An Overview of E-Assessment

Nuri DOĞAN*, Nermin KIBRISLIOĞLU UYSAL, Hülya KELECİOĞLU***, Ronald K. HAMBLETON****

1. INTRODUCTION

Along with technological developments, electronic devices/tools have been affecting our lives in many aspects. Inevitably, these developments have affected the learning and teaching processes. In the last decade, there has been an increase in the usage of electronic tools/devices in teaching and learning processes, as well as the assessment of these processes. Parallel to the increasing discussions on the use of e-learning methods in the learning-teaching process, how to use these tools on assessment and evaluation processes has become a hot topic in educational research. We observed different terms used to emphasize the same assessment approach in the literature, such as electronic assessment/evaluation, online assessment/evaluation, etc. Hence, we used these terms interchangeably in this paper.

2. THE EFFECT OF TECHNOLOGY ON THE LEARNING-TEACHING PROCESS

The effect of technology on the learning-teaching process accelerated and became inevitable with the emergence of personal computers and the Internet. Although the Internet had only been used as an internal communication tool in individual institutions at an early age, it became widespread with the emergence of web browser software in 1993 (Richardson, 2009). When the Internet emerged first, the web pages were non-interactive and static, their source codes were inaccessible, and it was under the monopoly of individual institutions or practitioners. In the early 2000s, the development of web 2.0 applications has made the Internet widespread and accessible (O'Reilly, 2005). Starting from the 1980s, the widespread use of the Internet and personal computers enabled and prepared a potential background for online teaching (Mason & Kaye, 1989). Over the years, innovations related to online teaching and learning has accelerated. Today, we have tools that enable interactions between many users, users and software, and users and content which enhance users'/students' active participation in an online platform (Benson & Brack, 2010).

The interaction capabilities of an online teaching-learning platform enrich not only active learning experiences but also online assessment procedures. The innovations in these interaction capabilities/tools, which started with the first-generation internet technologies in the web 2.0 era, have reached a much more advanced level in today's web 4.0 era. Blogs, folksonomy, web services, digital media files, mobile learning technologies, file sharing applications, social networking software, virtual realities, simulations, web design tools, wikis, e-portfolios are among these developments. As a result of these developments, the number of people and organizations providing online education has increased day by day.

On the other hand, similar to in-person, face-to-face education practices, students' differences, the content, and learning outcomes/ objectives are still the core elements that should be considered in the first place while designing and conducting online teaching-learning practices. The instructors' capabilities and competencies can also be added among these items. These elements would guide the planning of the teaching process according to the current conditions. Moreover, in-person and online learning-teaching practices are also similar regarding the principles that should be followed to increase the quality of teaching and the assessment procedures. To improve the quality of teaching practices, we can discuss some core principles as:

* Professor, Hacettepe University, Ankara-TURKEY. e-posta: nurid@hacettepe.edu.tr (ORCID: 0000-0001-6274-2016)
** Ph.D., Hacettepe University, Ankara-TURKEY. e-posta: nkibrislioglu@hacettepe.edu.tr (ORCID: 0000-0002-9592-469X)
*** Professor, Hacettepe University, Ankara-TURKEY. e-posta: hulyaebb@hacettepe.edu.tr (ORCID: 0000-0001-6274-2016)
**** Professor, University of Massachusetts, Amherst-USA. e-posta: rhk@educ.umass.edu (ORCID: 0000-0003-4297-421X)

- Presenting learning outcomes explicitly,
- creating the content in a way that can attract students 'attention,
- relating the content with real-life,
- respecting individual differences and considering these differences while planning the learning-teaching process,
- using appropriate assessment tools,
- providing timely feedback,
- ensuring students' active participation in learning and assessment processes,
- learning from students (using students' feedback to enhance and or plan the teaching practices),
- communicating with students effectively and productively,
- improving collaboration between students (Chickering & Gamson, 1987; Ramsden, 2003)

The principles to improve learning-teaching processes shows the importance of selecting appropriate assessment tools, providing feedback, including students to the assessment processes, and evaluating teaching practices by students' feedback. While face-to-face teaching practices bring the instructor to the forefront in planning and managing the learning-teaching process, online teaching practices bring technologic infrastructure, teaching management system software, and instructor's competences on technology usage to the forefront as well as the instructors. Providing the required technological infrastructure is the institutions' responsibility and may appear as an essential requirement for sustainable and quality online education (Nichols, 2008). We observed that many institutions use learning management systems (LMS) specifically designed for online teaching and/or virtual learning environments (VLE) in addition to developing and updating tools and operating systems to build and infrastructure for online education. Although some principles are common to improve the quality of education in online and face-to-face environments, the teaching practices have undergone a significant structural change depending on the capabilities of LMSs in online teaching environments. For example, the teaching process now has to be planned and carried out in a way that combines in-school and out-school activities, face-to-face and online opportunities, the use of synchronous and non-synchronous techniques and the national as well as the international level. As a result, the assessment procedures have been changing as the assessment designs are highly related to the online teaching process.

3. E-ASSESSMENT TYPES

Especially with the COVID-19 epidemic that emerged at the beginning of 2020, online teaching or e-learning, in general, has become the dominant method at almost every level in the world. Teachers/instructors switched from face-to-face instruction to online education and they have been experiencing some difficulties in e-learning, teaching, and the e-assessment. While face-to-face teaching has a long history, online teaching is relatively new, and there are some uncertainties in their role in the teaching process. These uncertainties also affect assessment procedures. The electronification of the learning process has revealed a need for electronification of assessment procedures designed for different purposes. While designing online teaching practices, there is a need to develop an assessment addressing these practices. Discussions mainly focus on how to use different assessment approaches in an online environment, how to ensure the validity and reliability of measurement results, how to prevent cheating, and how to ensure test security. Hence, online assessments bring significant challenges to cope with. Therefore, e-assessment requires planning on how and when to conduct the assessment, exceptional attention to the purpose of the assessment and/or assessment plan, and basic principles of assessment as well as the knowledge about the tool and software being used and developing the skills to use them.

In an e-assessment design, basic principles of assessment are the base and starting point. The assessment procedure requires detailed planning first, and some stages of the plan apply to both online and face-to-face assessments. For example, to provide a basis for future decisions in the first phase of the assessment plan, one needs to answer this question: 'What is the purpose of the assessment?'. There may be two different answers to this question like "to decide whether they are successful in a particular course or task," or "to identify students' learning gaps, and to design activities to compensate them." These answers are conceptually defined as Formative assessment, summative assessment, and assessment as learning (Gibbs, Habeshaw & Habeshaw, 1988; Carless, 2007; Earl, 2003).

A detailed schedule, including the date and time of the assessments, is essential for both summative and formative assessment practices. Sharing this schedule with students and making it available and easily accessible is also a necessary element of a good assessment plan. It is always a good practice to create clear communication with students and simplify the process as much as possible. The means of communication could be diversified in an online platform to make it more efficient. Contact with students regarding assessment tasks should be supported by simultaneous communication opportunities and written and verbal instructions at every stage of an online assessment process. A communication initiated with students before the assessment process will help determine their needs and guide them. Effective communication, including feedback to students 'questions and informing them about future tasks in advance, will build trust in the student-teacher relationship.

To contribute students' learning via assessment procedures, creating a useful feedback mechanism is essential. According to Nicol and Macfarlane-Dick (2006), effective feedback should:
- be given on time (as close as possible),
- enhance learning, self-assessment, motivation, and self-confidence,
- improve communication both between students and between students and instructor,

- provide quality and clear information to students about their performances and learning,
- provide an opportunity for students to bridge the gap between current and expected performances,
- provide the required information for instructors to enhance teaching practices.

Online assessments could accelerate the feedback process, which is considered as an essential advantage. It is quite possible to create an effective feedback procedure with the help of sophisticated algorithms in online assessment platforms.

The assessment for the learning approach, on the other hand, bases on the idea that handling learning, and assessment procedures simultaneously results in more permanent learning (Carless, 2007; Dann, 2002). While the contribution of assessment to learning through feedback is provided indirectly in formative assessment, assessment for the learning approach deals with learning and assessment processes within and directly connected. Hence, the first principle of this approach is to design assessment tasks to enable students to learn effectively. Second, students should have access to the rubrics or assessment criteria beforehand, and they should be actively involved in their own and peers' learning. The third principle of assessment for the learning approach is that the feedback should be given timely and forward-looking (Carless, 2007). Thus, both the current and future learning of students could be supported. Moreover, self-assessment and peer-assessment are used more frequently in the assessment for the learning approach (Dann, 2007). Online assessment platforms could be a convenient way to the assessment for the learning approach as it could create feedback instantly, quickly, and reliably and provide easy to use platform for self-assessment and peer-assessment.

Although summative and formative assessments are the most commonly used ones in education, assessments could be conducted for different reasons. Some of them are selection and replacement, enhancing learning, structuring learning, directing learning, detecting and correcting misconceptions, evaluating teaching, evaluating the teacher performances, etc. The online assessment has many advantages over face-to-face or in-class assessments that facilitate different assessment approaches. The ability to use various measurement tools to evaluate the performance, providing individualized tests, instant scoring, and instant feedback can be examples of those advantages. Besides traditional instruments such as multiple-choice tests, standard achievement tests, experiments, observations, interviews, portfolios in an online assessment platform, one can use various tools like blogs, interactive texts, virtual experiments, interactive problem-solving, projects, gamification, e-portfolio, etc. Self-assessments and peer assessments that enhance students' active participation in the assessment process could be easily used in those platforms. Actively participating in the assessment process motivates students and may provide a new learning environment. Moreover, as students learn more about assessment processes, their self-assessment skills will also improve.

In online assessment, assessment environments can be divided into four categories. The first category is the evaluation products category, which includes essays, research reports, review articles, project reports, audio or visual media records, presentations, etc. The second one contains tools that can be scored automatedly like multiple-choice, short answer tests, matching, gap-filling, right-wrong, drag-and-drop items, simulation questions, etc. The third one is online discussion tasks like discussion groups, role-play activities, case studies, etc. The last one is the web publishing category, which includes web pages, blogs, wikis, shared documents, e-portfolios, etc. (Benson & Brack, 2010).

Another tool that online assessment platforms can provide is computer-based tests (CBT). These tests could be standard or non-standard, and the assessments created with a basis on CBT implementations are defined as computer-based assessments (CBA) (Bartram, 1997). As CBT uses automatic scoring, receiving score reports is easy and quick, which is the outstanding advantage of this method. The number of paper-pencil tests converted to CBTs has increased rapidly as personal computers have become widespread. CBTs have both advantages, like creating rapid reports, and disadvantages like requiring some hardware compared to paper-pencil tests. Although there are also some discussions regarding the equivalence of two forms (Bartram, 2005; Mead & Drasgow, 1993), it is not a significant problem in many measurements except for the speed tests.

Traditional scoring techniques can be used in online assessments. In regular assessments, instructors may grade students based on the weighted average of different tasks or the rank of the students in the classroom. In online assessments, on the other hand, much more information is gathered regarding the students, and this may complicate the grading procedure. Therefore, using automated scoring and grading algorithms is more feasible than traditional grading techniques for online assessments. These algorithms require the use of models called learning analytics. On the other hand, many LMS modules allow an eclectic approach that combines the traditional method with the automatic grading approach. If an LMS is used in the online evaluation process, the reporting and monitoring modules available in many LMS will allow you to see statistics about student activities that will enable tracking when, how often, how long, and which modules of the system students participated in. These modules provide online exams, surveys, and interactive visuals in assessment processes, and students' activities in discussion groups, contribution to group work, responses to system messages, other user registrations, and so on. Gathering detailed information about students in various ways will help make more accurate decisions about the students. When students see that all their efforts are used in the evaluation, it may increase their motivation as well. Moreover, assessment reports can be created at any time, providing feedback regarding the students' current performances.

4. TECHNICAL ISSUES IN E-ASSESSMENT

Blaming the technology for every problem faced in an online assessment platform is a common phenomenon. However, identifying all possible problems and taking the necessary measures before starting the assessment could prevent many problems. Institutions should provide easily accessible technical support, and instructors and students should be informed about what to do, how to get help, and from whom they can get help when certain problems arise. Before deciding whether to use e-assessment platforms, practitioners should be sure that all instructors and students have access to the required hardware, software, and the Internet connection with suitable bandwidth. On the other hand, it should be noted that technical problems can always arise as long as technology is used. Therefore, it is necessary to make good planning in the issues like stopping and continuing the process under certain conditions, restarting, back up, etc. For example, if students need to download a large file as a requirement of the evaluation process, determining whether they have the appropriate tools and software in advance becomes vital. If an LMS software will be used in the assessment, it is a good practice to know the capacity of the system and possible interruptions in the access.

Another critical issue in an e-assessment is security. We need to verify the identities of examinees and be sure that students are the ones who completed the tasks at hand. Although plagiarism, cheating, taking the exam for somebody else etc. are common problems for online and in-person assessments, having an internet connection and gathering information online easily make cheating easier in an online environment. A planned assessment in a detailed way could partly handle some of these problems. For example, successive tasks, assignments that require students' own research and experience, authentic tasks for each student might prevent cheating and plagiarism. There is also software that can detect plagiarism. However, it is sometimes difficult to detect cheating or whether students get more help than required for both testing conditions. In general, creating authentic assessment tasks in which students need to relate their unique experiences might be useful. E-assessment platforms can provide various features and tools to create authentic assessments. Although detailed authentic tasks are used, it is good to use more than one tool like plagiarism software to ensure security. Continuous assessment is another standard method to deal with cheating. By using small, successive tasks, we can assess students continuously and reduce the risk of cheating. However, continuous assessment requires continuous feedback and providing timely, and quality feedback requires time. There is also a risk that continuous assessment might turn into overassessment, decreasing both students' and instructors' motivation and causing fatigue. Indeed, the importance of the decisions made by the assessment results determines which control mechanism we need to use and how much strict we should be. High-stake assessments require severe precautions for security. The institutions should provide an ideal and equal environment for all examinees. On the other hand, low-stake assessments may not need high-level security precautions.

Lastly, ensuring the validity and reliability of the test scores is vital in every testing situation. Therefore, one always needs to provide evidence regarding our test scores' validity, consistency, and objectivity. Preparing assessment blueprints and varying assessment tasks considering the individual difference enhance the scores' validity and reliability. It is useful to take a flexible approach to traditional validity and reliability concepts to develop a contextual approach to the assessment tasks in accordance with contextual learning that supports authenticity and prepares students for life. The contextual approach requires reviewing the assessment criteria, tools, and approaches regularly. It is also crucial to take advantage of differentiated assessment approaches, as developing authentic and contextual standards alone may not be enough to ensure validity and reliability. Online assessment platforms offer powerful tools, and features for contextual and differentiated assessment approaches (Boud & Falchikov, 2006; Knight, 2006).

5. CONCLUSION

New technologies open up new opportunities for learning and assessment. It is not possible not to take advantage of technology's benefits, which may only be delayed. For example, despite many online education programs developed until 2020, many teachers, students, or institutions had insufficient knowledge and barely used them. However, with the COVID-19 pandemic, everybody was pushed to use online platforms, whether they prefer it or not. While those who have experience in this field adapted quickly, the rest had difficulties in adjusting. Therefore, recent events have shown that it is no longer possible to delay the use of online learning, mobile learning, and e-assessment applications. Instead of avoiding them, we should focus on overcoming the most important disadvantages of this process, such as cheating, plagiarism, and taking the exam for someone else.

LMS offers some mechanisms to ensure the security of the assessment. Some of these mechanisms are using safe web browsers to protect the exam content, blocking copy and paste options, preventing hackers from interfering with the content or the system by using trusted network layers, using monitoring tools to ensure examiners identity, controlling IP addresses, limiting access time to prevent content sharing, mixing the options, randomizing the item order, and preventing from switching between pages with test stop rules. Although none of these measures can guarantee exam security, it should be noted that this also applies to all assessment types.

Finally, the International Testing Commission published a guideline in 2006 for the online assessment process. This guide outlines principles and steps on an online assessment and the bases and backgrounds of these principles for test developers,

test publishers, and test-takers. Therefore, we strongly encourage institutions and practitioners who are planning to conduct an online assessment to benefit from this guideline.

Research and Publication Ethics Statement

All information in this paper has been obtained and presented in accordance with academic rules and ethical concerns.

Contribution Rates of Authors to the Article

The authors equally contributed for the article.

Statement of Interest

The authors declare that there is no conflict of interest.

6. REFERENCES

Bartram, D. (1997). Distance assessment: Psychological assessment through the Internet. *Selection Development Review, 13*, 10–14.

Bartram, D. (2005). Computer-based testing and the Internet. In A. Evers, O. Smit-Voskuyl, & N. Anderson (Eds.), *The handbook of selection*. Oxford: Blackwell.

Benson, R., & Brack, C. (2010). *Online learning and assessment in higher education: A planning guide*. Chandos Publishing, Oxford.

Boud, D., & Falchikov, N. (2006). Aligning assessment with long-term learning. *Assessment & Evaluation in Higher Education, 31*(4), 399–413.

Carless, D. (2007). Learning-oriented assessment: Conceptual bases and practical implications. *Innovations in Education and Teaching International, 44*(1), 57–66.

Chickering, A. W., & Gamson, Z. F. (1987). Seven principles for good practice in undergraduate education. *American Association of Higher Education Bulletin, 39*(7), 3–7.

Dann, R. (2002). *Promoting assessment as learning: Improving the learning process*. Taylor & Francis Group, London.

Earl, L. M. (2003). *Assessment as learning: Using classroom assessment to maximize student learning*. Thousand Oaks, CA: Corwin Press.

Gibbs, G., Habeshaw, S. & Habeshaw, T. (1988). *53 Interesting ways to assess your students*. Bristol: Technical and Educational Services Ltd.

Knight, P. (2006). The local practices of assessment. *Assessment & Evaluation in Higher Education, 31*(4), 435–52.

Mason, R., & Kaye, A. (Eds.) (1989). *Mindweave: Communication, computers and distance education.* Oxford: Pergamon.

Mead, A. D., & Drasgow, F. (1993). Equivalence of computerized and paper-and-pencil cognitive ability tests: A meta-analysis. *Psychological Bulletin,* 114, 449–458.

Nicol, D. J., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: A model and seven principles of good feedback practice. *Studies in Higher Education, 31*(2), 199–218.

Nichols, M. (2008). Institutional perspectives: The challenges of e-learning diffusion. *British Journal of Educational Technology, 39(4)*, 598–609.

O'Reilly, T. (2005). *What is Web 2.0: Design patterns and business models for the next generation of software*. Retrieved 20 December 2019 from http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html

Ramsden, P. (2003). *Learning to teach in higher education* (2nd ed.). London: RoutledgeFalmer.

Richardson, W. (2009). *Blogs, wikis, podcasts, and other powerful web tools for classrooms* (2nd ed.). Thousand Oaks, CA: Corwin Press.

The International Test Commission (2006). International guidelines on computer-based and internet-delivered testing. *International Journal of Testing, 6(2)*, 143-171. doi: 10.1207/s15327574ijt0602_4