

RESEARCH ARTICLE

Use of an e-toolkit in the development of digital competencies in Weeks of International Teaching

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Abstract: Numerous scholars have emphasized the advantages of travelling abroad to enhance one's skills. Nevertheless, the pandemic has revealed the immense importance of digital skills in every aspect of our current information-based society. There is an increased demand for both physical and digital workplaces. As a result, universities must modify their educational programs to meet the requirements of employers and equip their students with the abilities and proficiencies essential to navigate this new era of the hybrid work environment. In this study, we focused on developing digital competence levels of international students and teachers during an International Week event using an e-toolkit and their acceptance of that digital tool following a mixed-method approach. Our results showed significant improvement in some dimensions of their digital competencies associated with digital content creation and problem-solving. Additionally, valuable results were shown regarding participants' perceptions of the e-toolkit's usefulness and ease of use. This study facilitates the potential international experiences can have on the digital competencies of both students and teachers with the use of innovative technological tools and the need for generalization on a larger scale and implementation of a more in-depth assessment.

Keywords: international mobility, digital competencies, e-toolkit

1 Introduction

Due to the rapid globalization of the national economies, labour market workforce mobility across nations has been steadily increasing (Dahal *et al.*, 2021). The continuous changes in labour markets and industries have put pressure on education, especially universities (Aguayo *et al.*, 2022). Specifically, the number of students travelling to a different country to pursue studies in 2019 was more than double compared to 2007 (OECD, 2021). The amount of international students in higher education has been increasing since 1998 by 5.5% on average (OECD, 2021). As most countries have concluded that international mobility students could benefit their economy and industries, they have put pressure on higher education institutes to internationalize their curriculum and provide the increasing number of international students with the proper teaching and learning approaches and competencies to meet their needs (Barianos, Papadakis & Vidakis, 2022; Huang & Jung, 2020).

As such, there has been growing interest in students' international mobility in recent years, mainly through programs like Erasmus, which the European Union has promoted since its establishment in 1987. Despite experiencing some decline during the pandemic (Kafarski & Kazak, 2022), the percentage of students participating in academic mobility through Erasmus has significantly risen over the years (Amendola & Restaino, 2016). Various studies have examined the effects of studying abroad on students' personal development and the benefits of Erasmus's participation in post-graduation employment (Bryla, 2015; Roy *et al.*, 2019). These studies have explored the determinants and implications of academic mobility and shed light on its impact on undergraduates' employment prospects.

As universities and educational organizations aimed to bring innovative approaches to international students, the pandemic impacted this process heavily (Chang & Chou, 2021; Mohammed,

2022; Mok et al., 2021) and showed the need to focus on the digital competencies of international students besides the more common ones such as intercultural, communication and self-confidence (Bohman & Borglin, 2014; Asli et al., 2017).

Over the last 15 years, many institutions have freely embraced openness and universal access to educational content for the public (McGreal, 2017). The term Open Educational Resources (OER), given during a UNESCO Forum (Johnstone, 2005), refers to teaching, learning, and research resources that can be freely accessed by the users, used in various ways, and re-purposed if need be (Huerta et al., 2023). The growing adoption of OER has led to many educational materials and resources everyone can access (McGreal, 2017).

However, the existence of various resources does not necessarily mean finding specific OER for a particular purpose (Jurayev, 2023). As such, we gathered OER material for developing digital competencies and developed an e-toolkit to be used by teachers, researchers, and students. This e-toolkit was developed in the context of the European project “Weeks of International Teaching-Inclusive and Digital (WITEA-ID)”. This digital e-Toolkit was designed to assist international students and teachers before, during, and after their mobility in growing their digital skills and competencies and acquiring the required knowledge to be competent and confident users of technology in their teaching or international mobility.

This study focused on developing students’ and teachers’ digital competence levels during an International Week event using an e-toolkit. Another point of interest was the acceptability of the digital e-toolkit from the perspective of the students and educators. More specifically, our research questions are as following:

- (1) What was the impact of the e-ToolKit on the students’ and teachers’ perception of their digital competencies in the context of International Week?
- (2) What were the students’ and teachers’ views on the usability, learning experience, and acceptability of the e-ToolKit in the context of International Week?

2 Literature review

2.1 International mobility and digital competencies

International mobility teaching more commonly occurs during a week of interactive lectures and workshops on digital and non-digital environments to allow participants to develop functional competencies during their international careers (Mikhaylov, 2014; Stoltenberg et al., 2017). Apart from the students, educators can benefit from such international events to enhance their digital competencies (Vlachoudi et al., 2023), learn new methodologies regarding teaching practices and share knowledge and experiences with colleagues from other countries (Ciftci & Karaman, 2018; Withers et al., 2019). Additionally, conducting these events in a hybrid way and focusing on improving their digital competencies is paramount to both teachers and students as the high cost of traveling to such venues, especially if they are on different continents, can be discouraging to carry out (Jacobs et al., 2014; Schartner, 2016). However, even in the case of countries within the European Union, *i.e.* Western Balkan countries, these costs can hinder the ability of students and academics to join these events (Klemenčič & Zgaga, 2014).

As universities can establish communities and encourage lifelong learning, it is crucial to promote events that also do the same, such as Weeks of International Teaching, in an even broader international spectrum (Potts, 2015). However, as the impact of international students has become evident (Tian & Genshu, 2018), it is crucial to understand their experience in such events. The difficulties and challenges they face and how they respond to and interact with these new academic environments and teaching methods are not apparent, especially in pre-test and post-test set-ups (Patelarou et al., 2022).

According to empirical research, the majority of evidence suggests that international experiences positively influence students’ individual development, including their intercultural understanding and foreign language competence, as well as their academic development (Beine et al., 2014; Caveziel et al., 2016; Patelarou et al., 2023). Additionally, participating in mobility programs has consistently been shown to assist students in developing international competence and becoming better prepared regarding future work requirements, particularly within the European economy. Moreover, students gain a significant advantage in securing their first job after graduation and advancing their early careers (Severino et al., 2014; Bryla, 2015).

Numerous advantages of participating in short-term mobility programs have been emphasized by researchers, which encompass cultural, personal, and employment/career outcomes (Kratz & Netz, 2016; Kronholz & Osborn, 2016). Previous research has identified a range of beneficial effects associated with participating in short-term international mobility programs, such as professional development, personal growth, intercultural competence, cross-cultural communication skills, language proficiency, cultural adaptability, cultural sensitivity and empathy,

global mindedness, cultural intelligence, as well as professional identity development (Roy et al., 2019).

International students have been shown to particularly value the quality of the universities, the cost of living, and associated educational fees when considering applying to an institution (Beine et al., 2014). Research indicates that the number of students that move to a country from abroad is positively correlated with the academic quality level of that country's educational system (Teichler, 2015; De Wit & Altbach, 2021) and negatively correlated with the cost of living (Ahmad & Buchanan, 2017). Furthermore, the availability of English-language programs can also significantly attract international students and high-skilled migrants (Liu, 2016; Bauder et al., 2018).

Mobility programs like Erasmus have positively affected labour market mobility within Europe. Studying abroad can significantly increase the likelihood of a person choosing to work in a foreign country (Roy et al., 2019). Additionally, students' professional development and higher education can be affected considerably by international experience. This encompasses foreign language competence, which can heavily impact the students' career development and job prospects (Bryla, 2015).

While students with previous mobility experience may have a shorter job search duration, more is needed to conclude that mobility alone is a reliable factor for future employability (Gajderowicz et al., 2012). However, the experience gained through mobility is linked with other characteristics and factors that improve the probability of finding employment

In addition, it is vital to understand the impact these educational practices can have, especially the ones that include ICT (Lavidas et al., 2022). Besides enhancing their competence, introducing and using different educational practices, whether learning strategies, pedagogy, or new instructional tools with ICT, can potentially increase academic stress (Tallvid, 2016; Dong et al., 2020). Other academic stress factors are a lack of university academic support and insufficient study skills (Karakose et al., 2022). These barriers are common to international students, as domestic students also face them. However, the difficulties faced by international students are more complex as they are troubled by language issues and uneven power relationships (Tian & Lu, 2018).

Moreover, digital competencies are vital in all stages of today's information-driven society, whether for learning, working, or socializing (Karakose, Tülübaş & Papadakis, 2022a). This was more evident in the workplace during the pandemic, where employees were required to become more flexible in work options and, in some cases, work entirely from home (Yang & Hong, 2021). As the crisis caused by the pandemic led to increased online time, and the need for both physical and digital workplaces grew, the need to find a way to develop and evaluate digital competencies emerged too. As such, universities have the responsibility to adapt to various situations and meet the needs of employers and future workers by helping them develop their skills in utilizing their own devices, working from home entirely or in a hybrid way (Yang et al., 2021; Haningsih & Rohmi, 2022).

2.2 E-toolkit

The Toolkit was developed to reform technical cooperation and project implementation. The Toolkit is directed towards decision-making and planning of science mobilities and is designed to ensure attention to questions such as the following (EU, 2011):

- (1) What are the more major current problems and their symptoms that could explain the present capacity situation when it comes to the planning and execution of scientific collaboration mobilities by staff and students?
- (2) What is the effective demand for support and competence development among students and staff?
- (3) What is the current level of mobility experience available to students and staff with their current perceived levels of competence in planning and executing a scientific collaboration mobility?
- (4) How can WITEA-ID design an output-focused capacity development process to provide active toolkit decision-making support to students and staff embarking on scientific collaboration mobilities?

With these questions in mind, we moved forward to developing a mind map of the approaches in planning and populating the e-Toolkit. The decision to use the flow chart approach was informed by information derived from the work of Miyazaki et al. (2017).

The realization of learning opportunities for explorative proving so that students can plan proofs together with constructing them, examine their proof construction processes/product, improve them if necessary, and/or advance them to further proving. Under this principle, focusing on planning proofs as the essential part of explorative proving, the system's design adopts the open-problem situation of proving to amplify the planning proofs, as shown in the

second subsection below. This usage can enhance students' capacity to think backwards and forward to connect conclusions with assumptions. Additionally, the principles of feedback (see final subsection below) are carefully considered so that learners can modify and improve their proving activities, which we consider to realize the interaction between 'Producing proof' and 'Looking back' as the critical parts of explorative proving in school mathematics.

In this same line, inspiration was also derived from another project where the development of an e-Toolkit for educational purposes was also developed (Mazohl *et al.*, 2018a; Mazohl *et al.*, 2018b; Ossiannilsson *et al.*, 2019). The concept of interactive engagement with the Toolkit and the possibility of open-ended problem-solving inspired the structure and the functioning of the WITEA-ID Toolkit.

In line with the above reasoning and the information and ideas from the literature, the conceptual image of the practical mind map to be pursued was developed in Figure 1.

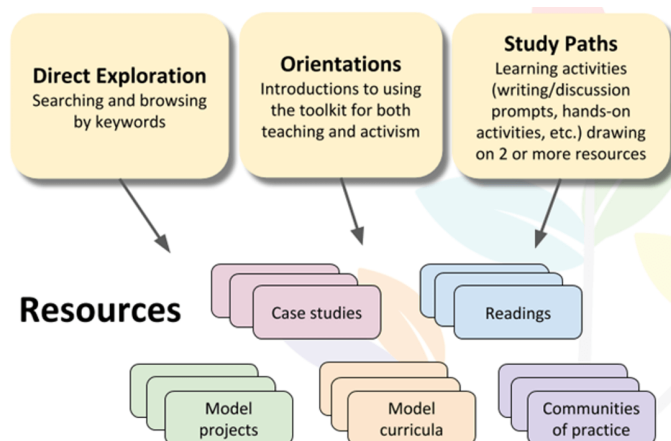


Figure 1 Initial practical mind map

The three critical points of access showed the different routes and possibilities for the client to use the Toolkit:

(1) Direct exploration using direct competence needs to be experienced as the keyword for searching and browsing the Toolkit.

(2) The information possibilities in the e-Toolkit are structured in a way that makes it possible for the client to use the Toolkit for teaching and developing purposeful reasoning or planning.

(3) Several pathways exist in the Toolkit, allowing students or staff members to access different resources. In line with the Terms of Reference of the WITEA-ID project, narrow pathways were designed. However, the broad structuring of the platform allows for substantial expansion and improvement to facilitate the creation of a "customer journey map" – a concept borrowed from consumer and marketing studies.

A framework illustration was used to structure and develop the e-Toolkit on the WordPress platform. Based on the mentioned literature support, it was decided to develop the e-Toolkit to offer a more spherical (holistic) growth experience than a linear, single-outcome process. An essential requirement is that the flow of mind should be attractive and easy for the students and staff to use.

The internal structuring must therefore allow for multiple road mapping experiences to allow for different angles to possible solutions. It is also important to note that most client journeys only sometimes happen linearly. Instead, clients often take a back-and-forth, cyclical, multi-channel journey.

We used this reference to lead us in the thinking to develop the functionality of the Toolkit. Especially the section on quality assurance testing was essential to consider in the development and functionality of the Toolkit. To implement these aspects, it was decided to use the following rubric evaluation framework to design the Toolkit. To ensure that the Toolkit meets the basic requirements for functionality in Higher Education, we followed a rubric of suggestions for functional effectiveness developed by Anstey & Watson (2018).

The Rubric for E-Learning Tool Evaluation offers a framework, with criteria and levels of achievement, to assess the suitability of an e-learning tool for their learners' needs and their own learning outcomes and classroom context. This rubric articulates the appropriate assessment criteria for e-learning tools using the standard design components of other analytical rubrics: categories, criteria, standards, and descriptors.

The rubric's evaluation criteria are into eight categories. Each category has specific characteristics or criteria against which e-learning tools are evaluated. Each criterion is assessed

against three standards: works well, minor concerns, or serious concerns. Finally, the rubric offers individual descriptions of the qualities an e-learning tool must have to achieve a standard.

Although our rubric integrates a broad range of functional, technical, and pedagogical criteria, it is not intended to be overly prescriptive. We aim for the framework to respond to a client's needs and be adapted appropriately. For example, when a rubric criterion is not relevant to the assessment of a particular tool, it can be excluded without impacting the overall quality of the toolkit experience.

Given the diversity of outcomes across learning experiences, this e-toolkit provides the basis for intended learning outcomes and planned instructional activities to develop the necessary competencies and capacities to support the planning and execution of high-quality collaborative scientific internationalization experiences. We designed the rubric with this intention in mind.

The functional mind map (Figure 2) was developed for the e-Toolkit implementing the approaches in the planning and populating the e-Toolkit as conceptualised above. This illustration only illustrates the functional modelling concept in the Toolkit. The structuring and

linkages in the Toolkit allow for different variations and permutations of interactive activity to meet the client's demands.

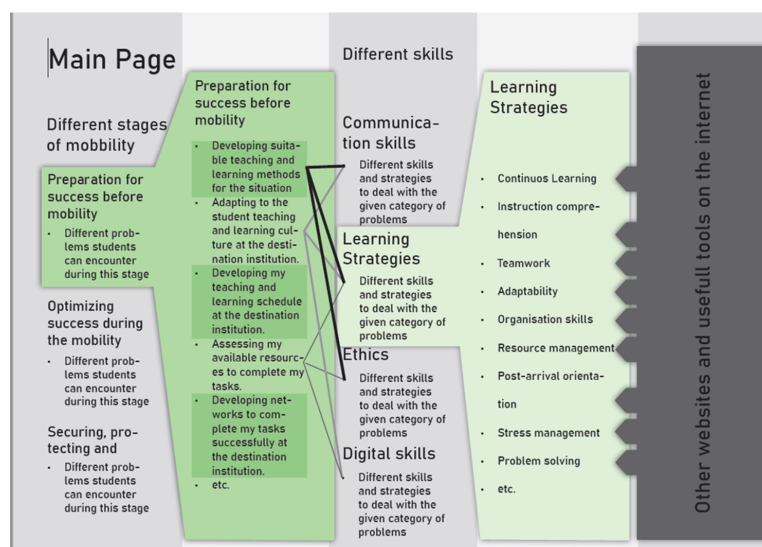


Figure 2 Developed Mind Map for the e-Toolkit

3 Methodology

This quantitative and qualitative study was carried out during an International Week in January 2023 in Heraklion, Crete, Greece. This study investigates the effect of using the digital e-toolkit during International Week workshops. Specifically, we explored the effect it had on digital competence and the acceptability of the e-toolkit from the international mobility students and teachers that participated in the event. The workshops were designed based on the digital e-toolkit and the flipped-learning approach.

We conducted a semi-experimental design with a convenience sample following a mixed methods approach and a robust ethical protocol (Petousi & Sifaki, 2020). Specifically, we evaluated the effect on digital competencies using pre-test and post-test questionnaires. This design aimed to clarify the background knowledge and level of the participants' digital competencies and afterwards showcase the effect the workshops had on them, something that only some studies on mobility teaching have researched (Patelaru et al., 2022). However, because the needs of international students and teachers in higher education are different since teachers' primary focus on digital tools is their use in learning (Holmes et al., 2018), we created an additional questionnaire solely for the teachers and the development of digital competencies for teaching. The questionnaires were created based on (Holmes et al., 2018; Galindo-Domínguez & Bezanilla, 2021) and adapted to our study.

Additionally, we utilized two questionnaires to evaluate the usability, user experience, and acceptability of the e-ToolKit. The first was a Likert-scale questionnaire to survey the participants' views of the workshops. The questionnaire was based on the work of Nikou & Economides (2019). However, quantitative methods can give us a clear understanding of the findings and the reason behind them, *i.e.* by connecting micro and macro domains with the use of triangulations, thus increasing the validity of our conclusions (Creswell et al., 2007; Azorín, 2010). Though

using interviews would have been ideal, due to the number of participants and the tight schedule of the International Week event, we opted for a questionnaire with open-ended questions.

The data that was gathered from the questionnaires regarding digital competencies were analyzed with the use of the statistical analysis tool SPSS. The participants in this research study differed with each research tool as the data collection tools were given via an online platform. The sample size of the digital competence questionnaire was 33, whereas, in the usability, learning experience, and acceptability questionnaire, there were 17. However, the sample size of the open-ended questions was 29.

Additionally, the Likert-scale questionnaire was also analyzed with the use of the same analysis tool. On the other hand, we followed a thematic content analysis on the open-ended questions as it would allow the systematic analysis of the views of several users and concisely present them (Cohen *et al.*, 2018). Following the suggestions of Cohen *et al.* (2018), discussions were conducted among the researchers while analyzing, grouping facts and statistics, and creating consensus on our results, thus increasing the reliability of our findings.

4 Results

The data collected were coded and analyzed based on their methodology. The findings presented below are distributed based on the research questions. As such, we will present the quantitative data from the pre and post-test digital competence questionnaire to answer the first research question and the quantitative and qualitative data from the other two questionnaires.

4.1 Digital competences

To address the initial inquiry, we employed pre-test and post-test questionnaires. We scrutinized the information using the paired-samples t-test to compare the averages of two evaluations gathered from a group. As seen from Table 1, the students' and teachers' perception of their digital competence (50 questions) was assessed over five competency areas. Each of these areas included some sub-dimensions. The five competency areas were: Information and data literacy (16 questions), communication and collaboration (15 questions), digital content creation (10 questions), safety (6 questions), and problem-solving (4 questions). This questionnaire graded all questions on a Likert-type scale of 1 to 5.

Based on Table 1, the participants did not show any significant difference in the first two content areas, Information and data literacy and communication and collaboration, apart from 2 questions in the second content area. However, in both content areas, the participants' mean scores are way above average, as most questions have a mean score of 4 ($M = 4.00$) or higher, even before the event. Especially on the sub-dimension of browsing, searching, and filtering data, information, and digital content, which included the first four questions, participants showed highly high scores. The only questions that showed interesting differences before and after the event were about the legal and ethical issues of using digital technologies and digital resources. Although the students and teachers showed some understanding of the legal and ethical issues associated with digital content ($M = 3.683$ & $M = 3.634$), their comprehension of these subjects showed improvement ($M = 4$ & $M = 3.97$). Nevertheless, the high scores in most of the pre-test questionnaire on the first two content areas indicate that the participants already consider themselves quite skilled in these areas, especially in the first sub-dimension.

Table 2 shows the data referring to the other three content areas, digital content creation, safety, and problem-solving. In the digital content creation area, the participants showed a significant improvement. Specifically, on the developing digital content sub-dimension, 4 out of 6 questions displayed significant improvement, as the average results on the majority of these questions increased to clearly above average or, in some cases, such as managing web spaces and publishing self-created content, to having a perfect understanding of the subject ($M = 3.97$). On the other hand, the safety content improved in some areas, such as protecting an individual's digital identity from others, but they needed to be considered statistically meaningful. Generally, the students and teachers showed an average understanding of the safety content area, which did not improve significantly after International Week.

Nonetheless, the last content area, problem-solving, significantly improved all questions. The participant exhibited average knowledge of how to solve technical problems, identify needs, and utilize digital content to enhance their competence before the event. However, they reported higher results after the event, significantly improving their knowledge by utilizing digital tools, such as online courses and forums. These results are significant as the e-toolkit utilizes such digital content and tools.

Table 1 Information and data literacy dimension in Digital competence questionnaire

Dimension	Questions	Mean Difference	Std Deviation	A Significant Difference (SD < 0.05)
Information and data literacy	I can configure the web browser of my computer when it is considered necessary.	0.06250	1.43544	0.807
	I can select sources of information of professional interest.	0.03030	0.58549	0.768
	I can locate digitized information using keywords and filters to refine and limit my search.	0.33333	1.10868	0.094
	I can use different search engines to locate information and resources for my mobility.	0.06061	1.22320	0.778
	I am aware of the restrictions on educational resources published with copyright.	0.28125	1.37335	0.256
	I can use educational resources available on the internet depending on the demands that the subjects pose to me.	0.27273	1.12563	0.174
	I can critically evaluate the information I locate on the internet.	0.06061	0.93339	0.712
	I am confident in my capability to apply digital technologies to increase my learning effectiveness and efficiency	-0.09091	1.10010	0.638
	I regularly reflect on my practice in digitally enhanced learning and look for the potential for improvement.	0.00000	1.04727	1.000
	I can find solutions to any challenges that emerge in digitally enhanced learning.	0.00000	1.29904	1.000
	I am comfortable with reading screen-based texts with concentration and persistence.	-0.06250	1.36636	0.798
	I am comfortable with digitally enhanced learning.	0.09091	1.10010	0.638
	I can save information in different formats and classify it to retrieve it quickly.	-0.06061	1.41287	0.807
	I can make backup copies of the information that I consider relevant.	-0.06250	1.38977	0.801
	I can use external storage spaces.	-0.06250	1.41279	0.804
Communication and collaboration	I can decide on the digital technologies that are most relevant and appropriate for my study among a variety of options.	-0.09091	1.15552	0.654
	I can use at least three different digital tools to interact with others.	-0.18750	1.53323	0.494
	When I browse, I can interact with different sources of digital information.	-0.15625	1.19432	0.465
	When I share information or content obtained online, I cite the author and the source, following the existing rules.	0.06250	1.21649	0.773
	I can select to share on the network, news, and resources on various web pages, forums, and other online communities.	0.03226	1.01600	0.861
	I can use programs and applications to create projectable, digital presentations.	-0.09375	1.27910	0.681
	I can spread the digital presentations created through mailing, social networks, uploading to repositories, etc.	-0.25000	1.21814	0.255
	I can actively participate in at least two virtual communities and social networks.	-0.06250	1.41279	0.804
	I can take advantage of digital media's possibilities, including social networks.	-0.09375	1.22762	0.669
	I can use online collaborative work tools to create shared knowledge.	-0.09375	1.35264	0.698
	I am fully aware of the legal and ethical issues with digital technologies.	-0.60606	1.14399	0.005
	I am fully aware of digital resources' legal and ethical issues.	-0.54545	1.14812	0.010
	I comply with the legal regulations regulating such information transfer when I send and receive digital messages.	0.12121	1.40885	0.625
	I can remember the sociocultural characteristics of the audiences I direct my digital messages.	0.06250	1.29359	0.786
	I can manage my digital identity, making only the personal data I want to be known publicly.	0.00000	1.43684	1.000
I can track my digital history.	0.00000	1.48556	1.000	

4.2 Use and acceptance of e-toolkit

In order to answer the second research question, we utilized quantitative and qualitative measures. University students' and teachers' perceptions of using and accepting the e-toolkit during the International Week were evaluated after the event with a questionnaire of 27 questions divided into three sections: Usage, lecture style, and acceptance of the e-toolkit. The last section is divided into four constructs, as shown in Table 5. Additionally, some of the questions in the usage questionnaire have reverse scoring to keep the respondents from answering recklessly and limit the agreement bias. Also, all questions were evaluated on a Likert-type of 1 to 5. Additionally, we used a second questionnaire with open-ended questions to gain a further understanding of the knowledge acquired during the workshops, possible drawbacks, and suggestions for improvements.

As Table 3 shows, after the end of the International week, most participants believed they could use the e-toolkit quite effectively and efficiently. Specifically, they stated that the e-toolkit was not very complicated (M = 3.5), they would not necessarily need a technical person to assist them (M = 3.83), its design was consistent (M = 3.72), and its features were well integrated (M = 3.88). Also, they did not find it difficult to use (M = 4.11). On the contrary, it could be operated with ease (M = 3.83), other people could learn to use it quickly (M = 3.61), and the vast majority were quite confident that they could use it successfully (M = 4).

Students and teachers were also asked about the lecture style used in the workshop in combination with the e-toolkit (Table 4). Most people agreed that the workshops' objectives were clear (M = 3.83) and matched the content of each teaching (M = 3.88). Though they considered the workshops adequately organized (M = 3.83) and with their involvement sufficiently motivated (M = 3.61) and able to produce some content of their own (M = 3.64), most of them found it very enjoyable (M = 4.16).

Table 5 shows the data referring to the acceptance of the e-toolkit. It is observed that their computer self-efficacy is quite adequate as they feel confident using the e-toolkit (M = 3.82) and possess the necessary skills and knowledge to utilize it (M = 3.94). Regarding their perceived usefulness, most believe it can assist them in their mobility (M = 3.94), with nearly 80,3% agreeing or strongly agreeing. The e-toolkit can also help enhance the participants' performance

Table 2 Digital content creation, safety and problem-solving dimensions in Digital competence questionnaire

Dimension	Questions	Mean Difference	Std Deviation	A Significant Difference (SD < 0.05)
Digital Content Creation	I can share simple digital materials on the web.	-0.75000	1.27000	0.002
	I can manage web spaces where I can publish multimedia content.	0.34375	1.65801	0.250
	I can create messages adapted in form and content to the characteristics of the digital communication channels I will broadcast.	-0.90909	1.52815	0.002
	I can create digital audio by mixing voice and music.	-0.81818	1.23629	0.001
	I can design and create digital presentations combining images, graphics, and texts.	-0.59375	1.52102	0.035
	I can create my videos by inserting photos, graphics, film clips, and texts.	-0.84375	1.46154	0.003
	I can use digital editing programs (audio and/or video) to modify content created by other authors or by me.	-0.80645	1.40046	0.003
	I know the regulations that regulate copyright according to the type of license chosen to protect them.	-0.75000	1.27000	0.002
	I am aware of the procedures by which an author liberalizes his rights and makes his work in the public domain free of charge.	0.34375	1.65801	0.250
Safety	I can modify the basic configuration of the tools and digital media to adapt to my needs and limitations.	-0.90909	1.52815	0.002
	I can perform essential maintenance and protection operations on my devices for system updates, antivirus, access passwords, etc.	0.00000	1.73205	1.000
	I know how to act when I detect a security threat on my devices and equipment.	-0.09677	1.61977	0.742
	I can protect sensitive personal data.	-0.03226	1.16859	0.879
	I can protect my digital identity and that of others.	-0.29032	1.16027	0.174
	I can make optimal use of digital devices so that they have the most negligible environmental impact.	0.06452	1.48179	0.810
Problem Solving	I can adopt effective measures to save energy and extend the life of the batteries of my digital devices.	0.06452	1.63168	0.827
	I can identify a technical problem by clearly explaining what the malfunction consists of.	-0.93333	1.04826	0.000
	I can solve non-complex technical problems related to standard digital devices and environments with the help of manual or available technical information.	-0.63333	1.40156	0.019
	I can use virtual environments to follow online courses for my training.	-0.53333	1.04166	0.009
	I can consult specialized forums that help me solve doubts or problems.	-0.56667	1.27802	0.022

Table 3 Participants' self-perception of ease of use

Ease of use questions	Absolutely Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	Mean Difference	Std Deviation
I can use the e-toolkit effectively.	5.6	11.1	5.6	33.3	44.4	4.0000	1.23669
The e-toolkit needs to be simplified. (reverse)	11.1	22.2	11.1	16.7	38.9	3.5000	1.50489
I found the e-toolkit easy to use.	5.6	16.7	5.6	33.3	38.9	3.8333	1.29479
I need the support of a technical person to use this e-toolkit. (reverse)	5.6	16.7	5.6	33.3	38.9	3.8333	1.29479
I found the various features of the e-toolkit to be well integrated.	5.6	11.1	0	55.5	27.8	3.8889	1.13183
There needed to be more consistency in the design of the e-toolkit. (reverse)	5.6	5.6	38.9	11.1	38.9	3.7222	1.22741
Most people would learn to use this e-toolkit very quickly.	11.1	0	27.8	38.9	22.2	3.6111	1.19503
I found the e-toolkit very difficult to use (reverse)	5.6	11.1	0	33.3	50.0	4.1111	1.23140

Table 4 Participants' self-perception of Lecture/Workshop style

Lecture/Workshop style questions	Absolutely Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	Mean Difference	Std Deviation
It was clear to me what I was supposed to learn in this lecture/workshop.	11.1	0	11.1	50.0	27.8	3.8333	1.20049
What we were taught matches what we were supposed to learn.	5.6	5.6	16.7	38.9	33.3	3.8889	1.13183
The lecture was well-organized and ran smoothly.	11.1	0	11.1	50.0	27.8	3.8333	1.20049
I could see the relevance of most of what we were taught in this lecture/workshop.	5.6	11.1	16.7	44.4	22.2	3.6667	1.13759
I felt encouraged to rethink my understanding of some aspects of the subject.	5.6	11.1	22.2	38.9	22.2	3.6111	1.14475
We were not just given information; we developed it with the instructor and each other.	11.8	5.9	17.6	35.3	29.4	3.6471	1.32009
I enjoyed this lecture/workshop.	5.6	5.6	0	44.4	44.4	4.1667	1.09813

(M = 4) and academic achievement (3.88). The students’ and teachers’ attitudes towards the e-toolkit were also pretty optimistic (M = 4.05), with 88.2% being upbeat or positive in its use in skills acquisition and showing their likeness in utilizing it (M = 3.75). Lastly, the participants stated that they intend to use the Toolkit in the future (M = 3.76) or spend some time with it (M = 3.52).

Table 5 Participants’ self-perception of acceptance of e-toolkit

Construct	Acceptance questions	Absolutely Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	Mean Difference	Std Deviation
Toolkit self-efficacy	I feel confident in using the e-tool kit.	5.9	0	23.5	47.1	23.5	3.8235	1.029
	I have the knowledge and skills to use the e-tool kit.	0	11.8	11.8	47.1	29.4	3.9412	.934
Perceived usefulness	The use of the e-tool kit can help me improve my mobility.	6.3	6.3	6.3	43.8	37.5	3.9412	1.333
	The use of the e-tool kit can help me improve my performance.	11.8	0	0	64.7	23.5	4.0000	1.360
	The use of the e-tool kit can help me improve my academic achievement.	12.5	0	6.3	50.0	31.2	3.8824	1.583
Attitude toward the tool kit	Using the e-tool kit to learn skills is a good idea.	0	11.8	0	58.8	29.4	4.0588	.809
	I like using the e-tool kit.	12.5	0	12.5	50.0	25.0	3.7500	1.533
Behavioural intention to use the tool kit	I intend to spend more time using the e-tool kit	11.8	0	17.6	64.7	5.9	3.5294	1.140
	I intend to use the e-tool kit in the future.	11.8	0	11.8	52.9	23.5	3.7647	1.441

Based on the respondents’ answers, four main themes were identified concerning what they had learned during this event (Figure 3). The vast majority of the participants stated that they acquired skills in digital applications, with some of them stating the themes of the workshops, *i.e.* “MIT App Inventor”, “some new apps for gamification”, or “to implement digital tools in education”. As this was the central aspect of the workshops, the enhancement of digital competencies, it is very positive that most of them recognized it. The second core theme was General learning experience/Knowledge and skills. Some participants should have stated the type of knowledge and skills they acquired. Most of their answers were noted as “experience”, “skills”, or “knowledge”. Though the workshop’s main objective was digital competencies, other skills were also part of the learning process, indicating why some teachers and students responded like that. This is also evident due to the last two emerging themes: intercultural skills, cooperation, and communication. The enhancement of intercultural skills in international mobility events has often been shown in such events (Bartel-Radic & Binet, 2020). Additionally, the workshop design, the active involvement of the teachers and students, and the use of collaborative exercises promoted their collaboration skills and intercultural communications. For instance, as one participant noted, “Collaboration with participants from different cultural and professional backgrounds”.

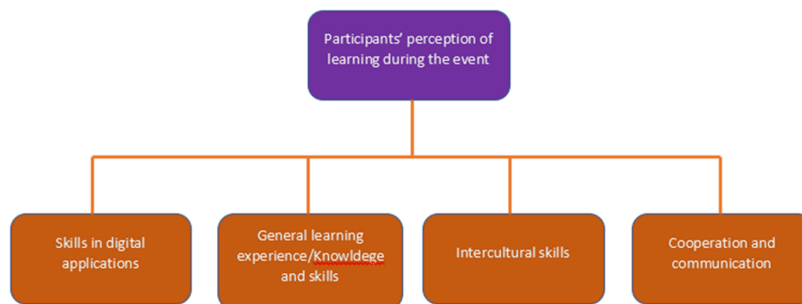


Figure 3 Thematic network of participants’ perception of learning during the event

Regarding possible shortcomings of the workshops, most of the respondents did not present or find any. However, there was 1 type of limitation that some of the participants noted. The acquisition of digital competencies was the main objective of the workshops. However, some students and teachers were concerned about the coherence and practical use of what they had learned in teaching. As one respondent outlined. “Connection among the presentations and workshops, more focus on teaching and how to teach better. For example, how to support critical thinking in students”. Though developing skills to utilize digital applications in teaching was part of the workshops, some participants needed help.

Finally, although most teachers and students still need to declare a way to improve the events, some participants proposed two improvements. As pointed out, some participants were concerned about organizational issues that affected the event and all lectures and workshops. Notably, one respondent outlined, “For future winter school, I would suggest making more detailed instructions, especially with a map where the meetings, lectures are held, links to the bus schedule and require punctuality”. Additionally, another point that was raised was the increase of more workshops. As it was stated by a participant, “Possibility to participate in more workshops”. This finding illustrates the importance of active involvement with workshops instead of passive engagement with presentations in such international educational events (Green, 2019).

5 Discussion

The importance of digital competence is highlighted in various policy agendas as a critical skill for the future in a knowledge-based economy, facilitating the digital restructuring of society (Karakose *et al.*, 2023). The COVID-19 pandemic has further underscored the significance of digital competencies in comprehending the use of digital technologies in educational contexts (Lavidas *et al.*, 2022; König *et al.*, 2020) and the work environment (Murawski & Bick, 2017).

One of the primary goals of this research study was to evaluate the potential of an innovative e-toolkit on the students’ and teachers’ digital competencies. Based on our results, the level of competence relating to information and data literacy, as well as communication and collaboration, showed slight improvement. However, as it was revealed, their average levels were already high, especially in some aspects of information and data literacy, where questions had a mean score of over 4 in 5 before the event. This also correlates to other post-Covid studies (Poszytek *et al.*, 2022). Although the lack of digital competencies among teachers and students has been shown in the past (Artacho *et al.*, 2020), during the pandemic, many universities and educational institutions utilized remote teaching (Gamage *et al.*, 2020). This increased teacher and student competencies and teachers’ acceptance of ICT use in teaching (Huamán-Romaní *et al.*, 2022). Because the primary focus of most ICT use during the pandemic was online teaching (Pokhre & Chhetri, 2021), it stands to reason that students and teachers display high levels of competence in these two dimensions.

The areas of digital competence that showed significant improvement were the digital content creation and problem-solving sections. Unlike similar studies before Covid-19 that presented low levels of digital content creation (Amhag *et al.*, 2019; Artacho *et al.*, 2020), the digital content creation of the teachers and students was near average before the event. However, their competencies improved in that dimension as well as their problem-solving skills after their workshops with the use of the e-toolkit. Academic environment support and enhancement of teachers’ readiness are vital for increasing teachers’ digital literacy (Li & Yu, 2022). Therefore, a tool that can increase these aspects can lead to an increase in digital competencies, especially in aspects that students also display lower results (Martzoukou *et al.*, 2020). As for the section regarding safety, lack knowledge in this aspect (Porlán & Sánchez, 2016; Gallego-Arrufat *et al.*, 2019) is noticeable both for teachers and students. Although the levels were adequate, the need for in-depth development after the pandemic era is still evident, and there is still room for improvement (Karakose, Tülübaş & Papadakis, 2022b).

Additionally, the present study investigated the views of the teachers and students on the usability, learning experience, and acceptability of the e-ToolKit in the context of International Week. Perceived ease of use has been found to significantly affect the use of various technological tools by students and teachers, especially in learning (Sánchez-Prieto *et al.*, 2019; Huang *et al.*, 2022). It has often been found, along with perceived usefulness, to be a key determinant of user attitudes towards utilizing a technological tool (Park & del Pobil, 2013). Our results indicate that small-scale events, such as the Weeks of International Teaching, can assist both international students and teachers in perceiving that they have sufficient capabilities to perform learning tasks and generally learn with an e-toolkit. This is important as it can likely lead them to perceive using the Toolkit for learning as effortless (Moreno *et al.*, 2017). Students attending university often face challenges with their academic studies, mainly when they must complete various learning tasks and assignments across multiple subjects. Consequently, it seems logical to suggest that if students perceive technology as easy and not challenging, they may be more inclined to utilize technology in their learning endeavours.

Moreover, students and teachers showed high acceptance of the e-toolkit as they displayed confidence in using it. They highlighted that it had been used to help them improve themselves to learn new skills. This sufficient and high level of responses can indicate that the participants received sufficient training to use the technology for teaching confidently and effectively (Mirzajani *et al.*, 2016). It is also suggested that the participants’ views were quite assertive

regarding the design of the e-toolkit and how it was introduced to them. The learning style utilized is also evident in the optimistic respondents' perception of the Lecture/Workshop style. This follows other studies in educational learning systems (Fathema & Sutton, 2013; Fathema et al., 2015).

Moreover, our qualitative results indicate that this international event can support digital competencies and other important ones, such as intercultural communication and cooperation (Mohammed, 2022; Patelarou et al., 2023), even if it is not their primary objective. Also, the success of this international mobility event was made more evident as the majority of the participants did not mention any issues or limitations. On the contrary, they were interested in attending more similar workshops. However, a few respondents raised an issue of the connection between the workshops and general organizational issues, which needs to be considered in similar events as it can negatively influence students' learning motivation in the learning process (Tanjung & Utomo, 2021).

6 Conclusions

International student mobility is an increasingly crucial educational means to enhance students' various competencies that will assist them in the future in their line of work. Due to the Covid-19 pandemic, the development of digital competencies has become even more critical than ever. Effectively teaching and working online has become a fundamental skill.

However, the education system still faces the challenge of developing digital competencies effectively, especially in utilizing digital means in education where teachers need more adequate skills. It is, therefore, essential to prioritize both initial and continuous educational interventions in this scope, which is a requirement that applies to all levels of education.

Although the partners of the WITEA Erasmus program that took part in this project and research study considered the completion of the event satisfactory, improvements could certainly be made. The one-week course duration was tight for the amount of information exchanged, making the work tedious for both the teaching team and learners. To enhance the experience, it would be beneficial to generalize it on a larger scale and conduct a more in-depth assessment of the competencies acquired. Furthermore, incorporating this learning into a more remote and digital format could improve the results and potentially give the curricula access to technical and pedagogical support from universities, improve the results and remove obstacles such as those that were raised concerning coherence and practical use.

Moreover, improvements could be made concerning the e-toolkit itself. Introducing the concept of a journey map would lead the client from his/her identified point of departure (identified competence need) to the logical conclusion of the journey (solutions and decision-making support outcomes). Also, additional decision-making support apps could be included to complete the customer journey to reach full support for addressing the competence needs.

A second experience, based on Massive open online courses (MOOCs) for a larger audience, could provide more flexibility and connectivity and alleviate the economic problems while providing students with international experiences and opportunities.

7 Limitations

The present research study contains certain drawbacks. The main issues correlate with the small sample size collected from quantitative tools. However, the sample size of the open-ended questions was sufficient, considering the qualitative analysis used. Despite utilizing a mixed-method approach, our sample size is better suited for a qualitative study. As a result, it is crucial to exercise great caution when generalizing the findings. In addition, the present research used students from the universities that are taking part in the WITEA Erasmus program, which constituted a convenience sample. Additionally, the survey's design did not consider personal factors that may affect the perceptions recorded, such as respondents' gender and interests. However, three separate researchers were included in the research analysis to reduce the unintended bias of the research analysts, a factor that can affect studies that utilize qualitative methods (Tahaei et al., 2020).

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