Mini Review

Role of Digital Formative Assessment in Improving the Assessment and Monitoring of Students' Learning and Their Significance During the COVID-19 Pandemic

Ahmed El-Hashash

[1] UoE-ZJU Institute of Biomedicine, The University of Edinburg, UK

[2] Zhejiang International Campus, Haining, China

* Correspondence: hashash05@yahoo.co.uk; Tel.: 86-057187572820

Abstract: Digital formative assessments have the features of digital learning environment and can be used by teachers to both empower students' learning and adapt the next steps in the learning process of their students. They are effective tools that can help lecturers and tutors to both collect and analyze the required information and data for supporting the teaching and learning processes. Importantly, digital formative assessments have been particularly critical during the COVID-19 pandemic due to increased students' learning outside traditional classrooms, limited face-to-face classes and other students' learning and assessment difficulties at many educational institutions worldwide. In this article, we describe the essential features and importance of digital formative assessments and their recently developed communication methods. We also discuss the significance of digital formative assessments in measuring students' learning and skills in times of global crisis such as the COVID-19 pandemic.

Abbreviations

LMS: Learning Management System
MCQs: multiple-choice questions

1. Introduction

The examination of the learning outcomes of higher education students from multiple viewpoints is one of the best methods to determine students' knowledge. Besides examinations, in-course assessments are used to generate the final mark for courses at various educational institutions worldwide. The assessment process of students' learning is critical since it aims to both gather and evaluate information on students' knowledge and understanding of the subject and to improve their learning [1]. We have recently compared and discussed key types of assessment methods of medical and biomedical science students [2,3].

The widely used student assessment methods are formative and summative assessments. While summative assessments contribute to students' final course mark and help with determining whether they achieved the learning outcomes, formative assessments do not contribute to students' final course mark. If properly used, formative assessments can both determine and monitor the understanding and learning skills of students. Providing feedback to students as a part of their formative assessments can lead to improving both their learning skills and performance [4,5].

Formative assessments are example of the learning assessments that aim to understand the learning levels of students [6]. They can both guide the learning processes and improve students' learning outcomes [7-10] as well as enhance students' learning [7]. Furthermore, formative assessments are important classroom practices for tutors and lecturers [11] and have been recently identified by [12] as a "policy pillar of educational significance".

2. Essential features and importance of digital formative assessments

Skills in information and communication technology are largely needed for learners in the current digital age. Gaining these skills will facilitate students' work with both digital assessments and various types of data systems [13-17].

Digital formative assessments have the features of digital learning environment and can be used by teachers to both empower students' learning and adapt the next steps in the learning process of their students [5,18,19]. In addition, they can provide feedbacks that help with both modifying and improving the learning activities and skills of students [18], and include many learning approaches and features of the digital learning environment such as, e-textbooks, social media (Wikis, blogs, etc.), mobile learning, digital diaries…. etc. Furthermore, effective digital formative assessments can lead to the identification of students' learning gaps and improvement of the quality of instructional materials of teachers [5,18,19].

Digital formative assessments should have several essential features, including being timely, constructive, valid and both more specific to students' learning needs and appropriate to their learning levels [4,5]. The timeliness of digital formative assessments is essential so that they can facilitate taking actions at the appropriate time to provide the required supports to students quickly. The constructive digital formative assessments are those with efficient feedback that can identify misunderstandings and provide guidance to improve students' learning and performance, while valid assessments have contents that are aligned with the knowledge/learning contents of students [4,5]. Furthermore, specificity is another key feature of successful digital of formative assessments that are specific when they inform lectures/tutors about which learning goals have been achieved and others that are not achieved yet in the course [4,5]. If properly designed, digital formative assessments can be used to collect and analyze data on students' learning efficiently and comprehensively [20]. These data can also help with identifying students' learning gaps and informing lectures/tutors of the quality of their instructional and teaching contents.

3. Digital formative assessments' communication

Currently, there are many appropriate tools and resources to conduct digital formative assessments. The tools and resources that are appropriate for digital formative assessments vary in their specific purposes and include communication tools that facilitate more student-teacher interactions and collaborations such as Zoom, phone calls, Microsoft Teams, and text messaging. Other tools are Learning Management System (LMS) tools that represent centralized platforms enabling the delivery of questions, quizzes, and tasks, and include Google Classroom, Moodle, and Schoology. Some tools have been developed for other specific purposes such as transmitting video responses (e.g., Screencastify and Recap), while Woot Math and DreamBox are tools facilitating students' personalized learning with easy-to-follow adaptive instructions [4]. In addition, e-mails can be easily used to send feedback and instructions to students. Moreover, text messaging via well-established messaging platforms, including WhatsApp and Messenger, can facilitate the delivery and track of several types of students' assessments such short answer questions and multiple-choice questions (MCQs; [4,5]). Indeed, more specialized tools like LMS and digital communication tools have facilitated the use of digital formative assessments as

an immediate, viable and long-term solution to collect and analyze data on students' learning efficiently and comprehensively [20].

There are two forms for administrating digital formative assessments: synchronous and asynchronous forms. In the synchronous form, Zoom, Microsoft Teams or other online platforms can be used to facilitate the work and interaction between students and lectures and tutors in real time. Phone calls can be also used as a tool in this form so that lectures/tutors provide their comments and feedbacks directly to their students in real time [4]. In the asynchronous form, students and lecturers/tutors cannot work together at the same time since they are clearly separated by time and space. They can, therefore, record questions, comments, feedbacks and other tasks and share them via several online applications such as Screencastify, Recap, and WURRLYedu. Moreover, lecturers/tutors can share their questions, comments, feedbacks and other tasks with their students via online tools such as Moodle and Google Classrooms [4].

4. Significance of digital formative assessments during the COVID-19 pandemic

Digital formative assessments have been particularly important during the COVID-19 pandemic due to increased students' learning outside traditional classrooms, limited face- to-face classes and other students' learning and assessment difficulties [4] at a wide range of education institutions worldwide. Moreover, digital formative assessments were critical during the COVID-19 pandemic since they promote the 21st century learning and skills for students [21], and represent a good solution for freshman and junior students who are not familiar with self-learning methods.

At our biomedical science institute (Zhejiang University-University of Edinburgh (UK) institute), digital formative assessments have been integrated through well-known online platforms in order to use them effectively in the management of the progress of our students during the COVID-19 pandemic. In addition, both asynchronous and synchronous methods of digital formative assessments have been used to determine the progress of our students during the COVID-19 pandemic (through feedbacks, assignments, quizzes…etc). Furthermore, we have used well known tools and resources that are appropriate for digital formative assessments, including communication tools facilitating student-teacher interactions and collaborations such as Zoom and Microsoft Teams, and LMS tools that represent centralized platforms enabling the delivery of questions, quizzes and tasks, including Moodle during the COVID-19 pandemic.

5. Conclusions

Digital formative assessments are effective tools that can help lecturers and tutors to both collect and analyze the required information and data for supporting the teaching and learning processes. They can provide help to students so that they continue to learn successfully along their learning trajectory. Effective digital formative assessments provide immediate evaluations of students' learning progress and can potentially complement summative assessments, to measure students' learning continually in times of global crisis such as the COVID-19 pandemic. More efficient digital formative assessments should have several essential features, including being timely, constructive, valid and both more specific to students' learning needs and appropriate to their learning levels. If properly used, digital formative assessments can promote the 21st century teaching and both learning and skills for students.

Acknowledgment

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