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The piloting and evaluation of the graduate employability skills app

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The Graduate Employability Skills app (GES-APP) is an innovative application that aims to assist students in higher education in thinking about and reflecting on their employability skills. This paper describes the iterative, 3 phase evaluation framework that was used in designing and evaluating the app and presents the key findings at each stage of the process. The iterative evaluation approach ensured that the GES-APP was modified at each phase by taking account of staff and students' suggestions for improvements. Participants in the evaluation were students and staff from the 4 partner institutions of the EU-funded GES-APP project. The initial piloting focused on self-reporting of employability skills and participants provided positive comments about this activity, the key idea, content organization and functionality. They considered that it was innovative, meaningful and important and motivated them in exploring their employability skills and attitudes. Participants also provided many useful suggestions that were used to improve the layout and the quality of graphics, enhance users' interactivity and feedback, and clarify the role of the employability coach. This revised prototype of the GES-APP was used in the quantitative and qualitative piloting of the extended app in phase 2. Further improvements were made and tested in phase 3. This involved a more rigorous, quasi-experimental design testing the final version of the GES-APP, using pre- and post-questionnaires to record students' understanding of their employability skills, employer needs and career preparation. Statistically significant changes were found following the GES-APP intervention along two key dimensions: (a) Understanding employer needs and the labor market and (b) preparing for a career. This evaluation suggests that students would welcome digital support of this kind in helping them make the transition from higher education into the world of work.

KEYWORDS

e-learning, APP, employability, skills, iterative evaluation, higher education

1 Introduction

Over the past 20 years, much thinking and policy argumentation has been directed towards employability, i.e., the knowledge, skills and abilities that individuals should acquire to effectively participate in the 21st century workplace (Suleman, 2018). In the globalized, highly competitive and rapidly changing workplace environment, employability and career development have acquired increasing prominence in both national and international policy reports (European Commission, 2014; NOC, 2013; National Association of College and Educators, 2016; OECD, 2019).

Academics, educators, policy makers and employers agree that young people need to develop a wide range of generic skills, which are necessary to find a 'good' job (Cheng et al.,

2022). Current views of employability development suggest that employability skills include, but go beyond discipline skills, knowledge and practices and include solving unstructured problems, adopting multiple ways of thinking, working with new information, communicating ideas and other soft skills (Bennett, 2020). Employability has become a central concept in debates concerning the relationship between Higher Education (HE) and the workplace, and the role of Higher Education institutions in relation to graduate employment (Bennett, 2019; Hora et al., 2018; Yorke and Knight, 2006). For example, in countries like USA, Canada, Australia, and in the European Union, policy directions agree that HE institutions should observe their students' employability and provide them with enhanced opportunities to develop their employability skills (AQE, 2019; CTE, 2015; Florida Chamber Foundation, 2019).

Studies have shown that employability development is not yet fully at the core of higher education curricula (Tomlinson, 2008; Tymon, 2013). Bennett et al. (2020) argues that this is because employability has been defined as the acquisition of generic skills, and these are typically developed separately from the core business of learning a discipline. However, Bennett advocates that the curriculum should support students in thinking about and reflecting on their employability and the development of employability skills. Tibby and Norton (2020) provide a useful framework for how this should be carried out. A wide range of employability initiatives, like training programs, online learning and development interventions, MOOCs, digital educational resources etc., have been reported (Bennett et al., 2020; Du, 2021; Pordelan and Hosseinian, 2022; Sampson and Osborn, 2015) with the aim of preparing, supporting and scaffolding students:

- a to make links between their study's discipline knowledge and future jobs
- b to collect, collate, reflect, and articulate evidence of their personal and professional development throughout their studies
- c to understand the labor market and think about their career path.

It was against this context that the GES-APP was designed and developed as an original application to address these issues by assisting higher education students to think and reflect on their employability skills. It also aimed to support them to be better prepared for their career journey by helping them to plan, record and present the

acquisition and the development of graduate employability skills throughout their university studies. Designing health and social apps is a complex process and, in a review of mental health apps, Wasil et al. (2019) strongly emphasized the need to ground such apps on evidence-based content. This paper describes the design and evaluation frameworks used in the GES-APP project, and the key findings revealed at each phase of the evaluation.

2 The GES-APP design and evaluation models

Learning design and evaluation models provide comprehensive frameworks for designing, developing and evaluating pedagogically sound and educationally effective e-learning programs and educational material (Mayes and De Freitas, 2004; Goodyear, 2005; Dimitriadis and Goodyear, 2013). Several frameworks also exist for providing clear and well-documented suggestions for analyzing, designing and evaluating educational games (Arnab et al., 2015; De Freitas and Oliver, 2006; Mishra, 2002). However, there is no generally accepted model for the design and the evaluation of e-learning tools and online educational applications.

Consequently, in developing the GES-APP the "Design Thinking" methodology was used (Abbas et al., 2022). This is a non-linear and non-sequential process that provides a solution-based approach for problem-solving defined by five phases: Empathise, Define, Ideate, Prototype and Test (Hasso-Plattner Institute, 2022; Dam and Siang, 2020). In Phase 1 (Empathise), an in-depth literature review of employability was conducted that provided a theoretical framework to ground the GES-APP in evidence-based content (Maciejewski et al., 2020). At the same time, in phase 2, a user Requirements Analysis (Define) helped to identify valid and relevant activities for the app that would ensure that it would meet the needs of key stakeholders. The findings of phase 1 and phase 2 were then implemented in the design of the GES-APP (Ideate) and the prototype of the GES-APP application (Prototype) was developed using FIGMA software (Petersen et al., 2023). The final phase (Test) was the testing of the app prototype to get feedback from users.

The activities chosen for inclusion in the final app are shown in Figure 1. Activity 1 concentrated on the self-reporting of skills, where app users would select a skill or quality and rate their competence on that skill. Activity 2 was the dream job activity which explicitly

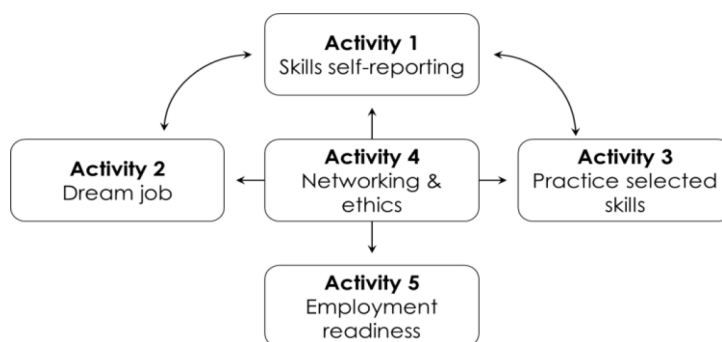


FIGURE 1
The activities chosen for inclusion in the final app.

encouraged users to reflect on the kind of career that they aspire to, and the skills required for that job. This activity aimed to help users think forward to try and clarify their career goals. In Activity 3 users practiced selected skills, while Activity 4 included tasks related to networking and ethics, and Activity 5 included employment readiness activities. The different phases of the evaluation focused on different activities.

2.1 The GES-APP evaluation methodology

With regards to the evaluation methodology, the ADDIE model was used (Figure 2). The model suggests a flexible, continuous process of improvement in the development phases of a specific learning tool or environment. The model has been widely adopted by educational designers and developers since it has particularly effective outcomes in the design, the creation and the evaluation of educational programs, educational materials, e-learning tools, e-learning environments and experiences (Lee and Jang, 2014).

In applying the iterative ADDIE model to the evaluation of GES-APP, a 3-stage process was used (Figure 3). Phase 1 was the early piloting of the initial prototype of the app with small numbers of end users. In phase 2, more rigorous piloting was carried out on the revised prototype with 33 undergraduate and Masters' students. Finally, a rigorous, large-scale evaluation of the final version of the GES-APP was carried out. This approach was also in line with a wider notion that investigations of users' engagement in digital learning environments need to be triangulated (Cohen et al., 2017) in order:

- to reveal critical aspects regarding the design of the GES-APP, students' engagement and their outcomes, in terms of employability awareness after using the app
- to increase the credibility and validity of our findings

- to provide definitive statements and suggestions for the improvement of the GES-APP.

Therefore, to describe the overall evaluation process for the GES-APP, user engagement, app interactivity features, content and content organization and users' learning outcomes need to be jointly analyzed. In addition, it was also important to consider connections among these components, and how a user would interact with them and relate this to the wider context of job requirements and employability skills. In this perspective, by combining ideas from well-documented and established evaluation frameworks in the literature and taking account of (a) the design features of the GES-APP, and (b) the expected outcomes to be achieved by the users, we developed a conceptual evaluation framework structured along five key dimensions: (1) Learning content and its organization, (2) the App interface mechanics and features, (3) Usability and learnability, (4) the expected learning outcomes, in terms of students' exploring, awareness and reflection on employability skills and (5) added value.

3 Phase 1 evaluation: early piloting of the initial prototype of the GES-APP

The phase 1 evaluation was a qualitative evaluation of the initial digital prototype of the app, with the following principal objectives:

- to examine perceptions of the acceptability of the app and app content in supporting employability
- to examine user experience of the app
- to provide detailed information about critical design and development features of the GES-APP
- to identify users' unanticipated problems and difficulties
- to collect feedback that could help to modify or revise the GES-APP functionality and activities

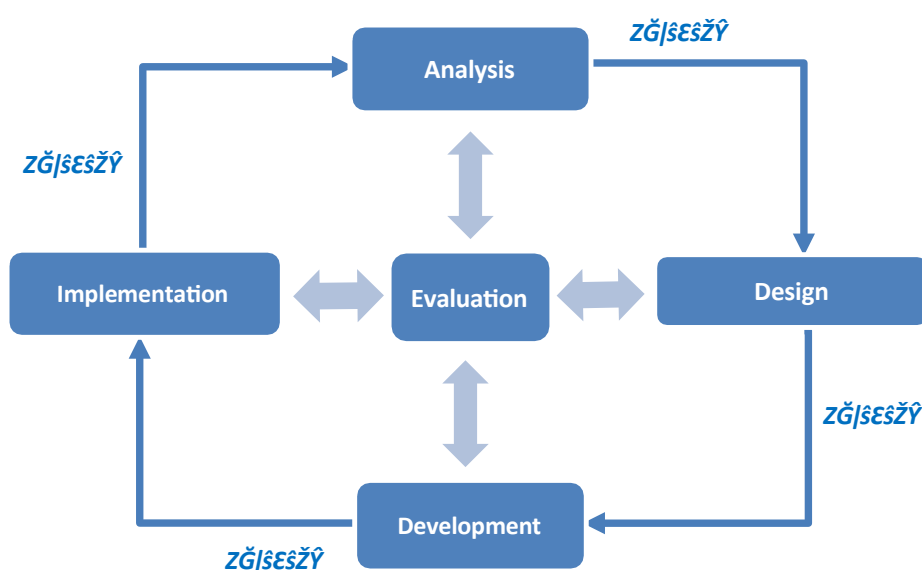


FIGURE 2
ADDIE model phases in the development-evaluation of the GES-APP.

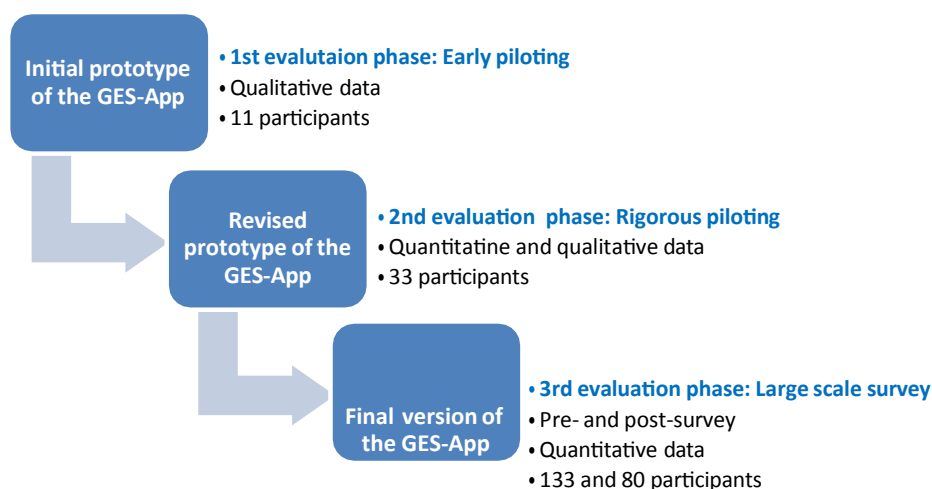


FIGURE 3
Three-level evaluation procedure of the GES-APP.

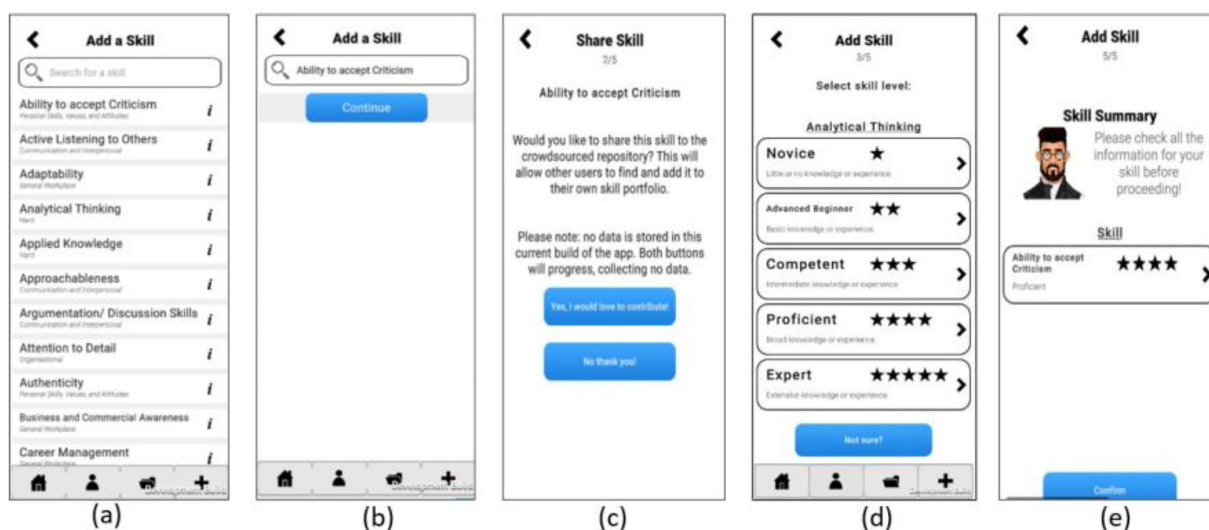


FIGURE 4
Skills self-reporting.

The phase 1 app prototype focused on a key activity: Activity 1, the self-reporting of skills (see Figure 4). Essentially app users would select a skill or quality from those offered in the Skills repository, such as: “The ability to accept criticism” and rate their perceived competence on that skill on one of 5 levels defined as: novice, advanced beginner, competent, proficient to expert (Dreyfus, 2004). If the relevant skill was not available in the repository, the user could also add new skills to the repository. A coach was included to guide participants through the activities.

3.1 Participants

A total of 12 students and staff members participated in the phase 1 evaluation of the GES-APP. Participants all came from the four partner institutions for the GES-APP project: the University of the West of Scotland (UWS), Norwegian University of Science and

Technology (NTNU), Cardinal Stefan Wyszyński University (UKSW), and the University of Peloponnese (UoP). There were two undergraduate students, and seven Masters’ students studying programs including psychology, social sciences and humanities, engineering, science and computer science, and two staff members both working in careers advisory roles. Table 1 presents demographic information regarding the participants in the early piloting evaluation study.

3.2 Procedure

Before taking part in the study, the researchers contacted each participant to explain the aim of the study and the GES-APP. Prior to each interview, participants had the opportunity to use the GES-APP prototype, to explore the content and discover features, to engage in activities, to think about and reflect on the app content.

TABLE 1 Demographic information of the participants in the early piloting evaluation.

Number	Pseudonym	Discipline	Level of studies	Institution	Gender	Age
1	M1-G	Humanities/social sciences	Master student	UoP	Female	31
2	M2-G	Assistant professor of social sciences	Head of Student Career Office	UoP	Male	43
3	M3-G	Humanities/social sciences	Undergraduate student	UoP	Female	22
4	M1-N	Engineering	Master student	NTNU	Female	24
5	M2-N	Engineering	Master student	NTNU	Female	28
6	M3-N	Informatics	Master student	NTNU	Male	26
7	M1-P	Artistic sciences	Master student	UKSW	Male	27
8	M2-P	Humanities/social sciences	Academic teacher	UKSW	Female	37
9	M3-P	Science (Mathematics)	Master student	UKSW	Male	21
10	M1-S	Psychology	Undergraduate student	UWS	Female	54
11	M2-S	Psychology	Master student	UWS	Female	28
12	M3-S	4 + years' experience in Career Guidance	Career Advisor	UWS	Female	34

Participants then took part in semi-structured interviews to establish their experiences of and perceptions of the phase 1 GES-APP prototype. Each interview lasted approximately 35–40 min.

3.3 Materials: interview schedule

An interview schedule was developed that included questions covering the following sections:

- Section 1: Participant demographic information: age, gender, institution, discipline and level of studies
- Section 2: Main idea, app Content and information flow: to what extent did the app address relevant information about employability
- Section 3: Design features, App interface, graphics, usability, learnability, ease of use
- Section 4: Outcomes of the GES-App: impact in exploring issues related employability
- Section 5: Suggestions for the improvement of the GES-App.

3.4 Results

All interviews were recorded and transcribed. A template analysis was carried out on the transcripts. Using *a priori* categories from the interview schedule as described by Brooks et al. (2015). A constant comparison method was used in an inductive manner including preliminary exploratory analysis, open coding, category creation, reduction and connection, description and interpretation (Creswell, 2021).

The findings of the qualitative data analysis of students' and staff perceptions were organized along the four main themes from sections 2–5 of the interview schedule.

3.4.1 GES-APP main idea and content

The participants were generally positive about the idea behind the GES-APP, the app content and its organization. They felt that the app was innovative, useful, and meaningful. Themes and illustrative comments concerning participants' views about the app content are shown below.

M3 G: “This app is innovative to some extent. Overall, my experience of using the application is positive.”

M1 P: “Overall, I liked the idea very much and I think it is a very useful application, and I have not really come across one like this.”

M1-P: “Overall, it is very useful, especially in the second half of your studies. When you think more and more about taking up a job and look for offers.”

M2 S: “I think it's really smart to have something like this on an app, and... yeah it was very meaningful I thought.”

Most participants appreciated the main idea behind Activity 1, i.e., self-reporting and evaluating their personal skills and experience. One student noted that using the App helped him realize he had valuable skills he could showcase to improve his job prospects.

M3 P: “The upside is that you can enter information yourself exactly, ...Same with experience... you can add references.”

M2 N: “Uploading documents/artifacts make me start thinking that I have more skills to showcase, and this can help me get a better job as then I know I have a better profile.”

M1-N: “It is helpful for the user to see a list of skills from where he can choose skills that suit to him. Providing a skill list can enhance knowledge, initiate thinking process and eagerness to acquire the skill you do not have.”

However, there were suggestions for improving the app content, such as having a pre-prepared list of the most important skills but also allowing students to add their own skills:

M1-G: “I am experienced in HR evaluation. I would suggest that the app could include a list of the most important skills, which are widely accepted/emerged from the literature, and recommend them to the user. In addition, the user should be also able to insert his skills in an open way.”

3.4.2 Design features: user experience, app interface, usability, learnability, ease of use

In this section we present the findings regarding participants' perceptions of the key design features of the GES-APP, namely user experience, App interface, usability, learnability and ease of use.

Participants were generally positive about their experiences of using the GES-APP. They thought that the app was interesting and motivating. Following we present some indicative quotes from participants interviews.

M1G: *"The application is actually interesting. It motivates the user to engage with."*

The app generated positive emotions, such as satisfaction and cheered users up by allowing them to see.

M1 P: *"When you see all the entered experiences and skills, you can see them from above, as if from a bird's eye view. So it definitely cheers you up."*

M3 P: *"Well, it seems to me that this is such a positive kick to do it, because, however, you feel satisfaction."*

Most of the participants were satisfied with the app usability. As the themes and illustrative comments shown below illustrate, participants found the app clear, well organized, simple and intuitive, easy to understand, the interface and buttons were straightforward and the functionality of the app was appropriate.

M1-P: *"It's quite okay. Everything is clear and well grouped."*

M2 S: *"I thought it was fairly straightforward to use...I can give it 9/10, each step was quite straight forward."*

M3-P: *"I did not feel overwhelmed. Everything was so simple that nowhere was too much effort. It was also not difficult to understand which panel is from what, what will happen, if I write something here or there, so that's very clear everything."*

M1-G: *"I would give a score of 8–9 out of 10... The app seems easy to use and clear. I did not find anything in the app's interface difficult or frustrated... it was clear what action needed to be taken by the user. However, I would like to know from the beginning where all this is going to lead."*

M1-G: *"I found graphics and app controls clear and distinct... The graphics were satisfactory, the interface is clear and straightforward."*

M3-G: *"I found the app simple and easy to understand; the controls and buttons were clear and responsive to my actions... The buttons and app controls are usable and in the right position on the screen. User actions were clear after watching the videos many times for guidance."*

M2-N: *"Words used for buttons and functionalities are quite clear."*

M2 N: *"Adding artifact is a good functionality. Instead of writing everything I can upload a document. It is nice to show case your work."*

However, as the comments below show, several participants also provided critical comments and suggestions for modifications of and improvement to the app interface saying that they felt that the user interface was not very motivating, and the graphics were unattractive and boring.

M1-N: *"But interface was not intuitive."*

M2-N: *"I felt like it is just boxes and squares. It reminds me old type interfaces, so it was quite demotivating. Maybe if interface improves it can encourage user to use this app."*

M2-P: *"However, the graphics are boring. I think it should be more attractive and encouraging."*

M3-S: *"Graphics, probably the use of colors, across the app. And, yeah, perhaps, in comparison to other commercial apps. Students may find it less attractive to them..."*

There were also criticisms of the functionality of the app, saying that it was not clear what the end goal in using the app was.

M3-N: *"It was not easy. It took a while to figure out how the app is built and what the purpose of the skills, project, artifacts etc. was. It was not clear what the point of adding things was and how they are connected."*

Protection of data was also noted as an issue by some students:

M2-N: *"If I know that my information can be visible to employers, then I think it influences it. If I know that it is just for me to keep my documentation and records, then I will not be much engaged."*

There was also a lack of feedback in the app and the role of the coach was not clear.

M1-G: *"The weakest point is the feedback provided to the student. There is no meaningful feedback from the application. The student needs to know that the information that he has uploaded is correct and meaningful to other people."*

MP 2: *"We choose the trainer at the beginning, so he could then guide us through the application, e.g., reacting to high grades, giving positive reinforcements or motivating us to complete a given skill. Maybe an application (trainer) could suggest how to develop individual skills."*

M3-N: *"was a bit weird that you choose an adviser, but the adviser does not guide you through the use of the app. It would be natural if the adviser was some sort of help/guide with using the app."*

3.4.3 Outcomes of the GES-APP

Most of the participants provided positive comments about the outcomes of using the app. These were categorized along 3 themes that

reflected participants' views of how they felt the app supported them: (a) identifying and documenting skills; (b) reflection on and self-awareness of employability skills and (c) preparation for the labor market. The following transcripts are representative of the key comments provided by participants.

M3-S: "I think is a good way of having a log book or something like that, like, having in one place."

M2-P: "The app helps students to think about and see what skills they have and what they need to develop. I think a list of these skills would be helpful, as not everyone knows what employability skills are. Also, if a student evaluates skills realistically (by awarding stars), it will indicate some direction of development."

M3-G: "Knowing yourself and your abilities requires empathy, self-reflection and self-evaluation skills.... In an interview, if you are claiming that you are good in something you have to prove it. So, using the app you cultivate skills such as self-evaluation and self-awareness..."

M3-S: "it will put students in the process of reflecting on their experiences, identifying new skills to develop/cultivate or ways to further enhance their skills and improve them."

M1-G: "I perceived the app more as a way of preparing students for the labor market and for the interviews and presentation of their CVs and skills."

3.4 Suggestions for improvement of the GES-APP

In addition to the negative comments about the design features discussed above, phase 1 participants also identified other areas of weakness in the phase 1 prototype and provided many useful suggestions about how to improve the app going forward. Participants felt that it would be useful to include a list with fundamental/critical skills as well as brief description of those skills and to connect job profiles with specific employability skills.

3.4.4.1 Skill recognition

M1-N: "If the app could provide list of skills, depending on a domain, it will make user think to develop those skills also which he does not have."

M2-S: "Students have problems coming up with those skills...I think it would be great if they could be suggested, at least offer skills already implemented into the app... In the same way for a student to be sure about with a skill level, they are at, that's quite difficult for them and the app does not help them like what example suggesting questions or asking them questions or guiding them in order to clarify for them to be aware of, which skill level they are on."

3.4.4.2 Connecting job profiles with specific skills

M1-S: "Maybe very useful to include a list containing job profiles and/or skill profiles (at a very abstract level) or examples of skill description. I think this is a real barrier for the students, i.e., to understand how to connect specific skills with specific jobs."

3.4.4.3 Exporting users' portfolio and connection to LinkedIn

The capacity to export the users' portfolio and connect to LinkedIn was another suggestion:

M2-G: "The app should be enhanced by including a kind of tool that could help users to export their data records/portfolios in a way that can be useful to third parties or interested people (e.g., an employer). I think that it could be a pdf file and/or a link to this information or to a platform like LinkedIn."

3.4.4.4 Word of caution

A careers' advisor had a word of caution about the limitations of apps like this to increase students' awareness about employability.

M3-S: "I do not think that effective self-awareness and reflection about one's skills can be done in that way, through the app. I think the students and the users, most of them will need much more help, in order to achieve that self-awareness, and that self-understanding and understanding that calls to move forward."

3.4.4.5 Programming bugs and technical issues

There were also a few technical problems that had to be addressed with this early version of the app. For example, some parts of the app did not fit correctly on the screen. The GES-APP was modified to take account of many of these suggested improvements from phase 1 and these were incorporated into the revised app.

M3-G: "However in the web version some parts did not fit correctly on the screen, e.g., the welcome message. In some cases, I could only type just one word, no more text. I would like to be able to type a short phrase."

M1-S: "There was obviously a couple of technical things which were more to do when you are typing. It did not allow you to put spaces, even though I was setting the space bar. I also noticed that you could not paste in a URL so that that would be another one."

3.5 Overall evaluation and suggestions for improvement

Overall, the participants in the phase 1 interviews provided positive comments about the GES-APP and its objectives, the key idea, the content organization and its functionality. They felt that it was an interesting, important, original and motivating means of exploring many aspects of employability. They liked that it helped them to understand, clarify, document and organize their employability skills and to self-assess their skill level on a variety of skills. They felt that it provided a different and useful perspective - "a bird's eye view" - on their skills. They considered it a meaningful way of helping students connect their skills, experiences, projects, references and artifacts. The participants felt that the GES-APP had a good level of game flow, usability and learnability, and that it was easy to understand. The app addressed its intended learning outcomes as students felt that app helped them explore and reflect on skills and values about employability, increase their self-awareness about careers and their interest in the labor market. Table 2 summarizes the key findings of early piloting.

These findings were important in encouraging the project team to continue to develop the app, since it recognized that the acceptance of

a technology is crucial if it is to be used successfully to carry out the relevant activity in Higher Education (Sandí-Delgado et al., 2022).

However, the phase 1 participants also identified areas of weakness in the early prototype and provided many useful suggestions about how to improve the app going forward, including: offering two versions of the App - Web and mobile; improving the aesthetics, layout and the quality of the graphics; using a more friendly/familiar app interface; enhancing user's interactivity and providing better feedback; clarifying the role of the employability coach; including a list with the fundamental/critical skills profile; connecting job profiles with specific employability skills; adding new functionalities such as exporting users' portfolio and connecting to LinkedIn. There were also a few technical problems that had to be addressed with this early version of the app. The GES-APP was modified to take account of many of these suggested improvements from phase 1 and these were incorporated into the revised app.

4 Phase 2: more rigorous piloting of the early prototype

Phase 1 evaluation indicated that participants viewed Activity 1, the skills self-reporting, as an acceptable and enjoyable way of finding

out about employability. The second phase of the evaluation involved an extended GES-APP prototype that included activities 1, 2 and 3 and used both quantitative and qualitative methods.

In Activity 2, the Dream Job activity, students select their dream job, i.e., the job that they aspire to, from a choice of many alternatives provided in the jobs database and the app shows the user the skills that are regarded as essential in carrying out that job (see Figure 5).

4.1 Participants

Overall, 33 students (23 undergraduates and 10 postgraduates) from the partner institutions participated in the second phase of the evaluation. 14 students were from the University of Peloponnese (UoP), 8 from the University of the West of Scotland (UWS), 8 students from the Cardinal Stefan Wyszyński University (UKSW) and 3 from the Norwegian University of Science and Technology (NTNU). Among the participants, 14 were male and 19 were female. Their age distribution was as follows: 21 students were between 20 and 25 years old, 5 were between 26 and 30, and 7 were above 36. Regarding their fields of study, 20 students were enrolled in undergraduate programs in social sciences, 7 were studying computer science, and 4 were humanities students.

TABLE 2 Key findings of the GES-APP early piloting.

Key findings	Factors
Strong points	• The key idea of the App • Clear objectives of the App • Rich and well-organized content • Meaningful way of connecting skills, experiences, projects, references and artifacts • The levels of skills proficiency • Good level of usability • Easy to understand and how to use the app (learnability) • The APP promotes students' active engagement • Suitable learning outcomes in terms of ◦ understanding and clarifying employability skills ◦ students' exploration and reflection on skills and values about employability ◦ documentation of skills ◦ students' preparation for job interviews-labor market • The App promotes ◦ reflection on students' experiences ◦ documentation of skills and experiences ◦ self-awareness about employability skills ◦ self-evaluation of skills
Weak points and Suggestions for improvement	• The role of the coach needs to be clarified • Student feedback should be more concrete-focused • Include a list with the fundamental/critical skill profile • Connect job profiles with specific employability skills • Insert an App helpdesk ◦ Provide examples of skills description, documentation ◦ Provide examples of developing personal portfolios • Improve the app aesthetics, the graphical interface and layout ◦ Use a more friendly-popular app interface ◦ Technical flaws to be solved: some parts did not fit correctly on the screen • Include new functionalities, such as exporting users' portfolios and connecting to LinkedIn • Provide both a web and a mobile version of the GES-APP • Translate the app into various national languages

4.2 Materials

4.2.1 The online questionnaire

4.2.1.1 Quantitative section

An online questionnaire assessing the app's usability was developed for the second stage of the GES-APP evaluation. The questionnaire was designed based on existing literature and our research experience with digital educational environments and apps. It included demographic questions as well as questions about participants' digital skills. The second section comprised 35 closed-ended questions exploring participants' perceptions and beliefs about the GES-APP features across seven dimensions:

- Interface and layout
- Learnability
- Easiness to use
- User interaction and feedback
- Usability
- Content and flow
- Outcomes and added value of the GES-APP

The scale items were presented as statements assessing participants' perceptions of various usability factors. Responses were measured on a 5-point Likert scale, ranging from 1 = I really disagree to 5 = I really agree.

4.2.1.2 Qualitative questions

In addition, five open-ended questions aimed to identify students' perceptions and preferences with regards to (a) the

added value of the GES-APP in students' preparation to find a 'good job', (b) the most interesting or outstanding aspects of the GES-APP, (c) the possible weakest parts of the GES-APP, (d) Web- mobile and PC versions of the GES-APP and (e) students' comments, ideas or suggestions that could improve the GES-APP.

4.3 Quantitative results

4.3.1 Digital skills

In response to a question about their level of digital skills, the majority of the students reported that they had a high level of digital skills, with 87.9% overall claiming to be competent (39.4%), proficient (36.4%) or expert (12.1%), with only 9.1% as advanced beginner and 3% as novice. This backed up our assumption in developing the app that potential app users would be familiar with digital technology. When asked about their use of social media use, 87.8% of participants were competent or proficient users of Facebook and 63.7% of Instagram. However, LinkedIn, an employment-focused social media platform, was not so widely used by the majority of the participants, with only 30.4% claiming to be competent or proficient.

4.3.2 Perceptions and beliefs about GES-APP

Figures 6 to 13 show the percentage of participants responding to each item on the seven dimensions of the Perceptions and beliefs about GES-APP questionnaire. These heatmaps display the spread of participants' responses. Mean ratings overall and for each item are also reported where relevant.

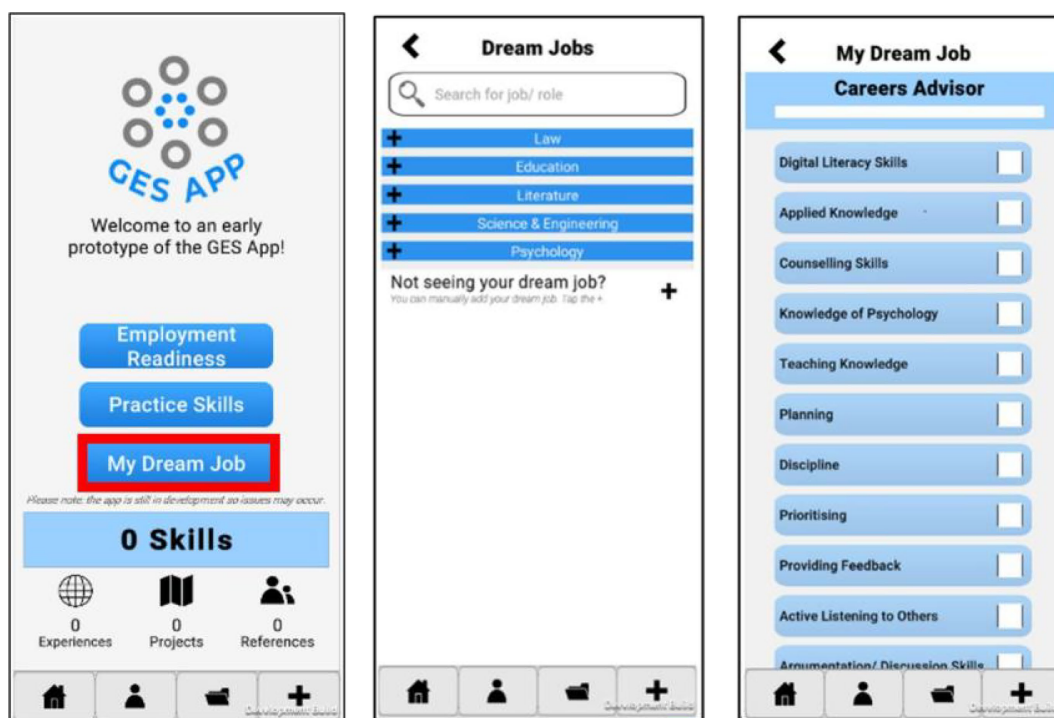


FIGURE 5
Dream job activity.

4.3.2.1 App interface and layout

The mean overall rating of 3.02 for items about the app interface and layout indicated that participants did not feel positive about the interface and the design layout of the 2nd GES-APP prototype. Figure 6 confirms this and shows participants' responses were divided between positive, neutral and negative perceptions of the various items in this dimension. Mean ratings for individual items ranged from only 22.3% agreeing that "The Home screen of the GES-APP was engaging" up to 45.5% for "I found the graphics of the GES-APP relevant (appropriate)" (45.5%). This suggested a need for modification of the graphical interface and layout of the app.

4.3.2.2 Learnability

Figure 7 shows that participants' responses to factors related to the learnability of the GES-APP, i.e., the level of ease with which a student learns how to use and navigate through the application were generally positive. 66.6% agreed that: "It was easy to understand how to navigate across the GES-APP" and 63% agreed that: "The metaphors used in the GES-APP interface were quite clear/straightforward." However, users were less sure about "I knew what to do next in the GES-APP" with only 38.2% agreeing. Overall, the mean rating of 3.55 for learnability further suggested that participants were generally positive about the learnability of the app.

4.3.2.3 Ease of use

Figure 8 shows that participants generally agreed that the app was easy to use with 69.7% agreeing that: "I could easily carry out the necessary actions in the GES-APP" and "I think that GES-APP is easy to use." and 67.6% agreeing that: "I felt I had enough control when using the GES-APP." However fewer (44.4%) agreed that "I felt very confident using the GES-APP" up to 67.6% agreeing that: "I felt I had enough control when using the GES-APP." The mean overall rating of 3.55 confirmed that generally ratings of ease of use was reasonably high.

4.3.2.4 User interaction features

Figure 9 shows that overall the participants were positive about the app interaction features with 69.7% agreeing that: "It was easy to decide about my choices (interaction) in the GES-APP." Participants were less positive about the feedback provided by the app with only

33.3% agreeing that: "I liked the feedback provided by the GES-APP about my choices." General satisfaction with user interaction features was confirmed by an overall mean of 3.43 for this subscale.

4.3.2.5 Usability

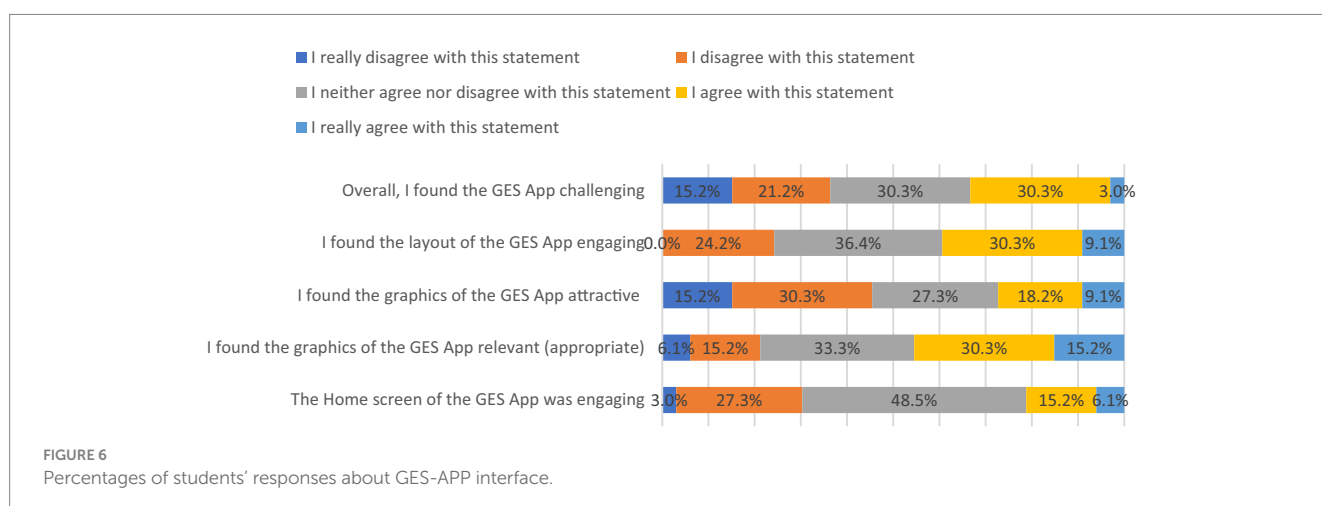
The fifth dimension related to students' feelings about the usability of the GES-APP. Figure 10 indicates that 57.6% agreed that: "As a student I think that GES App is an interesting app." Since the app was intended as an engaging means of learning about employability it was disappointing that only 36.3% agreed that: "I found the GES-APP enjoyable." However, users were reasonably happy that the app was not too complex with only 12.2% agreeing that: "I found GES-APP unnecessarily complex."

4.3.2.6 App content

Figure 11 indicates that the majority of the participants were reasonably positive about the app content. 75.8% of the students liked that the app "helps them connect their skills, projects, artifacts, experiences and references about employability," while 69.7% agreed that the app is: "suitable to be used in university courses about employability." Participants were less enthusiastic about the organization of the app content with only 23.2% agreeing that: "The organization of the GES-APP content was attractive to me."

4.3.2.7 Added value of the GES-APP

The last dimension of the evaluation scale included 11 items regarding students' perceptions of the added value of the GES-APP. Figure 12 shows that the participants were positive about all items on this sub-scale and this was confirmed by the overall mean value of 3.47. It was reassuring that 66.6% of participants agreed that: "I was reflecting on my experiences related to employability skills after using the GES-APP" and 66.7% agreed that: "I was able to rethink about my employability skills after using the GES-APP" as these items reflect the main project objectives, i. e. to develop an app that helped students become more reflective about their employability skills. Only 36.4% agreed that: "After using the GES-APP I felt more prepared for an interview to take a job" indicating that participants were less keen to endorse the capacity of the app to support them in interview skills. This illustrates that the items do distinguish between the facilities that the app aims to support.



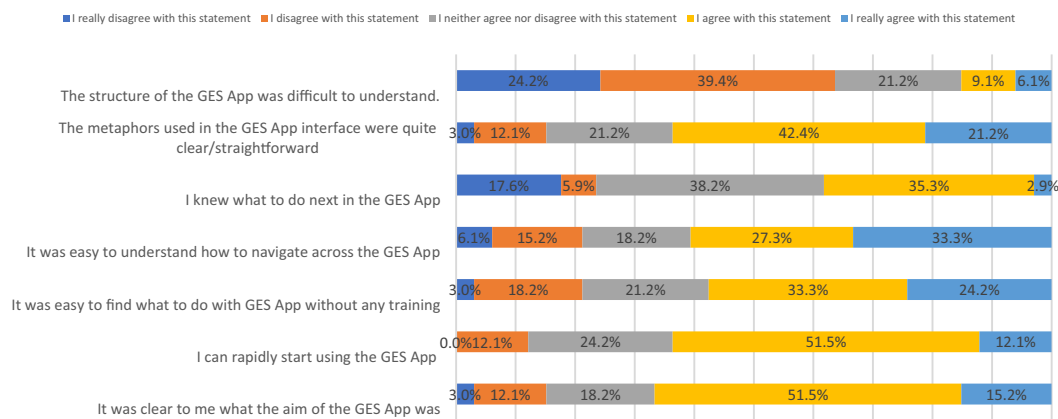


FIGURE 7
Percentages of students' responses about GES-APP learnability.

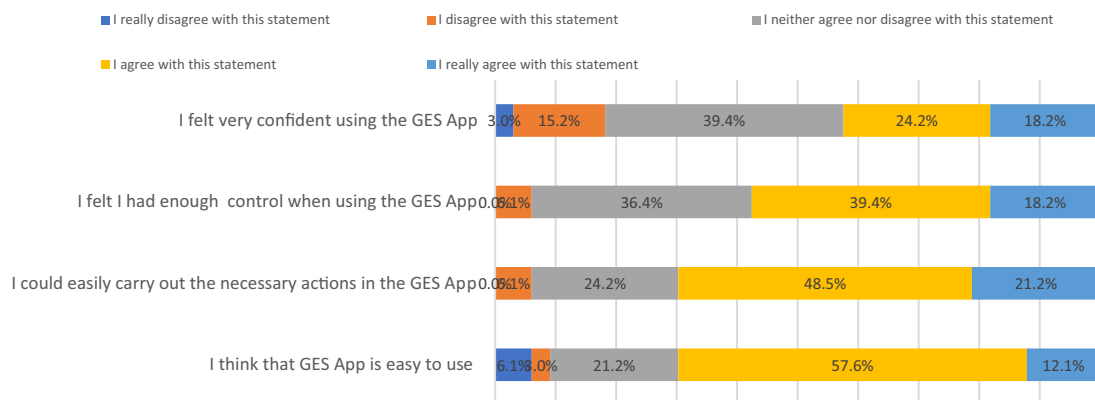


FIGURE 8
Percentages of students' responses about GES-APP ease of use.

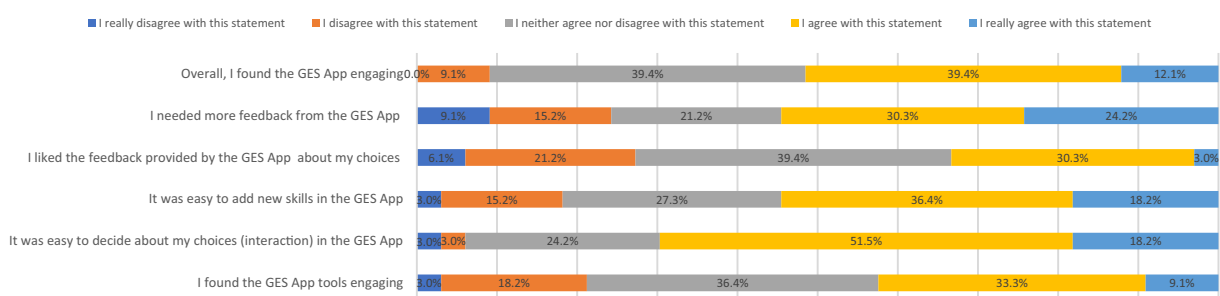


FIGURE 9
Percentages of students' responses about user interaction and feedback.

4.4 Qualitative results

4.4.1 Positive aspects of the app

A content analysis of the participants' written responses to the open questions was carried out. [Appendix A](#) shows what the respondents viewed as positive features of the app. Participants found

that the app was engaging and more engaging than other means of looking at employability. They liked the way the app helps them to collect, organize and reflect upon their employability skills, personal skills and achievements. The app also helped participants to get a deeper look into the labor market, and this motivated them to be more ambitious in their career goals. The app was viewed as useful for

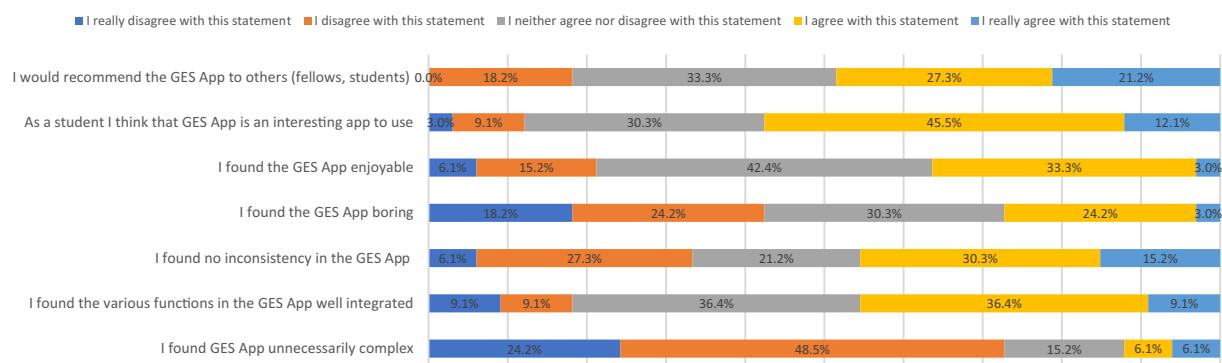


FIGURE 10
Percentages of students' responses about usability factors.

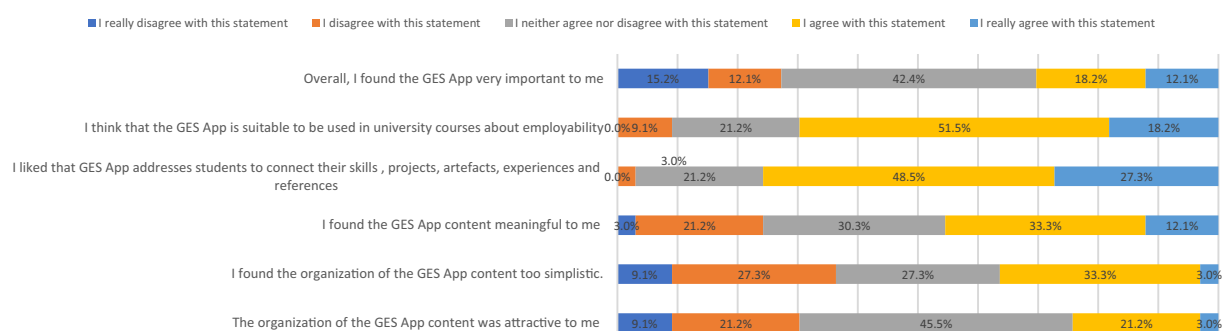


FIGURE 11
Percentages of students' responses about the GES-APP content.

connecting dream jobs to the skills required. It helped to increase users' knowledge of the skills required for specific jobs and their confidence that they may have more of these skills than they realized.

4.4.2 Suggestions for improvement

The phase 2 respondents also had many suggestions about how to improve the interface and graphics to make them more engaging and attractive (see [Appendix B](#)). They also felt that there should be enhanced feedback for the user. Skills could be categorized more clearly, and it should be clearer how people could acquire skills they do not yet have. There should be more guidance and instructions, and the role of the coach should be clearer. With respect to whether the mobile or desktop version should be developed, most respondents preferred the mobile version but there were also some who liked both.

4.5 Conclusion

The analysis of both quantitative and qualitative data in the stage 2 evaluation was consistent with the results of phase 1 in providing further encouraging results that the participants accepted the GES-APP as a useful and relevant method of

finding out about employability. The majority of the participants were generally positive about the app content and their experiences of using it as well as the ease of use, the usability, the learnability, the added value of the GES-APP.

However, user interaction features, app interface and layout received lower ratings and detailed suggestions for improvement, in line with the 1st phase of the evaluation. A number of the suggested changes were made and modifications and improvements provided the final version of the GES-APP for evaluation. The key priorities for development from phase 2 to phase 3 were as follows:

Improvement of the User Interface and graphics, aesthetics, styling of buttons: Some minor changes were made to the graphics, including the color scheme, and overall aesthetics to make certain activities look better and improve the functionality and fluidity of the app.

Connecting Dream Jobs to specific skills: The core functionality of the dream jobs activity was improved between Stage 2 and Stage 3. The implementation of registered skills was added to ensure when skills were added it was registered if listed in your dream job or vice-versa.

Coach: It was decided to keep in the role of the coach for these stages, while further thought was given to the purpose or further implementation of the coach.

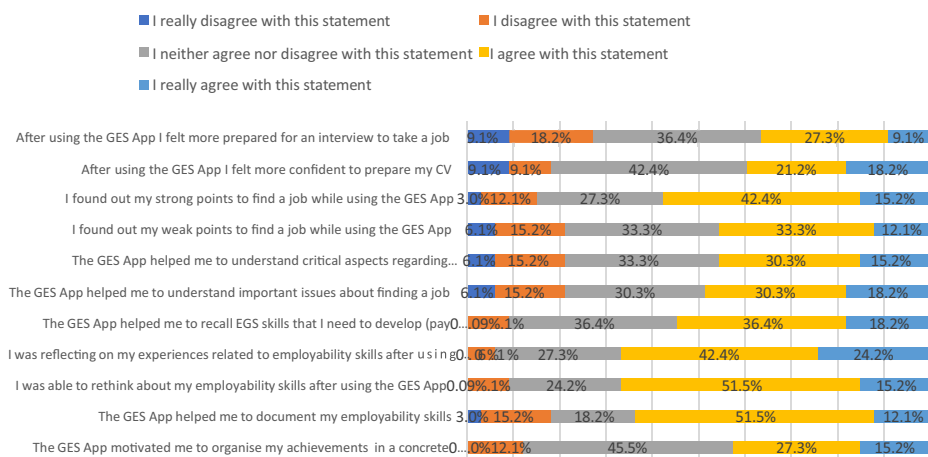


FIGURE 12

Outcomes - Added value of the GES-APP.

App Functionality: The general functionality of the app was improved, and further development of activities was carried out. The scrolling on the PC version was sluggish. This was tested on multiple devices and no problem from developer end.

Mobile vs Desktop: As the app is made purely for Android devices, no further action was taken on this due to the initial plans of it being a phone app and not a web-based app/ website.

4.6 The final app

The results of phases 1 and 2 were encouraging, highlighting the importance of potential users accepting the app as a suitable tool for carrying out the target activity. The key activities included in the final version of GES-APP (Figure 1) were the (1) skills self-evaluation, (2) the dream job and (3) practicing selected skills. The latter included links to a wide range of existing external resources relating to skill acquisition, such as videos, papers, blogs, free courses and self-assessment and mini games. Due to time pressure, activity 4: networking and ethics and activity 5: employment readiness did not make it to the final version of the GES-APP.

5 Phase 3: large scale evaluation of the final GES-APP version

Phase 3 involved a large-scale evaluation of the final version of the GES-APP. The learning outcomes for the app were to increase students' understanding of employability skills, their future careers and connections between these.

5.1 Design

This more rigorous evaluation involved a quasi-experimental study using a pre- and post-test design to assess students' attitudes to and perceptions of employability skills before and after using the app. An online questionnaire was developed concerning employability

skills and awareness. The students responded to the questionnaire before the instructional intervention with the GES-APP. Two weeks later, students who had completed the questionnaire at pre-test, were asked to respond again to the GES scale. Participation in the study was voluntary and informed consent was obtained. Ideally, we would have included a control group who did not have access to the app, but during discussions about the ethics of the study it was decided that it would be unfair to withhold the app from students who wished to develop their employability skills.

5.2 Participants

Overall, 213 completed questionnaires were received. A total of 133 students from the four partner institutions responded to the pre-test questionnaire before the instructional intervention and their engagement in using the GES-APP. Two weeks later, 80 of them also responded to the post-test questionnaire.

Thirty three of the participants were male, with 99 females and one preferring not to provide any gender information. Sixty-five undergraduates and 68 Masters students from the partners' institutions participated in phase one of the final evaluation. Fifty students came from the University of Peloponnese (UoP), 23 from the University of the West of Scotland (UWS), 56 students from the Cardinal Stefan Wyszyński University (UKSW) and 4 from the Norwegian University of Science and Technology (NTNU).

Students were from varied disciplines with 73 students studying a program in social sciences, 24 were studying psychology, 10 were studying computer science, 13 were humanities students, 3 educational sciences, 3 engineering, 4 business/management, 2 science and 1 was doing nursing. Thirty eight worked full-time, 53 worked part-time and 42 were unemployed.

5.3 Materials

An online questionnaire was developed. The first part of the questionnaire recorded demographic information, including

information about the students' perceptions of their competence in digital skills. The second part aimed to examine students' awareness of employability skills and the Labor market. The instrument was specifically developed for the project and was based upon the existing literature on graduate employability reported in project output O1 (Boyle et al., 2020). Partners' practical knowledge and research experience regarding online educational environments was also helpful to the development of the GES scale. The scale contained 52 items concerning students' perceptions and beliefs about employability, grouped into three sub-dimensions: University Studies and Employability, Understanding Employer Needs and the Labor Market, and Preparing for a Career (see Appendix C). The same questionnaire was administered before and after participants used the app to assess whether using the app led to changes along these dimensions.

University Studies and Employability: The first subscale of the GES scale included 14 items representing students' beliefs and perceptions regarding their university studies in terms of knowledge and skills that they would need to get a job in that area.

Understanding employer needs and the Labor Market: The second subscale of the GES scale included 14 items representing students' beliefs and perceptions that they know which skills are required to get a job and they know what employers are looking for and value in graduates.

Preparing for a career: The third subscale of the GES scale comprises 24 items representing students' beliefs and perceptions about how well prepared they are for getting a career, with respect to having a career plan and being able to document their skills.

All items were worded on a 5-point Likert scale, from 1 = I really disagree to 5 = I really agree.

The internal consistency of each of the 3 subscales was calculated, before and after the intervention with GES-APP and Table 3 presents the Cronbach's alpha coefficients. The results indicate that the internal reliability of the survey items is high indicating adequate reliability in measuring students' rating of their employability skills (DeVellis, 2003).

5.4 Results

5.4.1 Digital skills

The majority of participants reported that they have a very good level of digital skills, with 73.8% claiming to be expert, proficient or competent. In addition, 80.5% claimed to be at least competent users of social media with only 3% saying they were novices.

5.4.2 University studies and employability

Descriptive statistics for the "University Studies and Employability" subscale for all those who completed both the pre- and post-tests are shown in the Supplementary materials. A Shapiro-Wilk

test confirmed that the scores were normally distributed, and a repeated measures *t*-test showed no statistically significant difference in overall ratings of "University studies and employability" from before (3.8) to after (3.8) the intervention. Mann-Whitney *U* tests found no statistically significant differences for any item from pre- to post- test. The mean ratings of 3.8 confirm that the participants were confident that their course of study at university was helping them to gain skills, such as critical thinking, that they could use in future employment and that would improve their career prospects.

5.4.3 Understanding employer needs and the labor market

Overall participants who responded to the post-survey gave significantly higher ratings to their ability to understand employer needs and the labor market ($M = 3.7$), compared to the students in the pre-survey ($M = 3.5$), and a paired samples *t*-test showed that this difference was significant, [$t(211) = -2.426, p = 0.016$]. This provided a strong indication that using the GES-APP helped students to achieve a more in-depth view of the labor market and what employers are looking for.

Furthermore, consideration of each item showed that, after the intervention, respondents rated all items on this dimension higher than pre-intervention. Mann-Whitney *U* tests were carried out for each item and significantly higher scores were found on the post test for three items ($p < 0.05$):

- 1 I can identify what employers value most in graduates ($U = 4,457, z = -2.114$)
- 2 I can locate specific jobs of interest to me ($U = 4,417, z = -2.220$)
- 3 I know how to find important information about job market for graduates ($U = 4,287, z = 2.437$).

These results suggest that using the app helped users to get a better idea of what employers are looking for in graduates, find out more about the job market and understand the job market better, so that they can locate jobs of interest.

5.4.4 Preparing for a career

Participants were generally positive about most of the items on this subscale and overall participants who responded to the post-survey gave higher ratings to the Preparing for a career subscale ($M = 3.6$), compared to their responses in the pre-survey ($M = 3.4$). A repeated measures *t*-test showed a statistically significant increase in the overall subscale mean, [$t(211) = -2.744, p = 0.007$], confirming more positive ratings following the GES-APP intervention. This suggested that using the GES-APP helped students to prepare for a career by having a career plan and being able to document and articulate their employability skills and experiences.

TABLE 3 Reliability coefficients for the three used scales before and after the teaching intervention.

GES subscales	Pre-survey Cronbach's alpha	Subscale Mean	Post-survey Cronbach's alpha	Subscale Mean
University studies and employability	0.861	3.8	0.882	3.8
Understanding employer needs and the labor market	0.884	3.5	0.909	3.7
Preparing for a career	0.922	3.4	0.938	3.6

Consideration of each item showed that, after the intervention, respondents rated all items on this dimension higher than pre-intervention, providing a strong indication that using the GES-APP helped students to feel that they were better prepared for the labor market. Mann–Whitney U tests were carried out for each item and Table 3 shows the items where statistically significantly higher scores were found on the post-test compared to pre-test ($p < 0.05$) with regards to eight items as following:

- 4 I can project/articulate my employability skills ($U = 4,268$, $z = -2.592$).
- 5 I know how to document my employability skills to find a job ($U = 4050.5$, $z = -3.038$).
- 6 I know how to document my experiences to find a job ($U = 4,467$, $z = -2.054$).
- 7 I keep a record of my employability skills ($U = 4,014$, $z = -3.084$).
- 8 I keep a record of my personal development achievements ($U = 3896.5$, $z = -3.391$).
- 9 I know how to improve my CV to find a ‘good’ job ($U = 4,434$, $z = -2.108$).
- 10 I can give concrete examples of my achievements which would interest employers ($U = 4,378$, $z = -2.275$).
- 11 I am able to create a self-development plan for employability ($U = 4432.5$, $z = -2.133$).

Students were more prepared for a career in terms of career planning, documenting their achievements and experiences, being able to match their skills to jobs and providing concrete examples of their achievements that would interest employers. It is interesting to note the relatively lower ratings for items about recording employability skills, personal development plans, online career profiles and contacts with possible employers before the intervention. This suggests that students are not good at keeping records of their skills and that this is an area where the GES-APP can help them.

5.5 Discussion

Consistent with the evidence that students have good digital skills, the majority of participants in this study rated themselves as highly competent users of digital technology who would welcome a digital tool like the GES-APP in helping them make the transition from higher education into the world of work.

The analysis of subscale 1 suggested that, both before and after the intervention, participants were confident that their university course is helping them to develop the employability skills needed to get a good job. Using the GES-APP did not make a difference to these ratings. These findings seem to suggest that the focus on employability in HE in recent years is having a positive impact on the skills gap, as our students seem to have more confidence that their degree is providing them with the skills needed to get a job, compared with students from a few years ago (Tomlinson, 2008; Hurrell, 2016).

Students’ ratings on the “understanding employer needs and the labor market” and “preparing for a career” dimensions of the GES scale both improved significantly after using the GES-APP, though it should be noted there was no control group. This suggests that the real benefits of the app seem to be in helping students to be clearer about

what employers value most in graduates and being able to document and articulate their skills and experiences to present to employers in a self- development plan for employability.

5.6 Limitations and future directions

Results should be qualified by the fact that there was no control group. Given the improvements relating to career preparation and understanding employer need that were seen after using the app, some the features of the app which were not included in the final version, specifically the networking feature and ‘employment readiness’, may have enhanced the user experience further. Future research could investigate the value of including a networking feature in apps like this to link users with both potential employers and other stakeholders such as trainers and peers. By including these features the app would provide users with a more holistic training experience with potentially enhanced results. The inclusion of gamification elements may also enhance user experience and help them achieve an enhanced state of readiness. This may be well suited to specific outputs such as CVs and cover letters.

6 Summary and conclusion

The results of the final evaluation provide evidence that the GES-APP successfully supported students in meeting the learning outcomes for the app, i.e., to help students in thinking about employability and their future careers. These findings illustrate the value in using the iterative, 3-phase piloting and evaluation approach in designing and evaluating the GES-APP. The ADDIE model offered a flexible, iterative approach which led to continuous improvement in the different phases.

Different findings emerged at the different evaluation stages. The small-scale qualitative evaluation in Phase 1 confirmed that participants found GES-APP an innovative and acceptable means of learning about employability, and they liked and saw the value of the skills reporting activity. Participants also made suggestions about how to improve the app and many of these, including the dream job, were incorporated into the revised app which was tested in the larger-scale, phase 2 quantitative and qualitative evaluation. Once again, participants found the app an acceptable and useful means of finding out about employability skills, and liked that it helped them to think about their future career and employment. Phase 2 participants also identified further modifications to improve the content, acceptability and usability of the app and these were incorporated into the final GES-APP.

The more rigorous phase 3 evaluation of the final version of GES-APP showed that, even before they used the app, participants were confident that their university studies were helping them to acquire useful skills that would help them to be employable and get a good job. This was encouraging in suggesting that the employability skills agenda in HE is starting to have an impact in increasing awareness of the importance of employability skills.

The findings also showed that, after using the GES-APP, students’ ratings on the two key dimensions of the questionnaire: (a) understanding employer needs and the labor market and (b) preparing for a career, were significantly higher than before use. These findings confirm that the GES-APP supports students to record and document

their skills and experiences in a focused way that takes account of employers' needs and their future careers. Students have typically found the transition from higher education into the world of work challenging (Biggeri et al., 2001). Students perceive themselves as having high levels of digital competence, and the current study suggests that students would welcome a digital support of this kind in helping them to make this transition. The GES-APP should be regarded not as a substitute for, but as an additional tool for educating, counseling and supporting graduates about employability, although to be of most value to students, its use should be embedded into modules and programs.

Developing employability skills continues to be a major focus for Higher Education staff and students and for employers (Olo et al., 2022; Tandika and Ndijuye, 2022). It seems likely that digital solutions such as apps will play an increasingly important role in helping students to reflect upon their careers and employability and ease their transition into employment. This paper has offered insights into how the GES-APP was designed to do this.

Data availability statement

The data supporting the conclusions of this article will be made available A. Jimoyiannis.

Ethics statement

The studies involving humans were approved by e-Learning Research Group (e-LeReG), University of the Peloponnese. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

AJ: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. EB: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. GS: Writing – original draft, Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – review & editing. ET-S: Supervision, Validation, Visualization, Writing – review & editing, Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software. PT: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration,

Resources, Software, Supervision, Validation, Visualization, Writing – review & editing. AA: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing – original draft. GB: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – review & editing. MI: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – review & editing.

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fcomp.2025.1581143/full#supplementary-material>

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