples. The classroom recordings also enhanced student learning by giving short breaks to refresh them from continuous online topic delivery and to respond to the questions through the chat box or email. Although the online class was recorded and shared among the peers to keep a record of each week's activity and help the students who could not attend the class.

Reinforcement learning

In this phase learning process was strengthened by knowing student behavior and attentiveness in the class through a surprise summative assessment at the end of each unit. This pattern was to maximize the performance of the student. However, the assessment topics were discussed earlier to meet the learning requirements, which gives the students an enhance student effort hours towards the study. The summative assessment was designed in two ways beginner and extensive. This environment has enabled a competitive nature and enthusiasm among the class cohort. Moreover, these assessments involved feedback, scheduled for one-to-one interaction in the class to solve the doubts and mistakes made during the assessments.

3. Conclusion

Although remote teaching and learning was a great challenge from on-site (face-to-face) to the online classroom, the online quiz environment is undoubtedly a valuable tool for managing the virtual classroom environment. The learning environment required special attention for the students to build relationships with each other and understand the course activities in such a way as to achieve the desired goals of the module in terms of formative Assessments. During the pandemic, the shift from conventional teaching to online learning at Middle East College (MEC) has enhanced the importance of using the quiz platform through Microsoft teams and big blue Button to facilitate the delivery of online teaching smoothly. To strengthen the learning and deep surfing for the modules, the different types of quizzes are designed to meet the student level and validate the understanding and topic delivery. The first plan was to provide a module information guide and other material one week ahead of the start of the semester to make students as active learners.

Similarly, the scheduled topics for the online class were delivered to make it a student centred approach for strengthening the community of learners. The different types of quizzes are used for topics already solved, with posted comments on each question and answer to convey the correct meaning and understanding. It is found that the online quiz teaching tool environment is an excellent opportunity to keep the students engaged and interactive with available technology tools. However, the methods of providing module material through voice-over power points, numerical solutions, video links, and formative assessments through Moodle and streaming servers with different formatted quizzes are to bring the online classroom alive with links, digital tools, and media. Hence, it is pretty helpful that to reach out to the students to draw the connection to them to the digital media and tools.

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