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Impact of Formative and Summative e-Assessment on the Active Learning Process

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Abstract

Assessment, one of the most important elements of students' effective learning process, plays a vital role in efficient instruction to enhance students' learning achievement. Assessment can be mainly two different types: Formative assessment and Summative assessment. This paper focuses on studying the impact of formative and summative e-assessment on students' learning process, especially in an active learning environment. The paper examines the current scope of e-assessment, especially the probable efficacy it brings in the formative and summative e-assessment. For that purpose, the paper analyzed the authentic formative and summative e-assessments of active learning in the classes delivered in asynchronous and synchronous methods where students' interactive participation is required. Reviewing the current literature related to formative and summative e-assessment practices, this paper focuses on the impact of formative and summative e-assessments on students' individual and group assignments in active learning. The purpose of this analysis is to understand the potential of formative assessment that offers feedback in improving students' learning process. Furthermore, the summative assessment, which measures how much students have learned over a certain period, is also being reviewed. Consequently, both the formative and summative e-assessment in active learning situations, especially in group settings where active interactions among group members are crucial, are discussed. An in-depth understanding of the impact of formative and summative e-assessments on students' active learning can be beneficial for instructors, students, and curriculum developers in higher education institutions.

Keywords: *Formative Assessment, Summative Assessment, E-Assessment, Active Learning*

Introduction

Assessment, which is key in students' learning process, plays a vital role in efficient instruction, enhancing students' learning achievement[5]. Since the assessment process is an active part of the curriculum that enables students to achieve their planned learning objectives, it is important to know the impact of different assessment methods on the learning process, especially in the active learning environment. In active learning, students learn by interacting with their peers and instructors in a well-designed active exercise. In this context, this paper focuses on studying the impact of e-assessment, both formative e-assessment and summative, on students' learning process, especially in an active learning environment.

Assessment is a process wherein instructors use data from a variety of assignments and exercises to enhance students' learning process[12]. The result of an assessment process can be a score or a verbal description of students' level of performance based on all kinds of procedures such as informal observations, self-assessments, quizzes, interviews, tests, labs, etc.[9]. Assessment is an integral part of the learning process that helps instructors determine if planned learning objectives are met[10]. The technology-enhanced assessment, commonly known as e-assessment, has opened up new possibilities due to its potentially beneficial characteristics such as offering more individualized, engaging assessments[5]. E-assessments are potentially more practical, cost-effective, valid, and reliable than conventional paper-based assessments[3].

Types of Assessment

Assessment, which can facilitate the learning process and summarize the level of knowledge[12], is mainly two different types: formative and summative[8]. Innovative technology can enhance the effectiveness of both types of assessment[12]. Formative assessments aimed to enhance support for students' learning achievement by helping them understand what concepts they are having difficulties in comprehending. Providing feedback, and formative assessment helps students in their learning process before they are finally assessed. Summative assessment, on the other hand, evaluates what knowledge students have learned at the end of the semester. Thus, summative assessment measures how much students have learned over a certain period[10]. Based on the goal of assessment - formative assessment is called the assessment for learning, whereas summative assessment is called the assessment of learning. Innovative technology can enhance the effectiveness of both types of assessment.

Formative Assessment

Formative assessment, one of the most effective methods of students' learning achievement, promotes the development of students' skills by providing feedback that includes explaining, interpreting, and reasoning[14]. Formative assessment is systematically designed to get information about students' achievement during the learning process[9]. This assessment method is concerned with how judgments about the quality of student performance can be used to improve students' competency in trial-and-error learning[15].

The assessment process is an important operating part of the curriculum that enables students to achieve planned learning outcomes; therefore, it should not be considered as just a means of determining whether students achieved a particular learning outcome or not[2]. Consequently, in formative assessment, feedback is provided to students to improve their learning efficiently and expediently. This feedback provides students the knowledge of the learning goal, and instructors the development of ways and means for reducing the gap between students' learning performance and what is aimed for[15].

Formative assessment allows instructors to provide continuous feedback to students on their learning performance. This assessment process allows students to be part of the learning process to improve their learning through frequent feedback, which motivates and encourages students to

learn more successfully. The instructors can help students improve their skills by examining their level of progress and adjusting the instructional strategies accordingly[8].

Thus, formative assessment indicates any gap between the planned learning outcome and the actual level of learning performance of the student. Formative assessment is an active ongoing process to identify students' need to improve their learning performances by monitoring, diagnosing, and adjusting the instruction process accordingly[1]. Advanced digital technology can facilitate providing feedback in formative assessment to ensure sustainable learning for students. Adopting a multi-modal approach with different technologies can be used for providing feedback in formative assessment. For example, multimedia technology can enhance the quality of individualized and interactive feedback to facilitate greater student engagement in their learning process[4].

Summative Assessment

Summative assessment, which does not provide feedback or suggestions to students to improve their learning performance, shows what learning objectives have been accomplished at the end of the semester or a certain period[9]. Summative assessment, which is widely utilized to screen students for their next level of education, degree, or employment, is developed by instructors or exam experts to test students' learning outcomes at the end of the semester or learning period[7]. For example, final exams, final projects, standardized tests such as Scholastic Assessment Test (SAT), Graduate Record Examinations (GRE), etc.[12, 9].

One of the various functions of assessment in higher education is to measure students' learning outcomes where standards of expertise are essential[4]. Summative assessment, which makes final judgments of students' learning performance[7], is generally applied to give students grades with mostly no feedback as a measure of learning[8]. In other words, the summative assessment leads to a judgment that summarizes all the evidence of students learning achievements up to a given point[15]. Thus, the summative assessment recaps at the end of the semester what the students learned during a semester. However, summative assessments do not provide instant feedback that can help struggling students[3].

Active Learning Environment

In an active learning environment, students take an active part in the learning process to earn knowledge on the subject matter. Unlike traditional approaches, active learning focuses on facilitating participatory student learning. In this approach, students are not passive recipients of the instructor's lecture, but rather active participants in the learning process in which the instructor serves as facilitator[6]. Active learning focuses on interactive, collaborative, and cooperative learning, where students' knowledge is built through the actions, they perform in well-designed exercises[16]. For example, lab-based active learning enables students to develop their skills and to actively engage in the learning process[13].

Active learning engages students in the learning process through class activities emphasizing higher-order thinking along with students' involvement in group work. Peer-based group learning

is a well-known active learning pedagogical exercise where students are usually given problems to solve and work together in groups to respond to questions. Instructors as facilitators ask students to work on a given problem with their group members, interact with them, and provide feedback to let the group members know whether they are on the right track or not[16]. In the active learning process, students acquire knowledge through active participation in the learning progression. In higher education, students act to perform skill-based programs, which enable them to develop their learning strategies as well as their individualized learning skills that help them to prepare for their future career path[13].

Formative Assessment vs. Summative Assessment

Formative assessment is designed to efficiently measure students' continuing progress in achieving their learning objectives and to indicate if any adjustments in the current instructional strategies are necessary. With the purpose of assessment for learning, formative assessment does not aim to judge the overall final achievement of students' learning. Instead, its purpose is to guide students in their learning process and make any adjustments needed in instructional strategy to achieve the planned learning objectives. Thus, the formative assessment or assessment for learning, which is increasingly being emphasized in academic learning[15], focuses on the integration of feedback-based continuing assessment into the instructional and learning process[12]. On the other hand, the summative assessment is designed to measure how much of the planned learning objectives students have achieved in a given academic period such as a semester or quarter. That is, the purpose of summative assessment is an assessment of learning where students' final learning achievement is measured, typically at the end of an academic year, or completion of a course in a semester or learning period[12, 9].

Research on assessment suggests the importance of both assessment strategies with some suggesting that formative assessment is more effective than summative assessment for students' learning achievement. Since the purpose of assessment in higher education is to support students' learning, the significance of feedback provided in formative assessments is recognized[14]. In learning processes that involve critical thinking and complex problem solving, overemphasis on summative assessments such as final grades, standardized test scores, rankings, and ratings of performance, and less emphasis on providing individualized and constructive feedback during the learning process is not helpful[14].

Applying Formative and Summative e-Assessments in Active Learning

The effectiveness of formative assessments was proved when applied in the active learning environment in an online undergraduate writing intensive class in the Cybersecurity program. This is a writing-intensive class, but a significant number of students lack academic and technical writing skills. As a result, the course was very challenging for those students who were without writing skills. Therefore, to improve students' academic and technical writing skills, students were encouraged to improve their writing performance, which is vital for their future careers and advanced degrees. For that reason, formative assessments were applied to ensure students achieved the planned learning outcomes improving their writing performance based on

feedback provided by their instructor. As part of the continuous improvement process, students were encouraged to improve their writing skills.

Students' learning outcome was evaluated by assessment tools such as exams and writing assignments in Canvas learning management systems. While exams, which was 40% of the total grade, were based on summative assessments; writing assignments, which was 60% of the total grade, were based on formative assessments. Students completed their writing assignments in an active learning environment. The writing assignments, that involved critical thinking, included engaging in writing research papers in three phases and discussions on four different topics.

Research Paper

Students were instructed to write research papers in three phases. They also had to specify the relevant references of their citations following the APA format in their paper. In each phase, students were provided feedback on their writing, based on which students improved their writing in the next paper. Reviewing students' research papers, the instructor provided feedback using SpeedGrader in the Canvas learning management system. Students were able to view the electronic feedback instantly and improve their research paper accordingly before submitting the paper in the next phase.

Discussion Topics

Students were instructed to engage in discussions on four different topics related to Cybersecurity. Students were required to participate in the discussion board in the Canvas learning management system for discussions and sharing information on topics. Students were asked to post elaborately and rationally on each discussion topic. Their discussion posts were required to be substantial adding value with new ideas or thoughts that would engage other students to respond. Students were also required to respond to two discussion posts by their peers. Their responses need to be argumentized with rationale. Students' discussion posts and responses to their peers were graded with feedback following the formative assessment method. This helped students improve their discussion posts and responses in the next discussion topics.

The impact of applying formative and summative e-assessment practices in the active learning environment was demonstrated in this case. Students who tried to improve their writing skills following feedback provided by the instructor in the SpeedGrader in Canvas learning management systems were successful in achieving planned learning objectives. Rather than overemphasizing summative assessments, more emphasis was given to formative assessment practices. It has been found that combining summative assessments and formative assessment practices, with more emphasis on formative assessment practices can ensure effective learning for students.

Conclusion

Although the effectiveness of using formative assessments providing interactive feedback in the instructional and learning process is important, both formative and summative assessments using

technology are valuable in enhancing students' learning processes. Based on the extensive review of existing literature, it is asserted that the use of advanced digital technology can be beneficial in facilitating effective assessments for learning[4]. Applying both formative and summative assessment methods can play a vital role in the enhancement of effective learning processes instead of applying either formative or summative assessment[11]. Finally, students' learning objectives, instructional strategies, and assessment methods must be carefully considered in e-assessment[5].

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