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Değerli Araştırmacılar,

Hacettepe Üniversitesi Eğitim Fakültesi Dergisi'nin 35. cilt, e-Assessment: International Perspectives temalı özel sayısının yayımlandığını duyurmaktan büyük mutluluk duyuyoruz.

e-Assessment: International Perspectives konusunun dergimizin gelişimine ve araştırmacılara katkı sağlayacağına içtenlikle inanıyoruz.

Derginin uluslararasılaşma hedefi doğrultusunda 4 farklı ülkeden araştırmacılar tarafından yazılan 4 araştırma makalesi yer almaktadır. Özel sayıya katkıda bulunan araştırmacılara gerçekten minnettarım.

Özel sayı editörleri olan Ronald K. Hambleton (The University of Massachusetts Amherst, USA), Hülya Kelecioğlu ve Nuri Doğan (Hacettepe University, TR) ve özel sayı yardımcı editörü Nermin Kıbrıslıoğlu Uysal'a çabaları için teşekkür ederim. Çok değerli hakemlere, yabancı dil düzeltme ekibine, makalelerin redaksiyonu ve dizgisine yardımcı olan ekibe çok teşekkür ediyorum.

Dergimize gösterdiğiniz ilgi ve katkılarınız için teşekkür ederim.

Prof. Dr. Ayhan YILMAZ

Dear researchers,

We are really glad to announce the publication of the special issue on e-Asssessment: International Perspective in the 35th volume of the Hacettepe University Journal of Education.

We sincerely believe that international perspectives of e-assessment will contribute to the development of our journal and the to the researchers in the field.

In alignment with the internationalization goal of our journal, four researchers based in four different countries contributed to the special issue. I truly appreciate the efforts of the contributors.

I would also like to thank the special issue editors, Ronald K. Hambleton (The University of Massachusetts Amherst, USA), Hülya Kelecioğlu and Nuri Doğan (Hacettepe University, TR); special issue assistant editor, Nermin Kıbrıslıoğlu Uysal; valuable reviewers from the field; language editing team of our journal; and our copyediting team for making this issue possible.

Thanks for your interest in and contributions to our journal.

Prof. Dr. Ayhan YILMAZ

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# An Overview of E-Assessment

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

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## 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:

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- 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.

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# E-Değerlendirmede Kimlik Doğrulama ve Yazarlık Kontrol Sistemi Kullanımına Yönelik Öğrenci Deneyimleri*

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**ÖZET**

Bu çalışmanın amacı, e-değerlendirme sürecinde kimlik doğrulama ve yazarlık kontrol sistemi kullanımında öğrencilerin deneyimlerini belirlemektir. Çalışma, Avrupa Komisyonu tarafından finanse edilen Horizon 2020 projesi kapsamında geliştirilen TeSLA Projesi (Öğrenme için Uyarlanabilir Güvene dayalı bir e-Değerlendirme Sistemi) kapsamında gerçekleştirilmiştir. TeSLA sistemi, e-değerlendirmede kimlik doğrulama, yüz tanıma, ses tanıma, tuş vuruşu dinamikleri, yazarlık kontrolü ve intihal araçları gibi çeşitli araçları içermektedir. Çalışma, kesitsel anket çalışması olarak tasarlanmıştır. Katılımcılar, İspanya, Bulgaristan ve Türkiye'de TeSLA sistemini kullanan üç üniversiteden toplam 735 öğrencidir. Öğrenciler, 2018-2019 Bahar Dönemi boyunca 92 lisans ve lisansüstü düzeydeki derste e-değerlendirme faaliyetleri için TeSLA sistemini kullanmışlardır. Veriler, derslerde TeSLA sisteminin uygulanmasından önce bir ön anket ve sistemi test ettikten sonra bir son anket aracılığıyla toplanmıştır. Veri analizi için tanımlayıcı istatistikler ve tek yönlü ANOVA Testi kullanılmıştır. Sonuç olarak, öğrencilerin TeSLA sistemini kullanırken farklı algıları ve deneyimleri olduğu; olumlu görüşlerin yanında olumsuz görüşlerin de ortaya çıktığı görülmüştür. Bu sonuçlara bağlı olarak elde edilen bulgular, ilgili literatür kapsamında ayrıntılı olarak tartışılmıştır.

**Anahtar Sözcükler:** E-değerlendirme, kimlik doğrulama, yazarlik denetimi, öğrenci deneyimleri, e-öğrenme, yükseköğretim

# Students' Experiences on Using an Authentication and Authorship Checking System in E-Assessment

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**ABSTRACT**

The aim of this study was to identify students' experiences in using an authentication and authorship checking system in e-assessment. The study was carried out within the context of the TeSLA Project (an Adaptive Trust-based e-Assessment System for Learning), which was developed under a Horizon 2020 project funded by the European Commission. The TeSLA system involves several instruments such as face recognition, voice recognition, keystroke dynamics, forensic analysis, and plagiarism tools for authentication and authorship checking in e-assessment. The study was designed as a cross-sectional survey. Participants were 735 students from three universities in Spain, Bulgaria and Turkey. Students used the TeSLA system during 2018-2019 Spring Semester for their e-assessment activities in 92 undergraduate and graduate courses. Data was collected via a pre-questionnaire before the implementation of the TeSLA system in the courses and a post-questionnaire after testing the system. Descriptive statistics and one-way ANOVA Test were used for data analysis. As a result, students had different perceptions and experiences in using the TeSLA system; while some students had positive views, some of them expressed contrary opinions. The findings of the study were discussed in detail in the context of relevant literature.

**Keywords:** E-assessment, student authentication, authorship checking, students' experiences, e-learning, higher education

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## 1. INTRODUCTION

The proliferation of digital technologies in a wide range of educational contexts during the last few decades has led to an increased interest in e-assessment (Brink & Lautenbach, 2011; Appiah & Van Tonder, 2018). Assessment is fundamentally important for learning and one of the key components in the instructional process (Jones, 2005; Guardia, 2016). E-assessment covers a range of activities in which digital technologies are used in assessment (JISC, 2007) since it involves the use of digital devices to assist in the construction, delivery, storage, or reporting of student assessment tasks (Crisp, 2011). According to Joint Information Systems Committee (JISC) "assessment lies at the heart of the learning experience: how learners are assessed shapes their understanding of the curriculum and determines their ability to progress" (JISC, 2018). Moreover, e-assessment now "makes more sense than ever because it encourages students to modify, complement and improve their learning" (Guardia, 2016). As Crisp summarises, e-assessment involves many possibilities that allow teachers to evidence student learning in a much deeper and often more authentic way than has been possible with traditional (paper-based) assessments (Crisp, 2011).

It is acknowledged by many researchers that e-assessment offers a range of potential advantages for teachers and students (Appiah & Van Tonder, 2018; Crisp, 2011), yet the same researchers reflect on its potential challenges, mainly related to security and authentication issues (Appiah & Van Tonder, 2018; Brink & Lautenbach, 2011; Crisp, 2011). For instance, Crisp (2011) noted that "the increased flexibility afforded to students by their being able to complete an e-assessment from any computer can sometimes cause issues with individual student authentication for high stakes exams" (p. 9). The authentication of students is considered as a major challenge for educational organizations offering e-learning (JISC, 2016; Obeidallah, Al Ahmad, Farouq, & Awad, 2015; Okada, Whitelock, Holmes, & Edwards, 2018) since it plays an important role for preventing academic dishonesty which has increased a lot over the past years (McCabe, 2016; Mellar, Peytcheva-Forsyth, Kocdar, Karadeniz, & Yovkova, 2018; QAA, 2016). On the other hand, there are systems which can validate the identity of learners doing assessment (JISC, 2016) and the research interest in their effectiveness to deter academic dishonesty is increasing (Adkins, Kenkel, & Lim, 2005; Bailie & Jortberg, 2009, Pittam, Elander, Lusher, Fox, & Payne, 2009; Levy & Ramim, 2007; Obeidallah et al., 2015). Two types of technologies which address academic dishonesty are recognized in the literature: 1) authentication technologies which seek to establish that the student taking the assessment is really who claim to be (Peytcheva-Forsyth, Mellar, & Aleksieva, 2019, McNabb, 2010); and 2) authorship checking technologies which seek to establish whether a document was actually written by the student who submits it (Peytcheva-Forsyth et al., 2019). While authorship checking technologies are mainly related to text-matching, the authentication systems can be used anytime a student logs into the learning management system, in proctoring situations, and during synchronous class sessions (Aceves & Aceves, 2009). There are a variety of identification technologies available, which Aceves & Aceves (2009) classify as biometric (e.g. fingerprint and iris scanning, keyboard typing cadence, speech recognition, etc.) and non-biometric authentication (e.g. web cameras that record the student's testing environment; onsite, remote proctors who monitor the student taking the exam at the student's location; "out-of-wallet" data mining of personal data that randomly requires students to answer personal questions before or during the exam; lockdown browsers that prohibit students from Internet; IP address verification and secure password and identification systems).

While the utilization of plagiarism detection system is a popular practice in universities, (Peytcheva-Forsyth, Yovkova, & Aleksieva, 2019; Halgamuge, 2017) the use of authentication systems, and more precisely the use of online proctoring systems for assessment is still quite limited in European universities (Draaijer, Jefferies, & Somers, 2017). The reasons for this could be related to the potential issues of implementation of such authentication systems. McNabb (2010) pointed out that when considering implementing authorship or authentication technologies, problems common to most technology implementations arise as well as new ones, such as the frequency of authentication and students' privacy issues which can affect students' experiences with technology. Therefore, it is crucial to explore students' perspectives and experiences with authorship and authentication checking systems in order to identify their impact on e-assessment and thus to use them effectively. Students' views and attitudes towards using such systems and factors, which may affect them, are a point of increasing interest in recent studies (Peytcheva-Forsyth et al., 2018a, 2018b, 2019; Okada et al., 2018, 2019), but yet students' experiences are poorly explored. This study aims to investigate students' experiences in using the student authentication and authorship system – TeSLA (An Adaptive Trust-Based E-Assessment System for Learning). Developed during 2016 and 2019, the TeSLA System, which constitutes the rationale of this study, aimed to create an integrated system in virtual learning environments to support authentication and authorship checking in e-assessment. This system has been developed under a Horizon 2020 project funded by the European Commission. The project consortium was composed of 18 partners, consisting of 8 universities, 3 quality agencies, 4 research centres and 3 companies. The TeSLA system was tested in three stages across seven institutions with the participation of more than 23.000 students. The data for this study is collected from three of the seven institutions taking part in the third and final stage of the pilot. These three institutions have been selected as representatives of three different contexts – an institution that offers wholly or principally online courses in Spain (University A), a campus-based institution that offers a range of blended courses in Bulgaria (University B) and an institution that offers both on-campus and online courses in Turkey (University C).

University A has 70,000 students, and its educational model is based on personalization and provision of guidance and support to the online students in their activities. The assessment activities are diverse, and the assessment model is mainly based on continuous and formative assessment, and additionally, there could be final face-to-face examinations. Course instructors supervised by the responsible teachers, design the assessment activities and conduct the assessments.

University B is a campus-based university with 25,000 students, and it is in the process of transforming some master's degree programs from face-to-face to online mode. A professor designs the assessments as a course leader, and an assistant professor provides the assessment feedback. The most common assessment type combines written online assignments or tests and a final face-to-face examination.

In University C, there are 22,000 on-campus students enrolled in a range of face-to-face and blended learning courses, and a much larger number of students are enrolled in its Open and Distance Education System (1,100,000 students). The faculty and the teachers establish the assessment model in on-campus courses. It may include face-to-face or online examinations and assignments. The Open Distance Education System involves courses and assessments designed by a group of course designers and academics. The assessment model is determined by the Assessment Department and it involves face-to-face mid-term and final examinations.

The specific impact of different institutional contexts on TeSLA system piloting is discussed in-depth in another study about the design and execution of large-scale pilots (Peytcheva-Forsyth & Mellar 2020), and it is taken into consideration in this research which main focus is on the impact of TeSLA system on students' attitudes and experience with the system. This paper first provides a description of the TeSLA system. It then sets out the research questions, methods, and findings of the study. Finally, findings are discussed within the relevant literature in the discussion section, and conclusions drawn from the study are presented.

## 1.1. The TeSLA System

The TeSLA system provides authentication and authorship verification. Several instruments (or tools) are integrated into the system for ensuring authentication and authorship of users that can be used in all e-assessment models and activities to prevent cheating and plagiarism. The instruments used for assuring authentication are Face Recognition (FR), Voice Recognition (VR), and Keystroke Dynamics (KD), whereas Forensic Analysis (FA) and Plagiarism (PL) are used to check authentication and authorship. FR and VR rely on who you are, whereas KD and FA respectively rely on how you type and how you write. A brief description of the instruments is provided below (Knuth, 2016):

- Face recognition (FR): The instrument analyses visual data such as images or videos and tries to recognize a face within the given data that has been derived during the enrolment; a webcam and a browser extension are required to capture images or videos.
- Voice recognition (VR): It analyses audio data of the user by comparing the characteristics of the voice with a model that has been derived from an example of speech during enrolment; it requires a microphone connected to the computer.
- Keystroke Dynamics (KD): This instrument recognizes patterns based on the timing information from pressed and released keys when a candidate is typing on a keyboard.
- Plagiarism (PL): It detects word-for-word copies in a given set of documents.
- Forensic analysis (FA): Authorship verification verifies that a document has been written by a specific author; it has to be trained with a set of text files written by the author.

The TeSLA system is capable of supporting diverse types of assessments such as formative, summative, continuous, or diagnostic. It is a modular system, and the individual instruments can be switched on or off as well as used in different combinations to match in the best possible way to the specifics of the particular assessment activity. When assessment activities are being designed, the available TeSLA instruments are presented as a list in the Virtual Learning Environment. (Mellar et al., 2018). The teacher creates e-assessment activities, where the security instruments are enabled so that she/he can select the most appropriate TeSLA instruments for the respective activity (Mellar et al., 2018). Two types of activities are required for authentication and authorship verification of students, which are enrolment and real e-assessment activities. An enrolment activity is the first step in which the learner introduces himself/herself to the system by recording 10-second video of his/her face for FR; recording speech samples of himself/herself for a given duration for VR; typing at least 30 samples, which must be extracted from 125 consecutive pressed keys for KD; submitting around 1000 words of written document that has been written by him/her before for FA (Okada et al., 2019). However, PL instrument does not require an enrolment activity. The enrolment activities are used as a reference for authentication and authorship checking in subsequent real activities for user registration, which are not graded. Then, the student performs real e-assessment activity. Finally, the system compares the samples collected in the enrolment and actual activities and indicates the degree of matching between the samples as a percentage. The system does not recommend a threshold percentage; it is the decision of the teacher or the institution to determine a threshold value to verify the authentication and authorship of the learner. The information that integrates the data collected by the authentication and authorship instruments is provided through dashboards (Guitart-Hormigo, Rodríguez & Baró, 2020). These dashboards are oriented to assist the decision-making process of teachers, above all, in case of suspicion of students' dishonest academic behaviour.

## 1.2. Research Questions

RQ1. What is TeSLA's impact regarding:
- trust in online assessment and e-authentication?
- personal data sharing and e-authentication?
- cheating and plagiarism?
- online assessment advantages and disadvantages?
- e-authentication advantages and disadvantages?

RQ2. What are the students' experiences of using:
- the TeSLA system?
- the tools in the TeSLA system; face recognition, voice recognition, keystroke analysis, anti-plagiarism, and forensic analysis?

## 2. METHOD

The study was designed as a cross sectional survey. Participants were 735 students who completed both pre- and post-questionnaire from University A, University B and University C (Table 1) from 92 undergraduate and graduate courses in various fields such as arts and humanities, science and social science. 58% of the 735 students were male, whereas 42% of them were female. 15% of the students were 21 or under 21 years old, 43% were between 22-30 years old, 25% were 31-40 years old, 14% were 41-50, 2.4% were 51 and over 51 years old. 0.6% of them preferred not to tell their age.

Table 1.
*Number of Students who Completed Questionnaires*

| | University A | University B | University C | Total |
|---|---|---|---|---|
| **Number of Students Completed Pre-Questionnaire** | 662 | 232 | 240 | 1134 |
| **Number of Students Completed Post-Questionnaire** | 627 | 219 | 171 | 1017 |
| **Number of Students Completed Both Pre&Post-Questionnaire** | 507 | 58 | 170 | 735 |

## 2.1. Data Collection

Two questionnaires were designed: a student pre-questionnaire before testing the system and a student post-questionnaire after experiencing the TeSLA system. The pre-questionnaire consisted of 10 parts, including 18 questions, and the post-questionnaire involved 10 parts with 17 questions, with similar questions of the pre-questionnaire. Items were prepared using a 5-point Likert type scale including "strongly agree", "agree", "neither agree nor disagree", "disagree", and "strongly disagree" except two parts which were "Online assessment advantages and disadvantages" and "Online assessment advantages and disadvantages regarding e-authentication". Students were asked to select all the items that are suitable for them in multi-choice type questions in these two parts. Demographics of students were also collected in the questionnaire. The questionnaires were created in English in cooperation with experts from the seven partner universities in the Project. The items in the questionnaires were checked and edited by the experts. Then, the questionnaires were translated into local languages by professional translators and checked by a group of experts. They were also tested in a pilot study by small groups of students in each university and finalized before their implementation. The procedures for the data collection were:

- *e-Assessment design:* The TeSLA system was used in real assessment activities by the 150 teachers involved in the testing phase of the system in the three mentioned universities during 2018-2019 Spring Semester. The teachers selected the most appropriate instruments for each assessment activity in their courses, and the selected tools were turned on in the system. For example, typing or choosing answers in quizzes or online text submissions (FA, KD and PL), performing a presentation (FR, VR), creating artifacts (FR, VR, KD, FA and PL) or uploading documents in the assignment (PL, FA) (Okada et al., 2019). All the tools mentioned above were used by several teachers in three universities.
- *Implementation:* The teachers provided guidelines and immediate support via videos, face-to-face and online sessions and written instructions for the use of the system both for the enrolment and real activities. The students completed the e-assessment activities during the semester until the given deadlines.
- Evaluation: The students were required to fill in the pre-questionnaire before starting the e-assessment activities. After completing the e-assessment activities, they were asked to fill in the post-questionnaire. The data was collected by using the Bristol Online Survey (BOS) system (https://www.onlinesurveys.ac.uk/) involving the same set of questions, which were translated into native languages of the universities. Volunteer students answered the questionnaires. A consent form was required before answering the questionnaires and using the TeSLA system.

## 2.2. Data Analysis

SPSS statistical program was used for data analysis. The goal of this study was to identify the impact of TeSLA, experiences of students, and whether the outcomes of the TeSLA pilot differ across the three universities, thus descriptive statistics and one-

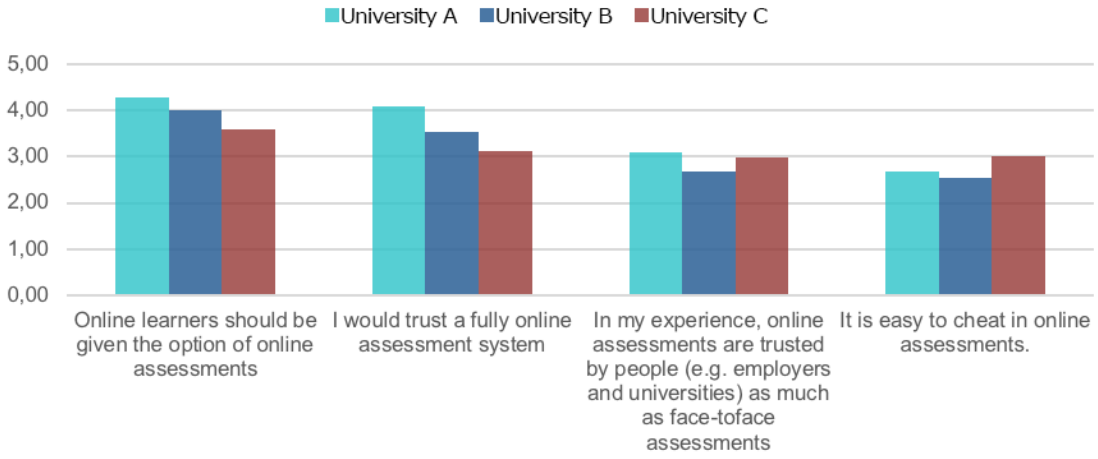
way ANOVA tests were performed, and the results were illustrated in the graphs. Items in the questionnaire were analyzed separately.

## 3. FINDINGS

### 3.1. TeSLA's impact

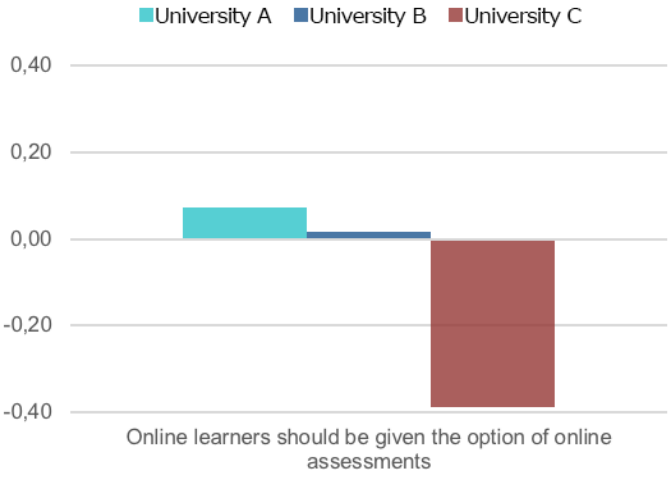
#### *3.1.1. Trust in online assessment and e-authentication*

Students were asked several questions about trust in online assessment before and after participating in TeSLA pilot. Figure 1 shows the after-TeSLA frequencies of these questions, and Figure 2 shows the changes between the situations before (pre-questionnaire responses) and after (post-questionnaire responses) the pilot. We only present the variables that have statistically significant differences across universities, as shown by the one-way ANOVA tests performed. We can see that University A students seem to have a higher trust in online assessments. On the contrary, University C students seem to be slightly more concerned that it is easy to cheat in online assessments. Moreover, after participating in TeSLA they seem less in favor of giving students the option of online assessments (see Figure 2).




*N=507 (University A), 58 (University B), 170 (University C)*

Figure 1. Attitudes towards online assessment (after TeSLA pilot)

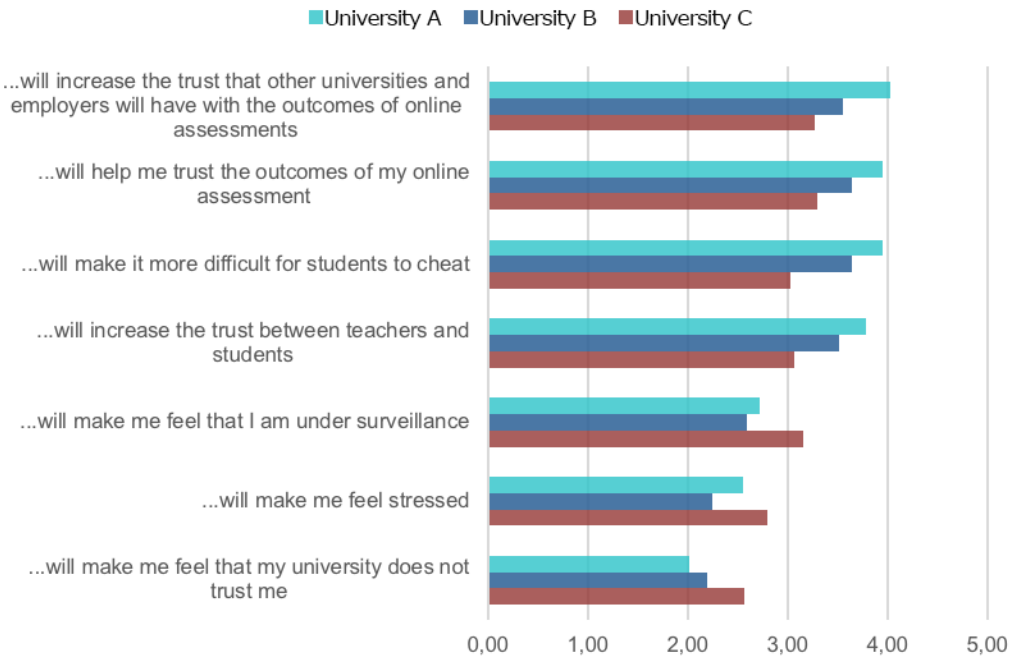



*N=507 (University A), 58 (University B), 170 (University C)*

Figure 2. Attitudes towards online assessment PRE - POST change

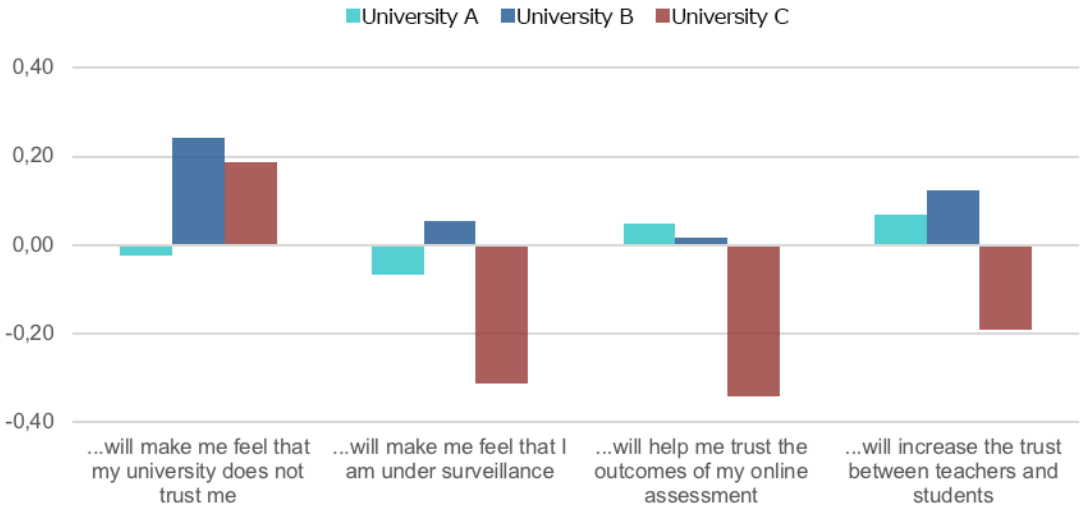
In addition to online assessment, students were asked specific questions about the use of e-authentication (security measures) for online assessment. Again, University A students have a more positive attitude towards e-authentication in comparison with students from the other two universities. They are more likely to agree that e-authentication will make it more difficult for students to cheat and that it will increase the trust between teachers and students, the trust of other universities and employers, and the trust of students on the outcomes of their online assessment (see Figure 3). In University C, students are more likely to disagree with these statements. In addition, there is a higher concern among the University C students that e-authentication might make students feel under surveillance and stressed and that they might perceive that the university does not trust them. After participating in TeSLA, University C students seem to have a worse perception on the potential impact of e-authentication on trust as they agree more that this mechanism may make students feel that the university does not trust them and less that it can help increase the trust of students in the outcomes of their online assessment and the trust between teachers and students. On the other hand, the concern that students may feel under surveillance has decreased after TeSLA pilot (see N=507 (University

A), 58 (University B), 170 (University C) Figure 4). University B students are the least concerned that authentication for online assessment may make students feel stressed and under surveillance.




*N=507 (University A), 58 (University B), 170 (University C)*

Figure 3. Attitudes towards authentication for online assessment (after TeSLA pilot)



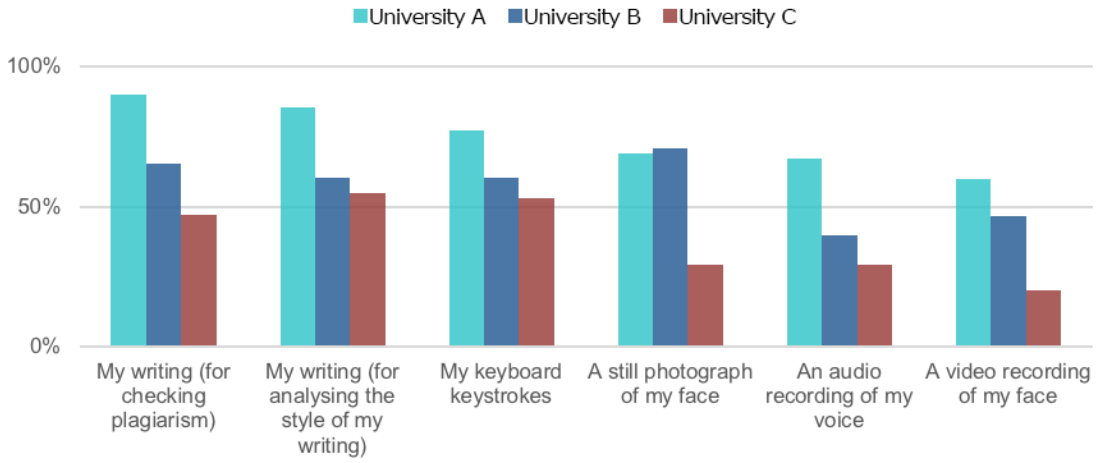

*N=507 (University A), 58 (University B), 170 (University C)*

Figure 4. Attitudes towards authentication for online assessment. PRE - POST change

### *3.1.2. Personal data and e-authentication*

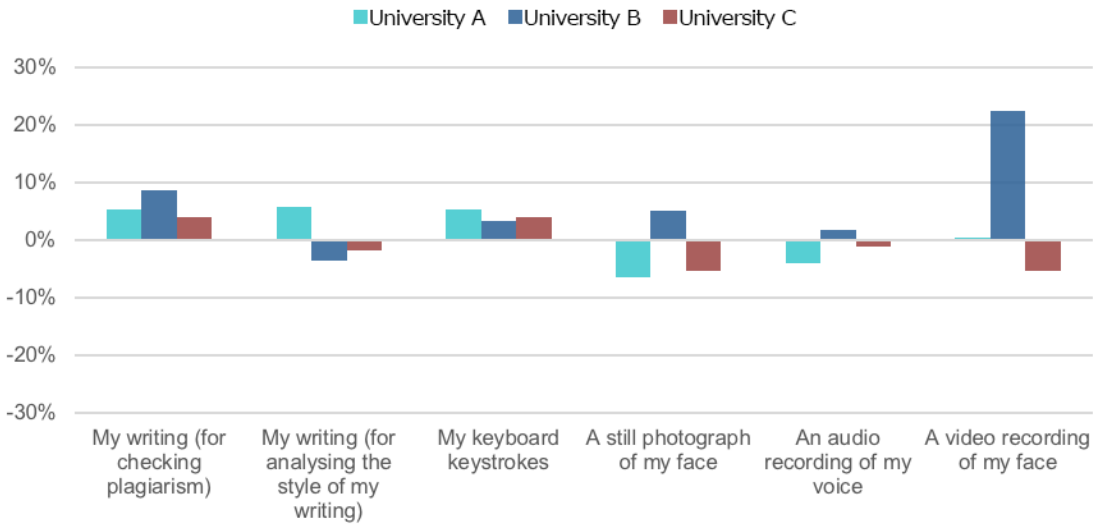
Students were asked what data they would be willing to share to authenticate and confirm the authorship of their online assessment before and after the pilot (Figure 5). University A students are more willing to share all types of data compared to students from University B and University C, except for the photograph of their face, for which percentages are almost the same in University A and University B. In fact, a photo of their face is the type of data that University B students are more willing to provide for the purpose of authentication. About 71% are willing to share such data, while less than one-third of University C students would do so. University C students are less willing to share all types of data, but they would rather share the data collected by the Keystroke Dynamics instrument than the other types of personal data. These are also the authentication mechanisms more often selected by University A students.

After the TeSLA pilot, there has been a noticeable increase (more than 20 percentage points) in the number of University B students willing to share a video recording of their face (Figure 6). However, this has slightly decreased in University C. In University A the largest change is a slight decrease in the willingness to share a photograph of their face.




*N=507 (University A), 58 (University B), 170 (University C)*

Figure 5. Willingness to share personal data (after TeSLA pilot)



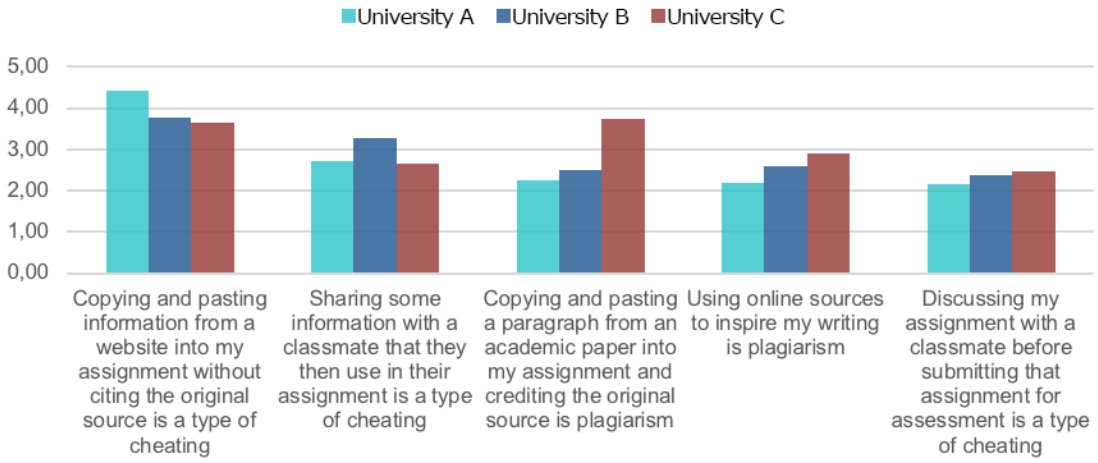

*N=507 (University A), 58 (University B), 170 (University C)*

Figure 6. Willingness to share personal data. PRE - POST change

### *3.1.3. Cheating and plagiarism*

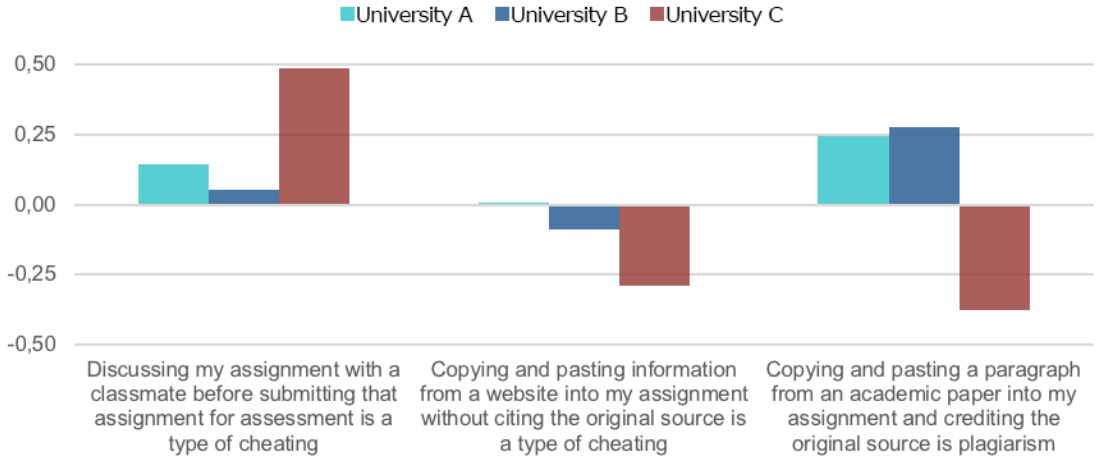
In addition to their willingness to share personal data, students were asked questions about cheating in online assessments (see Figure 7). The perceptions vary across universities depending on the specifics of the institutional context. University A students agree more that copying and pasting information from a website into my assignment without citing the original source could be defined as cheating. In University C students' opinions copying and pasting a paragraph from an academic paper into their assignment and crediting the original source is also plagiarism, but University A and University B students do not seem to agree on this. University B is the university where students agree more that sharing some information with a classmate that they then use in their assignment is a type of cheating.

Participation in TeSLA seems to have had an impact on some of these perceptions (Figure 8). Particularly, regarding the action of discussing the assignment with a classmate before submitting that assignment for assessment, as now University C students agree more that this is a type of cheating. Agreement has also slightly increased in University A. However, University C students agree less than before the pilot that the actions related to copying and pasting information from other sources are plagiarism.




*N=507 (University A), 58 (University B), 170 (University C)*

Figure 7. Attitudes towards cheating and plagiarism (after TeSLA pilot)



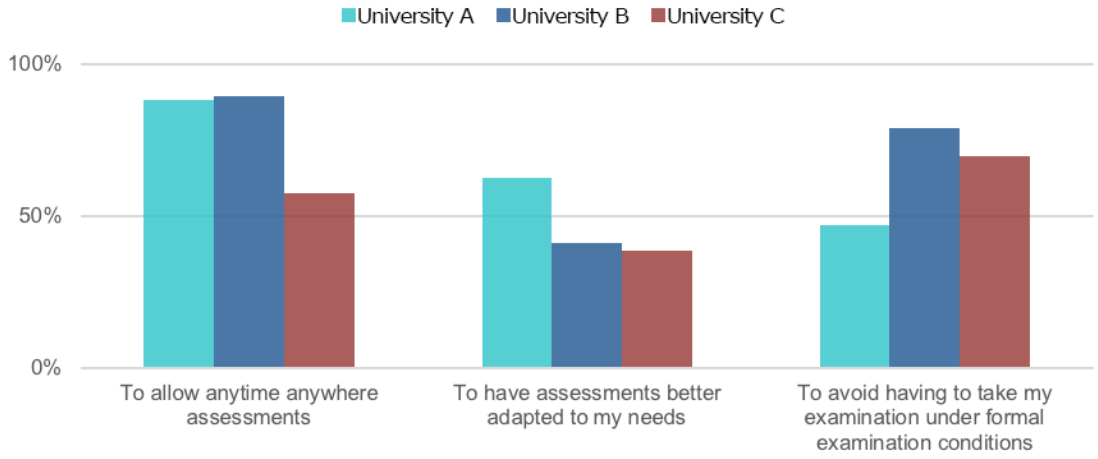

*N=507 (University A), 58 (University B), 170 (University C)*

Figure 8. Attitudes towards cheating and plagiarism. PRE - POST change

### *3.1.4. Online assessment advantages and disadvantages*

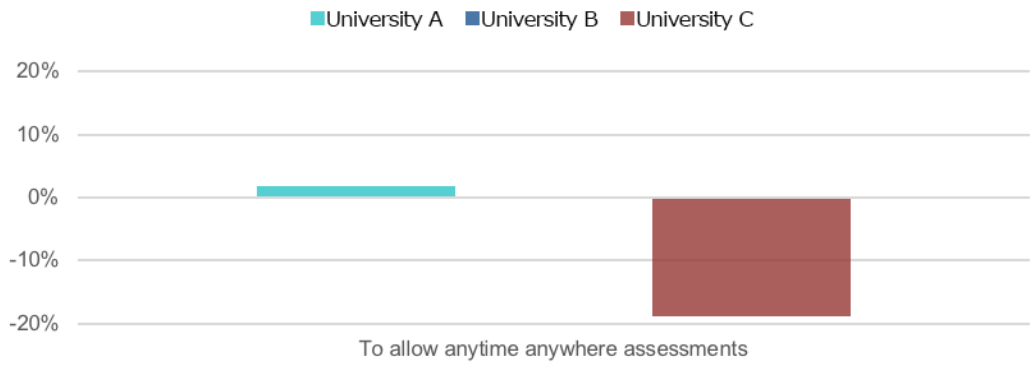
There are some differences across universities regarding the advantages of online assessments (see Figure 9). The far majority of students in University A and University B recognise that using online assessment allows anytime anywhere assessments. However, this percentage is lower in University C and it has clearly decreased after the TeSLA pilot (by 19 percentage points), while it has remained unchanged in the other two universities (see Figure 10).

On the other hand, a majority of University B and University C students think that one of the advantages of online assessments is that they avoid examinations under formal conditions, but only 47% of University A participants agree on this. However, University A students tend to select more the advantage of having assessments better adapted to their needs (Figure 9).



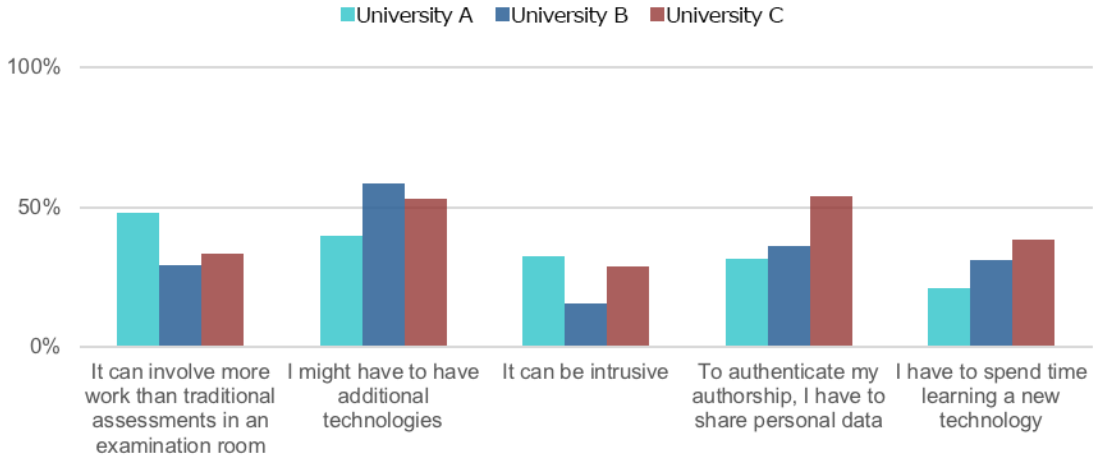

*N=507 (University A), 58 (University B), 170 (University C)*

Figure 9. Advantages online assessment (after TeSLA pilot)




*N=507 (University A), 58 (University B), 170 (University C)*
Figure 10. Advantages online assessment. PRE - POST change

Students were also asked about some disadvantages of online assessment. In this case, there are also differences across universities (see Figure 11). Compared to the other two universities, a larger number of University A students consider as disadvantages the fact that online assessment can involve more work than traditional assessments and that it can be intrusive. On the other hand, University C students are more concerned by the fact that online assessment might require them to share personal data and spend time learning a new technology. Lastly, University B students select more often as a disadvantage the need to have additional technologies.

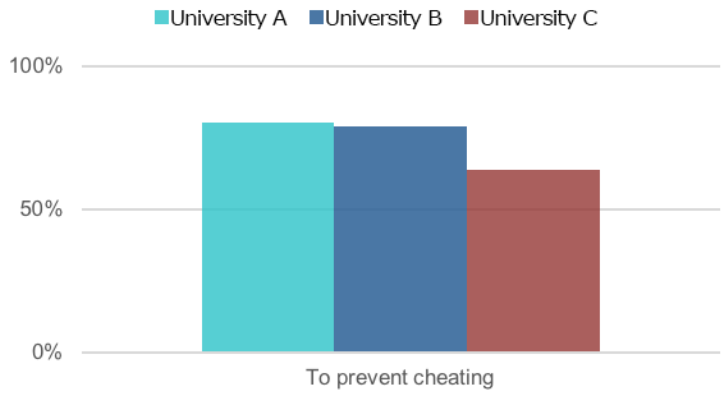



*N=507 (University A), 58 (University B), 170 (University C)*
Figure 11. Disadvantages online assessment (after TeSLA pilot)

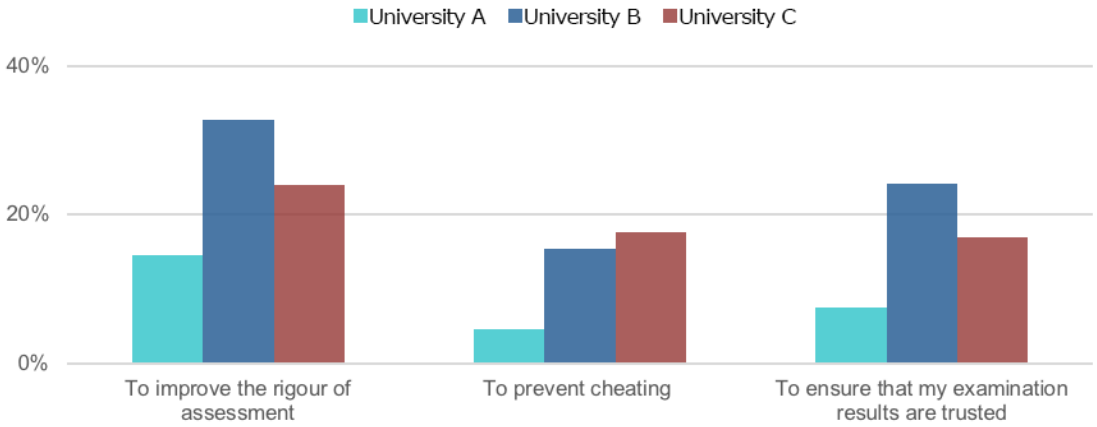
### *3.1.5. Online assessment advantages and disadvantages regarding e-authentication*

Regarding the advantages of TeSLA e-authentication, there are significant differences in the percentage of students who selected 'to prevent cheating'. Around 70% of students in University A and University B consider that TeSLA e-authentication may prevent cheating, but this percentage is 15 points lower in University C (see Figure 12).

Participation in TeSLA had a positive impact on these perceptions, as Figure 13 shows that more students selected these items with regards to TeSLA e-authentication (after the pilot) than for e-authentication in general (before the pilot). In all three universities the highest growth refers to the perception that TeSLA e-authentication can improve the rigour of assessment. The 24 points increase in the percentage of University B students who consider that TeSLA can help ensure that their examination results are trusted is also remarkable.




*N=507 (University A), 58 (University B), 170 (University C)*
Figure 12. Advantages e-authentication (after TeSLA pilot)

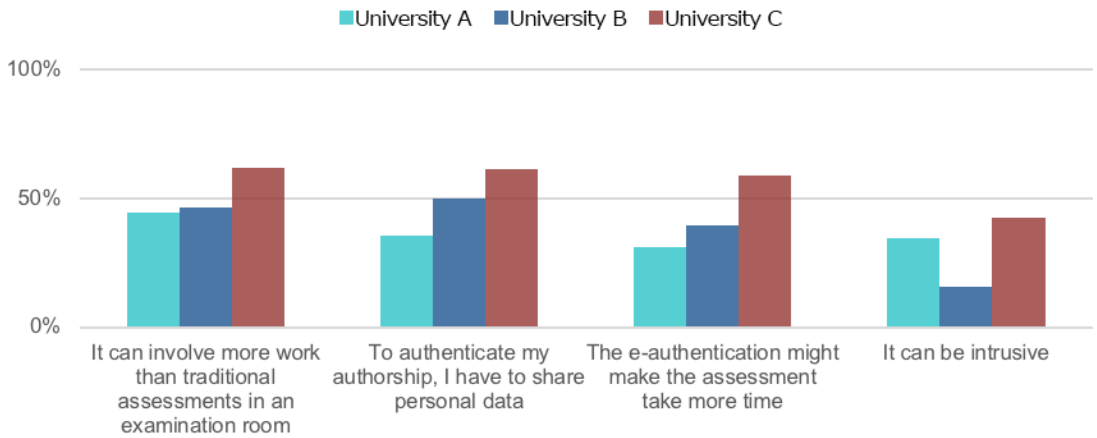



*N=507 (University A), 58 (University B), 170 (University C)*
Figure 13. Advantages e-authentication. PRE - POST change

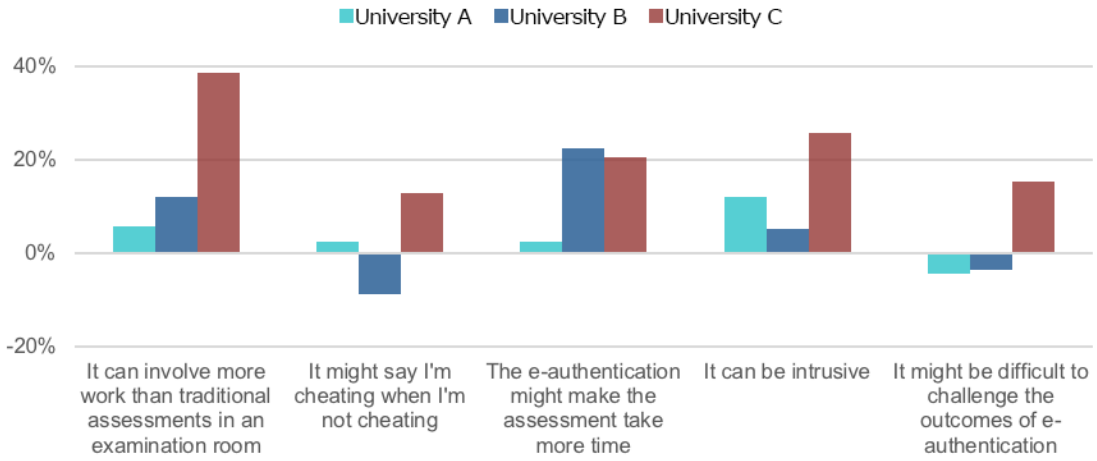
On the other hand, University C students identify more disadvantages in TeSLA e-authentication than students in the other two universities (see Figure 14). Moreover, participation in TeSLA had a negative impact on this, especially regarding the perception that TeSLA e-authentication can involve more work than traditional assessment (see Figure 15).

University A students are the least concerned about the fact that TeSLA e-authentication may require them to share personal data and that it may involve more time. However, after trialling TeSLA a higher percentage of respondents think that it can involve more work and that it can be intrusive.

University B students are those who reply less often that TeSLA e-authentication can be intrusive, but after the pilot the percentage of those who think that this type of authentication might make the assessment more time consuming has increased considerably (22 percentage points).




*N=507 (University A), 58 (University B), 170 (University C)*
Figure 14. Disadvantages e-authentication (after TeSLA pilot)

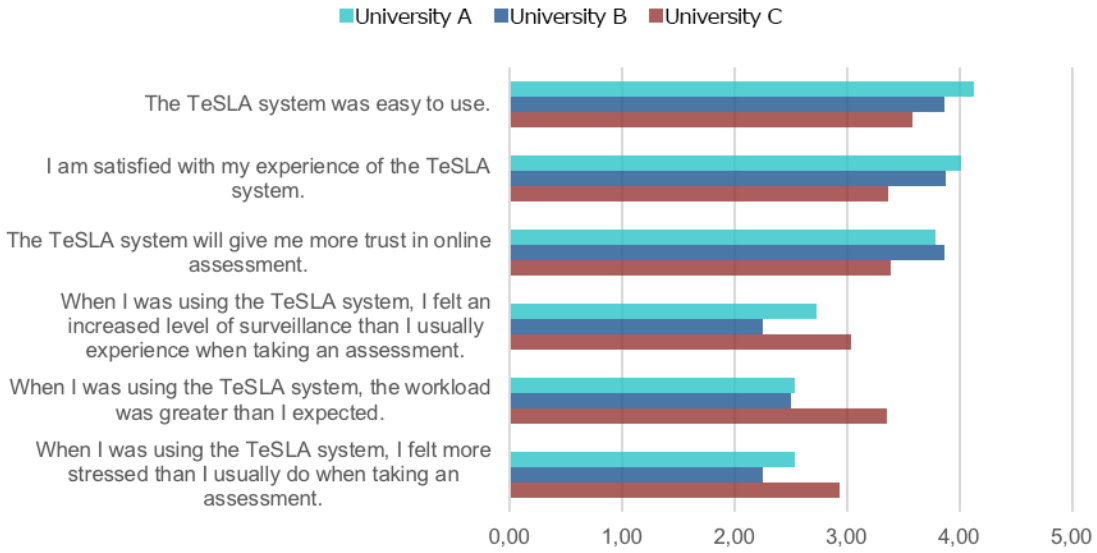



*N=507 (University A), 58 (University B), 170 (University C)*
Figure 15. Disadvantages e-authentication. PRE - POST change

## 3.2. TeSLA's experience

### *3.2.1. TeSLA system*

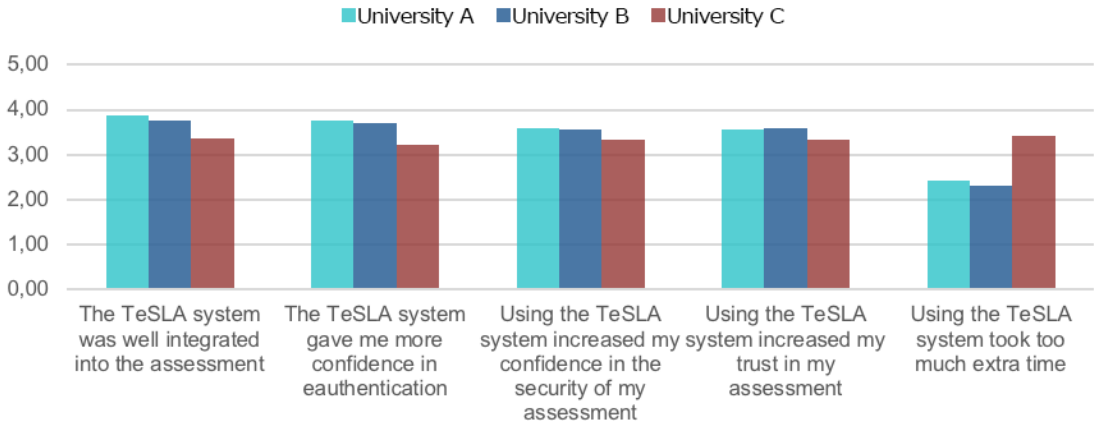
University A students seem more satisfied with TeSLA experience and perceive the system as easy to use (Figure 16). University B participants are those who agree more that TeSLA would increase their trust in online assessments. On the contrary, University C students appear to be less satisfied with TeSLA. Moreover, in University C there is a higher agreement on the fact indicated that the workload was greater than expected and that they felt stressed and under surveillance. University B students are those who agree less on these negative statements.



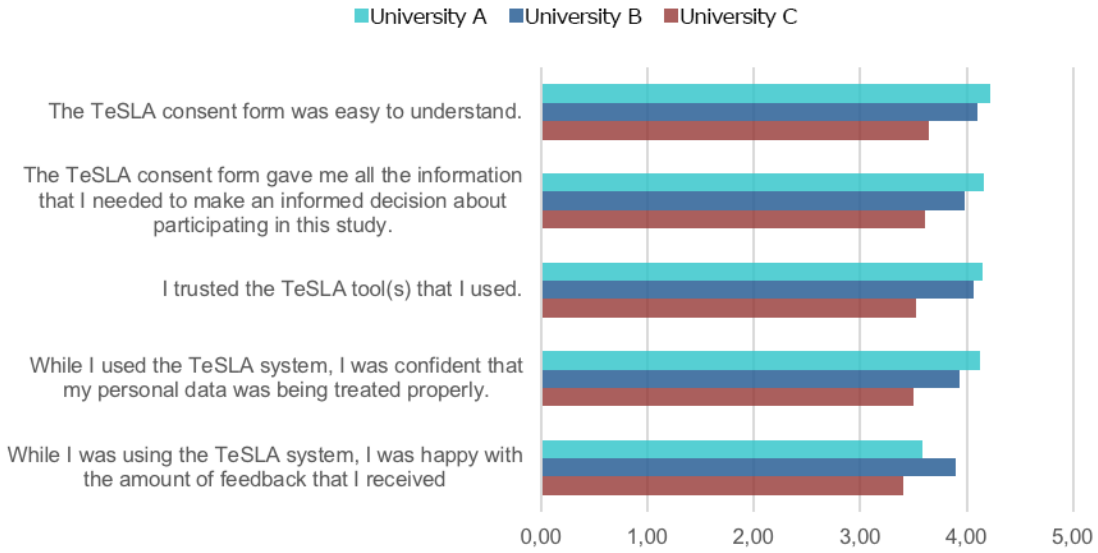

*N=507 (University A), 58 (University B), 170 (University C)*
Figure 16. TESLA general experience

In addition to their general experience, students were asked specific questions about trust after finalising the pilot. Generally, students in University A and University B tend to agree that the system was well integrated into the assessment and that it gave them more confidence in e-authentication. However, the level of agreement is lower among University C students (see Figure 17). The latter also tend to agree more that using the system took too much extra time.

Similarly, University C students are those agreeing less with the privacy, informed consent and feedback related questions (Figure 18). University A students agree more on these statements, except for "while I was using the TeSLA system, I received enough feedback", in which the level of agreement is higher in University B. University A students were more confident that their personal data was treated properly and indicated a higher trust in the TeSLA tool(s) they used.



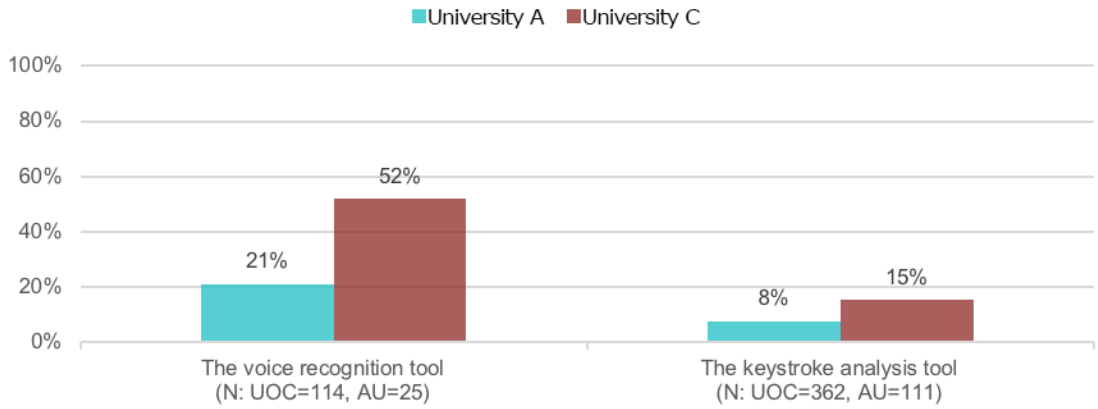

*N=507 (University A), 58 (University B), 170 (University C)*
Figure 17. TESLA Trust




*N=507 (University A), 58 (University B), 170 (University C)*
Figure 18. TESLA Privacy, informed consent and feedback

### *3.2.2. Tools*

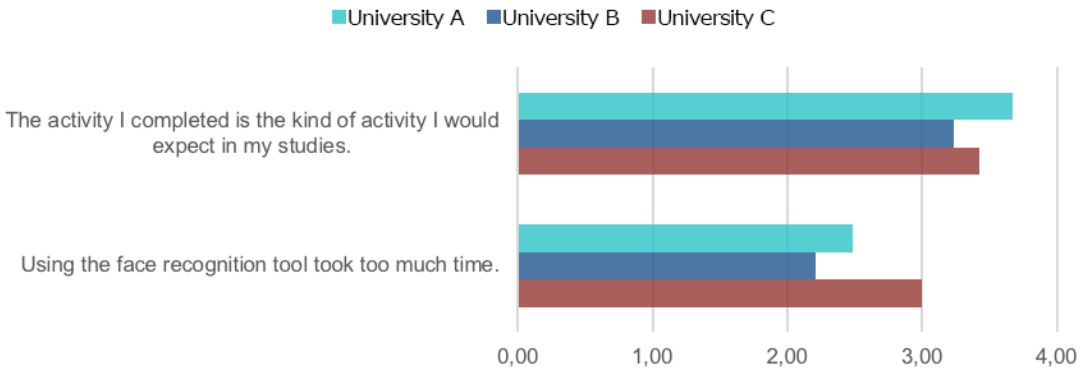
Students were using different tools during the pilots. University C students encountered significantly more difficulties than University A participants when using the Keystroke Dynamics and especially when testing the Voice Recognition tool, as about half of them experienced problems with this tool (Figure 19). Very few University B students trialled these two tools, therefore they have not been included in the figure.




*N=507 (University A), 58 (University B), 170 (University C)*
Figure 19. Students who experienced problems while using TeSLA tools

### *3.2.2.1. Face recognition*

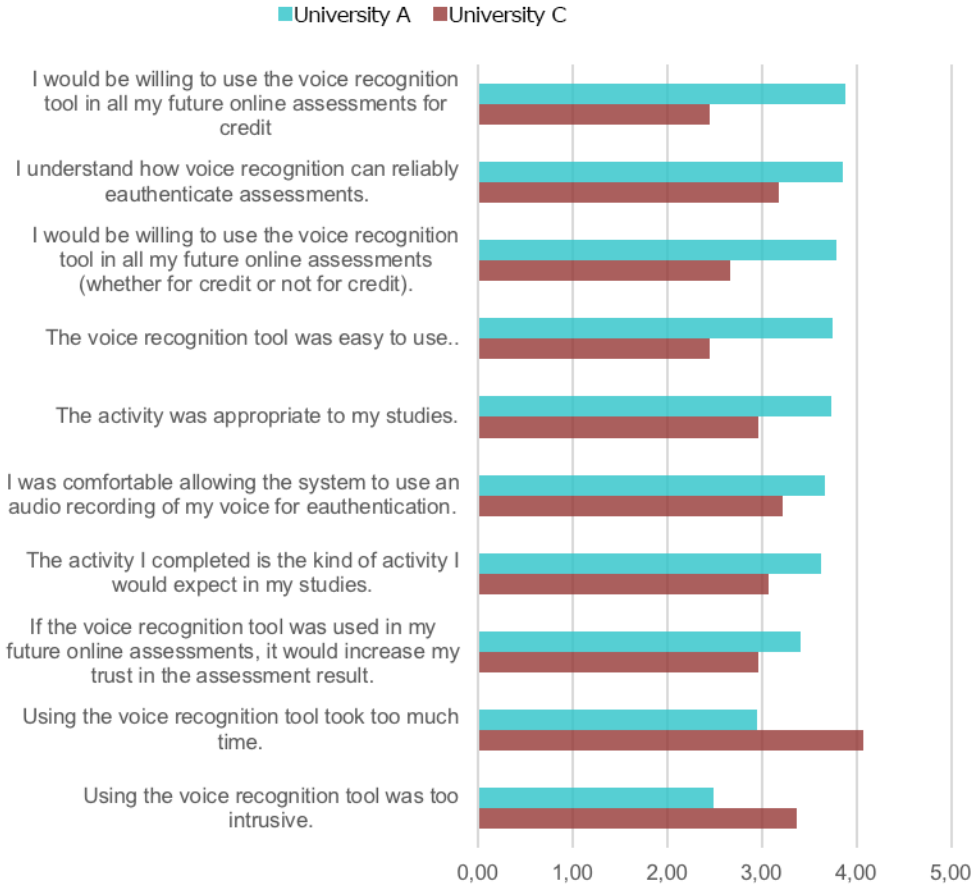
Students using the Face Recognition were enquired to assess their experiences (see Figure 20). Students in University A tend to agree that the activity completed was the kind of activity they would expect in their studies, and the level of agreement is higher than in the other two universities. On the other hand, University B and University A students tend to disagree that using the Face Recognition tool took too much time, but the opinions seem more divergent in University C (as the mean is equal to 3, that equals to neither agree nor disagree).




*N=507 (University A), 58 (University B), 170 (University C)*
Figure 20. Face recognition assessments

### *3.2.2.2. Voice recognition*

University A students also have a better opinion about the Voice Recognition tool and are more willing to use it in their assignments (see Figure 21). Again, University C students agree more that using the tool took too much time and they also tend to agree that it was too intrusive.




*N=507 (University A), 170 (University C)*
Figure 21. Voice recognition assessments

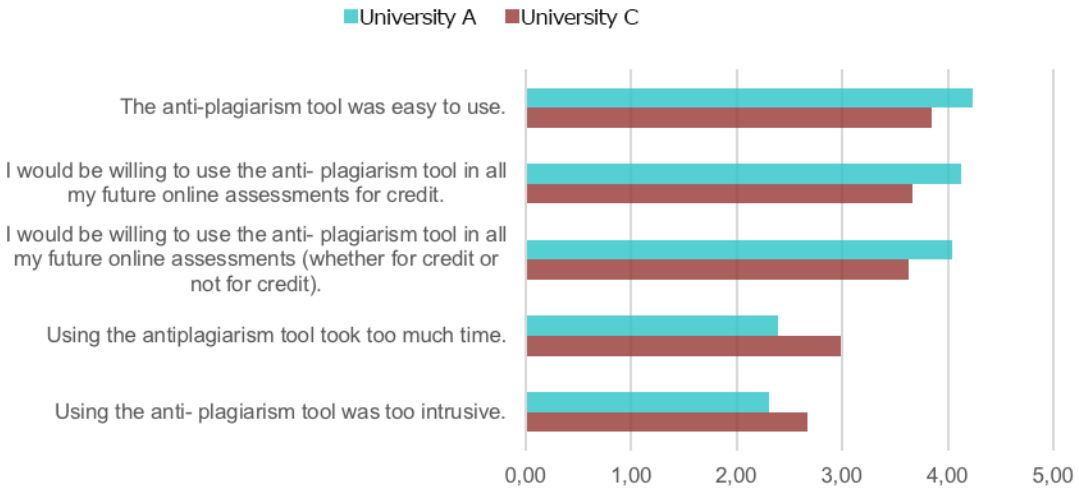
### *3.2.2.3. Keystroke Dynamics*

Students in University A agree that the Keystroke Dynamics was easy to use, they were comfortable using it and express willingness to use the tool in the future. University C students' opinion about this tool is a bit worse than that of University A participants, and they tend to agree that using the keystroke analysis took too much extra time (Figure 22).


*N=507 (University A), 170 (University C)*
Figure 22. Keystroke analysis assessment

### *3.2.2.4. Anti-plagiarism*

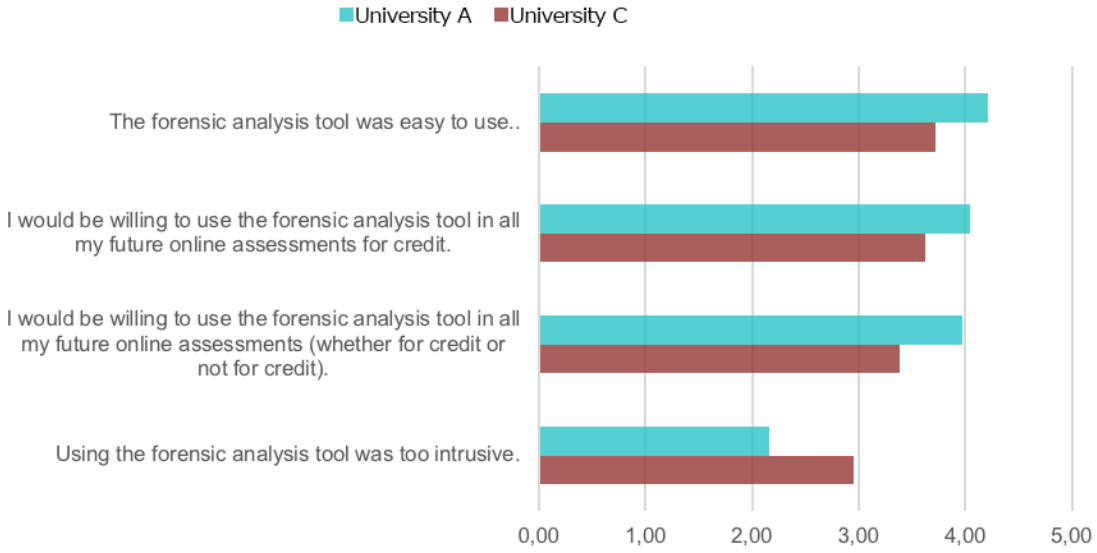
As seen with the other tools, University A students agree more that the anti-plagiarism tool was easy to use and have a higher willingness to use it in the future than University C students. Participants from University C agree more than those from University A that the tool was too time-consuming and intrusive, although the values are rather low in both universities (Figure 23). Very few University B students trialled this tool, therefore they have not been included in the figure.




*N=507 (University A), 170 (University C)*
Figure 23. Anti-plagiarism assessments

### *3.2.2.5. Forensic analysis*

University A students generally have a positive view on the Forensic Analysis, they agree that it was easy to use and express willingness to use in their future online assessments (see Figure 24). The agreement on these statements is lower among University C students, who, in addition, disagree less that the tool was too intrusive. Very few University B students trialled this tool, therefore they have not been included in the figure.




*N=507 (University A), 170 (University C)*
Figure 24. Forensic analysis assessments

## 4. DISCUSSION

This section discusses the main findings, based on the results of the study conducted, in regards with the research questions (RQ) formulated at the beginning of this paper. The section also contextualizes the results with related research works on the field of e-assessment. RQ1 deals with TeSLA impact (RQ1). RQ2 evaluates the students' experiences on using the TeSLA system, and the tools it provides.

Concerning the impact of TeSLA systems (RQ1), University B participants are those who agree more that TeSLA would increase their trust in online assessments, which is similar to the findings of other studies. Bahar and Asil (2018) found out that the positive attitude to e-assessment is influenced by factors such as gender, computer usage, and level of education. Furthermore, Hettiarachchi, Huertas, and Mor (2015) indicated that e-assessment had a positive impact on students' performance and learning processes. However, our study revealed that University C students are less satisfied with TeSLA and they agree more that the workload was greater than expected and that they felt stressed and under surveillance. This may be related to the results that Rolim and Isaias (2019) emphasized in their study conducted in Portugal. They stated that e-assessment applications had just begun, and therefore resistance and distrust could be observed. It is thought that this could be the reason for the deficiency of positive opinions. In like manner, Husband (2017) also mentioned that despite the effectiveness of e-assessment tools to provide benefits for both students and teachers to improve their learning and management of assessment, the lack of literature is a proof that implementing e-assessment tools needs to be further researched with a focus on how to mediate validity and reliability challenges between paper and computer-based assessments.

Students recognise more advantages of TeSLA e-authentication (after the pilot) than of e-authentication in general (before the pilot), especially with regards to the perception that TeSLA e-authentication can improve the accuracy of assessment. There was also a remarkable increase in the percentage of University B students who consider that TeSLA can ensure that their examination results are trusted. This result directly contributes to the main advantages of using e-assessment (providing direct and immediate feedback for students, improving student performance, reducing the time and effort of the teacher, decreasing the cost for the institution, and encouraging high-order thinking, which is one of the educational aims) (Alruwais, Wills, & Wald, 2018).

University C students identify more disadvantages in TeSLA e-authentication, and participation in TeSLA had a negative impact on their perceptions. After trialling TeSLA, University A students agreed more that TeSLA e-authentication can involve more work and that it can be intrusive. Moreover, the percentage of University B students who think that the assessment might take more time increased considerably. Studies in the literature indicate that students have different perceptions and experiences about e-assessment. While most of the students are willing to take part in e-assessment, there are also pessimistic views (Attia, 2014; Dermo, 2009; Ferrao, 2010; Hillier, 2014; Sorensen, 2013). Dermo (2009) found that the positive feelings of students were only slightly stronger than the negative feelings about the validity, practicality, security and reliability aspects of e-assessment. Similarly, Lee-Post and Hapke (2017) found that one fourth of the students were pessimistic about the

implementation of e-assessment. These negative opinions should be taken into account by the teachers, administrators and instructional designers while designing and implementing instruments for e-assessment. Fluck, Pullen, and Harper (2009) and Hillier (2014) emphasize the importance of the first positive experience in e-exams for rapid adoption of such practices.

In order to authenticate and confirm the authorship of their online assessment, University A students are more willing to share most types of data except for the photograph of their face, which is the item most selected by University B students. University C students are less willing to share all types of data. University A and University C students would rather share their writing of their keyboard keystrokes than the other items. In fact, it can be observed that, with the exception of University B, the types of data students are willing to share are sorted from less intrusive to more intrusive (writing, keyboard keystrokes, voice samples, and face data samples). University A students were more confident that their personal data was being treated properly and indicated a higher trust in the TeSLA tool(s) they used. These results are supported by Okada et al. (2018). It is cited that students have affirmative acceptance and trust in e-authentication for online assessments. They also mentioned that e-authentication has the potential to enhance the quality and trustworthiness of online assessments.

Regarding the students' experiences on using TeSLA system (RQ2), University A students generally have more positive attitudes and opinions towards the TeSLA system and its tools than students from the other two universities. University C students are generally those expressing less positive opinions. This difference may be due to the difference among the modes of learning in the universities; as University A is an online university, students at University A may be more familiar with using online systems when compared with other universities. Thus, it can be concluded that the mode of learning may have an influence on the perspectives and experiences of students in using authentication and authorship systems. In a similar way, University A students seem more satisfied with TeSLA experience and agree more that the system was easy to use.

Also, the University A students have more positive attitudes/opinions towards TeSLA tools than University C students. For example, they tend to think that they are easy to use and they express higher willingness to use them in the future. Also, as previously explained, University C students agree more that using the tools took too much time, and they experienced some workload. Just a few students from University B tested the tools, except for the face recognition. It is worth mentioning that TeSLA system was under development during the project, meaning that students tested a beta version of the system. It is expected that in the future the feeling of workload can be reduced.

Wrapping up, results suggest that the educational context of each university is relevant. In spite of all students recognise the potential of TeSLA system in ensuring authentication and authorship, University A students express more positive opinions. This is probably related to the fact that this institution offers only online courses. Furthermore, its student profile is a person with family and professional commitments, this is why they are older than the average age of the other institutions. In addition, University A has detected an increasing number of students living abroad. For them, avoiding face-to-face examinations at the end of the semester means saving time, and to have a guarantee that their efforts can be trusted by quality assurance agencies and society at large. University B students have expressed positive opinions as a result of their participation in the pilot. This is consistent with the fact that this institution is incorporating blended courses to its educational offer.

## 5. CONCLUSIONS

The aim of the study presented in this paper has been to investigate students' expectations and experiences on using a system (the TeSLA system) that helps to ensure students' authentication and authorship in a real educational setting. In order to have a broad view, the study considers three universities with different educational contexts, which reflects the deep transformation that higher education institutions have suffered since the incorporation of the information and communication technologies into the teaching-learning process.

While e-learning is widely accepted and extended, on-site final examinations continue being the most usual instrument to assess learners and to ensure their identity. However, this is not aligned with the common principles which characterise e-learning, for instance, flexibility, mobility or accessibility. Assessment should not be a limiting factor in e-learning, on the contrary, e-assessment should facilitate the principles cited above. E-assessment could be considered a beneficial alternative to the traditional assessment. However, in relation to being considered trustworthy, not everyone agrees with this statement. It could be achieved that there is a strong correlation with trust and being sustained to the usage of e-assessment tools (Rolim & Isaias, 2019).

The use of tools oriented to ensure authorship and authentication, and the integration of these tools into the assessment process according to pedagogical criteria is a matter of interest in the field of technology enhanced learning, thus contributing that e-assessment could be considered a beneficial alternative to the traditional assessment. The development of systems as TeSLA system, clearly constitutes a step forward in this direction. Nevertheless, the use of this kind of systems requires the commitment of all involved stakeholders: faculty boards, teachers, students and quality assurance agencies. This paper presents and discusses the main findings concerning the expectations and experiences of the first class beneficiaries of this kind of systems, the students.

In this study, there were significant differences in opinions between institutions, which were conducted with students from institutions with three different cultures in three different countries. This situation has been tried to be interpreted for various reasons. Furthermore, it may be meaningful to focus on cultural differences to understand the rationale for this variation. Aparicio, Bacao, and Oliveira (2016) also emphasized that the culture variable should be taken into consideration in the studies since the effect of cultural diversity on the sense of satisfaction and acceptance is essential. The transformation of cultural values is quite complicated, and eliminating cultural differences is one of the most challenging situations to achieve while using e-learning tools (Carless, 2005). However, recognizing the cultural and social effects during the implementation of e-learning tools (Tarhini, Hone, Liu, & Tarhini, 2017), will allow being more sensitive to changes (Tapanes, Smith, & White, 2009). Therefore, future research may also consider the cultural differences dimension to investigate the acceptance of e-learning tools, such as e-assessment.

**Research and Publication Ethics Statement**

The authors declare that this study has been conducted in accordance with research and publication ethics rules. The authors further declare that they have not submitted this article to any other journal for publication before.

**Contribution Rates of Authors to the Article**

The authors contributed to the manuscript equally.

**Support Statement**

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**Statement of Interest**

The authors declare that there is no conflict of interest.

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# Üniversite Öğrencilerinin Web Tabanlı Biçimlendirmeye Yönelik Değerlendirme Sistemini Kabul Durumlarının İncelenmesi

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**ÖZET**

Bu araştırmada, öğrencilerin biçimlendirmeye yönelik değerlendirmelerinin yapılabileceği bir "Web Tabanlı Biçimlendirmeye Yönelik Değerlendirme (WTBYD)" sistemi geliştirilmiştir. Bu sistem, öğrencilerin performanslarına yönelik madde bazında ayrıntılandırılmıştır ve test bazında ölçüt-referanslı anlık dönütler sağlamaktadır. Çalışmada, öğrencilerin geliştirilen WTBYD'yi kabul durumlarının incelenmesi amaçlanmıştır. Araştırma ters-yüz öğrenme modeli yaklaşımı ile işlenen Bilgisayar I dersi kapsamında 381 üniversite öğrencisi üzerinde gerçekleştirilmiştir. Araştırmanın uygulama süreci 12 hafta sürmüş olup, her haftanın sonunda öğrenciler WTBYD'ye katılmıştır. Araştırma verileri web tabanlı değerlendirme sistemini kabul ölçeği ile toplanmıştır. Araştırma bulguları WTBYD'yi kabul yapısının; yarar algısı, kullanım kolaylığı, bilgisayar öz-yeterliği, sosyal etki, içerik algısı, beğenme durumu, ilgi durumu ve kullanım niyeti bileşenlerinden oluştuğu görülmüştür. Araştırmadan elde edilen bulgular doğrultusunda WTBYD'yi geliştirme ve kullanma noktasında öğretmenlere, öğretim tasarımcılarına, karar vericilere ve araştırmacılara çeşitli önerilerde bulunulmuştur.

**Anahtar Sözcükler:** Anlık dönüt, web tabanlı biçimlendirmeye yönelik değerlendirme, kabul durumları

# Examining University Students' Acceptance of Web-based Formative Assessment System

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**ABSTRACT**

In this research, a Web-based Formative Assessment System (WBFAS) was developed for students to support their formative assessment on their learning experiences. The system provides students with instant feedback which is detailed based on items and criteria-referenced based on tests. The present research aims to examine students' acceptance of WBFAS. The research was conducted on 381 university students who are enrolled in Computer I course designed with Flipped Classroom model. The implementation of the research lasted 12 weeks, and at the end of each week students participated in WBFAS. The data of the research were obtained with the scale of acceptance of web-based assessment system. It has been found that the structure of acceptance of WBFAS was consisted of elements of computer self-efficacy, ease of use, social influence, perceived content, state of enjoyment, state of interest, perceived usefulness and usage intention. Based on the findings derived from the research, several suggestions were proposed for teachers, instructional designers, decision-makers and researchers regarding the development and use of WBFAS.

**Keywords:** Web-based formative assessment, instant feedback, acceptance

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## 1. INTRODUCTION

Today, in line with the developments in digital technologies, the amount of information has been growing rapidly, and individuals and societies have been experiencing a digital transformation. It is important that today's learners -as expressed as

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the learners of 21st century- could adapt to the changing conditions of society and life. In this sense, the knowledge and abilities such as technological literacy, problem solving skills, creativity, critical thinking, interpersonal skills, leadership, cognitive flexibility are seen as fundamental proficiencies today (Care, 2018; World Economic Forum, 2016).

The digital transformation which is experienced at individual and social terms together with the developments in information and communication technologies affects education. Accordingly, learning process and environments have begun to be designed based on digital technologies and 21st century learner abilities. In this respect, in the recent years, the studies on web-based assessment approaches and systems have been accelerated (McCarthy, 2017; McLaughlin, & Yan, 2017; Hooshyar et al., 2016). This assessment approach, called as web-based formative assessment system (WBFAS), is applied using web-based tools and systems in the instruction process. In this approach, by identifying learning inadequacies/difficulties/mistakes of the students it is aimed at taking precautions to prevent these undesired experiences. In WBFAS, it can be ensured that students are enabled to review their learning process by giving them instant and detailed feedback. This, at the same time, facilitates individualization of instruction. Students have the opportunity to participate in WBFAS whenever and wherever they want. So, this creates a facility for flexible learning.

WBFAS could be useful for understanding the learning process and outputs of learners. However, one of the important factors affecting whether this type of assessment approaches reach their aim is related to what extent students accept WBFAS approach. It is seen that there are only a few studies on acceptance and use of WBFAS in the literature. Different from existing studies, in the present research, a WBFAS system where students receive feedback which is detailed based on items and criteria-referenced based on tests is developed. Within the scope of the research, student's level of acceptance of this system is analyzed. In this manner, this research has a unique value, and it is thought that findings obtained from this research will improve the flow and depth of the research with respect to the design and use of WBFAS systems.

## 1.1. Theoretical Background

### *1.1.1. Self-assessment, web-based formative assessment and feedback*

Formative assessment are the evaluations which are performed any time during the instruction process and which provide feedback to the learner to improve learning (Sadler, 1989). This assessment type is mostly used by teachers to give feedback to the students during the learning process. The results obtained from the formative assessment can be used to improve student success and make changes in the instruction process and strategies (Dunn & Mulvenon, 2009). Formative assessment enables a student to observe his/her learning process.

WBFAS is an assessment in which feedback is provided automatically and instantly to the learner through web-based system and tools. WBFAS can be differentiated from traditional formative assessment applications with regard to aspects that WBFAS can be applied at any time and place desired, provide instant feedback to the student, the assessment can be individualized and WBFAS can be repeated as much as wanted. WBFAS can be used for objectives such as ensuring student's participation in the online learning process, increasing student's motivation, allowing the student to monitor and assess his/herself. And this is of importance and value with regards to enabling individualization of instruction. There has been an increasing interest in WBFAS in recent years in terms of enabling individualized instruction, targeting constant development of students and handling student's assessment with an integrative manner throughout the process.

In the literature, there are different tools and methods used for WBFAS. The methods such as game-based assessment, peer assessment, e-portfolio creation, online discussions and cooperative assessment are used in this process (Gikandi et al., 2011; Hooshyar et al., 2016; McLaughlin & Yan, 2017). Furthermore, one of the most preferred methods in formative assessment is self-assessment. Self-assessment is a process that learner assesses how much he/she learned something based on his/her criteria and makes a judgement. (Leach, 2012). Web-based self-assessment is an assessment where students can test themselves to make a valid and reliable judgement about their level of knowledge and ability, and one or several supportive activities such as graded scoring keys can be found. The main objective of self-assessment is to allow learners to determine strong and weak aspects of their performance and enhance their learning (McMilllan, 2007). Thus, self-assessment has a crucial role in formative-based assessment (Andrade & Valtcheva, 2009). The keyword for effective self-assessment is feedback.

Feedback is a special explanation to give information regarding a specific study of the learner (Brookhart, 2008). It is anticipated that feedback is used by instructors to format the instruction and by learners to format their own learning process (Black & Wiliam, 2009). Feedback gives the information about at which level the learner is in the process of formative-based assessment and what the learner needs to know. Feedback initiates the motivation factor by developing the control sense of the learners on their own learning (Brookhart, 2008). Furthermore, it is stated that there is a correlation between the regular feedbacks provided on learner's academic performance and the progress of his/her next academic performance (Tuckman, 1999).

It has been remarked that formative-based assessment done to form the instruction attracts little interest, especially in a traditional learning environment, although it is continuously emphasized that it significantly contributes to the learning-instructing process (Pachler et al., 2010; Wang, Wang, & Huang, 2008). Because, in traditional formative assessment, providing personalized feedback is a process that requires time-consuming and serious efforts (Cukusic, Garaca, & Jadric, 2014).

Moreover, constrains such as the time limit in the curriculum and crowded classrooms can also be obstacles. On the other hand, especially assessment practices in web-based/technology-based formative assessment has advantages in providing instant and adaptable feedback to the learners. The learners can participate in formative assessment activities in flexible time and location and can do self-assessment by obtaining feedback. In the present study, WBFAS in the form of multiple-choice tests on the topics of that each week are conducted to the learners at the end of the week. In these tests, by applying formative assessment where learners can receive feedback, which is detailed based on items and criteria-referenced based on tests, it is aimed that learners can do self-assessment.

### *1.1.2. Web-based formative assessment acceptance*

Technology Acceptance Models (Davis, 1989) could be utilized for examining structures affecting acceptance and adoption of an emerged technology by the target group. Terzis and Economides (2011) remark that the acceptance of learners is essential in order to acquire expected benefits from formative-based assessment systems. Accordingly, Terzis and Economides (2011) revealed an acceptance model in order to present learners' behaviour on web-based assessment (CBA) use and intention towards technology acceptance models.

There are eight factors in this model that are developed to identify learners' intentions to use CBA systems. These factors are perceived enjoyment, "perceived usefulness, perceived ease of use, perceived computer self-efficacy", social influence, facilitative conditions, goal expectancy, and content in order (Yurdugül & Bayrak, 2014, p. 184). Perceived usefulness is the level of belief towards that learners' use of assessment system improves their performance. Perceived ease of use refers to learners' belief towards using the system with less effort (Davis, 1989). Computer self-efficacy is learners' belief towards their abilities on computer use (Compeau & Higgins, 1995). Social influence refers to the effect of immediate surroundings (teacher, manager, parents, peer, etc.) on learner's behavior and beliefs (Terzis & Economides, 2011). Content is explained as the relation of the questions in the assessment system with the content of the subject (Terzis & Economides, 2011).

It is important to understand why a tool and/or learning environment designed for instruction is adopted or not since the goal is actually not only to create the tool and learning environment but also to ensure their use and sustainability (Usluel & Mazman, 2010). Drawing on this, learners' acceptance status of WBFAS developed is analyzed within the scope of the research.

## 1.2. Literature Review

In their research, Karay et al. (2012) compared the effect of CBA and paper-based assessment methods on the acceptance of formative assessment. As a result of a research study carried with medicine students, no difference was observed on the general acceptance of two types of assessment on pre-clinic phase of medicine education. However, in the clinic phase, a significant difference was observed in favor of CBA. As a result of the research, it is stated that providing immediate feedback could increase the acceptance of CBA. In their study, Terzis and Economides (2011) studied the effect of gender on the acceptance of CBA. The results of the research showed that the factors of perceived ease of use and perceived playfulness are essential for women on acceptance. On the other hand, perceived playfulness and perceived usefulness are the most crucial aspects for men. This shows that in the condition where the content of CBA is clear and enjoyable, the acceptance level could be high. In their research, Terzis et al. (2012) analyzed the effect of student's personality aspects on CBA acceptance. As a result, students' personality traits are found effective on acceptance.

In the research of Terzis et al. (2012, p. 718), the effect of emotional feedback on CBA acceptance was studied. It was observed that emotional feedback has a direct effect on Behavioral Use Intention". It was determined that "emotional feedback has effect on playfulness, benefit and ease of use. In their research, Terzis et al. (2012) analyzed the factors effective on students' CBA continuance acceptance. The results of the research showed that ease of use and enjoyment factors are effective on CBA's continuance acceptance. In their research, Terzis et al. (2013) compared the difference between cross-cultural issues in CBA acceptance. In this context, they compared the students' CBA acceptance in Greece and Mexico. The results of the research show that the structure of CBA acceptance is valid for both cultures and "Greek students' behavioral intention is triggered mainly by Perceived Playfulness and Perceived Ease of Use, while Mexican students' behavioral intention is caused by Perceived Playfulness and Perceived Usefulness" (Terzis et al., 2013, p.411).

Lin and Lai (2019) analyzed the effect of self-arrangement on CBA acceptance model factors. In the results of study, it is noted that perceived performance expectancy and social influence considerably affect CBA acceptance. The effort expectancy of the students who have low self-arrangement abilities has significantly higher level of effect on behavioral intention compared to the students who have high self-arrangement abilities. Furthermore, it is noticed that the students who have high self-arrangement skills are significantly effective on CBA behavioral intention.

## 1.3. Problem

In the literature, there are several research studies regarding students' acceptance towards CBA. In these studies, researchers have attempted to put forward a model in order to identify the general acceptance of students. Also, in some studies, it is seen that acceptance cases are compared in terms of several variables such as self-arrangement. However, there is a gap in the

literature on how different feedback types, such as immediate feedback has an effect on CBA acceptance (Karay et al., 2012; Terzis et al., 2012). In addition, it is observed that today WYBYD has begun to be utilized with the widespread use of web-based tools. Nevertheless, when the literature is analyzed, it is observed that research findings on the acceptance of WBFAS are needed. Accordingly, in the present study, a WBFAS system is developed where university students can perform their formative self-assessment and receive feedback, which is detailed based on items and criteria-referenced based on tests. In this research, students' acceptance of WBFAS is analyzed.

## 2. METHOD

Quantitative method was used in the present study. Descriptive methodology was used to explore the status of the students' acceptance and use of WBFAS.

### 2.1. Participants

The participants of the research consisted of 381 undergraduate students studying in a Turkish public university enrolled in Computer I course. The students took their Computer I course according to FC model. At the end of each week, students participated in formative assessment with regard to the topic of the week in a learning management system. Students were from the departments of Turkish Language and Literature, Contemporary Turkish Dialects and Literature, History, Turkish Language Education, Elementary Mathematics Education, Political Science, and Public Administration. 134 of students (35.2%) are male and 247 of them (64.8%) are female. Students participated voluntarily. The ages of the students vary between 18 and 25.

### 2.2. Data Collection Tools

The data of this research was collected from a personal data collection form and a web-based assessment system acceptance scale.

#### *2.2.1. Personal data collection form*

The form was developed by the researchers of the present study. In the form, several questions regarding demographic information of the participants such as gender, department and age are addressed.

#### *2.2.2. Web-based assessment system acceptance scale*

The scale developed by Yurdugül and Bayrak (2014) and revised by Alır (2015) is used in order to identify the students' web-based assessment acceptance. The scale consists of eight dimensions which are "perceived usefulness, perceived ease of use, computer self-efficacy, social influence" (Terzis & Economides, 2011a, p. 1032), perceived relationship with the course content, perceived enjoyment, interest and behavioral intention. 5-point likert scale ranks from 'I don't agree' (1) and 'I totally agree' (5). The Cronbach Alfa confidence values of scale factors which are re-calculated for this research range from .82 to .91. The high score obtained from the scale indicates that students have high acceptance status for WBFAS.

Whether the scale data demonstrates normal distribution or not was examined and it was observed that the data distribute within the range of +1 to -1. Hence, it was seen that the data shows normal distribution. KMO (Kaiser-Meyer-Olkin) coefficient and Bartlett Sphericity test were used to ensure the sample and data are suitable for factor analysis. According to Hair et al. (1998), it is noted that if KMO is higher than .060 and Bartlett test is significant, then data is suitable for factor analysis. KMO coefficient was calculated as .87 for web-based assessment system acceptance scale. It is determined that since the value is higher than .60, the data is suitable for factor analysis. The Bartlett test for the scales was meaningful ($p<0.05$). Thus, the questionnaires were deemed suitable for factor analysis.

### 2.3. Web-based Assessment Environment and Study Process

The research was carried out in Computer I course, which was designed according to Flipped Classroom (FC) model. In accordance with the FC model, the first stage of the course was delivered online. Moodle, a learning management system (LMS), was used as a learning environment in the research. Online courses were held in Moodle LMS. The researchers were asked to upload the videos of the week on the LMS to let the students prepare for the topics. In accordance with the FC model, the second stage of the course was delivered face to face in the computer laboratory. Students practiced applications on the subjects in the computer lab. At the end of the relevant week, students conducted formative assessment application over LMS. The learning process proceeded in a similar way over the course of 12 weeks. Within the scope of the course, students learned about basic computer hardware, operating systems, word processor, presentation and spreadsheet software. The formative assessment application was prepared using Moodle's quiz tool. The screenshot of the WBFAS system is presented in Figure 1.

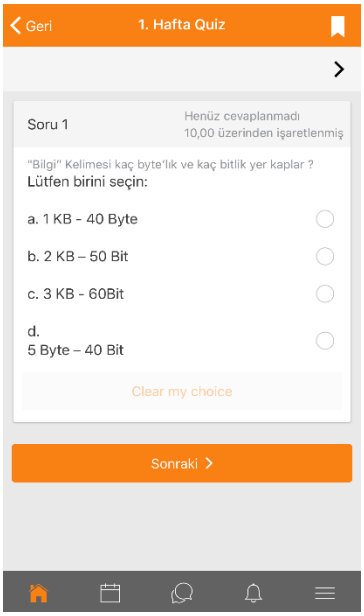

Figure 1. Screenshot of WBFAS

The exam was prepared in the form of multiple-choice test. A quiz consisting of 30 questions was prepared every week. Feedback was provided to each distracter question. When the student answered the question incorrect, an explanatory feedback was provided instantly to clarify why his or her answer was wrong. Thus, the student could see which subjects he/she is lacking. When the student completes the exam, a report showing which questions the student answers correct and which ones wrong, what score the student gets from the exam is presented to the student. The aim in the formative assessment is to enable the students to review their learning process, then discover and correct what he or she knows incorrect and missing. In this manner, it is designed in a way that the students can re-take formative assessment as much as they want. The students can practice the exam whenever and wherever they want and there is no time-limit for the exam practice. The students can answer the questions by contemplating on them as much as they want. In other words, whenever the students sit for the exam, the order of the questions are randomly assigned.

### 2.4. Data Analysis

Data set of the research was analyzed in terms of suitability for the factor analysis. For this purpose, the data set was analyzed with regards to sample size, normality, linearity and multiple-linearity, and it was found that data set was suitable for factor analysis.

## 3. FINDINGS

### 3.1. Acceptance of WBFAS

Students' acceptance status of WBFAS system was analyzed in accordance with the goal of the research. For this purpose, primarily, descriptive statistics related to the factors in the web-based assessment system acceptance structure were calculated. The findings are shown in Table 1.

Table 1.
*Results for the Measurement Model*

| Construct items | Mean | Standard deviation | Factor loading (>0.7) | Cronbach a (>0.7) | Composite reliability (>0.7) | Average variance extracted (>0.5) |
|---|---|---|---|---|---|---|
| Perceived Usefulness | 11.09 | 2.82 | | 0.921 | 0.90 | 0.75 |
| Item1 | | | 0.901 | | | |
| Item2 | | | 0.860 | | | |
| Item3 | | | 0.841 | | | |
| Perceived Ease of Use | 11.53 | 2.90 | | 0.910 | 0.94 | 0.85 |
| Item1 | | | 0.931 | | | |
| Item2 | | | 0.916 | | | |
| Item3 | | | 0.921 | | | |
| Computer Self-Efficacy | 11.49 | 2.67 | | 0.878 | 0.92 | 0.80 |
| Item1 | | | 0.919 | | | |
| Item2 | | | 0.902 | | | |
| Item3 | | | 0.870 | | | |
| Social Influence | 11.06 | 2.65 | | 0.816 | 0.89 | 0.73 |
| Item1 | | | 0.867 | | | |
| Item2 | | | 0.828 | | | |
| Item3 | | | 0.869 | | | |
| Content | 11.31 | 2.63 | | 0.857 | 0.91 | 0.77 |
| Item1 | | | 0.870 | | | |
| Item2 | | | 0.890 | | | |
| Item3 | | | 0.887 | | | |
| Enjoyment | 7.20 | 2.02 | | 0.879 | 0.94 | 0.89 |
| Item1 | | | 0.945 | | | |
| Item2 | | | 0.945 | | | |
| Interest | 7.25 | 1.98 | | 0.877 | 0.94 | 0.89 |
| Item1 | | | 0.944 | | | |
| Item2 | | | 0.944 | | | |
| Behavioral Intention | 10.48 | 3.10 | | 0.922 | 0.95 | 0.86 |
| Item1 | | | 0.917 | | | |
| Item2 | | | 0.930 | | | |
| Item3 | | | 0.944 | | | |

On looking at Table 1, it is seen that the values of Factor loading, Cronbach a, Composite Reliability, and Average Variance Extracted are over the threshold levels. In other words, it could be said that validity and reliability of factors and factor items are acceptable. The correlation values between the factors in the model are presented in Table 2.

Table 2.
*Correlation Values between the Factors in the Model*

| | | Perceived Usefulness | Perceived Ease of Use | Computer Self-Efficacy | Social Influence | Content | Enjoyment | Interest | Behavioral Intention |
|---|---|---|---|---|---|---|---|---|---|
| Perceived Usefulness | r | 1 | | | | | | | |
| Perceived Ease of Use | r | .757** | 1 | | | | | | |
| Computer Self-Efficacy | r | .695** | .812** | 1 | | | | | |
| Social Influence | r | .799** | .767** | .736** | 1 | | | | |
| Content | r | .809** | .753** | .728** | .819** | 1 | | | |
| Enjoyment | r | .775** | .716** | .698** | .764** | .749** | 1 | | |
| Interest | r | .789** | .667** | .676** | .765** | .775** | .859** | 1 | |
| Behavioral Intention | r | .735** | .613** | .615** | .735** | .687** | .809** | .839** | 1 |

**. Correlation is significant at the 0.01 level (2-tailed).

On looking at Table 2, correlation values between scale structures vary between .613 and .859. According to Pallant (2001), the situation when correlation values are r = .10 to .29 shows small, when r = .30 to .49 shows moderate and when r = .50 to 1.0 shows strong relationship. The structural patterns as part of the acceptance model established by Terzis and Economides (2011) are given in Figure 2.

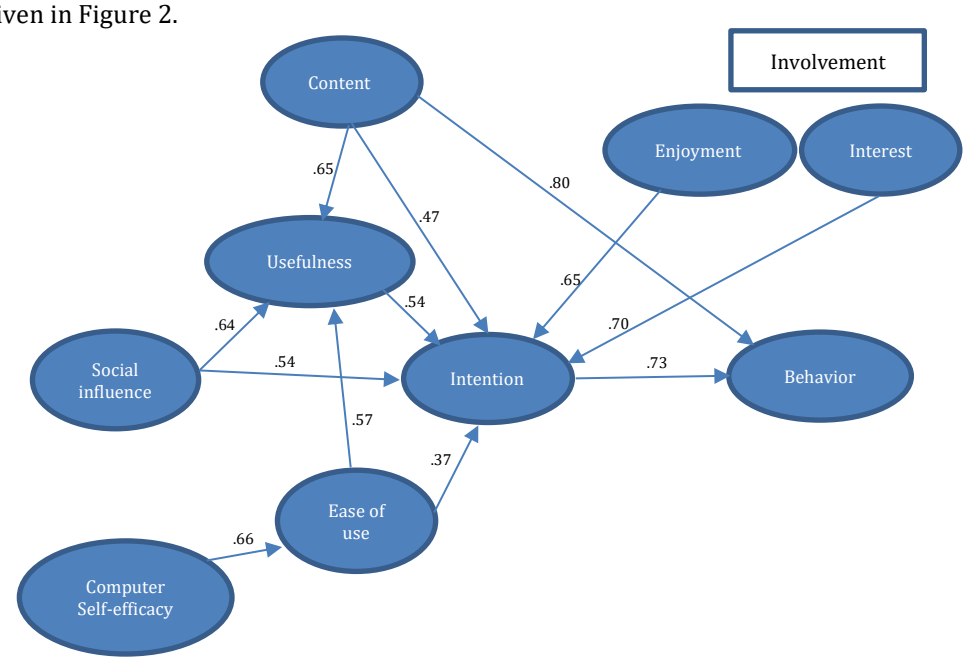


Figure 2. The pattern and parameter estimates of web-based formative assessment acceptance model

The estimate values obtained in Figure 2 are statistically significant at 0.05 level. Accordingly, it is found that all effects specified in the model that are put forward for students' formative assessment are statistically significant. These estimate values are constructed and presented in Table 3 based on the results of path analysis.

Table 3.
*The Parameter Values and Trial Results of Web-based Formative Assessment Acceptance Model*

| Affecting Variable | | Affected Variable | $R^2$ | Result |
|---|---|---|---|---|
| Perceived ease of use | → | Behavioral Intention | 0.37* | Has effect |
| Perceived Usefulness | → | Behavioral Intention | 0.54* | Has effect |
| Social influence | → | Behavioral Intention | 0.73* | Has effect |
| Content | → | Behavioral Intention | 0.47* | Has effect |
| Enjoyment | → | Behavioral Intention | 0.65* | Has effect |
| Interest | → | Behavioral Intention | 0.70* | Has effect |
| Perceived ease of use | → | Perceived usefulness | 0.57* | Has effect |
| Content | → | Perceived usefulness | 0.65* | Has effect |
| Social influence | → | Perceived usefulness | 0.64* | Has effect |
| Computer self-efficacy | → | Perceived Ease of Use | 0.66* | Has effect |

As given in Table 3, it is found that social influence variables (such as family, teacher and peer guidance) has the most effect (b=0.73; P≤0.05) over the learners' use of intention of WBFAS. Next, it was observed that interest in the system (b=0.70; P≤0.05) and the state of the enjoyment by the system (b=0.65; P≤0.05) respectively have the most effect. It was observed that the perceived usefulness (b=0.54; P≤0.05) that students get by using the system has fourth most effect over intention. It is also noted that the fact that students see the system contents as important (b=0.47; P≤0.05) and find the use of system easy (b=0.37; P≤0.05) are other important factors affecting the intention of students on the use of system.

It is possible to assert that what affects the perceived usefulness towards the use of WBFAS would be an important finding in acceptance model. It was observed that the most important variable that is effective over the perceived usefulness that use of system would provide to the students was perceived relationship with the course content (b=0.65; P≤0.05). It was also observed that a further factor that is significant over perceived usefulness is social influence (b=0.64; P≤0.05) variable (such as family, teacher and peer guidance). Easiness to use the system (b=0.57; P≤0.05) is another factor effective over the perceived usefulness of students. The fact that students' having a high level of computer self-efficacy (b=0.66; P≤0.05) indicates that the system could be used more easily by the students.

It was observed that the most important factor effective over the attitude of students towards the use of system was social influence (b=0.82; P≤0.05). Therefore, recommendation of people who are close to the students such as a family, a teacher and a peer towards using the system is important. As perceived content, the situation that the question contents/feedback in the system are deemed important and beneficial (b=0.80; P≤0.05) by the students significantly affects the attitude of students towards the use of system. A further factor effective on the attitude of students towards the use of system is intention of use (b=0.73; P≤0.05). Accordingly, if students significantly have an intention to use the system, then their intention could considerably be observed in their behaviors to use.

## 4. DISCUSSION AND CONCLUSION

In this research, a WBFAS was designed for students so that they can do a formative assessment on their learning experience in Computer I course. In the system where WBFAS is used, students can receive feedback which is detailed based on items and criteria-referenced based on tests regarding their performance. Within the scope of the research, factors affecting behavioral intentions of the students towards the use of WBFAS were analyzed. The results are presented as follow.

The findings of the research reveal that the relations among perceived usefulness, perceived ease of use, computer self-efficacy, social influence, perceived relationship with the course content, enjoyment, interest and behavioral intention dimensions that were situated in WBFAS acceptance model are at high level. Based on the results of the research;

- The factors effective on behavioral intention are identified as social influence, enjoyment, interest, perceived usefulness, perceived content, and perceived ease of use.
- The factors effective on perceived usefulness are identified as perceived content, social influence, and perceived ease of use.
- The factor effective on perceived ease of use is identified as computer self-efficacy.

It is observed that the most important factor which is effective on behavioral intention is social influence. Consequently, social factors have critical role on enabling students to develop their acceptance and use of WBFAS. Peers of students and teachers act as the social determinants. Behavioral examples, attitudes, intentions, recommendations and advices of peers and teachers towards the use of WBFAS are influential on other students' use of WBFAS. Accordingly, favourable social factors will also develop behavioral intention of students. Mazman, Usluel and Çevik (2009) explain that social influence affects directly or indirectly the intention of use and emphasize that peer influence is significant.

A further factor effective on behavioral intention is interest. Boosting interest of the students towards WBFAS will affirmatively affect the behavioral intention towards the use of WBFAS. In this sense, it is important to develop an interface and contents that can attract the attention of the students while designing WBFAS system. These are the components aiming at enhancing the interaction between student-content and student-interface. Improving the interaction between student-content and student-interface will also favourably affect the students' state of enjoyment from the system of WBFAS. Enjoyment is another factor effective over behavioral intention. It is considered that the results of the present research are consistent with the literature. In some studies, it is observed that enjoyment and interest factors are dealt under the perceived playfulness. According to the results of the research, it is found that perceived playfulness is one of the factors affecting behavioral intention (Moon & Kim, 2001; Terzis & Economides, 2011a; Wang et al., 2009).

The fact that WBFAS system supports the perceived usefulness of the students is important over the development of behavioral intentions. In this manner, in order to improve the perceived usefulness of students, it is necessary that the feedback regarding formative assessment questions and question choices in the system contribute to the learning process of the students, allowing them to learn new matters and to realize their learning deficiencies. Furthermore, it is crucial that questions are associated with the topic content of relevant week. Therefore, it is critical to pay attention to these issues with regard to the design of questions and feedback. These, at the same time, will improve positively the perceived content of the students. The more perceived content of the students is supported, the more behavioral intention is supported. In other words, it is observed that perceived content affects positively the behavioral intention in CBA, as the results of the present research confirms (Terzis & Economides, 2011a; Terzis et al., 2013; Nikou & Economides, 2017b).

A further factor affecting behavioral intention is the ease of use. The research shows that perceived ease of use is effective on the intention of use of CBA system (Terzis & Economides, 2011a; Terzis, Moridis, & Economides, 2013; Terzis, Moridis, Economides & Mendez, 2013; Nikou & Economides, 2017a, 2017b). Similarly, in the present research it is found that the ease of use of WBFAS system affects behavioral intention. It is important that the use of WBFAS system should be easy. The fact that system can work properly with different hardware such as desktop computer, tablet, and smartphones and that the design of interface is efficient, productive and attractive will increase the ease of use. As a matter of fact confirming this finding, Nikou and Economides (2017b) concluded that the user interface affects the ease of use.

The factors effective on students' perceived usefulness towards WBFAS system are identified as perceived content and social influence. In this sense, the fact that use of interface is easy, design of the content is efficient (questions and feedback), and the peer and teachers of the students provide affirmative opinion and guidance regarding the use of system will increase the perceived usefulness of the system. These are, at the same time, the factors affecting behavioral intention. In the research of Terzis and Economides (2011a), it is seen that perceived content is one of factors effective over perceived usefulness. In their research, Nikou and Economides (2019) concluded that the elements (perceived content, ease of use etc.) associated with output quality which is specified as instructional design factors are effective on perceived usefulness.

Students' having high level of computer self-efficacy is a factor ensuring the perceived ease of use with regard to the use of WBFAS system. Therefore, it is important that teachers who want to utilize similar applications in the education process should support students' computer self-efficacy. In their research, Terzis et al. (2013) concluded that computer self-efficacy is effective on perceived ease of use. In their research, Nikou and Economides (2017b, 2019) found that students' computer self-efficacy on mobile learning is effective over perceived ease of use.

The present research is carried out with undergraduate students who are taking Computer I course. By doing similar studies in different subjects/courses, the results can be compared. In a similar way, by carrying out a similar study with the groups such as students in secondary school or high school, the results of the model with regard to the age factor can be compared. Along with the students, it is also important to analyze behaviors of the teachers on the acceptance and use of WBFAS systems since the teachers have a critical role in students' behaviors on use under the social effect condition. Finally, with the variables which are likely to affect the attitude of educational components on use of WBFAS system such as computer literacy, computer anxiety, attitude, and gender, the learners' attitude on acceptance and use of WBFAS system could be examined.

**Research and Publication Ethics Statement**

Subjects of the research voluntary participated to the study. Name of the participants were kept anonymous.

**Contribution Rates of Authors to the Article**

Authors equally contributed to the article.

**Statement of Interest**

The authors of the present article declare that there is no conflict of interest.

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## 6. GENİŞ ÖZET

Bu araştırmada, üniversite öğrencilerinin biçimlendirmeye yönelik değerlendirme yapabilecekleri ve ortaya koydukları performanslarına ilişkin bir Web Tabanlı Biçimlendirmeye Yönelik Değerlendirme (WTBYD) sistemi tasarlanmıştır. Araştırmada, öğrencilerin bu sistemi kabul ve kullanma durumları incelenmiştir.

WTBYD'in istenilen yer ve zamanda uygulanabilmesi, öğrenciye anlık dönüt sağlaması, değerlendirmenin bireyselleştirilmesi, istenildiği kadar tekrarlanabilmesi açısından geleneksel biçimlendirici değerlendirme uygulamalarından farklılaşabilmektedir. WTBYD öğrencinin online öğrenme sürecine olan katılımını sağlamak, motivasyonunu artırmak, öğrencinin kendini izlemesine ve değerlendirmesine olanak tanımak gibi amaçlar için kullanılabilmektedir. WTBYD sonucunda öğrenciye özgü öneriler yapılabilmektedir. Bu da öğretimin bireyselleştirilmesini sağlaması adına önem ve değer taşımaktadır. Bireyselleştirilmiş öğretime olanak tanıması, öğrencinin sürekli gelişmesini hedeflemesi ve öğrencinin değerlendirilmesini bir süreç boyunca bütüncül olarak ele alması açısından son yıllarda WTBYD'e yönelik artan bir ilgi söz konusudur.

Bu çalışmada, öğrencilerin bu sistemi kabul ve kullanma durumları araştırılmıştır. Ortaya çıkan yeni bir teknolojinin hedef kitle tarafından benimsenmesini ve kabulünü etkileyen yapıların incelenmesi Teknoloji Kabul Modelleri yardımıyla gerçekleştirilmektedir (Davis, 1989). Terzis ve Economides (2011) biçimlendirmeye yönelik değerlendirme sistemlerinden beklenen faydanın alınabilmesinde öğrenenlerin kabul durumlarının önemli olduğunu belirtmektedir. Bu doğrultuda Terzis ve Economides (2011) teknoloji kabul modelleri doğrultusunda öğrenenlerin bilgisayar tabanlı değerlendirme (CBA) kullanım davranışını ve niyetini ortaya koymak amacıyla bir kabul modeli ortaya koymuştur. Öğrenenlerin CBA sistemlerini kullanma niyetlerinin belirlenmesi amacıyla geliştirilen bu modelde toplam sekiz faktör yer almaktadır. Bu faktörler sırasıyla; algılanan eğlenebilirlik, algılanan yarar, algılanan kullanım kolaylığı, bilgisayar öz-yeterlik algısı, sosyal etki, kolaylaştırıcı koşullar, amaç beklentisi ve içerik faktörleridir (Yurdugul & Bayrak, 2014). Algılanan yarar, öğrenenin değerlendirme sistemini kullanmasının öğrenme sürecindeki performansını geliştireceğine yönelik inanç düzeyidir. Algılanan kullanım kolaylığı, öğrenenin sistemi çaba gerektirmeden kullanabileceğine yönelik inancı olarak tanımlanmaktadır (Davis, 1989). Bilgisayar öz-yeterliği, öğrenenin bilgisayar kullanma becerilerine yönelik inancıdır (Compeau & Higgins, 1995). Sosyal etki öğrenenin davranış ve inançlarına yönelik çevrenin (öğretmen, yönetici, ebeveyn, akran, etc.) etkisi olarak tanımlanmaktadır (Terzis & Economides, 2011). İçerik ise değerlendirme sisteminde yer alan soruların ders içeriğiyle ilişkisi olarak ifade edilmiştir (Terzis & Economides, 2011).

Araştırma Bilgisayar I dersi kapsamında gerçekleştirilmiştir. Öğrencilerin 134'ü (%35.2) erkek, 247'si (%64.8) kadındır. Öğrenciler araştırmaya gönüllü olarak katılmıştır. Öğrencilerin yaşları 18-25 aralığında değişmektedir. Ders kapsamında öğrencilere temel bilgisayar donanımı, işletim sistemleri, kelime işlemci programı, elektronik hesaplama programı, elektronik sunum programı ve İnternet kullanımı konuları ele alınmıştır. Araştırmada öğrenme yönetim sistemi olarak Moodle

kullanılmıştır. Ders konuları haftalık olarak öğrenme yönetim sisteminde öğrencilerin erişimine açılmıştır. Öğrencilerin ders konularına çalışmaları için video ve e-kitap şeklinde ders içerikleri hazırlanmıştır. Ders konuları ve içerikleri ilgili haftanın başında öğrencilerin erişimine açılmıştır. Böylece öğrenciler yüzyüze dersten önce ders konularına çalışabilmiştir. Yüzyüze dersler ise bilgisayar laboratuarında işlenmiştir. Öğrenciler burada ders konuları ile ilgili uygulamalar gerçekleştirmişlerdir. Haftanın sonunda ise öğrenme yönetim sisteminde web tabanlı biçimlendirici değerlendirme sistemi öğrencilerin erişimine açılmıştır.

Web tabanlı biçimlendirici değerlendirme sisteminin amacı öğrencilerin ilgili haftanın konularıyla ilgili kendilerini değerlendirmelerini, performanslarını test etmelerini sağlamaktır. Web tabanlı biçimlendirici değerlendirme sistemi Moodle'ın sınav uygulaması ile geliştirilmiştir. Her hafta konularla ilgili çoktan seçmeli sorulardan oluşan bir biçimlendirici değerlendirme uygulaması hazırlanmıştır. Biçimlendirici değerlendirme sistemi sınav bitiminde öğrencilerin cevapladığı sorularla ilgili doğru ve yanlış cevabı göstermektedir. Ayrıca yanlış cevap seçeneğini işaretleyenler içinde yanlışın olası nedeni ve bu yanlışı gidermek için hangi konuya tekrar bakması gerektiği ile ilgili dönüt ve ipuçları verilmektedir. Söz konusu web tabanlı biçimlendirici değerlendirme sistemi 12 hafta boyunca öğrenciye uygulanmıştır.

Öğrencilerin web tabanlı değerlendirme sistemini kabul durumlarını belirlemek amacıyla Yurdugül ve Bayrak (2014) tarafından geliştirilen Alır (2015) tarafından revize edilen ölçek kullanılmıştır. Web tabanlı değerlendirme sistemi kabul ölçeği; algılanan yarar, algılanan kullanım kolaylığı, bilgisayar öz-yeterliği, sosyal etki, içerik, hoşlanma, ilgi ve davranışsal niyet olmak üzere 8 boyuttan oluşmaktadır.

12 haftalık süreç sonunda söz konusu web tabanlı biçimlendirici değerlendirme sistemi ile ilgili öğrencilerde kabul ve kullanım algısının oluştuğu düşünülmüştür. Bunu belirlemek amacıyla Web Tabanlı Değerlendirme Sistemini Kabul Ölçeği öğrencilere uygulanmıştır. Araştırma verileri 381 üniversite öğrencisinden elde edilmiştir. Öğrencilerin bu sistemi kabul yapısı; yarar algısı, kullanım kolaylığı, bilgisayar öz-yeterliği, sosyal etki, içerik algısı, hoşlanma durumu, ilgi durumu ve kullanım niyeti bileşenlerinden oluşmaktadır. Araştırmadan elde edilen bulgular doğrultusunda üniversite öğrencilerinin web tabanlı biçimlendirici değerlendirme sistemini kabul durumları incelenmiştir. Öğrencilerin geliştirilen biçimlendirici değerlendirme için ortaya konulan modelde belirtilen tüm etkilerin istatistiksel olarak anlamlı olduğu bulunmuştur. Ayrıca, öğrenenlerin web tabanlı biçimlendirici değerlendirme sistemini kullanma niyeti üzerinde sosyal etki değişkeninin (aile, öğretmen ve akran yönlendirmesi gibi) en fazla etkiye ($b=0.73$; $P\leq0.05$) sahip olduğu görülmektedir. Ardından sırasıyla sisteme duyulan ilginin ($b=0.70$; $P\leq0.05$) ve sistemden hoşlanma durumunun ($b=0.65$; $P\leq0.05$) en büyük etkiye sahip olduğu görülmektedir. Öğrencilerin sistemi kullanmaktan elde edecekleri yarar algısının ($b=0.54$; $P\leq0.05$) niyet üzerinde dördüncü büyük etkiye sahip olduğu görülmektedir. Öğrencilerin sistemdeki içeriklerin önemli görmesi ($b=0.47$; $P\leq0.05$) ve sistemin kullanımının kolay olması ($b=0.37$; $P\leq0.05$) öğrencilerin sistemi kullanma niyetlerini etkileyen diğer önemli faktörler olduğu görülmektedir. Web tabanlı biçimlendirici değerlendirme sistemini kullanmaya yönelik yarar algısını nelerin etkilediğinin de kabul modelinde önemli bir bulgu oluşturacağı düşünülmüştür. Sistemi kullanmanın öğrenciye sağlayacağı yarar algısı üzerinde etkili olan en önemli değişkenin içerik algısı ($b=0.65$; $P\leq0.05$) olduğu görülmektedir. Yarar algısı üzerinde önemli olan bir diğer faktör ise sosyal etki ($b=0.64$; $P\leq0.05$) değişkeni (aile, öğretmen ve akran yönlendirmesi gibi) olduğu görülmektedir. Sistemin kullanımının kolay olması ($b=0.57$; $P\leq0.05$) da öğrencilerin yarar algısı üzerinde etkili olan bir diğer faktördür. Öğrencilerin bilgisayar öz-yeterliklerinin gelişmiş olması ($b=0.66$; $P\leq0.05$) sistemin öğrencilerce daha kolay kullanılabileceğini göstermektedir. Öğrencilerin sistemi kullanma davranışı üzerinde etkili olan en önemli faktörün sosyal etki ($b=0.82$; $P\leq0.05$) olduğu görülmektedir. Buna göre öğrencilerin aileleri, öğretmen, akran gibi yakınlarının sistemi kullanmaya yönelik tavsiyeleri önemlidir. İçerik algısı olarak öğrencilerin sistemde yer alan soru içeriklerinin/dönütlerin öğrencilerce önemli görülmesi, işine yarar olması ($b=0.80$; $P\leq0.05$) öğrencilerin sistemi kullanma davranışlarını önemli ölçüde etkilemektedir. Öğrencilerin sistemi kullanma davranışı üzerinde etkili olan diğer faktör ise kullanım niyetidir ($b=0.73$; $P\leq0.05$). Buna göre öğrencilerin niyetlerinin yüksek olması önemli ölçüde kullanma davranışına yansımaktadır.

Araştırmadan elde edilen bulgular doğrultusunda öğretmenler, öğretim tasarımcıları, karar vericiler ve araştırmacılar için çeşitli önerilerde bulunulmuştur.

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# Sınıf Öğretmenlerinin Alternatif Ölçme Değerlendirme Araçlarını Kullanmalarına Yönelik Web Tabanlı Modül Tasarımı ve Değerlendirilmesi*

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**ÖZET**

Bu çalışmada sınıf öğretmenlerinin eğitim öğretim sürecinde alternatif ölçme ve değerlendirme araçlarını kullanabilmelerini sağlayacak web tabanlı bir ölçme değerlendirme sistemi tasarlayıp bu sistemin kullanılabilirliğini incelemek amaçlanmıştır. Araştırma tasarım tabanlı araştırma yaklaşımı ile şekillenmiştir. Araştırmada geliştirilen tasarımın ön uygulama ve ana uygulama süreci 6 gönüllü sınıf öğretmeni ile iki eğitim öğretim sürecinde gerçekleştirilmiştir. Araştırmada ilk olarak sistemin fizibilitesini belirlemek için yönetici modülünden tasarım süreci incelenmiştir. Ardından yarı yapılandırılmış görüşmeler ile sisteme yönelik öğretmen görüşleri alınmıştır. Elde edilen verileri betimsel analize tabi tutulmuştur. Araştırma sonucunda web tabanlı ölçme değerlendirme sisteminin öğretmenleri zamana ve mekâna olan bağlılıktan kurtardığı, öğretmenlere öğrenci dosyalarını çevrim içi ortamda saklama ve değerlendirme fırsatı verdiği görülmüştür. Ayrıca ölçme değerlendirme formlarının sınıfın gelişim ve başarı düzeyi dikkate alınarak öğretmen tarafından hazırlanabilmesine, kullanılmasına, paylaşılmasına, saklanmasına fırsat verdiği görülmüştür. Öte yandan öğrenciyi değerlendirme sürecine kattığı ve velilere geribildirim verdiği görülmüştür.

**Anahtar Sözcükler:** Alternatif ölçme değerlendirme, sınıf öğretmeni, web tabanlı ölçme değerlendirme sistemi, tasarım tabanlı araştırma

# Web Based Module Design and Evaluation for the Classroom Teachers: Alternative Assessment and Evaluation Tools

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**ABSTRACT**

This study aims to determine the applicability of the web-based assessment and evaluation system which designed for classroom teachers to usability. This study employs a design-based research approach. The developed design was realized with 6 class teachers who were volunteers during the two educational period including pre-application and main application. First, the design process was examined to determine the feasibility of the system. Then the opinions of the teachers who used the tool were taken. Semi-structured interviews with teachers were conducted and the data obtained were subjected to descriptive analysis. In case the feasibility of the system was examined through manager module the results of the uncovered that web-based assessment and evaluation system helped classroom teachers become independent from time and space factors, and enable teachers to evaluate and save online records of students' files. Besides, it is seen that it supports teachers in preparing, sharing, and keeping assessment and evaluation forms through considering development and success levels of the students. It is also seen that it involved students into the evaluation process and provided feedback for parents. Finally, it is observed that the web-based assessment and evaluation system removed the problems faced during the use of alternative assessment and evaluation tools and provide for teachers during the application.

**Keywords:** Alternative assessment and evaluation, classroom teacher, web-based assessment and evaluation system, design-based research

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## 1. INTRODUCTION

In Turkey, a comprehensive educational reform was developed between 2004 and 2005 and amendments were introduced to educational programs in line with the theoretical and practical educational approaches around the world (Akınoğlu, 2005). During this process of change, MoNE (2006) adopted the constructivist approach. The essence of this approach is for the learning individual to process and construct knowledge by making use of his/her experiences and thoughts (Özenç & Doğan, 2007). The fact that each individual has different characteristics and experiences that leads to this knowledge construction process to differ. This differentiation also has an impact on the post-learning evaluation. Because the learning process that is based on individual construction requires different types of evaluation that take into account individual differences. Okur and Azar (2011) suggest that students' individual needs, interests, developmental characteristics, styles of learning, learning difficulties and even languages and cultures need to be taken into consideration in an assessment and evaluation activity. This makes it necessary to make use of alternative assessment and evaluation methods along with traditional ones. Because traditional assessment and evaluation methods allow us to identify student's acquirement level of a certain qualification while alternative ones allow us to see which stage in the learning process a student is in (Çoruhlu, Nas & Çepni, 2009).

The application and effectiveness of assessment and evaluation approaches available in curricula depend on the teacher. Because it is the teacher's responsibility to plan the assessment and evaluation process, to make use of the data acquired throughout this process, and to ensure student participation (Özenç, 2013, p.4). Studies on new curricula show that teachers are most anxious about assessment and evaluation (Bal, 2013; Bayrakdar Çiftçi, Akgün & Deniz, 2013; Benzer & Eldem, 2013; Çiftçi, Sünbül & Köksal, 2013). This may be associated with the teacher's ability to use alternative assessment and evaluation tools with the introduction of a new approach. The reason for this could be the fact that teachers are still under the influence of traditional assessment and evaluation approaches (Çakır & Çimer, 2007; Çalık, 2007; Erdal, 2007) or that they lack information on alternative assessment and evaluation approaches (Adanalı, 2008; Çoruhlu, Nas & Çepni, 2009; Okur & Azar, 2011; Sağlam-Arslan, Kaymakçı-Devecioğlu & Arslan, 2009; Yayla, 2011). Another reason is the fact that teachers find it time-consuming (Okur, 2008; Sağlam, 2013; Bayram, 2012; Özeren, 2013).

There are some efforts to encourage the use of alternative assessment and evaluation tools by teachers. For example, an in-service training was delivered to science teachers within the framework of a study conducted by Şenel (2008). Although there was an improvement in the knowledge and skills of teachers, as a result of this training, no significant difference was observed. It is safe to say that in-service training delivered by MoNE have similar results. Teachers attribute this to the inadequacy of in-service training (Anıl & Acar, 2008; Acar & Anıl, 2009; Bal, 2009; Güneş et al. , 2010) Another effort on encouraging the use of alternative assessment and evaluation tools is the development of web-based assessment and evaluation programs. International literature demonstrates that web-based programs for alternative assessment and evaluation tools such as e-portfolio, peer review, rubric development, etc. are being developed (Bartlett, 2002; Dornisch & McLoughlin, 2006; Lin, Liu & Yuan, 2001). There are similar studies (Bacanak, 2008; Çelik, 2006; Çepni et al. , 2012; Çırak, 2015; Şimşek, 2013) in Turkish literature. For instance, the study conducted by Bacanak (2008) showed that a web-based performance evaluation program was designed to help science teachers to prepare performance evaluation forms and this program was able to overcome problems experienced during the use of alternative assessment and evaluation process. However, web-based programs that are designed as a part of studies are limited to certain assessment tools such as rating scale, checklist, rubric and observation form. On the other hand, there is no web-based assessment system designed specifically for classroom teachers. It is required to make use of a web-based assessment and evaluation system starting from primary school, which is the first stage into compulsory education in Turkey. Making use of the web-based assessment and evaluation system starting from the first stage of formal education could help teachers physically collect cognitive, affective, socio-emotional and academic data about students, and take more objective decisions on students and make assessments. Teachers can also design the learning process taking into consideration information on students and individual differences based on this information. Having information on children throughout the learning process in a single platform can enable guiding services for children to be designed in a much healthier way by form teachers, branch teachers and guiding counselors. Therefore, in order to effectively measure and evaluate the achievements of the new program, it is necessary to use more and more process-based, different types of measurement tools and methods instead of traditional measurement and evaluation methods (Duban & Küçükyılmaz, 2008; Gömleksiz & Kan, 2010; Nazlıçiçek & Akarsu, 2008; Sağlam-Arslan, Devecioğlu-Kaymakçı & Arslan, 2008; Tay, Tokcan & Oruç, 2009). All these developments can only be possible by introducing a web-based assessment and evaluation system for the use of form teachers. It is of vital importance to make a web-based assessment and evaluation system operational in primary schools for students to experience a healthier and more effective learning process and for teachers to make the learning process more effective.

## 2. METHODOLOGY

### 2.1. The Research Model

The study employed the design-based research (DBR) method. The DBR is a flexible research method that helps to take the interaction between theory and application to a higher level (Kuzu, Çankaya & Mısırlı,2011). In addition, this method aims to improve educational practices and where analysis, design, development and implementation are conducted in a cycle in a real application environment by means of the cooperation between the implementer and researcher (Wang & Hannafin, 2005).

## 2.2. The Study Group

In order to determine the applicability of the web-based assessment and evaluation system designed during the research process, the application was conducted for two semesters during the academic year of 2017-2018. The implementation could be carried out by 6 form teachers, who volunteered to implement the web-based assessment and evaluation system. Implementing teachers were particularly selected from classes of different characteristics among the sample, which was identified during the situational analysis. The table below demonstrates details on implementing teachers and classes in which the implementation took place.

Table 1.
*Participants' Demographic Information*

| acTeher Details | | | | Class Details | | |
|---|---|---|---|---|---|---|
| **Code** | **Gender** | **Experience** | **Classroom size** | **Type of Learning** | **Class** | **School Region** |
| M | Female | 9 years | 22 | Normal | First Grade | Village |
| D | Female | 3 years | 30 | Normal | Second Grade | Town |
| Ö | Male | 11 years | 27 | Normal | Third Grade | District Center |
| R | Male | 10 years | 47 | Normal | First Grade | Provincial Center |
| E | Male | 14 years | 12 | Normal | Fourth Grade | Village |
| Y | Female | 9 years | 15 | Multigrade Class | First and Second Grade | Hamlet |

Table 1 shows that the implementation was carried out by 6 form teachers, 3 females and 3 males. Participant teachers have an experience of 3 to 14 years. There were 5 regular classrooms and 1 multigrade class which is defined as students of different ages, classes and abilities receiving education in the same group (Little, 1995; UNESCO, 1989) in which were at least 12 and at most 47 regularly-attending students. There were 2 classes in first grade, 1 class each for second, third and fourth grades, and 1 multigrade class for first and second grades. In terms of regions of schools where these classes are located, there were city centers (1), district centers (1), towns (1), villages (2) and hamlets (1). In addition, during the interviews conducted with implementing teachers, each teacher was given a letter code to prevent any confusion and to protect their personal information. One important thing was to make sure that all teachers had personal computers and smartphones. This way, it was assured that the teachers did not have any material-related problems when dealing with the web-based evaluation and assessment system.

## 2.3. Data collection tool

In this research, semi-structured face-to-face interviews were held with form teachers who implemented the design for two semesters to explore the applicability of the web-based assessment and evaluation system. Interviews are a data collection method involving questions and answers for a predefined purpose (McMillan & Schumacher, 2010). The researcher has the opportunity to get in-depth information on the topic by taking the opinions of teachers after implementation through interviews (McMillan & Schumacher, 2010). The interview questions were drawn up by taking into consideration the purpose of the study and based on a literature review and views of two field experts and one linguist. Through interview questions, teachers were asked their opinions on the structure, applicability, contribution to the learning process, advantages and disadvantages of the web-based assessment and evaluation system and to compare this system to the e-school system which is expressed in the form of a system in which business and transactions related to education, education and management are conducted electronically and information is maintained (MEB, 2017).

## 2.4. Data analysis

Semi-structured interviews were conducted with teachers to identify the applicability of the assessment and evaluation system. The descriptive analysis method was adopted to analyze the data obtained from interviews. Descriptive analysis is a method often used to obtain summary information about desired events and cases (Büyüköztürk, Çakmak, Akgün, Karadeniz and Demirel, 2026). In the descriptive analysis process, the data is first described in detail, and then the interview is explained using direct excerpts from the data (Aktaş, 2014). After the explanation, all cases related to cause and effect relations are examined individually and conclusions are formed.

## 2.5. The design process of the research

First, a literature review was performed to ensure the effective use of alternative assessment and evaluation tools by form teachers. Then, 1158 form teachers were consulted to identify the existing situation on the use of alternative assessment and evaluation tools (Demirkol & Kılıç, 2020). The web-based assessment and evaluation system was developed in line with the data collected through the situational analysis, views of faculty members at the department of computer and instructional technologies and literature reviews (Bacanak, 2008; Çepni et al., 2012; Çırak, 2015; Şimşek, 2013).

It was decided to test the applicability of the designed system with 6 volunteer form teachers. Before the application, form teachers received seminars on how to use the web-based assessment and evaluation system. These seminars lasted 8 hours, 2 hours per day for 4 days (2 weekends). In addition, a user's manual for the web-based assessment and evaluation system was developed and handed out to teachers to support them during the implementation process. After briefing the teachers, they were asked to provide information to parents and students. After briefing, participating teachers, parents and students created accounts in the system. This way, the active involvement of parents and students was ensured.

After creating accounts for active users and delivering the necessary information with regards to the system, the system was made operational for the first time. The first application lasted through the fall semester of the school year of 2017-2018. During the application, constant feedback was received from participating teachers about the web-based assessment and evaluation system and necessary improvements were made accordingly. A second application took place during the spring semester of the school year of 2017-2018 after the improvements. After the application, participating teachers were interviewed about the applicability of the system. Data collection tools and product files, which were used by teachers and students, were analyzed by the researcher through the administrator module. Afterwards, a report was drawn up reflecting the collected data.

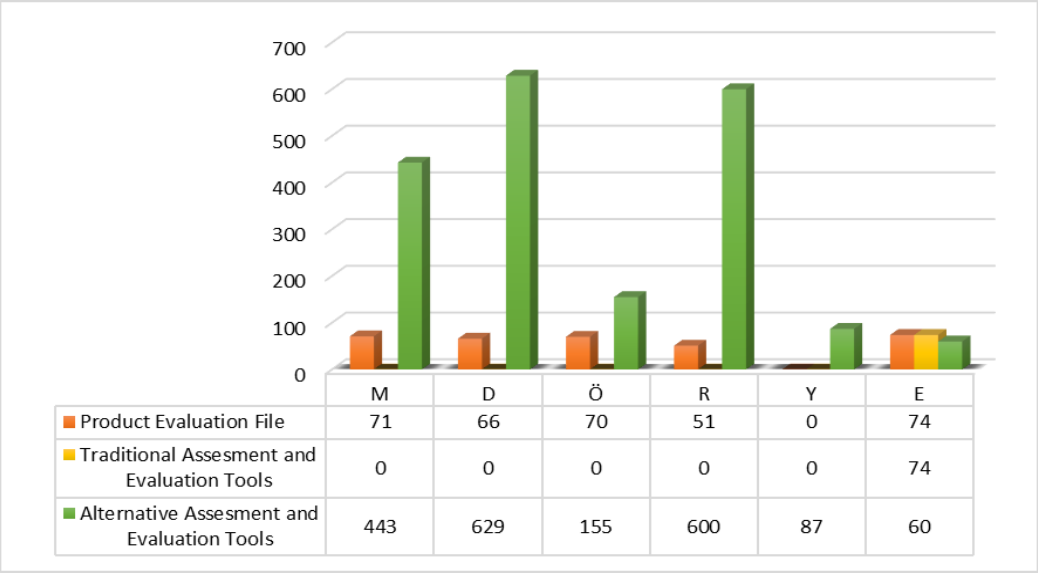
Following the review of the literature and situational analysis, a web-based assessment and evaluation system to enable teachers and students to actively participate in the assessment process and to inform parents about students. An application effort took place to identify the applicability of the design. The implementation was conducted during the fall and spring semesters of the school year of 2017 and 2018.

At the end of the first semester of implementation, teachers were interviewed to identify the problems with regards to the system and these problems (Likert scale type added by teachers, coloring student grades according to grades, archiving portfolios) were resolved. In addition, the features requested by teachers to be included in the system were taken into consideration and these features were either added onto the system or some changes were made in accordance with the research budget. At the end of the second semester, during which the research was conducted, forms in the web-based evaluation and assessment system and their levels of usage were analyzed. In addition, interviews were conducted with teachers, who were involved in the application, to identify the applicability of the system. First, a seminar was delivered to teachers, who would do the implementation, to inform them about the web-based evaluation and assessment system. Then, each teacher was assigned a username and password for logging in. In addition, each teacher was handed a user's manual on the web-based evaluation and assessment system to avoid any problems during implementation. Teachers were left to decide whether parents and students should be a part of the implementation process and to do registration.

## 3. FINDINGS

### 3.1. Findings on the application of the design

The application showed that teachers made use of the web-based assessment and evaluation system. The graph below demonstrates the level of use of alternative and traditional assessment and evaluation tools by teachers and the number of files they uploaded to the system.




| | M | D | Ö | R | Y | E |
|---|---|---|---|---|---|---|
| Product Evaluation File | 71 | 66 | 70 | 51 | 0 | 74 |
| Traditional Assesment and Evaluation Tools | 0 | 0 | 0 | 0 | 0 | 74 |
| Alternative Assesment and Evaluation Tools | 443 | 629 | 155 | 600 | 87 | 60 |

Figure 1: Graph demonstrating the amount of assessment and evaluation tools used in the system.

According to Figure 1, a second-grade teacher, teacher D, made the most use out of alternative evaluation and assessment tools, which were either already available in the system or were uploaded by teachers. The teacher D uploaded 66 product files onto the system along with explanations and remarks.

For first-grade teachers M and R, M actively used 443 alternative assessment and evaluation tools in the system and R used 600. In terms of the number of product files uploaded onto the system, the teacher M uploaded 71 and the teacher R uploaded 51 product files onto the system. Teachers M and R uploaded onto the system files of products online activities, text reading, free activity, etc. and made use of similar assessment and evaluation tools. Teachers M and R rarely made evaluations or added remarks on product files they upload onto the system.

As seen from the table above, the teacher Y, who is teaching a multigrade class of first and second graders, used 87 alternative assessment and evaluation tools and did not upload any product file onto the system. Based on the findings of the evaluation and assessment system, the teacher Y only made use of evaluation and assessment forms that were already available on the system or were uploaded by other teachers and did not develop any new evaluation and assessment tool.

A third-grade teacher, teacher Ö, used 155 alternative assessment and evaluation tools in the system and uploaded 70 product files. The teacher Ö added two joint project products onto each student's page in the system and also made use of the project evaluation form and research evaluation scale for this project.

A fourth-grade teacher, teacher E, uploaded onto the system results collected from both alternative assessment and evaluation tools (60) and traditional assessment and evaluation tools (74). This teacher also uploaded traditional assessment and evaluation tools (74) such as multiple-choice tests, gap-fill exercises, etc. as product files. The findings collected from the system show that teacher E does not make use of alternative assessment and evaluation tools in each class.

Table 2.
*The List of Assessment and Evaluation Tools Used by Participants during Implementation*

| Course | Class | Data Collection Tool Used | Added By | Number of Use |
|---|---|---|---|---|
| Math | First Grade | General Student Monitoring Form (Psychological Characteristics) | Administrator | 2 |
| | | General Student Monitoring Form (Social Skills) | Administrator | 2 |
| | | General Student Monitoring Form (Social Skills) | Administrator | 1 |
| | | Math Evaluation Form | Teacher R | 2 |
| | | Number Evaluation Form | Teacher R | 2 |
| | | Evaluation Form for Addition | Teacher M | 2 |
| | | Evaluation Form for Subtraction | Teacher M | 2 |
| | Second Grade | Evaluation Form for Problem Solving Skills | Teacher D | 2 |
| | | General Student Monitoring Form (Psychological Characteristics) | Administrator | 1 |
| | | Evaluation Form for the Concept of Time | Teacher D | 1 |
| | | General Student Monitoring Form (Cognitive) | Administrator | 1 |
| | | Evaluation Form for Geometric Shapes | Teacher D | 1 |
| | | Evaluation Form for Multiplication and Division | Teacher D | 1 |
| | Third Grade | Research Evaluation Scale | Administrator | 1 |
| | Fourth Grade | - | | |
| Turkish | First Grade | Exhibition Evaluation Scale | Administrator | 2 |
| | | Evaluation Form for the First Teaching Process for Reading and Writing | Teacher R | 2 |
| | | Evaluation Form for Writing | Teacher M | 2 |
| | | Evaluation Form for Reading | Teacher M | 2 |
| | | Evaluation Form for Comprehension | Teacher M | 2 |
| | Second Grade | Evaluation Form for Individual and Social Contact | Teacher D | 1 |
| | | Oral Presentation Evaluation Scale | Administrator | 1 |
| | | Written Presentation Evaluation Scale | Administrator | 1 |
| | | Discussion Evaluation Scale | Administrator | 1 |
| | | Listening Skills | Teacher D | 1 |
| | | Speed Reading Evaluation Form | Teacher D | 1 |
| | | Acquisition Evaluation Form | Teacher D | 1 |
| | Third Grade | Checklist for Reading and Writing | | 1 |
| | Fourth Grade | Student Observation Form | Administrator | 1 |

| | | | | |
|---|---|---|---|---|
| Life Sciences | First Grade | Evaluation Form on Life in Turkey | Teacher R | 2 |
| | | Evaluation Form on Safe Life | Teacher R | 2 |
| | | Evaluation Form on Healthy Life | Teacher R | 2 |
| | | Exhibition Evaluation Scale | Administrator | 2 |
| | Second Grade | Evaluation Form for Individual and Social Contact | Teacher D | 1 |
| | | General Student Monitoring Form (Psychomotor Skills) | Administrator | 1 |
| | | Exhibition Evaluation Scale | Administrator | 1 |
| | | Acquisition Evaluation Form - 2 | Teacher D | 1 |
| | | Acquisition Evaluation Form on Health | Teacher D | 1 |
| | | Peer Evaluation Scale | Teacher D | 1 |
| | | Research Evaluation Scale | Teacher D | 1 |
| | Third Grade | Evaluation Form on Life in Turkey | | 1 |
| Music | First Grade | Musical Evaluation Form -1 | Teacher R | 2 |
| | Second Grade | Musical Evaluation Form -1 | Teacher R | 1 |
| | | General Student Monitoring Form (Social Skills) | Administrator | 1 |
| | Third Grade | Evaluation Form (Creativity) Third Grade | Teacher Ö | 1 |
| | Fourth Grade | Musical Evaluation Form – 4 | Teacher E | 1 |
| Games and Physical Activities | First Grade | Game Evaluation Form | Teacher R | 2 |
| | | Game and Physical Activity Evaluation Form | Teacher M | 2 |
| | | Observation Form | Administrator | 2 |
| | Second Grade | General Student Monitoring Form (Social Skills) | Administrator | 1 |
| | | General Student Monitoring Form (Psychological Characteristics) | Administrator | 1 |
| | Third Grade | Application Test Evaluation Scale | Teacher Ö | 1 |
| | Fourth Grade | Application Test Evaluation Scale | Teacher Ö | 1 |
| Visual Arts | First Grade | Visual Arts Evaluation Form | Teacher R | 2 |
| | | Visual Arts Evaluation Form – 2 | Teacher M | 2 |
| | Second Grade | - | | - |
| | Third Grade | Visual Arts Product Evaluation Form | Teacher Ö | 1 |
| | Fourth Grade | Visual Arts Product Evaluation Form | Teacher E | 1 |
| Science | Third Grade | Project evaluation form | Administrator | 1 |

The list of assessment and evaluation tools developed and added to the web-based assessment and evaluation system by the administrator or a teacher and used for student evaluation is shown in the table above. 18 of the actively used assessment and evaluation tools were uploaded onto the system by the administrator and 36 by teachers: 13 by the teacher D, 10 by the teacher R, 4 by the teacher M, 4 by the teacher Ö and 2 by the teacher E. Assessment and evaluation tools developed onto the system by one teacher is also used by other teachers in the system. For example, teachers M and R, who are first grade teachers, use the assessment and evaluation tools they developed and used onto the system jointly. It is noteworthy that the multigrade class teacher Y did not develop any assessment and evaluation tool onto the system but made use of assessment and evaluation tools uploaded by the administrator or other teachers. In addition, teachers mostly made use of the gains related to learning areas in courses as criteria in the assessment and evaluation tools they designed.

In terms of the use of evaluation and assessment tools by course: 14 types of evaluation and assessment tools were used for math and Turkish courses, 12 for life sciences courses, 7 for game and physical exercises courses, 4 for visual arts courses and 1 for science. The fourth-grade teacher made use of traditional evaluation and assessment tools for Human Rights, Civics and Democracy, Science, Religious Culture and Ethics, Social Sciences, Math, Foreign Language, and Road Safety courses as product files and uploaded onto the system student grades, which were collected as a result of the evaluation, as written exam scores. Interviews were held with teachers after the implementation using semi-structured forms to identify the convenience of the design. Through these interviews held with teachers, the applicability of the web-based assessment and evaluation system within the teaching process was explored.

### 3.2. Views of teachers in the applicability of the design

This section involves views of form teachers who implemented the web-based assessment and evaluation system. The views of teachers on the applicability of the design of the web-based assessment and evaluation system revolve around six main topics. These topics are listed under titles and interpreted directly by teachers' views.

- The structure of the web-based assessment and evaluation system

The aim was to identify the design of the web-based evaluation and assessment system in terms of accessing and navigating the system and its ease of use, etc. by the implementing teachers. To this end, teachers were asked "Can you evaluate the design of the web-based assessment and evaluation system?" Based on the answers, it is safe to say that teachers share a similar view in terms of the structure of the system. Teachers found the web-based assessment and evaluation system simple, user-friendly and easy-to-understand and mentioned that it was easy to access data since there were not many tabs. In addition, teachers welcomed the fact that the system was accessible from anywhere with an Internet connection, it was compatible with computers, phones and tablets, and operated with username and password to offer privacy. The facts that averages collected from evaluation and assessment forms are added automatically under course average and that the score of the student is shown in a different color in a way that it is not tiring for the eyes were also welcomed by teachers. Here are views of some of the teachers on this topic:

> Teacher R: *It has an easy-to-use design. With the ID number and a password, you can easily access the program. It is particularly great that the program is accessible through mobile phone. Markers on the left and right of the program window enable users to reach data easily. The fact that assessment results are presented in an easy-to-understand way at once made my job easier for the application and evaluation process.*

> Teacher E: *You can access the program wherever you have an Internet connection. We can also login to the system using our mobile phones. This is very convenient and easy.*

> Teacher D: *It has an easy-to-use design. Finding the data you are looking for is very easy. Functionality and limited number of signs in the upper right panel enable that. Having form, teacher and student sections separately indicated in the upper left panel makes it easier for me to access data. It was not challenging to login to the system since we used our ID numbers and passwords but seeing the not secure writing in red from time to time in the address bar was a bit disturbing. Colors of the design were matching. The colors that are used are not tiring for the eyes and not complex. In addition, not having any unnecessary titles or information on the system makes it easier to use.*

It can be concluded that teachers found the design convenient and easy-to-use. In addition to the positive feedback on the design of the system received from teachers, some teachers mentioned seeing the *not secure* indication on the address bar while logging in. This situation is related to the web browser that is used by the teacher. Because a web browser tries to identify the privacy of the website and the adequacy of encryption when connecting to a website. If the encryption of a website is not strong enough, the browser will disconnect from the website or display an error page.

- Applicability of the web-based evaluation and assessment system in teaching

To analyze the applicability of the web-based evaluation and assessment system during the teaching process teachers were asked "Do you think the web-based assessment and evaluation system is applicable to the teaching process?" The common view of the teachers suggest that the web-based assessment and evaluation system is applicable to the teaching process. The facts that the evaluation and assessment system can be put to use at any time, a scale can be developed and put to use on any topic, it can evaluate a student in all aspects, students can do self, peer and group evaluations, and parents can login and monitor each and every stage of learning were welcomed and found to be applicable by teachers. In addition, the fact that student product files can be stored and evaluated, and remarks and anecdotes can be stored was considered an added value of the system by teachers. Here are the views of teachers on the applicability of the web-based evaluation and assessment system to the teaching process.

> Teacher Ö: *I can do evaluation whenever I want and store products. We can also evaluate the self-evaluation system as a criterion. This is particularly beneficial for project evaluations. It is a great advantage to also have parents and students in the system. However, it makes me nervous that student pages with self-evaluation could be viewed by parents.*

> Teacher Y: *It is a very easy-to-use system. It allows me to engage in any kind of evaluation any time. However, the fact that it is a web-based system and I am working in a village school prevents me from benefiting from it fully. Because in the village I am working in, the reception is not good and satellite Internet is extremely limited. That is why I can only use the system in Diyarbakır, at home. Nevertheless, thanks to the system I do not have to be buried in paperwork and that is great.*

Teacher R: *Yes, I think it is useful. It is especially great that we have concrete data on students, we can store product files and access these data with only using a password. However, it was troublesome to enter the data of all 56 students in my class. In classes with low population, this would be a proper and easy-to-use design.*

Teacher D: *I think the applicability of the web-based evaluation and assessment system to the teaching process comes from the fact that you can reflect the teaching process onto the system as much as you like. Especially, the fact that you can develop a scale in any topic you want and store it to use any time is of vital importance to evaluate the child in every aspect. For example, if you want to find out the cause of an emerging problem in the classroom, you will be able to easily find it out by making use of a simple Likert scale. To this end, we have recently developed and carried out a survey to explore how children reflect their family relationships and domestic life onto school. The thing that I like about the system the most is the opportunity to carry out multiple assessments. It is motivating to be able to present these as alternative evaluation and assessment tools. I also got motivated when I realized that I was far away from traditionalism when entering data. I think the most functional module in the system was the product evaluation module. Thanks to this module, I was able to evaluate the products of my students, get to know them much better and store my products for life. Aside from being able to evaluate students in all aspects using the Likert scale, color coding (good, mediocre, poor) the grades of students after entering the grades enabled teachers to evaluate students from various aspects. The fact that the system displays not only failed but also successful courses or scales and fields showed that each child may succeed in different fields and courses.*

It can be concluded that after the application, teachers found the web-based evaluation and assessment system applicable to the teaching process. Even so, Internet connection failures in some regions where teachers work during the implementation and high classroom populations caused some troubles for teachers. The possibility of parents filling out the student module concerns teachers.

- The benefits of using the web-based evaluation and assessment system for teachers

To identify the benefits of using the web-based evaluation and assessment system for teachers, teachers were asked "What kind of benefits the web-based evaluation and assessment system offered for you during the application?" Based on the teachers' views, they are able conduct evaluations of multiple students at the same time by using the web-based assessment and evaluation system and as a result of this, students can see more clearly what they can and cannot achieve. In addition, the fact that the system enables teachers to store student products, evaluation forms and results on these forms saved teachers to deal with paperwork. Teachers also adapt the program based on the learning speed of children in line with the results of the overall evaluation. Based on the views of teachers, parents can log into the system and view evaluation results of students and teachers received positive feedback from parents. Here are the views of some of the teachers on the benefits of the web-based evaluation and assessment system for teachers:

Teacher D: *The most important contribution of the design was the fact that it proved my observations in class right. After filling out the scales I realized that the student in class was completely the same with the student I evaluated in the design. In short, the course was the child's body while the design was his inner world. As I said before, thanks to multiple evaluation criteria, I was able to get to know a student in every aspect and to focus on his/her areas of success (green-colored grades) rather than failures. For example, I was able to identify some students' language problems since they were able to speed read but unable to solve or understand Turkish questions or understand mathematical expressions but unable to understand or solve mathematical problems. In summary, I've had the opportunity to get to know students closely because this system allows you to analyze. Especially while developing the products, even a single line of drawing made by the child reflects his/her inner world and enables me to determine what kind of approach to adopt.*

Teacher R: *As a teacher, I was able to see each and every student's learning level. I was able to see what they are and not able to do and adapted my curriculum accordingly. I have also received positive feedback from parents. They were also able to easily see the educational development of their children by means of the system. I did not make my students do the self or peer assessment because I thought they would not be able to deal with data entry since they are first graders. The fact that the classroom population was high also created a challenge. I may be able to do that next year.*

Teacher E: *The biggest contribution the system offered me was the ability for me to evaluate students during class using observation forms and application scales. By making use of these forms in addition to written exams, I was able to gather information about students even though students did not offer such information in exams. This enabled me to have a more positive approach towards students.*

- Comparison of the web-based evaluation and assessment system with the e-school system

To compare the web-based evaluation and assessment system with the e-school system of the Ministry of National Education, teachers were asked "Can you compare the web-based evaluation and assessment system with the e-school system in terms of evaluation?" Here are views of some of the teachers on this topic:

Teacher Y: *There is no opportunity to evaluate in the e-school system. E-school only allows teachers to enter student grades. This evaluation and assessment system allows us to evaluate, identify criteria and store and interpret files. You can even inform parents and students in detail.*

Teacher M: *The web-based evaluation and assessment system is more comprehensive than the e-school system and allows you to evaluate on a wider scale. Frankly, while entering the grades of students to e-school, we don't have to explain how we did the evaluation, we only enter the grade based on what we think about students.*

Teacher D: *What I realized when comparing this system with the e-school was that this system does not allow fast grade entry. Even though I used this function, I sometimes think that it is unfair to successful students to give the same grade for every student. In addition, the sharing module allows you to actively use and enrich the content just like in the EBA.*

It can be concluded that teachers compared the web-based evaluation and assessment system with the e-school and that they consider e-school's grade module to be a system that records only a student's achievement in a specific course rather than an evaluation. Teachers consider the web-based evaluation and assessment system to be a more comprehensive tool that is able to reflect the evaluation process onto the system as it is. Based on the interviews, it is safe to say that teachers liked the product storing function, which is not supported in the e-school system, of the web-based evaluation and assessment system.

- The advantages and disadvantages of the web-based evaluation and assessment system

To identify the advantages and disadvantages of the web-based assessment and evaluation system that is used by teachers for two semesters, teachers were asked "What are the advantages and disadvantages of the web-based assessment and evaluation system?" Here are views of some of the teachers on this topic:

Teacher Ö: *Let me tell you about the advantages of the system first. First of all, it enables you to evaluate. Through self-assessment, it allows students to evaluate themselves. It allows parents to be informed in detail. Teachers can share information and application if they wish to do so. For example, you can make use of the evaluation forms drawn up by other teachers. It also allows you to design your own evaluation form. In terms of disadvantages, it does not allow fast grade entry. And entering the information of students and parents took a lot of time.*

Teacher R: *We are able to evaluate each and every student individually using concrete data. Thanks to this system, we do not only learn about children's details but also their interests. Parents can get information on every stage of the learning process. I can file and store student products. We can also include students in the evaluation process. I can develop my own evaluation tool. All of these were the advantages of the system, which I have used and liked. My classroom has a lot of students, so I had a hard time uploading the data onto the system. Having more ready-to-use evaluation forms in the system would have made my work easier.*

Teacher E: *The system is great to use. For example, while the students were playing games or doing activities, I was able to do the evaluation on my phone. I was able to upload all tests and exams for math, science, etc. onto the system. Which allows me to access exam papers whenever I need to. There is one thing that I think is a disadvantage, which is having to evaluate students individually. I wish the system had a function where I could see and evaluate students collectively.*

Based on the views, it can be concluded that all the teachers think the web-based evaluation and assessment system offers advantages. The fact that the system offers concrete data on students, is available on smartphones and allows teachers to develop evaluation forms were listed as advantages by teachers. Some other advantages are the abilities to evaluate students, inform parents and exchange information among teachers. Nevertheless, teachers found it disadvantageous to upload student and parent data onto the system and to enter the information for each student separately for evaluation. As a result of the interviews conducted to identify the advantages and disadvantages of the system, it is striking that some teachers considered the system not having a fast grade entry function a disadvantage while others considered the lack of this function an advantage. Teachers, who argue that the system should have a fast grade entry function, pointed out that it was time consuming to evaluate each student individually. Teachers, who think that it is better not to have a fast grade entry function, argue that evaluating students individually would improve objectivity and help teachers to adopt a fairer approach towards evaluation.

- Recommendations for the web-based evaluation and assessment system

After hearing their views, teachers were also asked about their recommendations for the web-based evaluation and assessment system Here are some of the recommendations of teachers with regards to the system:

Teacher Ö: *Having a fast grade entry function in the system would be better. Being able to automatically upload student and parent data as in the e-school system may be more efficient.*

Teacher R: *The system is quite good but having a fast grade entry function would save a lot of time. Highlighting the sharing page can improve cooperation among teachers.*

Teacher M: *Having to enter all data for each student evaluation is limiting in terms of effective use of time. It would also be better to have a collective evaluation function.*

It is safe to say that recommendations of teachers with regards to the web-based evaluation and assessment system mostly focus on functions that are considered a waste of time. Teachers recommend student and parent data to be able to automatically upload onto the system and to have a fast grade entry function.

## 4. DISCUSSION AND CONCLUSION

### 4.1. Results collected during the application process and discussion

During the one-year application process of the research, six teachers actively made use of the web-based evaluation and assessment system. It is safe to say that the classroom size, the region in which the school is located and the grade has an impact on how teachers use the web-based evaluation and assessment process and lead them to direct the evaluation and assessment process differently. Another reason for this difference is the fact that participating teachers implement the evaluation and assessment process based on their annual curricula. For example, the teachers R and M, who teach first-graders, mostly upload reading and writing related product files onto the evaluation and assessment system while the fourth-grade teacher uploads product files on multiple choice and gap-filling tests. However, the teacher Y of the multigrade class did not upload any product file onto the system.

Based on the results of the application, it is concluded that teachers use the evaluation and assessment forms developed by themselves more than the ones already available in the system which is added by administrators. This supports the results of the research carried out by Bacanak (2008). In addition, evaluation and assessment forms that are designed and uploaded onto the system by teachers are used by implementing teachers unbeknownst to others. This result is in line with the results of the research by Çepni et al. (2012) and Eyal (2012). For example, first-grade teachers made use of evaluation forms designed by one another. This may be due to teachers living in the same province and teaching students with similar cultural and social backgrounds.

During the implementation process, only one teacher (teacher D) involved students in the evaluation and assessment system. Based on the observations by the researcher, other teachers made students carry out self-evaluations. Nevertheless, it is safe to say that teachers have trust issues in involving students to the web-based evaluation and assessment system. The reason why teachers do not let students use self-evaluation forms in the student module is because they believe that students would not be able to use the web-based evaluation and assessment system due to their age and readiness level. Another obstacle before this application is the concern of teachers about the possibility of self-evaluation and peer evaluation forms to be filled out by parents instead of students. In Bacanak's (2008) research conducted in secondary schools' children were included in the evaluation process by means of the developed programs and the application led to positive outcomes. This difference between the results of this research and studies in the literature can be associated with demographic differences of sample groups of these studies.

### 4.2. Results of teachers' views and discussion

As a result of the application, teachers generally found the web-based evaluation and assessment system to be user-friendly, easy-to-understand and simple. The fact that the system is accessible from not only computers but also smart phones, iPads, etc. was received positively by teachers. Teachers also found it useful that each user can log into the system with their own ID number and password and that all evaluation and assessment forms can be shared, except for confidential information. The fact that average scores obtained from an evaluation and assessment form used in the web-based evaluation and assessment system is automatically included in the general average of the related course and that student evaluation results can be viewed in different colors that are not tiring to the eye were received positively by teachers.

It was found that teachers have a tendency to make use of alternative evaluation and assessment tools in conjunction with the web-based evaluation and assessment system. In particular, it was useful for teachers to be able to conduct evaluation during a school year at any time without any need for documentation. The evaluation and assessment tool, which was used during the evaluation process, was found to be developable and applicable by teachers. In addition to that, the ability to store student product files and evaluations, remarks, and anecdotal records with regards to these product files in the system was another feature of the system found useful by teachers. The use of student product files allows teachers to reduce their burden of scoring exam papers on a daily basis and improves their collective understanding, perceptive and thinking skills through multidimensional scoring (Kan, 2007, p. 32). For the process of evaluating student product files, teachers' inability to access products at a desired time and place and collecting and archiving products are considered as problems (Erdemci, 2015). The fact that student product files are accessible through the web-based evaluation and assessment system anytime anywhere makes up for the disadvantages of student product files. The fact that 362 product files were uploaded to the system by teachers

during the process of application of the web-based measurement and evaluation system can be considered as proof for this situation.

Parent information system is included both in the web-based evaluation and assessment system and the e-school system. The literature suggests that the purpose of the parent information system in the e-school system is in parallel with the way parents make use of it (Demirli, Demirkol & Varol, 2011) and that it helps parents to get information about their children without having to go to their schools (Gültekin, 2010). Another feature that teachers find useful is the fact that the parent module in the web-based evaluation and assessment system serves a similar purpose. Thanks to this feature of the system, results that are collected in every step of the evaluation process are included in the teacher and parent modules, which serve as feedback for students and inform parents. The student module enables students to take active part in the evaluation process by allowing them to evaluate themselves with self-evaluation, their friends with peer evaluation and their group with group evaluation. A study conducted by Çırak (2015) suggests that web-based peer and self-evaluation are an effective method of improving students' communication skills and interpersonal relationships. During the implementation process, only teacher D performed peer evaluation. As concluded from the interviews, teachers think that students do not make use of self, peer and group evaluation forms because they are not ready to deal with a web-based system just yet. Another reason why teachers did not make the student module available was the possibility of the self-evaluation to be filled out not by students but by their parents since students may be under pressure by their parents to score higher. Despite this view, the majority of the teachers think that this feature is applicable.

Teachers pointed out that by making use of the web-based evaluation and assessment system they were able to collect concrete data on students by conducting multiple evaluations and thanks to this data they were able to get clearer information about students' learning levels. For example, by making use of the system during the evaluation process, teacher D discovered that a student of his was unable to comprehend Turkish questions due to language problems even though this student was able to speed read and was successful in class. Teachers consider such situations as added value. Thanks to these data, teachers were able to get more concrete information on the learning level of the class and adapt their teaching process based on the learning speed of students. It is safe to say that teachers had the opportunity to get to know and understand students in more detail thanks to the ability of storing product files and conducting multiple evaluation in the web-based assessment system. Form teachers were asked to compare the web-based evaluation and assessment system with the e-school system. Teachers found the web-based evaluation and assessment system to be more comprehensive. Teachers consider the grade section of the e-school to be only a grade entry system but consider the web-based evaluation and assessment system to be an evaluation system that reflects students' learning processes. In addition, the fact that evaluation and assessment forms can be developed by teachers and that students can take part in the assessment process using the student module in the web-based assessment system is one of the reasons why teachers find this system more usable than the e-school system. Finally, it is striking that the function that enables teachers to exchange information in the web-based evaluation and assessment system is likened to the EBA system.

Form teachers found the web-based evaluation and assessment system to be advantageous in many aspects. Teachers consider the web-based evaluation and assessment system to be easy-to-use thanks to its compatibility with computers, smartphones and tablets in terms of accessibility and use. Aside from the evaluation and assessment forms already available in the system, the ability of teachers to develop their own evaluation and assessment forms and having student and parent modules are considered as advantages of the system. On the other hand, the fact that teachers have to enter student and parent information into the system one by one and the lack of fast grade entry function are considered disadvantages. The fact that student information in the Central Civil Registration System is not linked with the system forces teachers to enter student and parent data into the web-based evaluation and assessment system one by one. The reason why the researcher did not take action on this situation is that the system is in the process of implementation. In addition, the reason why some teachers think that the lack of the fast grade entry function in the system was the convenience this function offers when they save student evaluations in the grade entry section of the e-school system and that this is not the case in the newly-designed system. Even though this is considered a disadvantage, the fast grade entry function was not included in the system because the objective was to make sure that teachers evaluate each student individually based on that specific student's differences, interests, needs and skills and that grades do not influence teachers' opinions during evaluation.

Recommendations offered by teachers on the web-based evaluation and assessment system are related to the disadvantages of the system. Teachers recommended transferring student and parent information from the Central Civil Registration System and adding the fast grade entry function to the system.

**Research and Publication Ethics Statement**

The authors hereby declare that they have not used any sources other than those listed in the references. The authors further declare that they have not submitted this article at any other journal for publication.

**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.

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## ANNEX 1. The Designed Web-Based Evaluation and Assessment System

A web-based evaluation and assessment system was developed under this study to improve the utility of alternative evaluation and assessment tools. The aim of this system is to develop, edit, use, and store rating scales, observation forms and checklists and ensure active participation of parents and students in the evaluation process. The system also offers an e-portfolio feature to make sure that students' works are evaluated, stored, and transferred onto the next learning stage. The newly-designed web-based evaluation and assessment system was made available on www.odesis.online.

While developing the web-based evaluation and assessment system, the PHP scripting language was used and the application was made compatible with IE version 9 and up and all updated browsers (Mobile, Tablet, iPad) by making use of HTML and Framework infrastructures. Thanks to the 100% search engine optimization (SEO), the website can be accessed via every search engine. Similarly, all links are interrelated so that search engines can follow and contain descriptive texts for these search engines. The web site has a user-friendly design which allows fast, easy and secure transition between web pages. The web-based evaluation and assessment system consists of the teacher module, the student module, the parent module and the administrator module. This section introduces the designed system.

### User login

For the evaluation and assessment system, teacher, student, parent and administrator roles were defined. A single interface was designed for all users to log into the system. User account information (username and password) was created for each participant, who will make use of the system. The interface designed for user login is shown in Figure 1.

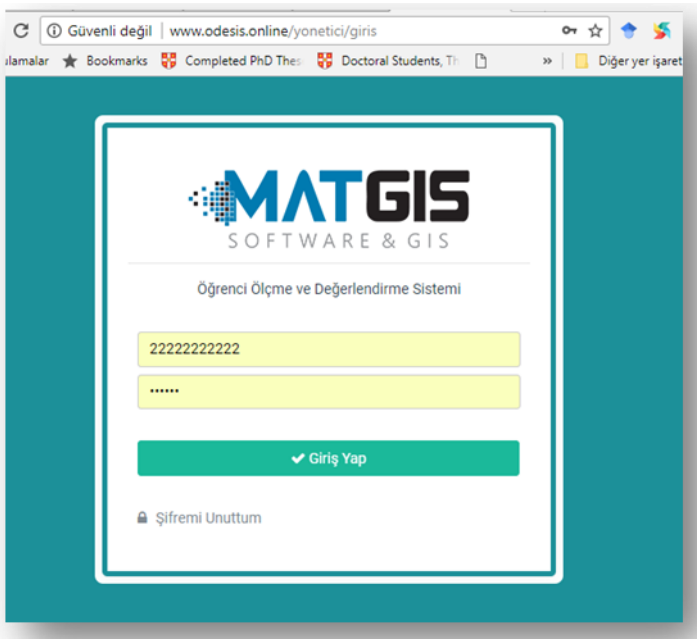


Figure 1. User login page of the web-based evaluation and assessment system

As shown in Figure 1, the developed system is accessible with internet support via www.odesis.online and user account information is requested at login stage. After the user login screen, participants who are logged in with their own account information, are directed to the interface of the role they are assigned with. User account information for the teacher role is assigned by implementers with administrator role. However, user account information assignments for student and parent roles are left to practitioners with teacher roles upon permission of administrators.

**Teacher's module**

After a teacher logs into the evaluation and assessment system by using the username and password provided by the administrator, the interface that teachers are authorized to display opens up. This interface enables teachers to view the student list, absentees, latest student evaluation forms and content shared by other teachers.

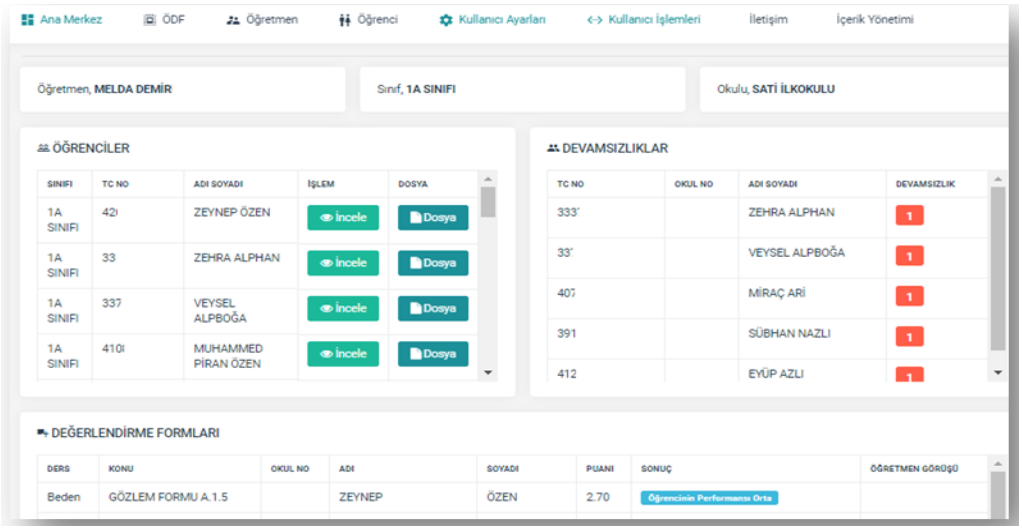


Figure 2. A screenshot of the teacher's module home page

Figure 2 shows the interface designed for the teacher's module. Clicking on the "Review" or "File" buttons takes the user to details with regards to the relevant student.

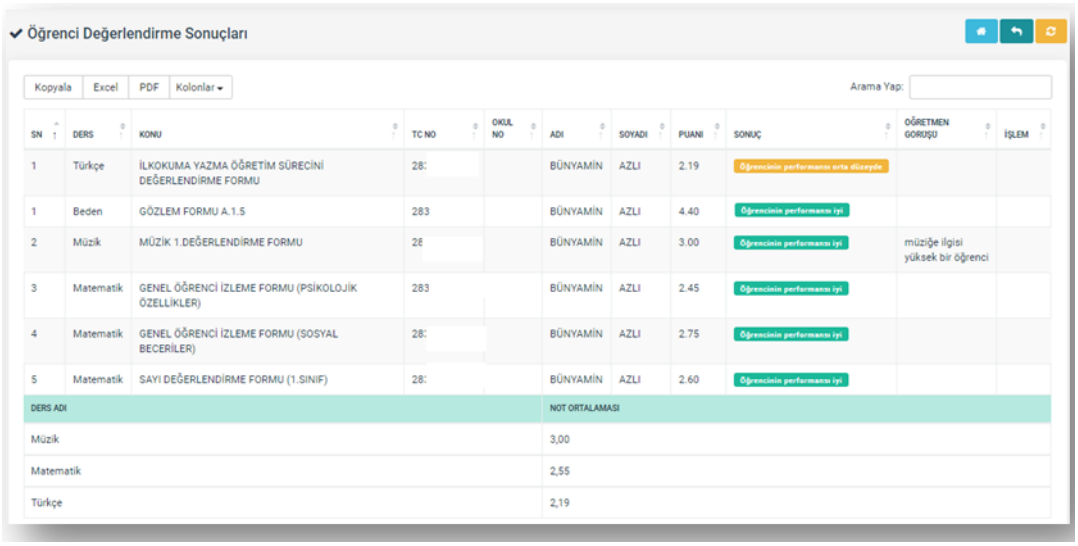


Figure 3. A screenshot of the review section of the teacher's module

**Review Section:** The review section contains all assessment forms used to evaluate students during the teaching period, averages obtained from assessment forms, results evaluating all averages and teachers' remarks. Figure 16 shows detailed information on the "Review" button. All evaluation forms and teachers' remarks under the review section can be saved in XLS or PDF formats. In addition, the "Search" function was also added to easily find a specific evaluation form.

**File Section:** By clicking on the file button, the user gets access to the database where all work of students that are made during the education process and that are thought to be a part of the product file is stored. The related interface is shown in Figure 4.Here, teachers can evaluate stored student product files and add notes. Each and every evaluation and registration procedure for every product can be viewed under the student evaluation folder.

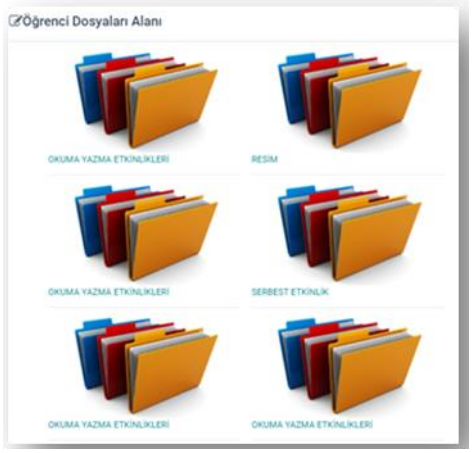


Figure 4. Screenshot of the student filing section in the teacher module

The teachers' module contains these tabs: Homepage, EAF, Student, General Settings, Evaluation, Communication and Content Management. These tabs can also be viewed from the administrator module. Tabs that are available both in the teacher and the administrator modules will be covered in this section. In addition to the tabs in the teacher module, information about the existing tabs is provided in the administrator module section. Here is the intended use of these tabs, which are available both in the teacher and in the administrator modules:

**EAF (Evaluation and Assessment Forms):** This is the tab where evaluation and assessment forms are designed, criteria for any feature to be evaluated are added and Likert scale type (3- or 5- point) is determined. For this section to become active, a teacher first must type in the title of the evaluation form he/she will be using and save it to the system, enter evaluation criteria and select the type of Likert to be used. Thus, the process of evaluating and assessing gains that teachers aim to teach during class is conducted by means of evaluation and assessment forms developed by teachers taking into consideration environmental factors and individual differences.

In addition, the evaluation and assessment forms in the teacher's guide books were added to the system for teachers' use. Sub tabs for the related tab can be seen in Figure 5.


Figure 5. Sub tabs of the evaluation and assessment form tab

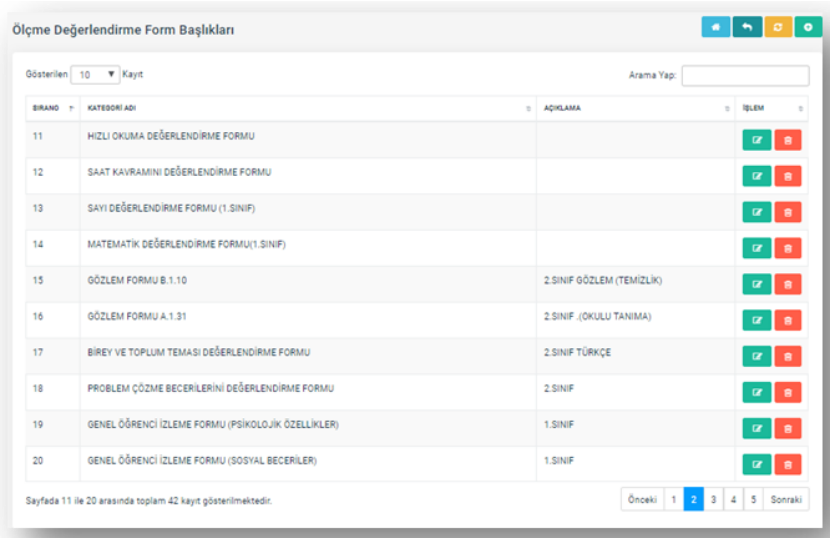


Figure 6. Screen shot of the evaluation and assessment form titles

Clicking on this tab will open up the sub tabs of form titles, evaluation criteria, 3-point Likert type form, 3-point Likert type project form and 5-point Likert type form. The intended use of these sub tabs is as follows:

**Form Titles:** This sub tab contains a list of evaluation and assessment forms previously saved in the system. Each new evaluation and assessment form that is prepared by implementers in the role of teachers is saved in this section of the system. The related interface is shown in Figure 19. From the form title sub tab, new forms and new categories can be added by clicking on the 'add' button and new evaluation and assessment forms can be saved.

The form adding page opens up after clicking the add new category button. Information on the type of the evaluation and assessment form to be used, its category and remarks can also be added in this section. This would provide information on the title, type (check list, project evaluation form, attitude scale) and purpose of the evaluation and assessment form to be used and in which course this form is going to be used. Self, peer and group evaluation and such forms that allow students to take active part in the evaluation and assessment process can be displayed and used from the student module after checking the *Do You Want the Student to View This Form?* field and saving it.

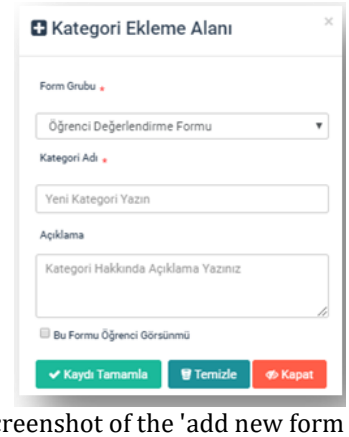


Figure 7. Screenshot of the 'add new form title' section

**Evaluation Criteria:** The criteria that will serve the purpose of evaluation assessment forms saved under the form title are saved to the system in this section.

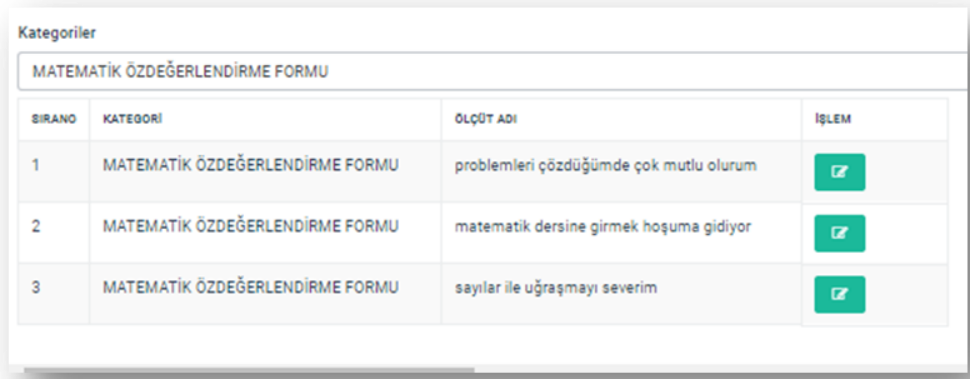


Figure 8. Screenshot of Evaluation and Assessment Form Criteria

This section allows users to view, change and delete, if necessary, criteria of all evaluation and assessment forms available in the evaluation and assessment system. In order for newly-prepared evaluation and assessment forms to be applicable in the system, the user clicks on the 'add new category' button. Then, the user selects the category among evaluation and assessment forms previously saved under the form title tab. Then, the user adds the criteria that will serve this form. After adding a criterion, the user can add another one by clicking on the (+) symbol or delete one by clicking on the (-) symbol. The number of criteria to be used in this section is not restricted. The number of criteria to be used is left to the discretion of the teacher who will use this form.

**Likert-Type Forms:** Sub tabs for all Likert-type forms in the evaluation and assessment forms tabs serve a similar purpose. For this reason, information on the features of sub tabs are provided under a single title. Tabs that contain Likert-type forms are where forms that are developed and uploaded to the system by teachers or that are provided to teachers by the administrator are stored and student evaluation is conducted.


Figure 9. Screenshot of the criteria adding field

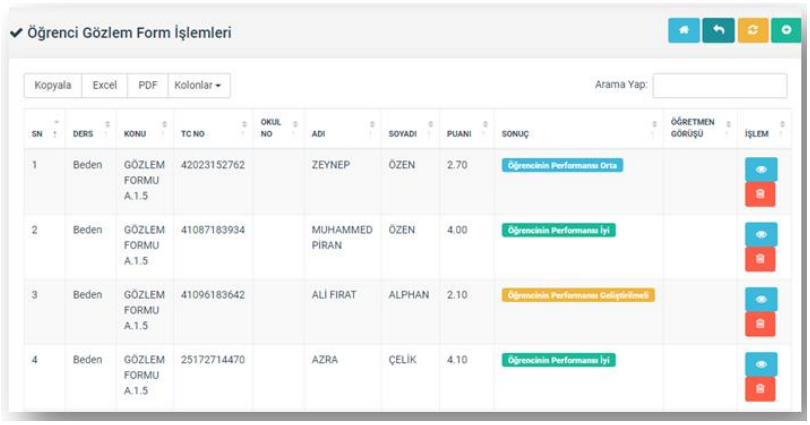


Figure 10. Screenshot of the section with evaluation and assessment forms

By clicking on the Likert-type form tabs, the user can view all forms applied by teachers on students and scores and results of these forms by student. A 'view registration' button was added to allow each form to be examined in more detail.

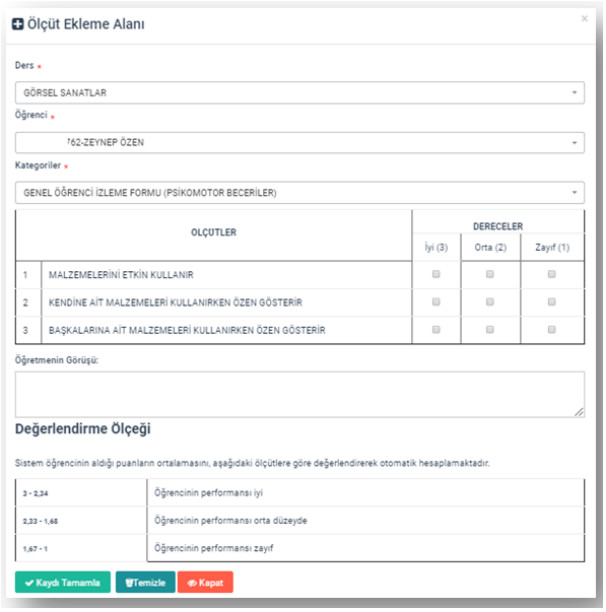


Figure 11. Screenshot of an evaluation and assessment form

During student evaluation, the user clicks on the 'add new category' button. After clicking this button, the user chooses the form to be used in the evaluation process. After the evaluation form is selected, sub criteria on the evaluation form appear and will be ready for use. In addition, a teacher can also write down an important note in the teacher's remarks field and save it in the evaluation form.

The average obtained after the evaluation is automatically added to the average of the course, which is the subject of the evaluation. Score and results obtained from the evaluation form can be viewed from the student module, in which the evaluation takes place, the 'review' section in the teacher module and the parent module. Data can also be entered to the system by conducting the same procedures for 5-point Likert type form and 3-point Likert type project form, which are under evaluation and assessment forms.

**Student Product File:** This is the tab where product compilation files are added. In this section, online records of products that are made by the students and believed should be in product files. Information or verbal evaluation can also be added with regards to products stored in the file section and their formation process. Remarks and details of stored product files can be seen in Figure 12.

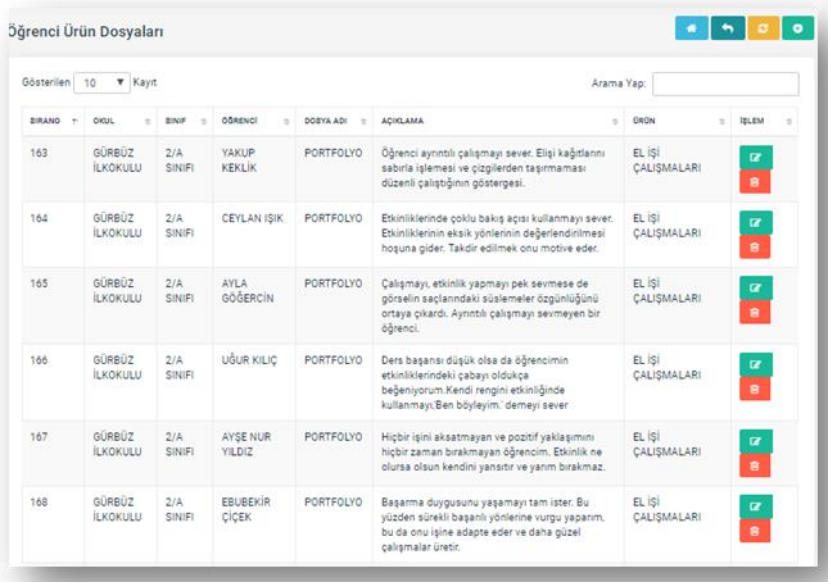


Figure 12. Screenshot of the tab where student product files are added and stored

Products saved in the student product file can be viewed on the 'file' sub tab on teachers' home page, which is specially prepared for each student. In addition, a product that is wished to be reviewed or updated can be easily accessed by typing in the product's name on the 'Search' section.

For adding a new product to the system, the user clicks the 'add new category' button. After clicking this button, the student product file adding sub tab opens. School, class, and details of the student, who is the owner of the product, are entered in the related fields in the interface. Then the names of the file and the product are entered into the system. After clicking on the select

file section in the image section, the image of the related product is uploaded to the system. During the file adding process, products can also be saved using mobile phones, tablets or computers. Turning on the device's camera enables the user to upload an image instantly. Fields indicated with a red asterisk must be filled out and cannot be left blank. In the “file description” section, any necessary remark about the product file can be typed into the system, but this field is not obligatory.

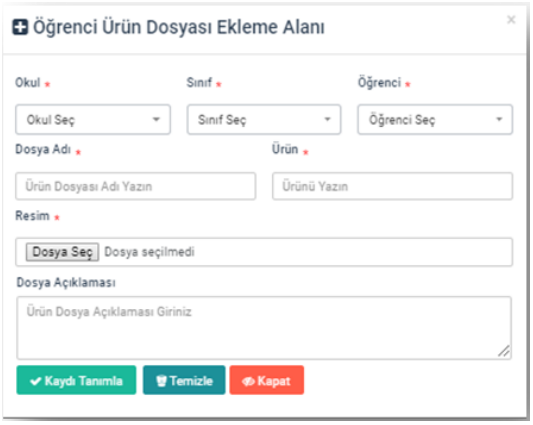


Figure 13. Screenshot of the student product file adding field

**Users:** This is the field where implementers, who will take active roles in the evaluation and assessment system, are registered to the system. With the authorization they receive from implementers with administrator roles, teachers can register students in their class and their parents to the system. The details of students and parents, which are added by teachers, can be viewed from this tab. In this section, user password change or registration information update can be made by clicking on the registration editing button. A user can have a passive status in the system due to transfer, habitual absence, illness, etc. To change a user's status to passive, click on the "Deactivate Registration" button. Statuses of active and passive users can be viewed from the system.

To add a new user to the system, click on the add new user button. The user selects from the tab the group (student group, parent group) in which the user will be included. ID information, first and last name and e-mail address information are entered and the password is identified at this stage. Due to its uniqueness, the Turkish ID number of each user is assigned as user name in user account details. The goal here is to prevent any confusion that may arise from similarities in names.

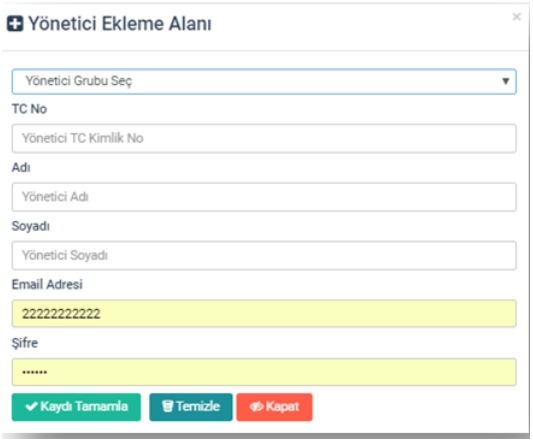


Figure 14. Screenshot of the "add new user" field

**User Operations:** This is the tab that is used to link together users. Registered students and their parents are linked. In this way, parents, who would like to work on the parent module, can only view their own children’s details.

**Student Page:** This is the section where the student details are registered.

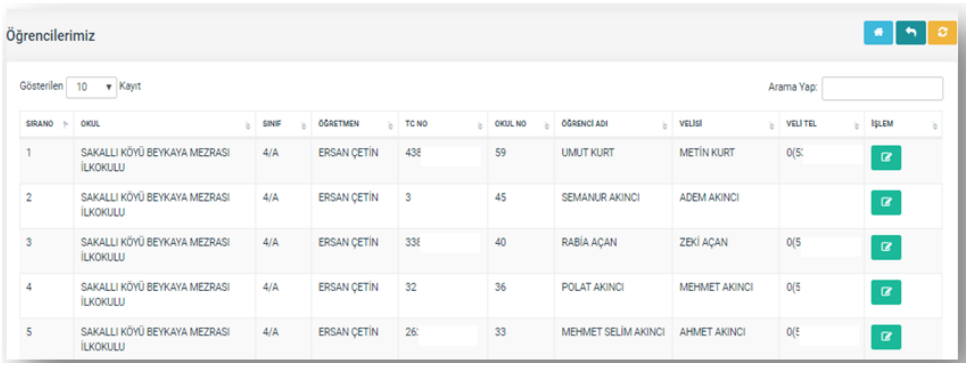


Figure 15. Screen shot of the tab where user information is uploaded and updated

Student tab shows information such as the ID number, enrolled school and class, name of parents and contact number. In order to upload student information to the system, the information in the tab that opens up after clicking the “procedure editing field" shown in Figure 15 must be filled in. This tab automatically shows student information such as ID number, enrolled school, class information and teacher in charge since this information is uploaded to the system while registering a user. Information such as the student's date of birth, place of birth, school number, sex, residential address, phone number, if available, e-mail address, details of parents such as phone number and the student's photo, if desired, can be uploaded onto the system in this section. Any special issue (special need, family-related issues, health issues, etc.) with regards to the student is also recorded in this section.

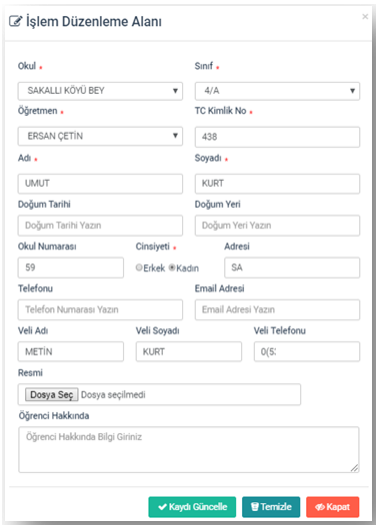


Figure 16. Student information editing field

**Parent Page:** This is the section where information with regards to parents is registered.


Figure 17. Screenshot of the page where parent details can be viewed and updated

This tab includes details such as the address, phone number and e-mail address of the parent, related students and the school they are enrolled in. Same as in the student system, to upload parent information onto the system, the user clicks on the *procedure editing field* and fills out the information on the page that opens up. From the opened page, the parent's information such as first and last name, phone number, address, e-mail address, his/her child who is the student, the school he/she is enrolled in are entered in the system. Any special information (divorced, convicted, special needs, etc.) with regards to the parent can also be saved in this field.

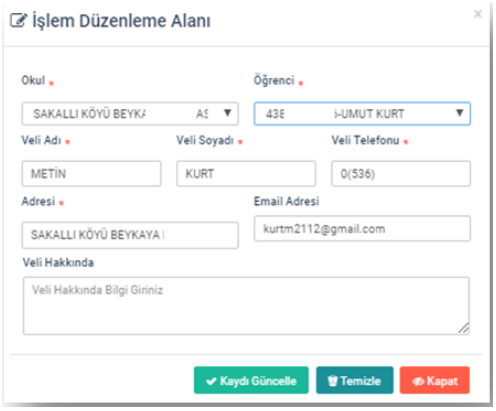


Figure 18. Parent information editing field

**Contact:** This is the tab with contact information of the institution the researcher, who developed the evaluation and measurement system, is affiliated with.

**Content Management:** This is the tab where teachers and administrators can exchange information, if they desire so. Through the content management tab, teachers can share form templates, official letters and comments and video links on current topics.

**The student module**

The interface that the student is authorized to view opens up when the student logs into the system using the username and password provided by the teacher. This interface is shown in Figure 19. The student module consists of three sections.

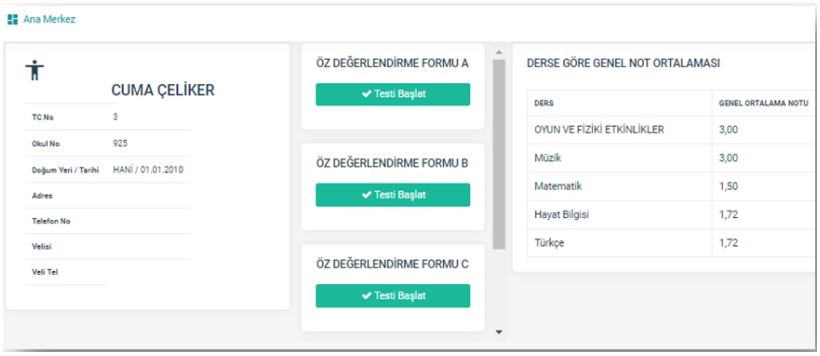


Figure 19. Screenshot of the student module

The first section contains the student's school and parent information. The second section contains evaluation forms developed by teachers that allow students to conduct self, peer and group evaluations. The third and final section contains average figures collected from a student's evaluations in the evaluation and assessment center for each course. Student implementers are only authorized to fill out the evaluation forms that are specified by teachers. Other information about students is entered by the teacher.

Grade point averages that can be viewed in teacher, student and parent modules are calculated based on the 3-point system in order to be compatible with the e-school system. Due to traditional exams conducted in fourth grade, evaluation of fourth graders are shaped in line with the 5-point system.

**Parent module**

Parents are able to get detailed information about students via the parent module in the system. After logging in using the username and password provided by teachers to parents, parents can view the interface that they are authorized to display (Figure 20).


Figure 20. Screenshot of the parent module

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# E-Sınavlardan Etkin Geri Bildirim Üretmek için Öneriler*

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**Makale Bilgisi**

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**ÖZET**

Günümüzün eğitim sistemleri öğrencilerin öğrenme sürecini desteklemek amacıyla birçok yeni teknolojiyi uyarlamaya ve kullanmaya devam etmektedir. Bu teknolojilerden birisi de e-sınavlardır. Bu tarz sınavlar öğrencilerin sınav sorularını bilgisayar ya da tablet gibi dijital araçlar ile cevaplamasına imkân vermektedir. E-sınavların önemli faydalarından biri de etkili, hızlı ve bireye özgü geri bildirim üretmeye imkân sağlamasıdır. Bununla beraber e-sınavlardan etkin olarak geri bildirim üretilmesine dair önerilerin yer aldığı çalışmalara literatürde rastlanılmamıştır. Literatürdeki bu önemli boşluğu doldurmak adına e-sınavlarda geri bildirim üretimine dair sistematik bir derleme çalışması yapılmıştır. Bu çalışma üç aşamada gerçekleştirilmiştir. İlk aşamada geri bildirim üretimine dair uygulamaları içeren çalışmalar derlenmiş ve önemli noktalar özetlenmiştir. İkinci aşamada ise e-sınavlardan etkin geribildirim üretmek için araştırmacı ve uygulayıcılara yönelik öneriler sunulmuştur. Son aşamada ise e-sınavlardan hızlı ve bireye özgü geri bildirim üretiminde kullanılabilecek altı adımdan oluşan bir yönerge ortaya konmuştur. Bu yönergede görsel ve yazılı öğelerden oluşan geri bildirimler aracılığıyla öğrencilerin sınav sonuçlarını nasıl daha etkin bir şekilde yorumlayabileceği gösterilmiştir.

**Keywords:** E-sınav, geri bildirim, sınav raporu, sınav geliştirme, bilgisayar destekli sınav

# Guidelines for Generating Effective Feedback from E-Assessments

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**ABSTRACT**

Today's education systems continue to adopt new technologies to support student learning. One of these technologies is e-assessment, a form of assessment that enables students to answer items using digital devices, such as computers and tablets. One of the benefits of e-assessments is the ability to generate interactive, timely, and customized feedback for students. Yet, despite vast literature on the generation and delivery of feedback, there is no systematic review of the guidelines on how e-assessments can be used for generating effective feedback. The objectives of this study are threefold. First, we synthesize the literature on the current practices in feedback generation. Second, we provide researchers and practitioners with a synthesis of guidelines for best practices in generating effective feedback with e-assessments. Third, we introduce a new framework in which we demonstrate the six steps of creating an e-assessment that can help produce immediate, customized, and specific feedback for students. This framework combines multiple forms of feedback (e.g., graphs, tables, and text) to improve the understanding of feedback and engage students in the interpretation of their score reports. Implications for practice and future research are discussed.

**Keywords:** E-assessment, feedback, score reporting, test development, computerized assessment

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## 1. INTRODUCTION

Many researchers have portrayed feedback as an important catalyst for improving student learning and academic performance (Bailey & Garner, 2010; Evans, 2013; Hattie & Gan, 2011). As an essential component of both summative and formative assessments, feedback serves several functions including providing students with information about the accuracy of their responses, the knowledge and understanding needed for correct responses, and helping students acquire essential knowledge (Narciss, 2008; Shute, 2008). Formative feedback generated by teachers enables students to capitalize on their strengths and identify their weaknesses, as well as guide them towards the necessary steps required to achieve the learning outcomes (Hatziapostolou & Paraskakis, 2010). Furthermore, acknowledging students' success and academic progress through feedback helps students develop a positive attitude toward learning and motivates them to learn more (Daniels & Bulut, 2019; Yuan & Kim, 2015).

In today's ever-changing technology landscape, education systems continue to evolve and adopt new technologies to support student learning. For example, e-assessment tools such as computer-based and computerized adaptive tests can be used to provide students with immediate feedback enriched with visual and interactive elements (e.g., Bulut, Cutumisu, Aquilina, & Singh, 2019). Furthermore, intelligent tutoring systems enable automated and adaptive feedback generation for learners within a personalized learning environment (e.g., Gutierrez & Atkinson, 2011). Similarly, massive open online courses (MOOCs) create additional learning opportunities, such as receiving feedback through online peer assessment (Suen, 2014). Despite these innovative approaches, generating effective feedback from e-assessments is still considered challenging because students are more likely to ignore feedback messages in e-assessment settings due to the lack of face-to-face interaction with their teacher (Wuensch, Aziz, Ozan, Kishore & Tabrizi, 2008; Timmers & Veldkamp, 2011; Van der Kleij, Eggen, Timmers & Veldkamp, 2012). Furthermore, students do not necessarily review their feedback carefully and even if they do, they may not understand or use it to enhance their learning (Prince, Handley, Millar, O'Donovan, 2010).

As emerging technologies continue to enable instructors to create high-quality assessments, incorporating effective feedback practices into e-assessments becomes highly essential. The goals of the current study are threefold. First, we will synthesize the literature on the current practices in feedback generation. Second, we will provide researchers and practitioners with a set of guidelines regarding the generation and delivery of effective feedback using e-assessments. Third, we will present a new framework in which we demonstrate the steps of creating an e-assessment that can help generate immediate, customized, and specific feedback for students. With this framework, instructors can design a fine-grained e-assessment that not only improves the content validity but also facilitates the generation and delivery of personalized feedback.

## 2. THE LITERATURE ON FEEDBACK GENERATION

### 2.1. Qualities of Effective Feedback

Previous research suggests that effective feedback must have several important qualities to promote learning and improve achievement. To be effective, feedback must be specific, timely, understandable, non-threatening, and revisable (STUNR; Schwartz, Tsang, & Blair, 2016). The following section will summarize each of the STUNR principles as well as other important characteristics of feedback.

#### *2.1.1. Specific*

For feedback to be effective, it must be content-specific, either goal or task-oriented (Hattie & Timperley, 2007), and neutral (Thurlings, Vermeulen, Bastiaens, & Stijnen, 2013). Feedback should help students understand their learning goals, self-monitor their progress, and identify ways to improve their performance (Yuan & Kim, 2015). Elaborated feedback (e.g., providing a directive explanation) is significantly more effective than feedback indicating whether or not the answer was correct or simply providing the correct answer (Schartel, 2012). This is particularly the case for higher-order learning outcomes (Van der Kleij, Feskens, & Eggen, 2015). Generally, elaborated and specific feedback is perceived as more useful than feedback that is general and brief (Harks, Rakoczy, Hattie, Besser, & Klieme, 2014). Moreover, feedback that simply praises the student fails to improve learning outcomes (Hattie & Gan, 2011; Hattie & Timperley, 2007), although this type of feedback may have a positive impact on students' motivation and perseverance (Van der Kleij et al., 2015). However, it is important to ensure that feedback is manageable, since overly detailed feedback with countless comments may become confusing for some students who may struggle with distinguishing important comments from the less important ones (Race, 2006).

#### *2.1.2. Timely*

The literature on the timing of feedback generally displays conflicting results, as many factors may influence this aspect of feedback delivery. However, many researchers suggest that students generally prefer immediate feedback to delayed feedback (Epstein et al., 2002; Daniels & Bulut, 2019; Yuan & Kim, 2015). Feedback seems to be more effective if it is provided quickly, while students can still remember how they addressed each assessed task (Race, 2006). However, the timing of feedback is dependent on the type of skill as well as on the level of task difficulty (Fluckiger, Vigil, Pasco, & Danielson, 2010). For example, during fluency tasks, immediate corrective feedback may have a negative impact on students (Hattie & Timperley, 2007). In

comparison, during difficult tasks delayed feedback may be useful, as it provides students with an opportunity to process the information related to the task (Clariana, Wagner, & Murphy, 2000). Shute (2008) suggested that for lower-order learning outcomes, immediate feedback works best, but for higher-order learning outcomes, delayed feedback works more effectively. Other research has also demonstrated that delayed feedback could lead to superior final test performance in comparison to immediate feedback, due to the spaced presentation of information (Butler, Karpicke, & Roediger, 2007). Also, the timing of feedback could depend on the source of feedback (i.e., teacher or peer). For example, Kulkarni, Bernstein, and Klemmer (2015) found that peer feedback becomes more effective when it is delivered within 24 hours and especially within an hour.

### *2.1.3. Individualized, non-threatening, and supportive of individual growth*

In addition to being timely, effective feedback should also support individual development and inform students about both their strengths and their weaknesses (Lilley & Barker, 2007). Feedback must be individualized, non-evaluative, and supportive. It should also address what the students did well, what areas they need to improve, and how they can improve their performance (Desrochers & Zell, 2012; Jonsson, 2012; Schartel, 2012; Shute, 2008). Feedback can promote learning when it is personal, manageable, motivational, and directly associated with the assessment guidelines and learning outcomes (Hatziapostolou & Paraskakis, 2010). To increase student motivation and encourage students to perform better, feedback must be constructive and empowering. Generally, students prefer feedback that is provided to them in person as it allows for an opportunity for discussion with the teacher and identifies areas in need of further improvement (Beaumont, O'Doherty, & Shannon, 2011; Blair, Curtis, Goodwin, & Shields, 2013).

### *2.1.4. Comprehensible*

For feedback to be effective, students must be able to comprehend the content of feedback. Thus, feedback must be clear and congruent with the knowledge level of students. Furthermore, a dialogue about the comments with the teacher allows students to reflect on their feedback and check their understanding of feedback (Yuan & Kim, 2015). Some students have also shown a preference for written feedback, as it provides them with an opportunity to reflect on the assignment at a later date (Blair et al., 2013).

### *2.1.5. Actionable*

Effective feedback incorporates strategies to ensure that students read and use feedback to improve their future performance. These strategies include revising and resubmitting work as a result of feedback, as well as writing a summary of the students' changes to demonstrate how they used feedback (Yuan & Kim, 2015). Furthermore, feedback should lead to a collaboration between the teacher and the students, be based on first-hand data, be restricted to behaviors that can be changed, and deal with decisions and actions rather than presumed intentions or interpretations (Schartel, 2012). Daniels and Bulut (2019) suggested that providing students with effective feedback may not be enough to influence students' subsequent performance and thus instructors should also help students build a plan of action based on the received feedback.

## 2.2. Lessons Learned from Feedback Research

Previous studies on feedback have highlighted many challenges in the generation, delivery, and use of feedback in practice. Studies show that there is often a big gap between teachers' expectations of the impact of feedback on student performance and the perceived usefulness of feedback among students. Some of the potential causes of this gap include failing to understand feedback (Lea & Street, 1998), prioritizing grades over feedback (Black & Wiliam, 1998), and lacking an action plan based on feedback (Daniels & Bulut, 2019). Also, students are usually not trained or supported in their use of feedback (Carless, Salter, Yang, & Lam, 2011; Quinton & Smallbone, 2010). Therefore, providing students with guidance on the content and interpretation of feedback could be a key factor influencing the effectiveness of feedback for students.

Research indicates that feedback is not a one-way interaction between the teacher and students. Instead, it is a part of a larger learning ecosystem that includes two-way interactions between many elements, such as the teacher, students, peers, the learning environment, and additional resources. When attempting to generate effective feedback for students, it is important to take into account the interaction between student and teacher mediators within the learning ecosystem. Some of these mediators include intelligence, personality, motivation, gender, culture, cognitive styles, educational experiences, and beliefs about learning (Evans, 2013). Evans (2013) also argued that the role, interrelationships, and importance of these mediators are likely to change over time.

Another important finding from previous research is that the feedback that students prefer to receive and the feedback that would benefit them are not necessarily the same (Jonsson, 2012). Race (2006) argued that, contrary to popular belief among students, the optimal type of feedback may not be specific, detailed, positive, and individualized. The feedback that is less specific and individualized could encourage students to seek further clarification on the provided information and lead to a productive learning experience (Jonsson, 2012). In line with these findings, Bulut et al. (2019) found that a majority of undergraduate students who reported specific and detailed feedback as their preference were not willing to review their exam reports that

included specific and detailed feedback on their performance. Instead, most students preferred to review a brief report with general feedback that was provided upon completion of the exam.

## 3. FEEDBACK IN E-ASSESSMENTS

Computerized feedback (i.e., computer-provided feedback) is a recently developed method of providing students with feedback, particularly in response to e-assessments. To date, researchers have reported both positive and negative findings regarding the effects and utilization of computerized feedback in education. Therefore, before deciding whether or not to employ computerized feedback, it is important to consider its advantages and disadvantages in practice. The following sections provide a summary of the advantages and disadvantages of computerized feedback, followed by a set of guidelines for generating effective feedback from e-assessments. Finally, a new framework for generating effective feedback from e-assessments is introduced.

### 3.1. Advantages of Computerized Feedback

#### *3.1.1. Timing*

Students participating in e-assessments can receive feedback more rapidly because computerized feedback is often automatically generated based on students' responses to the items (Epstein et al., 2002; Yuan & Kim, 2015). For example, the e-assessment systems are capable of providing immediate feedback through an answer-until-correct option in which students have the opportunity to make multiple attempts until they find the correct answer. This approach promotes the acquisition and retention of knowledge (Epstein et al., 2002). Also, immediate feedback in an e-assessment setting leads to a positive impact on learning, as students are still able to recall how they addressed each task, which would not be possible in a paper-pencil testing setting (Race, 2006; Van der Kleij et al., 2015). In K-12 large-scale assessments, digital score reports including feedback can be shared rapidly with students, parents, schools, and other stakeholders (Desrochers & Zell, 2012; Kyllonen, 2009). Furthermore, the availability of immediate computerized feedback reduces the workload for teachers, especially when large numbers of students or long tests are involved (Timmers, 2013).

#### *3.1.2. Diversity*

The dynamic nature of e-assessments enables greater diversity in computerized feedback with regard to the content, type, and amount of information being presented to students. Research shows that, in addition to conventional forms of feedback, computerized feedback can be provided in many other forms, such as affective and emotional feedback (Moridis & Economides, 2012), positive and negative feedback (Weedon, 2000), individualized feedback (Wu, Kuo, & Wang, 2017), and peer-to-peer feedback (McCarthy, 2017). Also, students can be given the option to choose what type of feedback (e.g., corrective feedback or diagnostic feedback) they might prefer before computerized feedback is generated from their responses to an e-assessment.

#### *3.1.3. Diagnostic information*

Computerized feedback is helpful for students to understand how successful they were in their learning (Lilley & Barker, 2007). In addition to indicating students' overall performance, computerized feedback can also be used for generating more specific and diagnostic information from e-assessments. When e-assessments are used as a formative assessment tool, computerized feedback generated from these assessments can help diagnose students' conceptual understanding of declarative knowledge, such as science education (Maier, Wolf, & Randler, 2016). Furthermore, the use of computerized feedback positively impacts the learning experience of students by guiding their efforts in learning and diagnosing misconceptions as well as areas of difficulty in their learning (Fui & Lian, 2018; Lowry, 2005).

### 3.2. Disadvantages of Computerized Feedback

#### *3.2.1. Perceived usefulness*

Generally, teachers anticipate that all students will perceive feedback in the way they intended it to be perceived (Harks et al., 2014). However, researchers argued that computerized feedback might not be perceived as useful as feedback given by teachers because students would be less likely to accept comments, praise, or criticism delivered via computers (e.g., Budge, 2011; Lepper, Woolverton, Mumme, & Gurtner, 1993). These studies indicate that students tend to use teacher-delivered feedback as a baseline when evaluating the effectiveness of computerized feedback. In an empirical study with college students, Lipnevich and Smith (2008) found that students rated the instructor's feedback as being more accurate and helpful than computerized feedback, despite the common belief that computerized feedback would be more trusted due to computers' capability to generate more neutral and unbiased information.

### *3.2.2. Disregard*

Previous research indicated that it can be more challenging to provide students with computerized feedback in an e-assessment setting because it is often easier for students to ignore computer-delivered feedback messages (Wuensch et al., 2008; Timmers & Veldkamp, 2011; Van der Kleij et al., 2012). Due to the lack of face-to-face interaction with the instructors, students do not necessarily read their computerized feedback and, if they do, they may not understand or use it (Prince et al., 2010).

### *3.2.3. No follow-up*

In an e-assessment setting, there is limited ability for students to engage in additional communication or follow-up with teachers regarding their feedback (Yuan & Kim, 2015). Race (2001) argued that students who fail to understand computerized feedback may not be able to follow up with their teacher to ask for further clarification, as they would normally do after receiving instructor-delivered feedback. Therefore, the impact of computerized feedback on student learning could be less positive than anticipated.

## 3.3. Guidelines for e-assessments

During the last two decades, there have been many publications, presentations, and technical reports including guidelines for the generation and delivery of feedback (e.g., Bulut, Cutumisu, Singh, & Aquilina, 2018; Jug, Jiang, & Bean, 2019; Nicol & Macfarlane-Dick, 2006; Pendleton, Schofield, Tate, & Havelock, 2003; Slater, Livingston, & Silver, 2019; Zapata-Rivera & Katz, 2014; Zenisky & Hambleton, 2012, 2016). However, these guidelines do not specifically focus on e-assessments. Therefore, a review of the existing resources that contain the current guidelines for generating effective feedback from e-assessments is needed. This section aims to provide a brief synthesis of guidelines for best practices in generating effective feedback with e-assessments. The guidelines were grouped into three categories: test development, the content of feedback, and the delivery of feedback. Using these categories, Table 1 presents a list of guidelines found in the feedback and score reporting literature.

Table 1.
*The Guidelines for Generating Effective Feedback with e-assessments*

| Category | Guidelines |
|---|---|
| Test development | The assessment should be deliberately designed to improve student performance (Wiggins, 1998).<br>The assessment should contain higher-order questions that are clearly worded and transparent in their marking (Walker, Topping, & Rodrigues, 2008).<br>The assessment should include clear instructions on how to answer each item (Walker et al., 2008).<br>The assessment should have a formative function providing feedforward for future learning (Bloxham, 2015, p. 109).<br>If possible, the instructor should allow students to engage in test construction (Nicol, 2007).<br>The teacher (or test developer) should create a test blueprint linking the items to the feedback generation process (Bulut et al., 2018).<br>If subscores by content categories are to be provided, each content category should have enough items with distinct information to produce reliable subscores (Bulut et al., 2018; Bulut, Davison, & Rodriguez, 2017; Sinharay, 2010). |
| Content of feedback | The score report should be tailored to meet the needs and characteristics of the target audience, such as students, parents, and teachers (Hambleton & Zenisky, 2013; Zapata-Rivera, & Katz, 2014).<br>The score report should have an aesthetically pleasing design without information overload (Bulut et al., 2018; Slater et al., 2019).<br>The score report should present the feedback in different forms, including narrative text, tables, and figures (Bulut et al., 2018).<br>The layout of the score report should be simple, with key results highlighted (Goodman & Hambleton, 2004; Slater et al., 2019).<br>Feedback presented in the score report should include a set of actions that students can take to improve their future performance (Daniels & Bulut, 2019; Hattie, 2009; Jonsson, 2012).<br>If interactive elements (e.g., visuals and tables) are to be used, how students will interact with these elements should be considered in the design process (Bulut et al., 2019; Slater et al., 2019).<br>Usability studies with students should be carried out to test whether the content of feedback is easy to follow (Slater et al., 2019; Zenisky & Hambleton, 2012). |
| Delivery of feedback | If there is an online location (e.g., a website) to view score reports, the homepage design should consider student interest and needs (Zenisky & Hambleton, 2012).<br>If online score reporting is used, downloadable PDFs that print out the same information in a clear way should also be included (Zenisky & Hambleton, 2012).<br>Students should be given the option to choose the timing (i.e., immediate or delayed) of feedback (Bulut et al., 2018).<br>Frequency of feedback (e.g., after each item or at the end) should be determined based on the type of e-assessment (i.e., summative or formative) and the number of items on the e-assessment (Bulut et al., 2018). |

### 3.4. A New Framework for Generating Feedback through e-Assessments

In this study, we also introduce a new framework that can be used for generating effective feedback from e-assessments. The main objective of the proposed framework is to encourage instructors and test developers to design a balanced assessment in terms of content domains, concepts targeted within each domain, and the number of items. The framework involves six steps. Figure 1 depicts each of these steps needed for generating effective feedback.

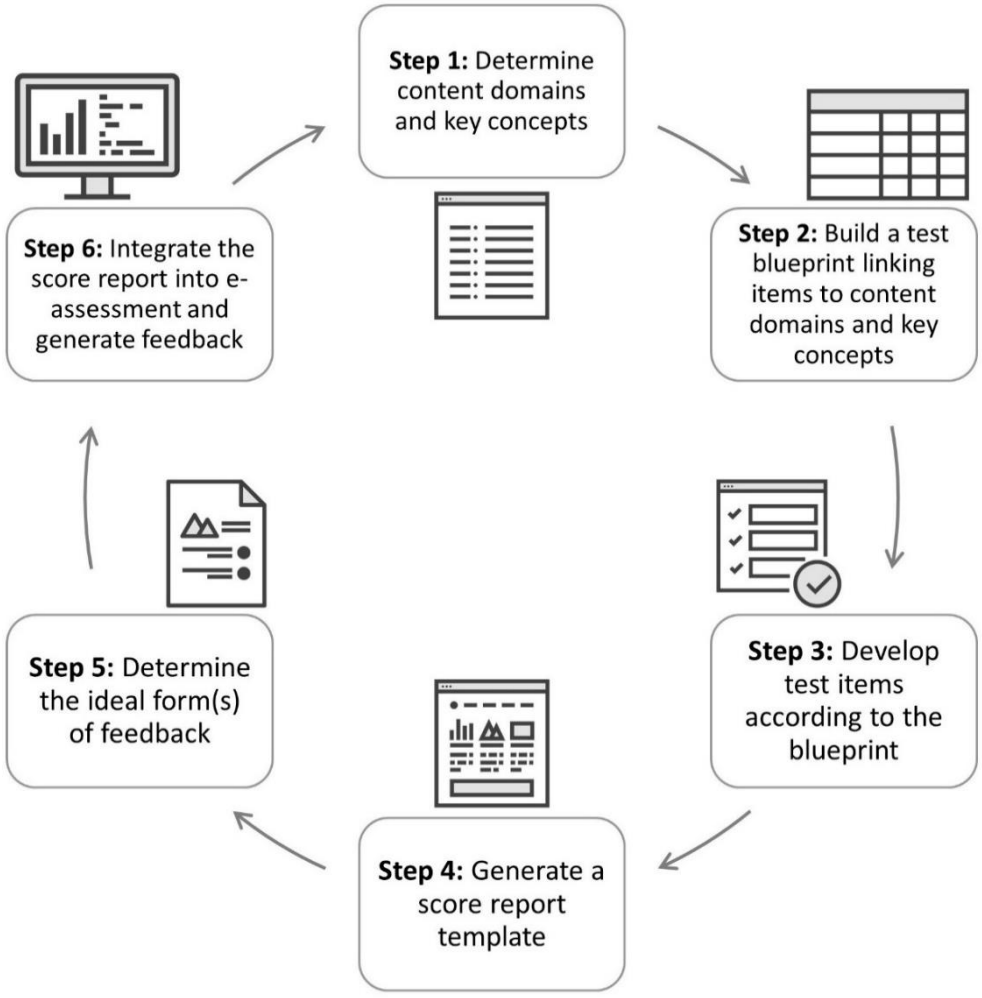


Figure 1. The workflow of the feedback generation process for e-assessments

In the first step, the instructor should determine the target content domains that need to be covered in the assessment. Also, the instructor should identify the key concepts within each content domain. The key concept refers to specific content knowledge or skills that students are expected to gain as they learn about each content domain. This step is highly crucial for the content validity of the assessment because drawing meaningful inferences from the assessment results depends on the degree to which the assessment measures the target construct adequately (Messick, 1989; Moss, 1995).

The second step focuses on building a test blueprint for the assessment. A test blueprint, also known as the table of test specifications, is essentially a two-way table of content domains (rows) and cognitive complexity levels (columns) intended to be included in the assessment. Haladyna and Rodriguez (2013) defined cognitive complexity as "the expected mental complexity involved when a test item is administered to a typical test taker" (p. 28). The test blueprint delineates the number (or proportion) of items for each combination of the content domains and cognitive complexity levels. The number of items reflects the relative weight of each content domain in the assessment. The total number of items for each row indicates the relative importance of each content domain, while the total number of items specified for each column represents the relative distribution for each level of cognitive complexity, such as the levels of remembering, understanding, and applying in Bloom's Revised Taxonomy (Anderson et al., 2001).

According to Perie and Huff (2015), what students should know and be able to do is one of the major questions that should drive the development of test blueprints for assessments. The test blueprint can guide the instructor significantly during the test development process, especially for item writing and test assembly. The instructor can develop a balanced assessment according to the test blueprint to ensure that the assessment appropriately reflects the content domains and the intended levels of cognitive complexity. However, using a traditional test blueprint, the instructor may still struggle with identifying what specific knowledge or skills need to be measured within each content domain. Therefore, the test blueprint could be expanded

with an additional column that provides a listing of the key concepts for each content domain. During the test development process, the instructor must ensure that each item on the assessment is linked to at least one of the key concepts listed in the test blueprint. Important key concepts could be targeted by multiple items in the assessment. Figure 2 shows an example of a test blueprint for a hypothetical assessment that is planned to include 40 items from four content domains. Each content domain has several key concepts that are expected to guide the instructor when creating and assembling items for the assessment (see Bulut et al., 2019 for the examples of key concepts created for an undergraduate course).

| Content | Key Concepts | Remembering | Understanding | Applying | Total | % |
|---|---|---|---|---|---|---|
| A | Key concept 1,<br>Key concept 2,<br>Key concept 3,<br>… | 8 | 4 | 4 | 16 | 40% |
| B | Key concept 1,<br>Key concept 2,<br>Key concept 3,<br>… | 2 | 6 | - | 8 | 20% |
| C | Key concept 1,<br>Key concept 2,<br>Key concept 3,<br>… | 4 | 4 | 4 | 12 | 30% |
| D | Key concept 1,<br>Key concept 2,<br>Key concept 3,<br>… | - | - | 4 | 4 | 10% |
| **Total** | | 14 | 14 | 12 | 40 | |
| **%** | | 35% | 35% | 30% | | |

Figure 2. A test blueprint for a hypothetical assessment with 40 items

The third step focuses on the development of test items according to the test blueprint. Unless it is a new assessment, the instructor can utilize previously developed items to build the assessment according to the test blueprint. If, however, the instructor needs to create new items, then the key concepts specified in the test blueprint could guide the item writing process. The instructor also needs to determine item format (e.g., selected-response and constructed-response), depending on the content domains, target levels of cognitive complexity, and the student population (see Haladyna and Rodriguez, 2013 for a comprehensive review of the item and test development processes). The final product of the item writing process should be an expanded, item-level form of the test blueprint in which each item is categorized based on their content domain, key concepts, and cognitive complexity. Figure 3 illustrates an expanded test blueprint using the same example of a hypothetical assessment with 40 items.

In the fourth step, a score report template needs to be created. The template can be created for either dynamic reporting (e.g., a web-based report with interactive features) or static reporting (e.g., a static document to download or print). The template should include the total score (e.g., total raw score, percent-correct score, or scaled score) as well as scores by content categories (i.e., subscores). Subscores can provide students with more fine-grained information from the assessment beyond a total score and help them identify their strengths and weaknesses more clearly (Bulut et al., 2017). In addition to the scores, the score report can also include other elements, such as narrative text, graphics, and tables. To create an aesthetically pleasing report for students, the principles of visual design (e.g., scale, contrast, balance, and visual hierarchy) and cognitive psychology should be considered during the design process. These design principles not only facilitate readability and interpretation of the feedback provided in the score reports, but also can draw the student's attention to the important information presented in the report (Gotch & Roduta Roberts, 2018).

| Item | Item Description | Content Domain | Key Concept | Cognitive Complexity |
|---|---|---|---|---|
| 1 | … | A | Key concept 1 | Remembering |
| 2 | … | B | Key concept 3 | Applying |
| 3 | … | C | Key concept 1 | Understanding |
| . | | . | . | . |
| . | | . | . | . |
| . | | . | . | . |
| 40 | … | B | Key concept 2 | Remembering |

Figure 3. An expanded form of the test blueprint after the test development process

In the fifth step, the instructor needs to determine the optimal ways to present feedback to the students. A score report typically includes a combination of interactive or static graphics, tables, numbers, and narrative text. The score report can present the feedback in a simple format (e.g., mostly narrative text and numbers) or in a relatively more advanced format (e.g., interactive graphics and tables). However, a balanced design can be developed by including multiple ways to present feedback and considering the target audience. For example, Bulut et al. (2019) found that undergraduate students did not prefer score reports that present feedback in a single format (e.g., only graphics or tables). Instead, most students wanted to receive their feedback in multiple formats, such as narrative text, graphics, and tables.

In the final step, the score report template is integrated into the e-assessment and used for generating feedback as students take the assessment. Unless the assessment contains constructed-response items that require human scoring, the score reports can be automatically generated immediately after the students complete the assessment. However, previous research shows that providing immediate feedback in the e-assessment settings could lead to negative consequences, such as avoiding reviewing the score reports after the assessment period is over (Bulut et al., 2019; Van der Kleij, 2012) and failing to understand and process the feedback (Prince et al., 2010). Therefore, the instructor may consider making the score reports available to their students once the students recover from mental fatigue that occurs due to prolonged cognitive activity when completing the assessment.

The feedback generation framework introduced in this study has several implications for researchers and practitioners. First, the framework allows researchers to investigate the effects of many elements and conditions in feedback generation, such as the timing of feedback (e.g., immediate or delayed), type of feedback (e.g., graphics, tables, or text), and density of feedback (e.g., concise or detailed). Second, this framework could be possibly extended to a small classroom assessment where the instructor uses both multiple-choice and constructed-response items together and scores the items manually. Following the steps of feedback generation (see Figure 6), the instructor can build a template using a particular software program (e.g., Microsoft Excel) and create individual score reports with different types of feedback. Third, the feedback generation framework can be used with other innovative applications (e.g., automatic item generation, automated test assembly, and automated score reporting) to build a more efficient and effective assessment platform for large-scale testing.

## 4. DISCUSSION

Today's education systems continue to evolve and adopt new technologies to support and enhance student learning. One of these technologies is e-assessment that refers to the use of information technology in conducting assessments (Singh & Villiers, 2017). Using e-assessment tools (e.g., computers, tablets, and smartphones), students can answer items in a digital environment. Previous research suggests that e-assessments facilitate the generation and delivery of effective feedback while students are solving the items. The instructor can use e-assessments to provide students with feedback that is not only timely but also tailored to students' needs (van der Kleij et al., 2012; Lopez, 2009). However, the existing literature does not present consistent evidence regarding the conditions in which timely and customized feedback generated from e-assessments can contribute to student learning. Therefore, this study aimed to present a review of the feedback literature over the past two decades, with a particular emphasis on the generation and delivery of feedback with e-assessments. The lessons learned from the feedback literature were discussed. Then, a review of the published feedback guidelines related to e-assessments was presented. Finally, a new framework for creating an e-assessment that can help generate immediate, customized, and specific feedback for students was introduced.

As Hepplestone, Holden, Irwin, Parkin, and Thorpe (2011) also indicated, there is a vast literature on effective feedback practices in education, whereas the literature on the use of technology to enhance the production, delivery, and utilization of feedback is still limited. The literature on the characteristics of effective feedback suggests that feedback must be specific, timely, easy to understand, non-threatening, revisable, and actionable (Jonsson, 2012; Schwartz et al., 2016; Shute, 2008). However, researchers also pointed out that there is a complex relationship among the effectiveness of feedback, student characteristics (e.g., personality, intelligence, and motivation), and other potential mediators (e.g., instructor, peers, and learning environment) in practice (Evans, 2013; Shute, 2008). In addition, research suggests that the perceived usefulness of feedback among students

depends on many factors, such as the content of feedback, student motivation, and students' familiarity with feedback (Bulut et al., 2019; Carless et al., 2011; Daniels & Bulut, 2019; Evans, 2013).

Recent studies appear to support the hypothesis that the quality, quantity, and use of feedback can be enhanced with the use of technology in education. Students participating in e-assessments can receive immediate feedback upon completion of the assessment, which would not be possible traditional paper-and-pencil testing (Van der Kleij et al., 2015; Yuan & Kim, 2015). The automatic generation of feedback from e-assessments could reduce the workload for teachers who are expected to evaluate a large group of students (Timmers, 2013). Feedback provided through online score reporting also offers a certain level of flexibility in accessing and reviewing the comments at a convenient time for each student (Hepplestone et al., 2011). In addition to the students, online score reports including feedback can also be shared with parents, schools, and other stakeholders (Desrochers & Zell, 2012; Kyllonen, 2009).

Despite the benefits of technology in supporting the generation and delivery of feedback, researchers also highlighted potential disadvantages of computerized feedback. For example, Budge (2011) found that students are less likely to accept comments, praise, or criticism provided within an e-assessment setting. Similarly, Lipnevich and Smith (2008) argued that teacher-delivered feedback is often perceived as more useful by students. Another potential challenge is that students are less likely to follow up with their instructors to seek further clarification on their feedback. Due to the lack of interaction with their teachers, students tend to disregard computer-delivered messages (Wuensch et al., 2008; Timmers & Veldkamp, 2011).

The existing guidelines found in the feedback literature focus on three aspects of the feedback generation process: test development, feedback content creation, and feedback delivery. For a balanced assessment that can produce effective feedback, the use of a test blueprint in the test development process appears to be essential (Bulut et al., 2018). In addition, instructors are recommended to consider a formative function for the e-assessment, so it can be used for improving student performance in future assessments. Regarding the content of feedback, researchers highlighted the necessity of utilizing the principles of visual design in creating a score report that is simple, easy to navigate, and aesthetically pleasing (Bulut et al., 2018; Slater et al., 2019; Zenisky & Hambleton, 2012). Researchers also made several suggestions related to the delivery of feedback. When determining the timing and frequency of feedback, the type of assessment, the length of assessment, and the characteristics of the target student group should be considered (Bulut et al., 2018).

Although the published guidelines and recommendations on the generation and delivery of feedback aim to enhance the effectiveness of feedback practices in the classroom, it should be acknowledged that some of these guidelines are not based on empirical evidence. With this limitation in mind, this study offers some insights into the conditions in which e-assessments can produce effective feedback that can support student learning. The feedback generation framework introduced in this study follows a teacher-centered approach in the design of both the assessment and feedback to be generated from the assessment. As instructors attempt to build a reliable assessment that can yield valid conclusions about the students, feedback generation should also be considered a key component, not an afterthought. Furthermore, in order to provide effective feedback to the students, instructors must employ the principles of both visual design and communication when designing score reports. Future research should focus on the complex interaction between student characteristics (e.g., age, grade level, and motivation level) and the feedback generated with e-assessments to better guide the instructors and test developers.

**Research and Publication Ethics Statement**

This study was carried out in accordance with the recommendations of the Research Ethics Office and the protocol (Pro00072612) was approved by the Research Ethics Board 2 at the University of Alberta.

**Contribution Rates of Authors to the Article**

Research idea: OB (60%), MC (40%); Literature review: OB (25%), MC (25%), DS (25%), AA (25%); Manuscript preparation: OB (60%), MC (20%), DS (10%), AA (10%).

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**Statement of Interest**

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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# YAYIN İLKELERİ VE YAZIM KURALLARI

## 1. YAYIN İLKELERİ

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**2.** Derginin yayın dili Türkçe ve İngilizce'dir.

**3.** Dergiye gönderilen makalelerin başka bir yerde yayınlanmamış veya yayınlanmak üzere eş zamanlı olarak başka bir dergiye gönderilmemiş olması gerekmektedir. Hacettepe Üniversitesi Eğitim Fakültesi Dergisi yayınlanmak üzere kabul edilen makalelerin tüm yayın haklarına sahiptir.

**4.** Dergiye gönderilecek makalelerin sadece http://efdergi.hacettepe.edu.tr adresindeki "Makale Yönetim Sistemi"nde açılan hesaba yüklenmesi gerekmektedir. Eş Editörlere, Yayın Kurulu üyelerine veya dergi iletişim e-posta adresine gönderilen makaleler resmi başvuru olarak kabul edilmemektedir.

**5.** Dergiye gönderilen makaleler ilk olarak dergi editör yardımcısı tarafından şekil incelemesinden geçirilir. Dergi şablonuna uygun olarak hazırlanan makaleler daha sonra eş editörlere gönderilir. Eş Editörler ve Yayın Kurulu tarafından derginin yayın ilkelerine uygunluğu incelenir ve uygun görülen makaleler alan editörlerine atanır. Alan editörleri makaleleri alanın var olan bilgi birikimine katkısı yönünden inceler ve uygun görürlerse makaleyi hakemlere gönderirler. Ön inceleme aşamalarında aşağıdaki noktalar göz önünde bulundurulur:

a) Yayın etiğine uygunluğu
b) Dergi yayın ilkelerine uygunluğu
c) Çalışmanın konusunun bilimsel açıdan özgünlüğü ve güncelliği
d) Çalışma konusunun eğitime katkısı
e) Yazım kurallarına ve makale yazım şablonuna uygunluğu

**6.** Ön incelemeler sonucunda uygun olduğuna karar verilen çalışmalar bilimsel açıdan değerlendirilmesi için hakemlere gönderilir. Hakem raporlarına dayalı olarak makalelerin yayınlanıp yayınlanmayacağına alan editörleri, Yayın Kurulu ve/veya eş editörler karar verir. Gerek duyulması durumunda çalışmalar, hakemlerden gelen eleştiri ve öneriler doğrultusunda, gözden geçirilmesi veya önerilen düzeltmelerin yapılması için yazarlara geri gönderilir.

**7.** Yazar(lar)la hakemler arasındaki iletişimi sadece eş editörler sağlar. Dergide makalelerin değerlendirilmesi sürecinde çift taraflı kör hakemlik sistemi uygulanmaktadır.

**8.** Yayına kabul edilen makalelerin basılması için, yazar(lar) tarafından garanti ve yükümlülük formunun imzalanması ve dergiye iletilmesi gerekmektedir. Ayrıca, yazar(lar)dan makaleyi bir intihal kontrol programı ile taramaları ve intihal kontrol programının ürettiği en çok % 10 benzerlik oranının olduğunu belgeleyen bir program çıktısını, garanti ve yükümlülük formuyla beraber göndermeleri istenir.

**9.** Hakemlerden gelen dönütler ve eş editörlerin kararına bağlı olarak dergiye gönderilen makalelerin ilk tur hakem değerlendirme süreçlerinin yaklaşık olarak 6-8 hafta sürmesi öngörülmektedir. Ancak bu süre alandan alana değişebilir. Değerlendirme yapmayı kabul etmeyen hakem olması durumunda süre uzayabilmektedir.

**10.** Yayına kabul edilen ve son biçimi verilen makaleler üzerinde yazar(lar) değişiklik yapamaz.

**11.** Yayınlanan makalenin içeriğinden (kaynakların ve alıntıların doğruluğundan, ileri sürülen görüşlerden ve telif hakkı olan çizelge, resim ve diğer görsellerden) yazar(lar) sorumludur.

**12.** Gelecek sayılarda basılmak üzere doi numarası verilen makaleler, **doi numarası sırasına veya kabul tarihine göre değil** makalelerin konuları ve alanları temel alınarak basılmaktadır. Her bir sayıda basılacak olan makaleler eğitimin farklı alanları dikkate alınarak eş editörler tarafından belirlenmektedir.

**13.** Yayına kabul edilen makaleler için yazar(lar)a ve hakemlere ücret ödenmez.

**14.** Açık erişim politikası gereğince, dergi sayıları ve makaleler derginin web sayfasında yer alır ve makalelerin tam metinlerine pdf dosyası olarak erişilebilir.

15. ULAKBİM TR Dizin kuralları gereği makalelerde yer alan tüm yazarların ORCID numaralarının makalenin son şekline eklenerek gönderilmesi gerekmektedir. ORCID numarası eksik yazarlara ait makalelere doi numarası verilmez ve erken görünüm olarak yayına açılmaz.

## 2. YAZIM KURALLARI

### 2.1. BAŞLIK VE DİPNOTLAR

Makale başlığı iki yana yaslı, 12 punto, koyu ve Cambria yazı tipinde, en çok 15 sözcük, bağlaçlar hariç her sözcüğün ilk harfi büyük olarak yazılmalıdır. Türkçe yazılmış makalelerde makalenin İngilizce başlığına da aynı biçim kullanılarak yer verilmelidir. Makale ile ilgili olarak, tezden üretilme, bir konferansta sunulma veya proje kapsamında yapılma gibi özel durumlar varsa (*) ile başlayan bir dipnot ile yazılmalıdır. Bu ekleme makale kabul edildikten sonra gerçekleştirilecektir. Yazar kimliklerinin tahmin edilmesine neden olabileceği için, yazarların makale gönderimi sırasında böyle bir dipnota yer vermemeleri gerekmektedir. Makale geliş, kabul, erken görünüm ve basım tarihlerinin eklenmesi ve makalenin APA6 referans verme stiline göre Türkçe ve İngilizce kaynak gösterimleri, kabul süreci sonrasında editörlerce yapılacaktır. Bu nedenle ilk aşamada bu alanların şablondaki gibi bırakılması gerekmektedir.

Çalışma kabul edildikten sonra çalışmanın yazar(lar)ının adı soyadı ortalı, koyu, 11 punto, Cambria yazı tipinde, soyadı büyük harflerle ve ortalanmış olarak, yazar sayısı birden fazla ise yazarlar tarafından belirlenen sırayla yazılacaktır. Yazar(lar)ın unvanıyla birlikte, çalıştığı yerin açık adı, şehir-ülke bilgisi, e-posta adresi ve ORCID numarası, başlığın altındaki yazar ismi ya da isimleriyle eşleştirilmiş dipnotlarla (*) belirtilmeli ve makalenin ilk sayfasının altındaki dipnotta yer almalıdır. Bu ekleme makale kabul edildikten sonra gerçekleştirilecektir. Yazar kimliklerinin tahmin edilmesine neden olabileceği için, yazarların makale gönderimi sırasında böyle bir dipnota yer vermemeleri gerekmektedir.

*Dipnotlar için ek açıklama:* Çalışma herhangi bir bilimsel etkinlikte bildiri olarak sunulmuş ise, makalenin başlığına dipnot simgesi (*) konularak, makalenin ilk sayfasının altında etkinliğin adı, yeri ve tarihi belirtilmelidir. Çalışma herhangi bir araştırma kurumu ya da fonu tarafından desteklenmiş ise, makalenin başlığına dipnot simgesi (*) konularak, desteği sağlayan kuruluşun adı, projenin numarası ve tamamlandığı tarih ilk sayfanın altında belirtilmelidir. Çalışma lisansüstü tezlerden üretilmiş ise, makalenin başlığına dipnot simgesi (*) konularak, tezin adı, danışmanın adı ve tamamlandığı tarih ilk sayfanın altında belirtilmelidir. Dipnotlardaki tüm bilgiler Palatino Linotype yazı tipinde, girintisiz ve 10 punto olmalıdır.

### 2.2. TÜRKÇE ve İNGİLİZCE KISA ÖZET

Çalışmalar Türkçe ve İngilizce dillerinde hazırlanıp gönderilebilir. Türkçe hazırlanan her çalışmanın ilk sayfasında Türkçe ve İngilizce kısa özet bulunmalıdır. Türkçe kısa özet, Cambria yazı tipinde, 9 punto ve 200 sözcüğü geçmeyecek şekilde tek sütun ve iki yana yaslı olarak şablonda belirtilen alana yazılmalıdır. İngilizce kısa özet ise aynı yazım biçimiyle, en çok 300 sözcük olacak şekilde hazırlanmalıdır. İngilizce gönderilen çalışmalarda Türkçe kısa özet bulunma zorunluluğu yoktur. Kısa özet içinde kaynak verilmemelidir. Her kısa özetin altında, çalışmayı betimleyen 2-5 anahtar sözcük bulunmalıdır.

## 3. BÖLÜMLER VE ALT BÖLÜMLER

Çalışmalarda ana bölüm başlıkları (birinci düzey başlıklar) Arabik rakamlarla numaralandırılarak Cambria yazı tipinde, 11 punto, koyu, sola yaslı ve tümü büyük harf biçiminde yazılmalıdır. Alt bölüm başlıkları (ikinci düzey başlıklar) Cambria yazı tipinde, 11 punto, koyu, sola yaslı, her sözcüğün ilk harfi büyük olarak yazılmalıdır. Üçüncü düzey başlıklar ise Cambria, 11 punto, koyu, italik, sola yaslı, yalnızca ilk sözcüğün ilk harfi büyük olacak biçimde yazılmalıdır.

Metin içindeki paragraflar en az üç cümleden oluşmalı ve paragraflar arasında bir satır boşluğu bırakılmalıdır. Aynı şekilde başlıkların öncesinde ve sonrasında da bir satır boşluk verilmelidir. Makalenin tamamında girintiye yer verilmemeli, paragraflar arasında önce ve sonra aralık değerleri 0 olmalıdır. Metin içi atıfların yazımında, tablolarda, şekillerde ve kaynakça yazımında APA 6 yazım stili kullanılmalıdır.

Çalışmalarda ana bölümler sırasıyla;

- GİRİŞ
- YÖNTEM
  - Evren ve örneklem/Çalışma Grubu/Katılımcılar/Denekler (bunlardan sadece biri)
  - Veri toplama yöntem(ler)i/teknikleri/araçları
  - Verilerin analizi
- BULGULAR
- TARTIŞMA, SONUÇ VE ÖNERİLER
- KAYNAKLAR

gibi temel bölümlerinden oluşmalıdır. Bununla birlikte çalışmalarda kullanılan yönteme göre yazarlar ilave bölüm veya alt bölümler oluşturabilirler.

Ana metine "1. GİRİŞ" alt başlığı yazılarak başlanmalıdır. YÖNTEM, BULGULAR ve TARTIŞMA, SONUÇ VE ÖNERİLER bölümlerine yeni sayfadan başlanmamalı, bir bölüm bittikten sonra, aynı sayfada diğeri onu izlemelidir. Sıklıkla kullanılan istatistiksel tekniklerin sunulmasında APA 6 yazım stili temel alınarak, istatistisel değerlere cümleler içerisinde yer verilmelidir. Bununla birlikte, uygun yerlerde yazar(lar) tablolar ve şekillerden faydalanabilirler. Makale metninin tamamının yazımında APA 6 yazım stili kullanılmalıdır.

Türkçe makalelerde Türk Dil Kurumu'nun sözlükleri ve yazım kılavuzu dikkate alınmalı ve mümkün olduğunca Türkçe sözcükler kullanılmalıdır. Alana özgü yabancı dildeki kavramın/terimin Türkçe karşılığı kullanılırken ilgili kavramın/terimin ilk kullanıldığı yerde yabancı dildeki karşılığı parantez içinde verilmelidir.

## 4. ŞEKİLLER

Şekiller yazım alanından taşmayacak şekilde makale içinde uygun görülen yerlere ortalı olacak şekilde yerleştirilebilir. Ana metinden şekle atıfta bulunulmalı ve mümkünse şekil açıklamalıdır. Her bir şeklin altında Arabik rakamlarla numaralandırılmış bir şekil başlığı yerleştirilmeli, makale boyunca aynı numaralandırma devam etmeli ve APA 6 yazım stiline uygun olarak yazılmalıdır. Şekil başlıkları biçim olarak Cambria yazı tipinde, 10 punto, sola yaslı, yalnızca ilk sözcüğün ilk harfi büyük olacak şekilde yazılmalıdır. Şekil başlığında kaynak kullanılmış ise parantez içinde kaynak bilgisi eklenmelidir. Eğer şekil içinde yazılar varsa, 9veya 10 punto olacak şekilde Cambria yazı tipiyle yazılabilir.

## 5. TABLOLAR

Tablolar sola dayalı olacak şekilde ve tamamında Cambria yazı tipi kullanılarak hazırlanmalıdır. Tablo başlığı, 10 punto ile yazılmalı, başlığın her kelimesinin sadece ilk harfi büyük olmalı ve başlık, tablo sayısının altında verilmelidir. Tablolarda APA 6 yazım stili kullanılmalıdır. Tablolara metin içinde tablo sayısı belirtilerek atıfta bulunulmalı ve tablo bittikten sonra yorumlanmalıdır. Tablolar, metin içinde kullanıldıkları yerde veya izleyen sayfada yer almalıdır. İlgili not ve kaynaklar, tablonun altında, "*Not*:" veya "*Kaynak*:" ifadelerinden sonra belirtilebilir.

## 6. KAYNAKLARIN BELİRTİLMESİ

Makalenin sonunda, varsa ek(ler)den önce kaynaklar, APA 6 yazım stiline uygun olarak verilmelidir. Kaynakların tamamı, 10 punto ile ve her bir kaynağın arasında 1 satır boşluk verilerek, Cambria yazı tipinde ve iki yana yaslı, tek satır aralığında, önce ve sonra paragraf değerleri 0 olacak şekilde, girintiye yer vermeden yazılmalıdır. Kaynakçada yer alan her kaynağa metin içinden atıfta bulunulduğundan, yine aynı şekilde metin içinde kullanılan her bir kaynağa da kaynakçada yer verildiğinden emin olunmalıdır.

## 7. EKLER

Yazar(lar) ihtiyaç duyarlarsa kaynakçadan sonra ve geniş özetten önce, Ekler bölümü oluşturabilirler. Bu kısımda verilecek eklere makale içinden mutlaka atıfta bulunulmalıdır. Birden fazla ek kullanılacaksa numaralandırılabilir. Yazarların eklere koyacakları eklentilerin makale içinde verilmesi durumunda bütünlüğü bozacak biçimde olması gerekmektedir. Makale içinde tablo veya şekil ile verilebilecek unsurlara Ekler'de yer verilmemelidir.

## 8. GENİŞ ÖZET

Makalede varsa Ekler, yoksa Kaynakça kısmından sonra 750-1000 sözcük uzunluğunda geniş İngilizce özete yer verilmelidir. Bu özet alt başlıklar (Giriş, Yöntem gibi) içermeden, makalenin temel fikirlerinin tümünü kapsayacak biçimde, paragraflar halinde olmalıdır. Geniş özette aynen alıntıya yer verilmemelidir. Geniş özette tablo veya şekil kullanılmamalıdır. Makalenin dili Türkçe ise geniş özet İngilizce olmalıdır. İngilizce makalelerde ise Türkçe geniş özet sunulma zorunluluğu yoktur, bu konudaki karar yazarlara bırakılmıştır. Geniş özet, 10 punto büyüklüğünde, Cambria yazı tipi kullanılarak hazırlanmış olmalıdır.

## 9. MAKALE ŞABLONU

Bir makale çalışmasıyla ilgili bütün ayrıntılara "Yazım Kuralları"nda burada belirtilmemiş olabilir. Biçimlendirmeyle ilgili daha ayrıntılı bilgi, dergiye yollanacak çalışmalar için kullanılması gereken şablon dosyada bulunmaktadır. Burada verilen bilgilerle şablon dosyadaki bilgilerin çelişmesi durumunda şablon dosyası temel alınmalıdır.

Çalışmaların derginin yazım kurallarına uygun hazırlanabilmesi için şablon dosyanın kullanılması gerekmektedir (Dosya-Türkçe: Türkçe Şablon). (Dosya-İngilizce: İngilizce Şablon). Eğer yazım işlemi başka bir dosyada yapılmışsa ilgili dosyanın içeriğinin şablon dosyaya aktarılması önerilmektedir. Şablona uygun olarak hazırlanmayan makaleler şekil kontrolü aşamasında yazarlara iade edilecektir.

## 10. DÜZELTME ÇİZELGESİ

Makaleye ilişkin düzeltme önerileri almış olan yazar(lar), hakem raporları ile birlikte gönderilen "Düzeltme Çizelgesi" üzerinde, her hakemin istemiş olduğu düzeltme/değişiklik önerilerine dayalı olarak yapılan işlemi sayfa numarası belirterek çizelgede belirtmelidir.

## H.Ü. Eğitim Fakültesi Dergisi İletişim:

Hacettepe Üniversitesi, Eğitim Fakültesi
06800, Beytepe- ANKARA/ TURKEY
**E-posta**: efdergi@hacettepe.edu.tr
**Web**: http://www.efdergi.hacettepe.edu.tr

Hacettepe Üniversitesi Eğitim Fakültesi Dergisi (HÜEF)
Hacettepe University Journal of Education (HUJE)
e-ISSN: 2536-4758

# PUBLICATION POLICIES AND AUTHOR GUIDELINES

## 1. PUBLICATION POLICIES

Hacettepe University Journal of Education is an international, peer-reviewed journal that is published four times a year (January, April, July, October) and publishes in accordance with the following principles:

**1.** In accordance with its publication policy, our journal includes original quantitative and qualitative research articles in all areas of education.

**2.** The language of the journal is Turkish and English.

**3.** Articles that are submitted to the journal should not have been published elsewhere or submitted to another journal for review. Hacettepe University Journal of Education claims all the rights of the articles that are accepted for publication.

**4.** Articles to be submitted to the journal should only be uploaded to the account created in the "Manuscript Handling System" at http://efdergi.hacettepe.edu.tr**.** Articles sent to Co-editors, Editorial Board members or journal contact e-mail addresses are not considered as official submissions.

**5.** Articles submitted to the journal are first reviewed by the Assistant Editor of the journal. Then, the articles prepared according to the journal template are sent to the Co-editors. The Co-Editors and the Editorial Board examine the compliance with the journal's publication principles and appropriate articles are assigned to field editors. Field editors examine articles in terms of their contribution to the existing knowledge of the field and, if they deem appropriate, they initiate the blind review process. The following points are taken into account during the preliminary examination:

a) Compliance with publication ethics
b) Compliance with publication principles
c) Scientific originality and significance of the subject of the study
d) Contribution of the subject study to the field of education
e) Compliance with spelling rules and journal manuscript template

**6.** The studies that are found to be suitable as result of preliminary examinations are sent to the referees for scientific evaluation through blind review. The Editors, Editorial Board and/or Co-editors decide whether the articles will be published based on the reviewer reports. If deemed necessary, the works are sent back to the authors for review or for proposed corrections in accordance with the criticisms and suggestions from the referees.

**7.** Only the Co-editors provide communication between the author(s) and the referees. In the evaluation of the articles in the journal, a double-blind review system is strictly applied.

**8.** In order to publish accepted articles, a guarantee and liability form must be signed by the author(s) and submitted to the journal. In addition, the author(s) are required to scan the article with a plagiarism control program and submit the program output documenting that the plagiarism control program has a maximum similarity rate of 10%, together with the guarantee and liability form.

**9.** Depending on the feedback from the reviewers and the decision of the co-editors, the first round of peer review process of the articles is expected to take approximately 6-8 weeks. However, this period may vary from field to field. The period may be extended if a need to replace a reviewer emerges.

**10.** The author (s) cannot make any changes on the accepted and finalized articles.

**11.** The author(s) is responsible for the content of the published article (the accuracy of the references and citations, the arguments and copyrighted tables, pictures and other images).

**12.** Articles that are given a doi number to be published in future issues are printed on the basis of the subjects and fields of the articles, **not on the order of the doi number or the date of acceptance.** The articles to be published in each issue are determined by the Co-editors considering the different fields of education.

**13.** No fee is paid to the author(s) and reviewers for the articles accepted for publication.

**14.** In accordance with the open access policy, the number of journals and articles are available on the journal's web page and full texts can be accessed as a pdf file.

**15.** According to the index rules of ULAKBİM TR, the ORCID numbers of all the authors in the articles must be submitted with the final form of the article. Authors whose ORCID number is missing are not given a doi number and the article is not published as online first.

## 2. AUTHOR GUIDELINES

### 2.1. TITLE AND FOOTNOTES

The title of the article should be justified, 12 point, bold, Cambria font, maximum 15 words, and the first letter of each word should be capitalized except for the conjunctions. In the articles written in Turkish, the English title of the article should be written in the same format. If there are special cases related to the article, such as being produced from the thesis, presented at a conference or produced within the scope of a project, it should be written with a footnote starting with (*). This will be done after the article is accepted. Authors should not include such a footnote at the time of submission, as this may lead to an estimate of their identity. Article arrival, acceptance, online first and publication dates will be added and Turkish and English references will be revised according to the APA 6 conventions by the editors after the acceptance process. Therefore, in the first stage, these fields should be left empty in the template.

After the acceptance of the study, the author (s) name of the study should be written in centered, bold, 11 point, Cambria font, surname in capital letters and centered. If the number of authors is more than one, they will be written in the order specified by the authors. Along with the title (s) of the author (s), full name of the place of work, city-country information, e-mail address and ORCID number, should be indicated with footnotes (*) paired with the author's name or names under the title and should be included in the footnote at the bottom of the first page of the article. This addition will be done after the article is accepted. Authors should not include such a footnote at the time of submission, as this may lead to an estimate of their identity.

*Annotations for footnotes:* If the study has been presented as a paper in any scientific activity, the footnote icon (*) should be placed in the title of the article, and the name, place and date of the activity should be indicated at the bottom of the first page of the article. If the study has been supported by any research institution or fund, the footnote symbol (*) should be placed in the title of the article, and the name of the sponsor, the number of the project and the date of completion should be indicated at the bottom of the first page. If the study has been produced from graduate theses, then the title of the thesis, the name of the supervisor and the date of the completion should be placed at the bottom of the first page by placing a footnote symbol (*) in the title of the article. All information in the footnotes should be in Palatino Linotype font, non-typed and 10 font size.

### 2.2. TURKISH and ENGLISH ABSTACT

Studies can be prepared and sent in Turkish and English. The first page of each study prepared in Turkish should contain an abstract in Turkish and English. The Turkish abstract should be written in Cambria font, 9 font size and written in single column and justified in the field specified in the template, not exceeding 200 words. The English abstract should be written in the same format, and should include up to 300 words. There is no obligation to include a Turkish abstract in the studies written in English. References should not be cited in the abstract. Below each abstract, there should be 2-5 keywords that describe the study.

## 3. SECTIONS AND SUBSECTIONS

Main section titles (first level titles) should be numbered with Arabic numerals and written in Cambria font, 11 font size, bold, left justified and all must be in capital letters. Subheadings (second level headings) should be written in Cambria font, 11 font size, bold, left justified, and the first letter of each word should be capitalized. The third level headings should be written in Cambria, 11 font size, bold, italic, left justified and only the first letter of the first word should be capitalized.

The paragraphs in the text should include at least three sentences and one line space should be left between the paragraphs. Likewise, one line space should be given before and after the headings. There should be no indentation throughout the article, and the spacing values before and after the paragraphs should be 0. APA 6 writing style should be used for in-text citations, tables, figures and bibliography.

The main sections in the manuscript should be:

- INTRODUCTION
- METHOD
  - Universe and sample / Working Group / Participants / Subjects (only one of them)
  - Data collection method (s) / techniques / tools
  - Analysis of data
- RESULTS
- DISCUSSION, CONCLUSIONS AND SUGGESTIONS
- REFERENCES

However, according to the methodology used in the studies, authors can create additional sections or sub-sections.

Main text should start with "1. INTRODUCTION". METHOD, FINDINGS AND DISCUSSION, CONCLUSION AND SUGGESTION parts should not be started on a new page, but should be the subsequent part of the main text. In presenting frequently used statistical techniques, statistical values should be included in the sentences based on APA 6 guidelines. Additionally, author (s) may make use of the tables and figures where appropriate. The whole manuscript should be written according to APA 6 writing style.

In Turkish manuscripts, the dictionaries and spelling guidelines of Turkish Language Institution should be taken into consideration and Turkish words should be used as much as possible. When using Turkish equivalent of a field-specific concept/term in a foreign language, the foreign language equivalent of the relevant concept / term should be given in parentheses in the first place.

## 4. FIGURES

Figures can be placed as centered, where appropriate, and they should not exceed the margins for written parts. In-text references should be made to the figure and, where possible, the figure should be explained. A figure title with Arabic numerals should be placed under each figure; the same numbering should continue throughout the article and be written in accordance with the APA 6 writing style. Figure captions should be written in Cambria font style, 10 font size, left-aligned, and the first letter of the first word should be capitalized. If a source is used in figure title, the source information should be added in parentheses. If the figure includes text, it can be written in Cambria font style and 9/10 font size.

## 5. TABLES

Tables should be left aligned and all the text in the tables should be written in Cambria font style. The title of the table should be in 10 font size and below the table number; and only the first letter of every word should be capitalized. APA 6 writing style should be used for the tables. Tables should be cited by specifying the number of tables in the text and they should be interpreted after the table. Tables should be placed in the text where they are used or on the following page. Related notes and references can be indicated at the bottom of the table after the “Note:” or “Source:" indicators.

## 6. REFERENCING

At the end of the article, references should be given according to APA 6 writing style before any appendices. All references should be written by using Cambria font style, 10 font size, before and after the paragraph values of "0", justified, single line spacing, with no indentation. There should be a single line spacing between each reference. It should be ensured that each reference in the references part is referred from the text, and that every reference used in the text is also included in the reference part.

## 7. APPENDICES

If the author(s) need it, they can create an appendices section after the bibliography and before the extended abstract. The appendices to be given in this section must be cited within the article. If more than one appendix is used, it can be numbered. The attachments to be included in the appendices should be in a way not to disrupt the integrity if they are given in the article. The elements that can be given in tables or figures should not be included in the Appendices.

## 8. EXTENDED ABSTRACT

The manuscript should include an extended English abstract of 750-1000 words, after appendices if the article has, if not, after the bibliography. This abstract should be in paragraphs, covering all the basic ideas of the article, without subheadings (Introduction, Method etc.). Direct quotations should not be included in the extended abstract. The table or figure should not be used in an extended abstract. If the article is in Turkish, the extended abstract should be in English. In English articles, there is no obligation to present an extended abstract in Turkish, and the decision on this issue is left to the authors. The abstract should be written in 10 font size, using Cambria font.

## 9. ARTICLE TEMPLATE

Not all details about an article work are specified here in the "Author Guidelines". More information about formatting is included in the template file, which should be used for studies to be submitted to the journal. If the information given here contradicts the information in the template file, it should be based on the template file.

In order to prepare the works according to the spelling rules of the journal, the template file should be used (File-Turkish: Turkish Template). (File-English: English Template). If writing is completed in another file, it is recommended to transfer the contents of the file to the template file. Manuscripts that are not prepared in accordance with the template will be returned to the authors during the stylistic control stage.

## 10. REVISION CHECKLIST

The author(s) who have received reviewer comments for the article should state the page number on the "Revision Checklist" sent together with the reviewer reports, specifying the page number based on the change requested by each reviewer.

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