SATISFACTION OF FUTURE ENGINEERING TEACHERS WITH THE USE OF THE ELECTRONIC PORTFOLIO IN THE PEDAGOGICAL DISCIPLINES

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Abstract: *The use of an e-portfolio as an assessment modality in e-distance learning is a response to recent developments in higher education where assessment is an integral part of teaching and learning. The present study aims to determine the level of student satisfaction with the use of the e-portfolio in the study of pedagogical disciplines and to reveal changes according to the identified variables. As a sample of this study, 123 students from UTCN enrolled in the psycho-pedagogical module in the initial teacher training were selected. From the closed items, it was confirmed that the students' satisfaction in using the e-portfolio was at a high level, that a complex portfolio is a relevant method for evaluating students' knowledge and skills, it promotes active and collaborative learning, the platform offers sufficient resources, and it is easy to use for carrying out the activities. There were no significant differences regarding gender, faculty profile, year of study and previous experience of students in using the e-portfolio. Various suggestions were made for future studies to create more effective online and hybrid learning environments in the training of future engineering teachers.*

Keywords: *e-portfolio; satisfaction; alternative/ complementary assessment methods; new technologies; future engineering teachers.*

1. Introduction

The COVID-19 pandemic has had a particularly strong impact on education, especially in methodological strategies and their practical implications for university activities. The transition from face-to-face teaching to online teaching environments in a very short time was a challenge for teachers, who had to find new teaching methodologies to make the teaching-learning-evaluation processes more flexible. Information and communication technologies represent a key element

in facing this challenge of building environments that facilitate communication and exchange of learning experiences between teachers and students. In this sense, Van Wyk (2017) states that teachers have become more exposed to technologies that influence the classroom environment, teaching strategies, methods, and techniques, and that this technological change requires teachers to have a deep understanding of digital pedagogy or Technological Pedagogical Content Knowledge – TPACK (Mishra & Koehler, 2006). The use of an e-portfolio as an assessment modality in e-distance learning is a response to recent developments in higher education where assessment is an integral part of teaching and learning. This suggests that the need to integrate technology into teaching and learning has driven the need to integrate technology into assessment as well. Since the purpose of this study is to identify the level of student satisfaction with the use of the e-portfolio from the perspective of the assessed students, now is a good time for the faculties to start the process of reflection on the methodological change involved in the development of university teaching, learning and assessment that encourages the use of virtual environments in combination with face-to-face activities to maximize the benefits of both, in other words the use of blended learning.

1.1. What is e-portfolio?

An e-portfolio "is essentially an electronic version of a paper-based portfolio, created in a computer environment" (Butler, 2006, p. 10), a so-called "digital container" (Benson, 2009, p. 12) that stores multimedia effects such as video and audio content and some social programs such as blogs, social networks, which allow online users unprecedented interconnection and interactivity for pedagogical and evaluation purposes. The e-portfolio has been introduced as an alternative or complementary way of assessment as higher education transforms from a paper-based teaching and learning approach to an e-learning approach. This change requires a rethinking of pedagogical training of teachers from the very beginning of their training, from traditional to digital. According to Boulton (2014), an e-portfolio is an evidence-based multimodal assessment strategy that is currently included in most university teacher education programs both locally and globally. Van Wyk (2017) names the e-portfolio as an alternative assessment strategy for empowering students' self-directed learning as future teachers, which provided them with the opportunity to use different types of information technology tools such as podcasts, blogs, PowerPoint presentations, electronic discussion forums etc.

In Barrett's (2011) conception, the main purpose of the e-portfolio can refer to learning/reflection and presentation/responsibility, the first

being directed to an internal audience, and the second to an external audience. However, in higher education there can be an interaction between these two poles, and the e-portfolio can contain aspects which aim to achieve both goals. According to the Romanian pedagogy, the e-portfolio is presented as an alternative/complementary assessment method which, through its informative and formative value, helps in the correct and appropriate assessment of students. Usually, the focus is on the components of the portfolio, as well as the advantages and disadvantages of its use both for the evaluated students and for their evaluators (Cucoș, 2014; Bocoș & Jucan, 2017; Frunză, Enache, & Oprea, 2008). However, it is worth noting that the purpose of the assessment, the type of study discipline, the objectives of the discipline, the knowledge level of students and the duration of the portfolio preparation determine the selection of elements that will be included in an e-portfolio.

According to Abrami and Barrett (2005), three types of portfolios can be identified: the portfolio as a tool for storing information to be used in the learning process, the portfolio of learning products (containing the learning outcomes) and the portfolio as a process and workspace (containing artifacts of the learning process that highlight the achievements and difficulties encountered). In fact, Cooper and Love (2007) described two types of portfolios: the formative portfolio (focused on the learning process for each student, on continuity and progress) and the summative portfolio (focused on the organization and learning outcomes). It is worth emphasizing the contribution of Frunză et al. (2008), which highlights two main aspects of this method: 1) the portfolio as a means of learning, which identifies aspects of student performance in learning such as: cognitive endurance - determined by a series of tasks developed by the student; metacognitive endurance – enhanced by considerations of work tasks, procedures and techniques; affective endurance – encouraged by personal contributions, the student's original achievements; conative endurance – stimulated by indications relating to the elimination or reduction of certain deficiencies or shortcomings; 2) the portfolio as a tool used to validate the results, mainly those acquired by the students.

In the academic environment, e-portfolios are usually classified as: the learning portfolio, the presentation portfolio, and the assessment portfolio (Cucoș, 2014). Currently, most e-portfolios are hybrid types that include features of developmental, assessment, and presentation portfolios.

According to Barberá et al. (2006), the digital portfolio has three phases: the presentation of students' academic preparation; collection,

selection, and publication of works; and the overall assessment of the digital portfolio according to specific criteria.

1.2. Satisfaction of future teachers regarding the use of the e-portfolio

E-portfolios are gaining ground in educational settings, especially in teacher education (Totter & Wyss, 2019). In this context, the portfolio goes a step further and is more than a collection of artefacts, as it encourages critical reflection, facilitates both formative and summative assessment and contributes to the formation and development of future teachers' competencies. (Mohammed et al., 2015).

The future teachers, having the benchmarks of the competence to qualitatively build the portfolio of their own pedagogical training, will be able to support the students in using this formative tool. As Van Wyk (2017) states, e-portfolios should not be seen as a "'nice-to-have' idea but be used as an integrated technology and pedagogy approach as vital components for the successful implementation of the e-ePortfolio as an alternative assessment strategy in student teacher empowerment" (pg. 288). The e-portfolio should provide future teachers with pedagogical and technological skills that enable them to cope with the current demands of teaching and learning in the digital classroom.

Deneen, Brown, and Carless (2018) found that a positive attitude toward the e-portfolio contributes to better assessment for learning. Wang and Jeffrey (2017) indicated that most learners preferred e-portfolio-based formative assessment over paper-based exams because formative assessment helped them sustain their motivation. Similarly, Jackson (2017) concludes that the e-portfolio has good utility as a tool for collaboration and communication between teaching staff and students and between students themselves. According to Kabilan and Khan's (2012) study, future teachers not only formed positive attitudes toward e-portfolios, but also developed a deeper understanding of the teacher's role, teaching skills, and activities.

The transformation in higher education in terms of the use of technologies in teaching and learning, as well as in assessment, is a global trend, which means that there should be a rethinking of the initial pedagogical training of teachers. This is the reason to explore how the use of an e-portfolio as an alternative/ complementary assessment method improves the pedagogical training of future engineering teachers in a psycho-pedagogical module.

2. Research design

2.1. Objective

The study examines the satisfaction level of using the e-portfolio, the formative potential of this alternative/ complementary assessment method, in the process of (self) assessment of the competences of future teachers. In the empirical research carried out, the questionnaire-based method and activity analysis (portfolios prepared by students) were used. Therefore, the research problem was formulated in the following main questions:

Question 1: What is the level of student satisfaction with using the e-portfolio?

Question 2: Is there a significant mean difference between students' satisfaction with the use of e-portfolio and gender, faculty profile, year of study and previous experience in using this tool?

With the various e-portfolio tools available in many universities around the world such as Mahara, Pebble, WordPress, Pathbrite, etc., the study helped highlight the use of university resources, the current Microsoft licenses available and the use of MS OneNote as a tool for e-portfolio. The digital portfolio was created using the Microsoft 365 platform, which consists of a set of communication and collaboration tools available in the Cloud and which integrate Microsoft Office applications. Through these tools, students were able to interact and receive feedback from their peers and the teacher. The content of the portfolio consisted of individual, or group tasks carried out by students in the disciplines Pedagogy I, Pedagogy II and Classroom Management, such as: critical and argumentative analyses, concept maps, questionnaires, case studies, comparative analyses, lesson projects, assessment tests, posters, etc. All students enrolled in the psycho-pedagogical module have an account for access to the Microsoft 365 platform. With this account, students have MS Office online, collaboration tools, online storage, many other communication applications and a free download on their computers and laptops. The availability of texts, images and uploaded files are the main elements needed to create a creative e-portfolio. E-portfolio sharing is also an important element that is available with MS OneNote. The transition to different teaching assessments was not difficult with the current availability of MS OneNote and the availability of video tutorials in access learning resources in the university.

2.2. Participants

The participation in this study consisted of 123 students in different undergraduate programs in UTCN enrolled in the psycho-pedagogical module. The sample of students is distributed as follows: 40.7% are from the construction profile, 59.3% students from the electrical

profile; 51.2% women, 48.8% men; 23.6% students are from the first year, 36.6% students in the second year and 39.8% students in the third year; 51.2% of the total number of students had previous experiences in using the e-portfolio, and 48.8% of the students did not have such previous experiences. The researcher informed the students about the objectives of the study and assured them that their participation would be voluntary and anonymous.

2.3. Instruments

The questionnaire used in the research was taken and adapted from the Questionnaire on the E-Portfolio in Higher Education (QEPHE) by Hinojosa-Pareja et al. (2020) to assess student satisfaction with the use of e- the proposed portfolio. The questionnaire is constructed on a 5-point Likert scale, on which participants rated each item from "Strongly Disagree" to "Strongly Agree". The questionnaire consists of 3 dimensions (Pedagogical issues – 14 items, Professor's work – 9 items, Usability – 9 items), and Cronbach's alpha value for the entire questionnaire was calculated at 0.92.

3. Results

To investigate the level of satisfaction of prospective teachers regarding the use of e-portfolio, means were calculated for each dimension of the QEPHE questionnaire. The analysis based on the observed scores on each dimension showed a positive level of satisfaction with the use of the e-portfolio (Table 1) (M = 4.15, SD = 0.408). The highest mean was found in the Usability dimension (M = 4.40, SD = 0.463) and the lowest mean was found in the Pedagogical Issues dimension (M = 3.89, SD = 0.741). According to the results presented in Table 1, student satisfaction was generally positive, implying that the e-portfolio is rated satisfactorily by students.

Dimensions	Mean	SD
Pedagogical Issues	3.89	0.741
Professor’s work	4.15	0.525
Usability	4.40	0.463
TOTAL	**4.15**	**0.408**

Table 1. Level of satisfaction with the use of e-portfolio

The second research question was whether there is a significant average difference between students' satisfaction with the use of e-portfolio and gender, faculty profile, year of study and previous experience in using this tool. The Mann-Whitney U test was used to

examine the level of student satisfaction according to gender, faculty profile and their previous experience in using the e-portfolio (Table 2).

Var.	Cases	N	Mean Rank	Sum Rank	U	Z	p	Effect Size
				Gender				
Satisf.	Female	63	60.83	3832.5	1816.5	-.372	.710	0.06
	Male	60	63.23	3793.5				
				Faculty profile				
Satisf.	Building	50	64.27	3213.5	1711.5	-.584	.559	0.10
	Electric	73	60.45	4412.5				
				Previous experience				
Satisf.	Yes	63	62.36	3928.5	1867.5	-.114	.909	0.02
	No	60	61.63	3697.5				
$p < .05$								

Table 2. Results of the Mann-Whitney U test of satisfaction scores towards the use of e-portfolio, according to gender, faculty profile and previous experience of the students

It can be seen from Table 2 that there was no statistically significant difference in students' satisfaction with the use of e-portfolio based on their gender ($U = 1816.5$, $p = .710$). Also, data analysis indicates that there was no statistically significant difference regarding faculty profile ($p = .559$, $r = 0.10$) and previous experience related to student satisfaction in using the e-portfolio ($p = .909$, $r = 0.02$).

Also, student satisfaction scores in the use of e-portfolio use were analysed by year of study in which the students are enrolled. The Kruskal Wallis H test was used to analyse satisfaction scores. The results are presented in Table 3:

Variable	Cases	N	Mean Rank	df	*X2*	p	Effect Size
			Year of study				
Satisfaction	1st year	29	73.43	2	3.947	.139	0.25
	2nd year	45	59.29				
	3rd year	49	57.72				
$p < .05$							

Table 3. Results of the Kruskal Wallis H test of satisfaction scores with the use of e-portfolio, according to the year of study

When Table 3 is examined, it is found that the satisfaction scores of students in the use of e-portfolio do not differ significantly by year of study ($X2 = 3.947$; $p > 0.05$, $r = 0.25$). However, given the mean ranking, it is understood that first-year students have a higher satisfaction with the use of e-portfolio compared to second- and third-year students.

4. Discussion

The present research is based on a quantitative analysis of the level of satisfaction of using the e-portfolio as an alternative/ complementary assessment method. According to the feedback received from the students included in our research sample, the e-portfolio is an effective assessment tool that provides increased satisfaction in the initial professionalization of future teachers. The results from this study are in line with those obtained from Alwraikat's (2012) study which indicated that students expressed positive attitudes towards the use of e-portfolio. The e-portfolio can indicate not only a student's academic level, but also their skills and aspirations, if the teacher is flexible and encourages creativity and diversity.

The usefulness of the e-portfolio in assessment, the methods used to stimulate active and interactive learning, as well as the tracking of learning progress seem to be essential for student satisfaction. In the same vein, Costley and Lange (2016), found that a lower level of teacher control over the learning process in facilitating participation and greater flexibility increased student satisfaction. However, the students in our study expressed uncertainty about both the teacher's concern for student learning and increasing their motivation in the course. The results support the findings of Bolliger and Martindale's study (2004) which indicated that teachers in digital environments should not only facilitate learning, but also motivate students.

Regarding the Professor's Work dimension, the items that the students evaluated the best were the creation of a favourable climate for learning and the explanation of the evaluation procedure that will be used with the e-portfolio, the students being generally satisfied with the teacher's actions. In the same line are the findings from the study by Gamiz-Sanchez et al. (2019) which shows that the highest rated items were those related to learning climate created, communication among students and the promotion of the free expression of ideas or concerns.

From the students' perspective, the strongest satisfaction factor was using the communication or interaction tools provided by the platform. Students appreciated with high scores that their own technological knowledge was sufficient to carry out the assigned activities and the ease of use of the platform, which provides the right tools for

interaction and communication with peers and the teacher. On the one hand, the teacher encouraged the use of platform tools to promote communication, using the most appropriate ones in each case. On the other hand, the support provided by the teacher was fundamental for the students' perception of the ease of use of e-portfolio, its usefulness, in solving questions and problems related to the platform (Arteaga-Sánchez & Duarte-Hueros, 2010).

In this study, the variables of gender, faculty profile, previous experience and year of study did not produce significant differences in student satisfaction. Our study shows, however, that not only the usefulness of the platform increases student satisfaction, but also how the teacher designs, implements and evaluates the e-portfolio. These findings are in line with Karami et al. (2019), who showed that an e-portfolio helps students develop their writing performance, improves the testing process, supports learning, encourages student participation, improves student autonomous learning, develops teachers' roles, and supports lifelong learning.

The university should implement a support program for students who experience access to and use of new technologies and address the issue of connectivity for students who experience such issues. The findings of Klampfer and Köhler's study (2015) show that a positive attitude of students towards the e-portfolio is associated with ease of use and reliability of the infrastructure. E-portfolio implementation requires a lot of resources in addition to an efficient platform. Moreover, it can be recommended that minimum digital skills be developed before using e-portfolios.

Despite the benefits of the e-portfolio, the performance of the activities has led students to resort to plagiarism, cheating or copyright infringement when sharing ideas. One way to combat this was to provide precise guidance on the norms of academic ethics and integrity, but also to include reflection activities on what happened during the process of creating the e-portfolio. We also specify that students need the support of teaching staff in planning and organizing documents, selecting the most relevant or representative materials, as well as counselling in motivation (general and personal), self-evaluation and the use of new technologies. When students do not have sufficient knowledge to compile a portfolio, it may be incomplete or inconsistent. The key point is to establish standards, clear, well-defined, and established evaluation criteria from the beginning, so if there are no standards for the artifacts in the portfolio, inconsistencies and gaps appear. Also, special attention should be paid to the time frame. Thus, the earlier students start creating a portfolio, the more complete it will be.

In the stage of initial training in higher education as future teachers, the portfolio can be an excellent addition to the professional and academic development of students, both from a methodological perspective and from an evaluative point of view, in the didactic strategy of different disciplines, allowing them to show what they learn, reflect on the learning process, engage students, and establish innovative alternatives based on their professional development. The use of alternative/ complementary assessment methods encourages students to focus on real and authentic tasks that relate to themselves and their daily activities. We also believe that students can monitor and control their learning activity through the e-portfolio, thereby contributing to their learning. The e-portfolio stimulated the cognitive and metacognitive development of the students and led them to be more responsible. They managed to enrich the content of the portfolio with many new and representative ideas for each topic with their own solutions. At the same time, constant cooperation with each other was encouraged. The students found the e-portfolio an interesting experience, they had an active role that made them more aware of their studying and learning possibilities.

The findings revealed that the e-portfolio gave students the opportunity to collaborate while using it, mainly on how individual assignments should be written and how group activities should be done. In this study, students collaborated by sharing ideas and learning experiences about traditional and modern teaching practices or classroom management principles implemented in pre-university education. These were some of the topics of group activities within the e-portfolio, namely, to form a community of practice in their endeavours as they connect and interact with each other to share information. By using an e-portfolio as an assessment method, students were given the opportunity to collaborate. The idea is supported by McCormick (2004), who states that the use of digital technologies provides opportunities both to "collaborate to learn" and to "learn to collaborate" (p. 159), in this case, learning about possibilities of management of the problems facing high school classes and learning to work with each other to formulate solutions in identifying and analysing strengths, weaknesses and preventing/overcoming the latter in student class management.

It is recommended that students' opinions about e-portfolio should be considered by decision-makers, teachers, researchers in higher education to review the current policy in universities to improve student satisfaction with instructional-educational activities. Given the contemporary paradigms of teaching and learning activities, e-portfolio assessments will produce more effective and beneficial outcomes for

learners. The researchers state that teachers need to inform students that e-portfolios focus on both processes and products as outcomes of their activities. Traditional product-only assessment should be replaced by more up-to-date assessment approaches that value not only the products, but also how learners spend their time learning.

5. Conclusion

The training of future teachers must be done in accordance with current education models and educational paradigms, as they are, in turn, able to train others. To traditional assessment methods that should not be eliminated, alternative/ complementary methods are gaining ground. Of these methods, the portfolio is the most widely used at all levels of schooling. In this study, we have shown the effectiveness of this digital tool in assessing and forming the competence profile of future teachers, with students having a high level of satisfaction in using the e-portfolio. The variables of gender, faculty profile, previous experiences and year of study did not produce significant differences in student satisfaction. Our study shows, however, that not only the usefulness of the platform increases student satisfaction, but also how the teacher designs, implements and evaluates the e-portfolio. However, the findings of this investigation cannot be generalized because only a small sample was used in a few initial teacher training courses.

It can therefore be concluded that the integration of the e-portfolio at the university level would increase the level of students' satisfaction with the use of this method in learning pedagogical subjects and would release their potentialities in relation to the learning process.

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