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Executive Summary

This report presents the evaluation framework and the key findings revealed by the evaluation process of the GES-App. The findings emerged from the analysis of both qualitative and quantitative data collected by students and staff from the partners' institutions. A three-stage methodology was used in the piloting and evaluation of the GES-App and the support materials:

a) **Early piloting** of the initial prototype of the app with small numbers of end users to ensure the acceptability, usability, students' engagement and usefulness of the game. Twelve participants (2 staff members, one carrier advisor and 9 students from the partner institutions) took part in this early piloting.

b) **More rigorous piloting** carried out with 33 undergraduate and master students from the partner institutions who used the second version of the GES-App prototype.

c) A **large scale evaluation** of the final version of the GES-App was carried out, with 133 participants in the pre-test and 80 in the post-test, to explore students' perceptions about the effectiveness of the GES-App toward supporting them to track, rethink and reflect on their employability skills.

This iterative evaluation was adopted to ensure that, following the initial piloting, the GES-App was modified by taking account of staff and students' suggestions for improvements. Many of them were actually relevant and helpful, and they were incorporated into the amended version of the App tested in the next evaluation stages.

Phase 1: 12 participants from the University of the West of Scotland (UWS), the Norwegian University of Science and Technology (NTNU), the Cardinal Stefan Wyszyński University (UKSW) and the University of the Peloponnese (UoP) took part in the first stage of the piloting to ensure acceptability, usability, and usefulness of the GES-App. Participants were selected from both undergraduate and master students who were studying in the partners' institutions. In addition, two instructors, one of them was also leading the Student Carrier Office, and one career advisor participated in and provided their feedback about how to improve the GES-App.

Findings: Overall, the participants in the early piloting provided positive comments about the App, the key idea, content organization and its functionality. They considered that it was meaningful, important, original and motivating towards exploring many aspects of their employability skills and attitudes. The participants felt that the GES-App has a good level of game flow, usability and learnability and that the expected outcomes are important since the App could support students toward exploring and reflecting on their employability skills. They also provided many useful suggestions about how to improve the App at this stage, such as:

- improving the layout and the quality of graphics
- enhancing user's interactivity and feedback
- clarifying the role of the users' employability coach
- including a list with the fundamental/critical skill profile
- connecting job profiles with specific employability skills
- inserting an App helpdesk
- adding new functionalities; i.e., exporting users' portfolio, connection to LinkedIn
- offering two versions of the App (Web and mobile).

Many of the suggestions above were incorporated into the updated, 2nd version of the GES-App.

Phase 2: Participants in the 2nd phase of more rigorous piloting were 33 undergraduate and postgraduate students from the partners' institutions. 8 students were coming from the University of the West of Scotland (UWS), 14 students from the University of Peloponnese (UoP), 8 from the Cardinal Stefan Wyszyński University (UKSW) and 3 students from the Norwegian University of Science and Technology (NTNU).

Quantitative and qualitative data was collected via an online questionnaire asking students about their views and perceptions of the GES-App, its goal and content in relation to employability skills, the acceptability, learnability and usability of the App. Following the App was modified by taking account of users' suggested improvements and many of them were incorporated into the final version of the GES-App.

Findings: The analysis of both quantitative and qualitative data provided encouraging results, since the majority of the participants were generally positive towards the easiness to use, the learnability, the usability, the content and the added value of the GES-App, with mean values of responses ranging from 3.34 up to 3.65. On the other hand, user interaction features, app interface and layout received lower rates and detailed written suggestions for improvement, in line to the 1st phase of the evaluation.

Phase 3: Phase 3 involved a quantitative quasi-experimental design of the final version of the GES-App using pre- and post- questionnaires to record students' perceptions of the GES-App features and the effectiveness of the app in relation to their employability awareness and skills. A total of 133 students from the partners' institutions participated in.

Findings: The analysis of students' responses, before to after the intervention with GES-App, have shown the GES-App was effective toward supporting students to track, explore and reflect on their employability skills as well as to think about their preparation for the labour market. The findings showed statistically significant changes in students' responses, from before to after the intervention with the GES-App, in two key dimensions: a) understanding the labour market and b) preparing for the labour market.

1. Introduction

Over the past decades, considerable thinking and policy argumentation has been focused, internationally, on the knowledge, skills and abilities that young people should acquire in order to effectively participate in the workplace and 21st century society. In this globalized, highly competitive and rapidly changing environment, employability and career development have acquired increasing prominence in both national and international policy reports (European Commission, 2014; NACE, 2017; NOC, 2013; OECD, 2019). Despite that the impact of digital technologies on graduates' future employment opportunities is not yet clear or concrete, it is very likely that new jobs will be created which require new types of employability skills (GES).

Academics, educators, policy makers and employers agree that young people need to develop a wide range of higher order skills, which are necessary to find a 'good' job. Current view of employability development suggests the employability skills include but go beyond discipline skills, knowledge and practices. For example, solving unstructured problems, adopting multiple ways of thinking, working with new information-tasks and communicating ideas were steadily increased over the last years. Employability has become a central concept in the debate concerning the relationship between higher education and the workplace and the role of Higher Education (HE) institutions in relation to graduates' employment (Bennett, 2019; Hora, Benbow & Smolarek, 2018; Yorke & Knight, 2006). For example, in countries like USA, Canada, Australia and European Union as well, policy directions agree that HE institutions should observe their students' employability and provide to them enhanced opportunities to develop their employability skills (AQF, 2019; CTE, 2015; Florida Chamber Foundation, 2019).

On the other hand, employability development is not yet at the core of the higher education curriculums. Bennett (2020) argues that this is due to the fact that employability has been poorly defined as the acquisition of generic skills and it is thought to be developed separately from the core business of learning a discipline. In this vein, she suggests that "employability is enabled both for graduates and in the longer term by their ability to conceptualise future life and work through broader employability thinking". Therefore, higher education students should have the opportunity to be engaged in thinking and reflecting about their employability and their development of employability skills.

A wide range of initiatives, like typical training programs, online learning and development interventions, MOOCs, digital educational resources etc., have been reported (Bennett, Knight & Rowley, 2020; Du, 2020; Pordelan & Hosseinian 2022; Sampson & Osborne, 2015) with the aim to prepare, support and scaffold students

a) to make links between their studies-discipline knowledge and their future jobs

b) to collect, collate, reflect, and articulate evidence of their personal and professional development throughout their studies

c) to understand the labour market and rethink about their carrier paths.

In this perspective the GES-App is an original application that was designed and developed to assist higher education students in thinking and reflecting on their employability skills. In addition, to support them to be better prepared for their carrier-job journey by helping them to plan, record and project the acquisition and the development of graduate employability skills throughout their university studies. This report presents the three-stage evaluation framework used in this project and the key findings revealed along and overall development process of the GES-App.

2. The GES-App evaluation model

Learning design models are expected to help designers to achieve deeper understanding of the factors that determine any educational intervention as well as the relationships among them. A model provides a comprehensive framework for designing, developing and evaluating pedagogically sound and educationally effective e-learning programs and educational material (Mayes & De Freitas, 2004; Goodyear, 2004; Dimitriadis & Goodyear, 2013). Our literature review indicated that there are a lot of learning design models, however there is no generally accepted model for the design and the evaluation of e-learning tools and online educational applications. However, the existing frameworks provided clear and well-documented suggestions for analysing, designing and evaluating educational apps (for example, Arnab et al. 2015; de Freitas & Oliver, 2006; Mishra, 2002).

On the other hand, the practical goal is to construct new knowledge necessary for the improvement of specific learning procedures and materials. Lee & Jang (2014) identified three broad types of learning design models according to their sources of data: a) theory-driven models, b) practice-driven models, and c) hybrid models, which are constructed both theoretically and practically. In addition, those models clarify the key aspects regarding rigorous methodologies and the iterative processes to be used by developers, researchers and educators alike. More importantly, they can provide efficient approaches and clear descriptions to bridge the gap between App design, development and evaluation.

Hirsh-Pasek and associates (2015) suggested four pillars for the design of educational Apps within the context that provides a clear learning goal: they should promote active, engaged, meaningful, and socially interactive learning. It appears as a general agreement that clarity is required in terms of the desired learning outcomes of any educational application in both formal and non-formal education. In other words, what are the expected outcomes and achievements of a student when he/she is interacting with the GES-App.

App evaluation tools need to be created with the objective to measure the appropriateness of an educational app, in terms of the quality and relevance to the educational and developmental needs of the users. Lee & Kim (2015) suggested four conceptual areas, and the related factors/criteria, for evaluating educational apps; namely, teaching and learning, screen design, technology, and economy-ethics. Therefore, based on the existing literature, it was decided that the key components in the development and the evaluation of the GES-App would be:

- the content and its organization
- the expected outcomes, in terms of students' exploring, awareness and reflection on employability skills and attitudes,
- the learning approach and pedagogy (meaningful, active, and reflective learning)
- the App interface features and mechanics.

The GES-App is developed using the "Design Thinking" methodology (Abbas et al., 2022) which 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 & Siang, 2020).

With regards to the evaluation methodology, we used the ADDIE which is 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 & Jang, 2014). The model suggests a sequential order in the development phases of a specific learning tool or environment, from the analysis to the evaluation. However, in the developmental procedure of the GES-App, ADDIE was thought and applied

as a flexible, continuous process of improvements and iterations in the development and evaluation of the application (Figure 1).

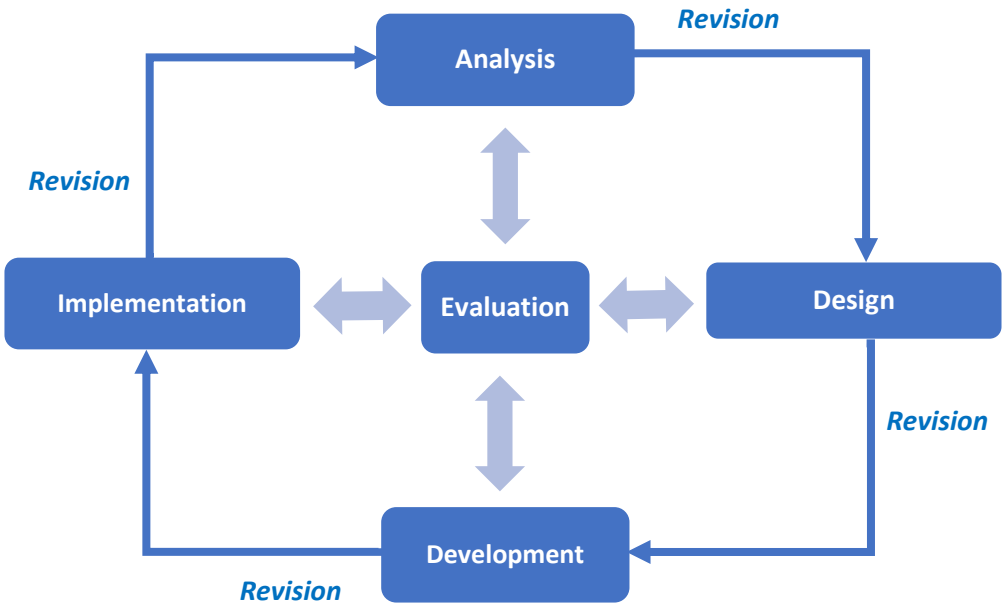

Figure 1. ADDIE model phases in the development-evaluation of the GES-App

3. The GES-App evaluation procedure

Responding to the need for a more rigorous and systematic evaluation of the application features as well as students' outcomes after using the GES-App, a consistent evaluation framework was developed and used in the pilots. This framework was dynamically evolving along three concrete but mutually related stages:

a) Early piloting of the initial prototype of the GES-App
b) More rigorous piloting of the early App prototypes
c) Large scale evaluation of the final version of the GES-App.

Figure 2 depicts the three level evaluation procedure of the GES-App, which was based on the analysis of the users' perceptions of the App. This approach was also in line with a wider notion that investigations of users' engagement in digital learning environments need to be triangulated (Cohen, Manion & Morrison, 2018) 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.

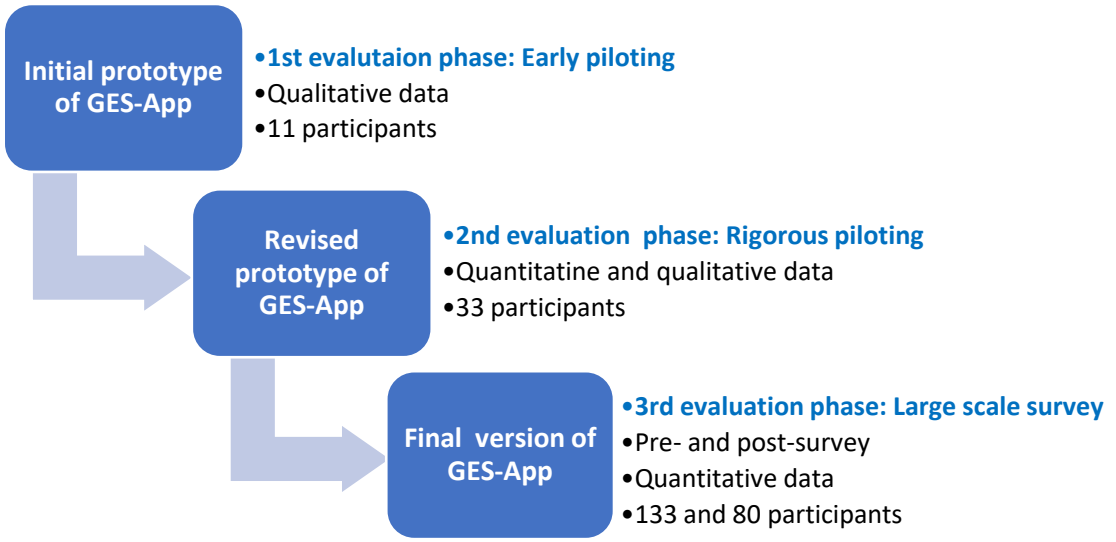

Figure 2. Three-level evaluation procedure of the GES-App

Therefore, to describe an overall evaluation process of the GES-App, user engagement, App interactivity features, content organization and users' learning outcomes need to be jointly analysed. 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 of 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 have developed a conceptual framework structured along five key dimensions of evaluation (Figure 3):

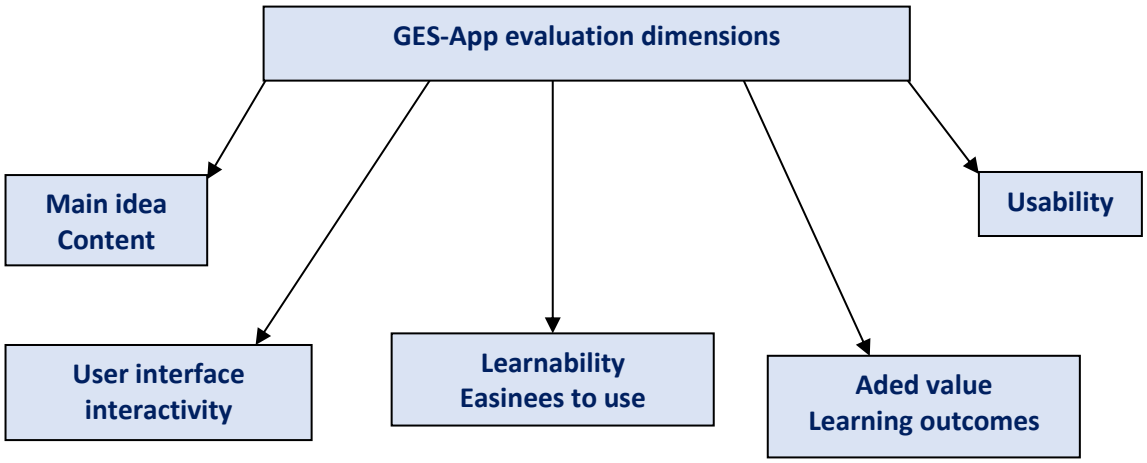

Figure 3. GES-App evaluation dimensions

Table 1. GES-App evaluation dimensions

Dimension	Factors
Learning Content	The key idea of GES-App The concept of employability Objectives of GES-App Content quality Structure of the information provided Learning design Student activities
User interface **Interactivity**	Design layout, graphics User interface Navigation and user control Interactivity Feedback and guidance App exploration and learning support
Learnability **Easiness to use**	First-time learnability, learnability over time Easy to understand the App Easy to use the App App control
Usability	Flow experience Motivation Engagement Concentration User experience
Added value **Students' outcomes**	Knowledge about employability Reflection on existing skills, attitudes and values about employability Rethinking about personal actions and goals

- Content of the GES-App: main idea, learning content and information flow
- GES-App user interface, interactivity, engagement
- GES-App learnability and
- GES-App usability
- Added value and learning outcomes of the GES-App.

Table 1 presents the key dimensions of the evaluation framework of the GES-App and the related factors explored in the piloting of the initial prototype as well as in the more rigorous evaluation of the first revisions of the prototype.

4. Early piloting of the initial prototype of the GES-App

The first evaluation phase has the form of formative evaluation. The aim of the early piloting was addressed by the following principal objectives:

- to provide detailed information about critical design and development factors of the GES-App
- to identify users' unanticipated problems and difficulties
- to provide information useful in improving the GES-App
- to lead to decisions about modification or revision of the GES-App functionality and students' activities.

4.1. Procedure and participants

A total of 12 students and staff members participated in the early phase of the GES-App evaluation procedure. They all were coming from the partner institutions; i.e., University of the West of Scotland, Norwegian University of Science and Technology, Cardinal Stefan Wyszyński University, and the University of Peloponnese). From the participants, two (2) were undergraduate students and seven (7) master students studying programs, like psychology, social sciences and humanities, engineering, science and computer science. Of the staff members, two were instructors (one of them was leading the Student Carrier Office), and the third was career advisor in her institution. Table 2 presents demographic information regarding the participants in the early piloting evaluation study.

Table 2. Demographic information of the participants in the early piloting evaluation

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

Data, regarding users' perceptions and suggestions of the GES-App, was collected through interviews with individuals (staff and students). Prior each interview process the researchers had early contacts with the respondents, explaining to them the aim of the project and the GES-App. This helped us to establish rapport, trust and the respect of the participants. Following, semi-structured interviews were carried out; each interview lasted approximately 35-40 minutes.

The semi-structured interview protocol is shown in Appendix A. In addition to the participant demographic information, four groups of questions were directed to the following dimensions:

- Section 1: Participant demographic information
- Section 2: GES-App features and design factors: User interface, graphics, design layout, usability, interactivity, learnability and other related features of the game

- Section 3: App Content and information flow: users' experience of interacting with the App, content quality, significance and organization, examples, and students' activities.
- Section 4: Outcomes of the GES-App: impact towards exploring issues related employability.
- Ideas and suggestions for the improvement of the GES-App.

The participants had the opportunity to use the App, to explore the content and discover features, to engage in activities, to think and reflect on the content and employability themes regarding critical aspects of dimensions of employability skills and personal achievements.

4.2. Qualitative data analysis

All interviews were recorded and transcribed for content analysis to identify emerging themes about the GES-App features. 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, 2015).

4.3. Results

At the early stage of the GES-App design and evaluation, the qualitative data analysis of students' and staff perceptions revealed critical information and factors regarding the GES-App design. The encouraging thing was that the majority of the students perceived positively many aspects of the GES-App. On the other hand, they considered that there was room for improvement and they provided concrete comments and suggestions.

The findings were organised along six main categories of factors, which were further analysed into sub-categories, as following:

- Main idea and content: content structure and organization, topics, activities
- User experience: engagement, motivation, received feedback
- Design features: App interface, usability, learnability, easiness to use
- Outcomes of the GES-App: Students' benefits, reflection and self-awareness about employability
- Pros and cons of the GES-App: interesting aspects, strongest and weakest parts of the GES-App
- Overall evaluation and suggestions for improvement of the GES-App.

4.3.1. GES-App main idea and content

The participants were positive about the idea behind the GES-App, the content therein and its organization. They liked many aspects of the App and they found the content and the topics interesting, meaningful, useful and personally relevant. They pointed out the originality and the significance of an App allowing students to insert and document their employability skills and experiences

Indicative quotes reflecting their views and statements are presented below:

M2-G: *"Yes, the skills included are really **important** and **make sense** to the students; this is actually of interest for the students.''*

M2-S: *"I think it's **really smart** to have something like this on an app, and to make something like streamlined and because I'm updating my CV right now and going through all this, I like how simple this was. And, yeah, it was **very meaningful** I thought"*

M3-P: *"The upside is that you can **enter information yourself exactly**, it's not that there is only a given key that you have to fit into. Same with **experience**. I also like the fact that you can add **references**, that is, you can simply give someone their first and last name, their email address to confirm that we are really good at what we do."*

M1-S: *''I can now understand that the whole focus is about bringing everything to an employer... I could see that the aim was to see where you are now and that would then also show you what you needed to do. So I can see that it doesn't just record, but it actually offers you the opportunity of actually building and see where your maybe your weaknesses are or will you need more strength or more confidence.''*

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. And that 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-G: *''The students can **insert** into the App and **document all their skills**, e.g. their participation in a musical performance, their **experience** of working in groups (e.g., in an academic course). They could use a reference from their professor at the university for that. Another example is working in a multi-cultural environment (e.g., an Erasmus project) and use the project coordinator as a reference to prove this experience.''*

M2-N: *"When I was adding experience, it makes me feel like **I have to do this** otherwise I cannot move forward."*

Creative comments and suggestions for helping students to insert their skills in a way useful to them were also provided:

M1-G: *''I am experienced in HR evaluation; this is one of my duties in the organization I am working; on the basis of skills, projects, experiences, references and artefacts the app is very good. But I am wondering if any user will be able to enter his skills correctly? ... 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.''*

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 don't have."*
M1-P: *"When it comes to artefacts, the function of **adding files from the phone** would also be useful, because there is only the possibility of linking."*

4.3.2. User experience

In general, the majority of the participants were positive about the **experience of using the GES-App**. They think that the App is based on an interesting and innovative idea, and using it was challenging towards exploring and better understanding issues about employability skills. Following are presented indicative quotes of the participant views and perceptions:

M1-G: *''The application is actually interesting. It motivates the user to engage with."*

M3-G: *"This app is innovative to some extent... Overall, my experience of using the application is positive.''*

M2-N: *"Every time I do something, the App saves it and let me know that it is saved or move towards the next steps. So it was fine."*

M2-S: *''I thought it was fairly straightforward to use. It was simple. It gave you really just kind of three main boxes to fill in and to record whatever it was you were recording up. And it would save it for you.''*
M2-N: *''Uploading documents/artefacts 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.''*

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

M1-S: *"It has gone down the 'very serious' employability route…I don't know if I am conveying that right… it's just like very serious and it wants this serious stuff here… and I can understand. The rest is just work. Well, how would I record this? And obviously, what references would I put in? So for me, it probably feels like, oh, that's an awful lot of work."*

M1-P: *"It strengthens a bit, because 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, when you enter your profile you will see all your skills and where they were used, so this is so motivating. Well, the application will not do it itself, it will only push us to do it."*

In addition, participants provided their criticism and **suggestions for improvement** with regards to the feedback to the user provided by the App:

M1-G: *"I would probably need some kind of feedback; for example, to provide a message if any documentation is missing/or necessary in relation to a skill reported.''*

M1-N: *"I didn't find any feedback in the app, but it would be nice to have it"*

M3-N: *"Have things explained better and make the app to suggest paths of action for the students."*

M2-P: *"I think the application could be more interactive. I missed feedback from the application regarding the entered content. 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."*

4.3.3. App interface

The participants were positive about the game interface and the transitions between the game tools. For example

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

M3-P: *"I think it is quite simple, intuitive how to add your skills or experience. Simple graphics, but nice, I would say minimalist and very clear (understandable)."*

M1-G: *"I didn't focused myself on the aesthetics of the interface, but I found graphics and app controls clear and distinct... The graphics were satisfactory, the interface is clear and straightforward''*

M2-N: *"Words used for buttons and functionalities are quite clear expect the "artefact", I was not sure what that meant then I clicked on it. Next screen showed me couple of options, so I got an idea what "artefact" means.*

M1-N: *''Buttons and interface were quite clear. Even if you don't watch videos, it is very easy to understand. But interface was not intuitive."*

On the other hand, user interface was not thought as motivating by other participants:

M2-N: *"When I started, 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: *"I found the interface simple and orderly. Easy to understand what the app is about. However, the graphics are boring. I think it should be more attractive and encouraging."*

M2-G: *''As a weak part of the app I consider the aesthetics and the graphical part of the interface. The application is very simple and students may not like this. I think that this flaw will be corrected along the way.''*

M3-N: *"App interface is a bit confusing. Was not too easy to figure out what the app was trying to do. It kind of feels like a thinly veiled frontend for a database and does not do a good job of telling the user how the interface work or what the functions are. The concept is interesting, but the app is lacking too much in design to make the user become invested in it."*

In addition, many participants were not satisfied of the graphics used in GES-App. They also provided detailed comments and suggestions for modifications and improvement of app interface, the screen layout and the graphics:

CA-S*: "Graphics, probably the use of colours, across the app. And, yeah, perhaps, in comparison to other commercial apps. Students may find it less attractive to them… probably because of the early stage not very attractive in comparison to other apps."*

M1-S: *"I don't know how appealing it would be to younger people who are used to like higher graphics and, you know, just what that's actually being given and all the apps that they download. So I don't know if it would rank in comparison."*

Important comments and suggestions regarding the App **user's profile** were also provided:

M1-N: *"It will be nice to change colours and add profile picture."*
M2-N: *"Only thing where I didn't feel control of was, when I was changing the avatar in the profile and couldn't change it with female one."*

4.3.4. Learnability

The majority of the participants found the App easy to understand its functionality and to use it. The following quotes are indicative and they reflect the views and the perceptions of the majority of the participants in the early piloting phase:

M2-G: *'The app was very simple and easy to use.''*
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.''*

M1-N: *"The app is not much complicated, simple, we can see what we have."*

M1-G: *"From the begging it was clear to me what action has to be done: adding new skills, and experiences self-assessing skills using a 5 level grading etc.''*

M3-P: *"I didn't 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."*

M2-S: *"The only time I got overloaded with that was when I you know have a technical issue and I got frustrated, but this is the early stage of the app that's obviously expected. And so no but once the things that were working. No, it made a lot of sense, it was smooth."*

However, one student reported difficulties in understanding the functionality of the GES-App:

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

In addition, the participants provided suggestions for clarifying the role of the coach, providing more information about the functionality of the app and improving the feedback to the users:

M1-G: *''I think that the app must provide more information to the user, it has to be clear in where this is going, what is the main goal. I don't know how that could happen, maybe in an introduction screen or in an Info button about the app; there should be some information about the app objectives and its functionality".*

M3-N: *It was not very clear about what you are supposed to do. It 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."*

M1-G: *''I would like to understand what does the coach means, what is his role in the app. I was missing some kind of key-information, i.e. some characteristics that I would like to know."*

4.3.5. Usability and interactivity

The majority of the participants were satisfied of the app usability, in terms of understanding its flow, the using instructions provided and the user control. Following are presented some indicative quotes from the staff interviews:

M1-S: *"It was quite simple to use. It was quite easy to make your way through the different sections."*

M2-S: *"It was very quick to just move on to the next thing, and as I see that was quite straightforward."*

M3-G: *"The app seemed to me simple and easy to use. App buttons and controls are usable and in the right position on the screen; User actions were clear after watching the videos. There were examples in the videos, e.g. in problem solving, which helped me a lot.''*

M1-G: *''I would give a score of 8-9 out of 10... The app seems easy to use and clear. I didn't 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-N: *"I will rate it 8/10. It was easy and understandable, even when I used it for first time. The goal of the app is to add the skill or experience as soon as you get it, so you don't need to remember anything except the date. For the first time, when you have to create your whole profile, it required much time but after that it is not frustrating as you will continuously update it."*

M2-S: *"I can give it 9/10, each step was quite straight forward."*

M1-P: *"It was just right. Maybe if I wanted to have everything documented, then I would have to look for some, I don't know, certificates to have it on hand. But I was up to date and I managed to write everything from my head. Rather, it was nice and enjoyable."*

On the other hand, criticism and comments related to the App functionality and protection of personal data were also provided by some students:

M2-N: *"User engagement is dependent on the features of this app. 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."*

M2-P: *"I think the application could be more interactive. I missed feedback from the application regarding the entered content. 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: *"Not really. I struggled to see what the feedback would be. If it is the thing that the system is supposed to show when something has been added, then it is a "no" as the system showed the wrong number for a time."*

4.3.6. Self-reflection

The majority of the participants provided positive comments regarding students' engagement and reflection about their employability skills. Indicative quotes reflecting their views regarding this aspect of the App are presented below:

M2-S: *"So I can see that it doesn't just record, but it actually offers you the opportunity of actually building and see where your weaknesses are or will you need more strength or more confidence."*

M1-G: *''The user is expected to actively get involved within the app. For sure, it takes enough time and effort to import personal data into the application. It is not about occasional or sporadic use and update with information. The user needs* ***to ask himself*** *about what kind of skills he possess, to reflect on them and* ***to think about*** *how he could provide documentation/proofs of the skills he is claiming. He also has to link those skills with specific experiences, projects and/or artefacts etc.''*

M3-G: *''I am already motivated to identify, capture and document my skills. I think that's what LinkedIn does very well… By updating your profile on regular basis, on an app like this, you send the message that you are interested about* ***self-improvement****. Using the app I also went through this process of wanting to improve my skills in order to search for a job.''*

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. When I conduct interviews I am not interested in what the candidate has written on their CV about their skills. What I am interested in is whether his or her answers reflect the skills they say that possess."*

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-P: *"Some skills that I gained quite a long time ago ... when I entered this application, I had to consider whether I can still say that it is my skill, is it up-to-date and how much I remember about it. Typing this makes you wonder if something is really my skill. I think it works very well."*

M1-P: *"There is reflection on what else can be done to strengthen or develop them. Just like there are some skills or knowledge that I acquired a long time ago, that have either become obsolete or just dropped out of my mind. For example, do you not refresh it, or do something to rebuild it. Such a good summary of the experiences so far."*

M2-P*: "The fact that you have to collect experiences and projects in one place and match them to skills is already developing. Judging your skills with stars gives you the opportunity to reflect on them."*

M2-G: *''Yes definitely the application can help university students to rethink the way of developing and cultivating their skills during their studies... It is quite clear that the use of the app will **change students' attitude**s; for example their views/skills about volunteering or lifelong learning.''*

M1-N: *''It can help you to access your skill that you learn every day. From skills' rating you can see what improvement you have made.''*

M1-G: *"Student's reflection is also very important. In this way, the student is getting in a process of thinking about and documenting what he has uploaded on the app."*

M3-S: *So, I find the app attractive and useful for two reasons. The first is that 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. The second reason is that it helps the student get into the **process of documenting** some skills. I am working on this topic in my academic courses; students are wondering how they could document and project their skills.''*

4.3.7. Outcomes of the GES-App

The participants reported that their views of the expected learning outcomes of the GES-App concern mainly a) student preparation for the labour market, b) rethinking about personal skills and attitudes about employability, and c) reflection and self-awareness about their employability skills. The following quotes are particularly characteristic and they reflecting the participants' views and perceptions:

M2-G: *''Using the app, the student tries to **identify and document the skills** that he/she is not possessing and he/she needs to cultivate. In addition, he/she is looking for ways to enhance his/her skills and improve them.''*

M3-S: *''I think is a good way of having a log book or something like that, like, having in one place. A clear place, recorded your experiences and your skills that later on, you could be using in a more organic way for other purposes, perhaps, but it's a good way of registering them. So it's like a journal of the things that you've done.''*

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."*

M1-P: *"It (the app) strengthens you a bit; because 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."*

M2-N: *"Using this application, I think, it improved my proficiency about skills."*

M1-S: *"I can understand it's about I suppose if you're looking for a career you want to keep everything in the one place that you can literally just open up and there is everything that you would want to show to an employer."*

M1-G: *"My opinion is that the main outcome of the App is that it could help students in terms of self-awareness about their employability skills. I am not sure if every user will return back to the app to update data and information, to add new elements or to enrich documentations… it doesn't make sense for someone to rate himself excellent in all skills, it has nothing to gain with that… Finally, the student is directed to think about the process of improving his/her skills.''*

M2-N: *''Rating my skills make me evaluate myself if I'm proficient or a beginner. In LinkedIn you can only see the skill not scale that how good you are, so it's a nice feature of this app.''*

M1-N: *"When you are having interviews, most of the time they ask about your skills/how you can describe yourself. Using this app regularly can make you think about your personality and your skills so it will be easy to respond."*

On the other hand, a carrier advisor appeared cautious about the impact and the effectiveness of apps like this to students'' awareness about employability:

M3-S: *"I don't think that effective self-awareness and reflection about one skills can be done in that way through, 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."*

4.3.8. Overall evaluation and suggestions

The participants considered as strong parts of the GES-App its main idea, the abilities offered to the students to understand, clarify and document their employability skills as well as well as to prepare themselves for a job interview. The following quotes from the interviews summarize the strong points of the GES-App:

M2-G: *"The **whole idea** and the goal of the application is interesting, it can be a portfolio of skills... the strong aspect of the application is the **connection between skills, references and artefacts**.''*

M3-G: *''The emergence of skills and experiences as opposed to knowledge... **Capturing and documenting skills** is the strongest part of the app and the most important to someone looking for a job.''*

M1-N: *"Skills and experiences are the strongest part of the application."*

M3-N: *"The strongest part is the introduction and the intent behind the app."*

M1-S: "*I think its simplicity is the strongest part. I don't know if it'll be viewed that way by younger people."*

M2-P: *"The application is such a stimulus to act and change. In order to benefit from it, the student must reflect on his skills."*

M3-P: *"The strongest part is that I can enter all the skills, match the experience I had to use and evaluate them. So you can organize your skills and combine them with experience. I believe this is the strongest part."*

M1-G: *"The role of the coach in the app ... In addition, I found very interesting and effective the idea of directing the student to project, document and link every skill to experiences, references and artefacts."*

M2-N: *"Rating the skills make me self-reflect and evaluate myself if I'm proficient or a beginner. In LinkedIn you can only see the skill not scale that how good you are, so I think it is the strongest part of this app."*

M2-S: *"I like that it has the option to add projects you've done, because I think that's something really smart, that people often don't include in their CVs, if they've spearheaded you know a conference at their work or if they implemented a new whatever schedule or something that made their workplace better."*

On the other hand, the graphics of the application, the user interface and the app feedback to the user were pointed out as the parts of the GES-App that need further improvement:

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.''*

M3-G: *''Students' support needs enhancement. Add a helpdesk providing concrete examples to the user/student who can ask if something is not clear or what he can do with the app.''*

In addition to the graphical interface, **skill recognition** and **connecting job profiles with specific skills** was another issue for improvement. Including a list with fundamental/critical skills as well as brief description of those skills was suggested by many participants in the sample:

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."*

M1-G: *"It will be useful to provide a list with popular/important skills as well as some kind of help/hints to the user on how to connect those skills to projects and experiences, in an open way."*

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're at, that's quite difficult for them and the app doesn't 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."*

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. Using this list, the users of the app will not be trapped into a continuous process of exploring skills etc. I think this is a real barrier for the students, i.e. to understand how to connect specific skills with specific jobs."*

M2-P: *"Such a list of skills could be combined with some **educational materials** available for students in the application, e.g. articles, videos. Something that would suggest or help how to develop a given skill."*

M2-G: *"Toward achieving an educational outcome, the app should contain **help and guidance** to the user. Some kind of definition and justification of the importance of basic skills, are helpful to the student to be forced for further search for details …For example, how certain skills are requested in specific areas of jobs.''*

Moreover, participants noted the need of the user to edit and change his skills' record, to easily add new information about skills and experiences, and to share his profile with others:

M1-N: *"When you try to add new experiences, there are many fields and they are all mandatory. Sometimes you don't feel the necessity to fill all the fields, so it was quite frustrating that the app does not let you move forward."*

M1-P: *"I had no ability to edit and delete projects and experiences... And also to expand on the details of the experience already entered."*

M3-S: *"Improvement in guidance; e.g., a list of the skills that they think they have, with some levels that they think they are at, and some experiences, but then how are they connecting everything and with what purpose."*

M2-N: *"It will be a great benefit if user can share profile, or recruiters can see our profiles."*

M3-S: *"It is also very useful to have text box in which you could include why, what is your evidence for that. … We need to give them some space in order for them to reflect and to take a note of what is the evidence, why they think they have that level and that skill.*

M3-G: *''I would suggest translation of the app in users' language, so it will be more familiar and easy to use for everyone.''*

Exporting users' portfolio and connection 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.''*

Finally, a couple of participants noticed specific **programming bugs and technical issues** to be solved in some cases. For example:

M3-N*: "Usability is quite low. It is clear that there are faults with the first version of the 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."*

M3-N*: "Suddenly, after poking around in the app while doing the interview, the number of projects, references, and experiences are correct. I suspect it might be an async error somewhere."*

M1-S: *"There was obviously a couple of technical things which were more to do when you're typing. It didn't allow you to put spaces, even though I was setting the space bar. And I had some capitals and obviously you couldn't delete a file once you had created one. I also noticed that you couldn't paste in a URL so that that would be another one."*

Table 3 summarizes the key findings and the factors revealed by the early piloting according to the participants' views and perceptions; i.e., the strong aspects and the weak points of the GES-App.

In addition, the early users indicated some areas for future improvement of the App and they also provided specific suggestions to this direction.

Table 3. Key findings of the early piloting

Key points	Factors

Strong points	• The key idea, clear objectives of the app
	• Rich content well-organized
	• Meaningful way of connecting skills, experiences, projects, references and artefacts
	• The levels of skills proficiency
	• Good level of usability
	• Easy to understand and how to use the app (learnability)
	• Promotes students' active engagement but needs significant effort from their part
	• The anticipated learning outcomes in terms of
	  ○ understanding and clarifying employability skills
	  ○ exploring and reflecting on skills and values about employability
	  ○ documentation of skills
	  ○ students' preparation for job interviews-labour 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 a helpdesk in the App
	  ○ Provide examples of skills description, documentation
	  ○ Provide examples of developing personal portfolios
	• Improve the app aesthetics of 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
	• Add new functions; i.e., exporting users' portfolio, connection to LinkedIn
	• Two versions of the App; i.e., Web and mobile
	• Translation of the App in national languages

4.4. Critical suggestions and conclusions for improvement

Following this initial piloting, the GES-App was modified to take account of users' suggested improvements and these were incorporated into the App. Further development of the App was guided by these results. Less successful actions were excluded and more popular suggestions were refined and developed in an iterative process to establish the second version of the App.

Stage 1 evaluation concentrated on the development of activity 1. Stage 2 concentrated on the development of activity 1 and activity 2. Between stages of the development, the app progressively improved concentrating on integration of front-end services, core fundamentals and allowing users to evidence and document their skills and chosen dream jobs. Any further developments taken involved

feedback from Stage 1 evaluation leading into Stage 2 evaluation. The vast changes concentrated on involved mainly functionality and aesthetics, including resolutions and different viewing media issues. Key findings from participants offered areas of improvement at the initial stage 1 evaluation. Below is the prioritization of changes that were made. Others were held off until further stages of both evaluation and development. The core factors considered were:

- Improvement of the app aesthetics of the graphical interface and layout.
    - Graphics and user interface were solely simple to begin and developed more into Stage 2.
    - These were developed through a monochromatic color scheme for the first initial stages of evaluation.
    - The layout was expanded upon and made more user friendly to more viewing media devices.
    - The layout was improved in places to allow viewing of text, graphics, and additional needs.
- Adding new functions
    - Further functionality was added, fixing previous functionality, and evolving from current activity development and adding new activities and features.
- Creating two versions of the app
    - The app was provided in later stages as a APK Android file or as a Web based WebGL version from Unity.
- The role of the coach
    - The coach was kept the same between Stage 1 and Stage 2 evaluation. It was considered not relevant to concentrate on until further development of activities had occurred.
- Implementation of Google Firebase
    - At this stage of evaluation this was concentrated on due to the nature of wanting the app to reach the final user.
    - Authentication & Real-time Database were implemented to ensure continual data flow in the long run of the development.

5. Phase 2: More rigorous piloting of the early prototypes

5.1. Procedure

The second evaluation phase was focused on a more rigorous piloting of the early revisions of the GES-App prototype. Quantitative and qualitative data regarding both, undergraduate and postgraduate, students' perceptions of the App were collected using an online questionnaire that developed for the specific needs of evaluating the GES-App.

Further development of the GES-App was guided by the most critical users' comments and suggestions. This was the final stage of modifications and improvements that provided the final version of the GES-App for evaluation.

5.2. Participants

A total of 33 undergraduate and postgraduate students from the partners' institutions participated in the second evaluation phase. As shown in Figure 4, 14 students were coming 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).

Demographic information was also recorded. Among participants, 20 were attending undergraduate programs in social sciences, 7 were studying computer science, and 4 students humanities. Their age was ranging as following: 21 students were 20-25 years old, 5 students were between 26-30 years, and 7 students above 36 years old. According to their gender, 14 participants were male and 19 female. Figure 5 presents the classification of the participant students with regards to their studies and their job experience.

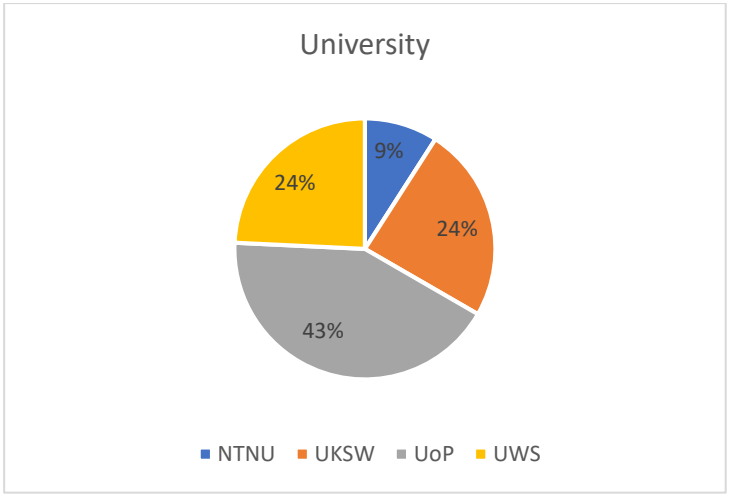

Figure 4. Participants and their institution

Figure 5. a) Participants' level of studies and b) job experience

As shown on Figure 6a, the majority of the students reported that they have a very good level of digital skills. In addition, they were competent users of social media (Facebook, Instagram). On the other hand, LinkedIn appeared to be new platform for the majority of the participants (Figure 6b).

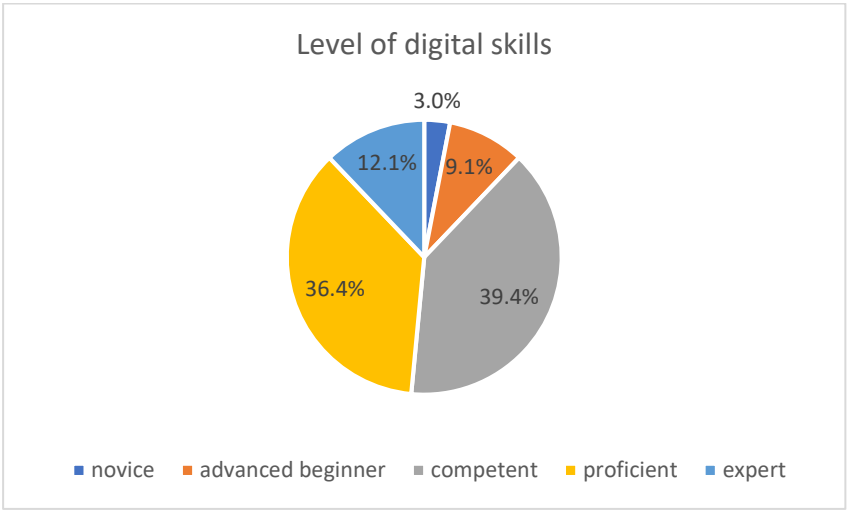

Figure 6a. Students' level of digital skills

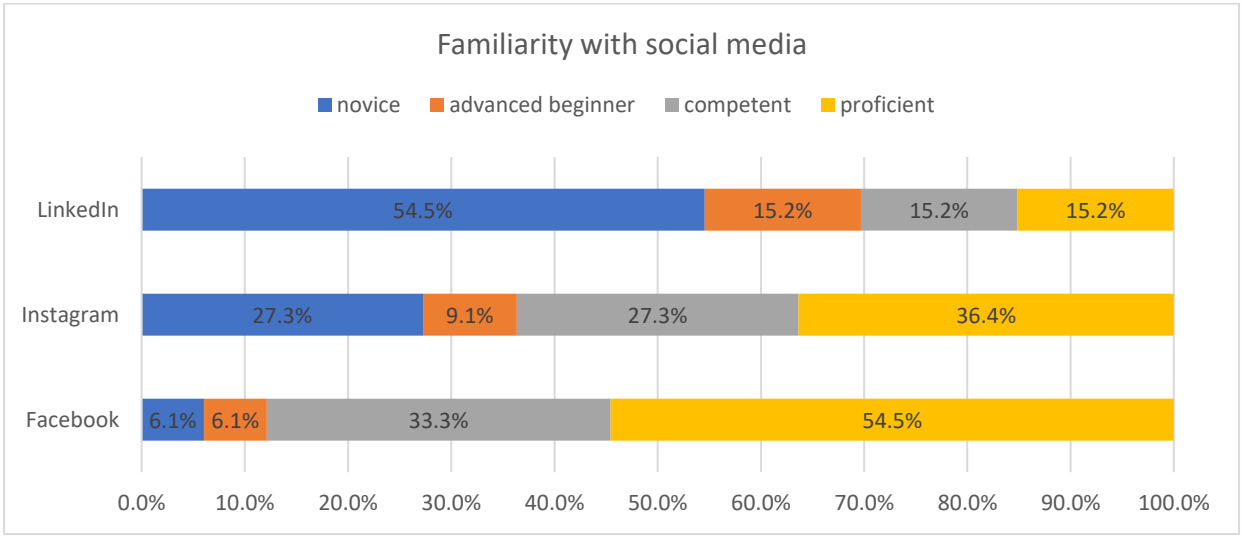

Figure 6b. Students' familiarity with social media

5.3. The questionnaire

The instrument was an online anonymous questionnaire specifically developed for the second stage of the GES-App evaluation. The questionnaire was a specific App usability scale (Appendix B), based upon the existing literature as well as our research experience regarding digital educational environments and Apps.

The first part of the questionnaire contained 35 questions close-ended questions presenting statements of perceptions and beliefs towards GES-App features. The scale items were worded in the form of statements asking students' perceptions of the various usability factors of the GES-App. The items were worded in 5-point Likert scale (1 = I really disagree, 5 = I really agree). They were directed towards factors within seven sub-dimensions:

- App interface and layout
- Learnability
- Easiness to use
- User interaction and feedback
- Usability
- GES-App content and flow
- Outcomes and added value of the GES-App

In addition, five open-ended questions had the objective to identify students' perceptions and preferences with regards to a) the added value of the GES-App towards their 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.

5.4. Results

5.4.1. App interface and layout

The first dimension of the evaluation scale revealed students' beliefs and perceptions with regards to the interface and the design layout of the initial prototype of the GES-App.. In general, the participants were divided between positive, neutral and negative perceptions in the various items (Figure 7).

Table 4 shows the mean values of the students' responses across the scale items. The recorded mean values concerning the items in this subscale were ranging from 2.76 up to 3.33. They perceived the GES-App relevant and engaging but, on the other hand, they were not satisfied of the graphical interface.

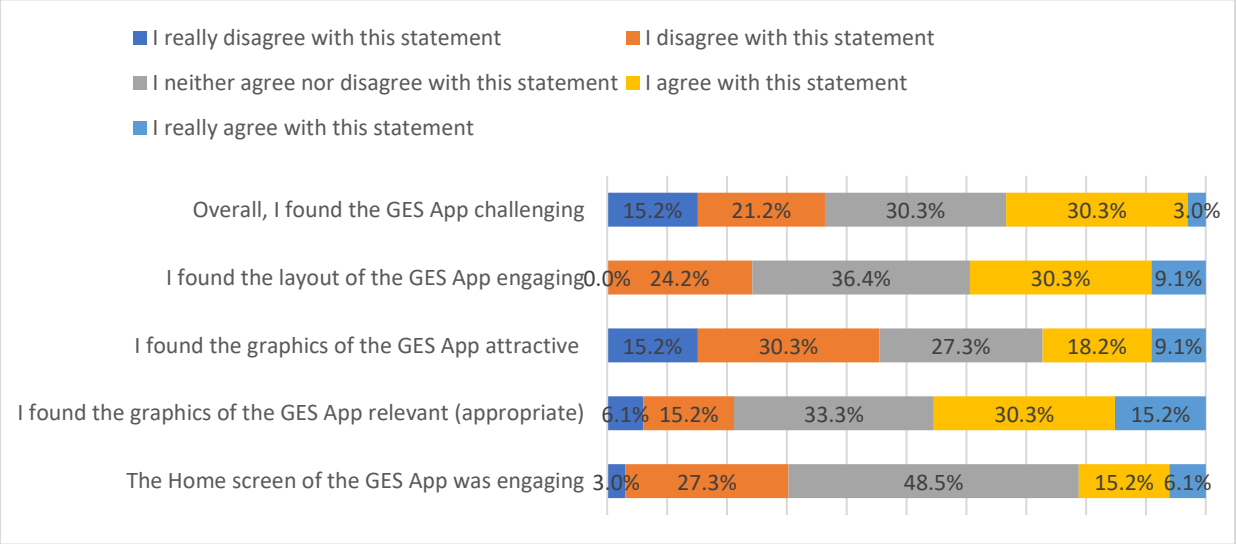

Figure 7. Percentages of students' responses about GES-App interface

Table 4. Students' perceptions of the GES-App interface

Items	Mean	SD
The Home screen of the GES-App was engaging	2.94	0.90
I found the graphics of the GES-App relevant (appropriate)	3.33	1.11
I found the graphics of the GES-App attractive	2.76	1.20
I found the layout of the GES-App engaging	3.24	0.94
Overall, I found the GES-App challenging	2.85	1.12
Overall mean	3.02	

5.4.2. Learnability

The second dimension of the scale includes seven items that represent various factors related to the learnability of the GES-App, i.e. the level of ease through which a student learns how to use and navigate through the application. The overall mean value of students' responses was 3.55. The results indicate that the majority of the participants were particularly positive about all factors in this dimension (Table 5 and Figure 8). The participants appeared neutral only about their next step within the App. This is expected to some extent due to functionality limitations of the initial prototype.

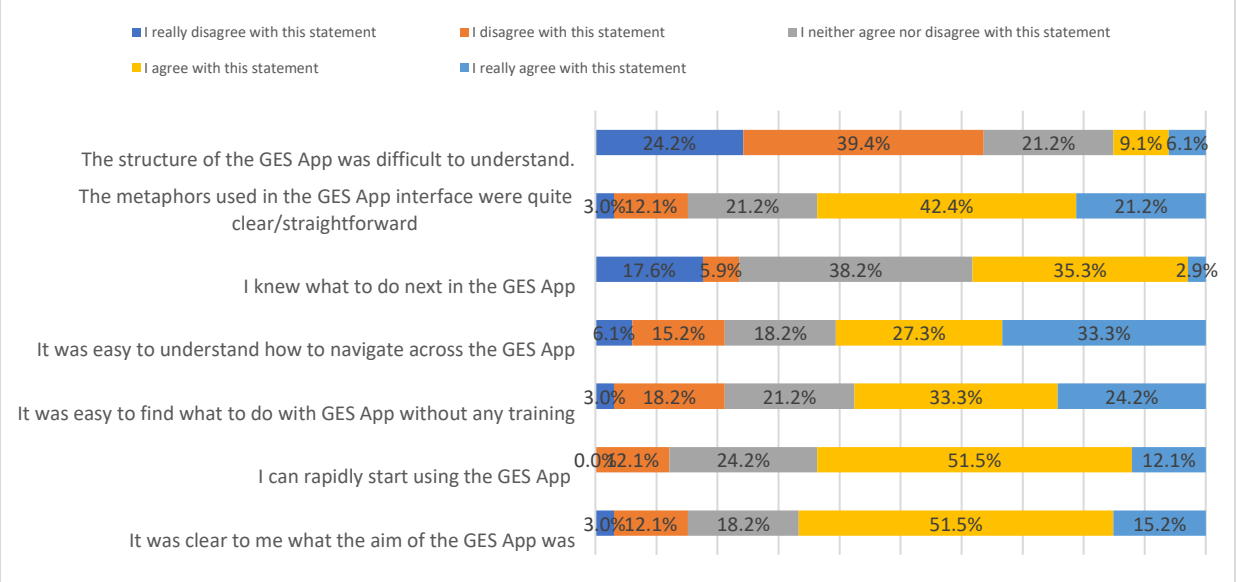

Figure 8. Percentages of students' responses about GES-App learnability

Table 5. Students' perceptions about the GES-App learnability

Items	Mean	SD
It was clear to me what the aim of the GES-App was	3.64	0.99
I can rapidly start using the GES-App	3.64	0.86
It was easy to find what to do with GES-App without any training	3.58	1.15
It was easy to understand how to navigate across the GES-App	3.67	1.27
I knew what to do next in the GES-App	3.00	1.15
The metaphors used in the GES-App interface were quite clear/straightforward	3.67	1.05
The structure of the GES-App was difficult to understand	3.67 (2.33)	1.14
Overall mean	3.55	

5.4.3. Easiness to use

The third dimension explored four items regarding students' perceptions of the game easiness to use (Figure 9). Results in Table 6 indicate that the majority of the participants were particularly positive regarding the app easiness.

The mean values of responses to the items of this dimension were ranging from 3.39 up to 3.85 (Overall mean = 3.65).

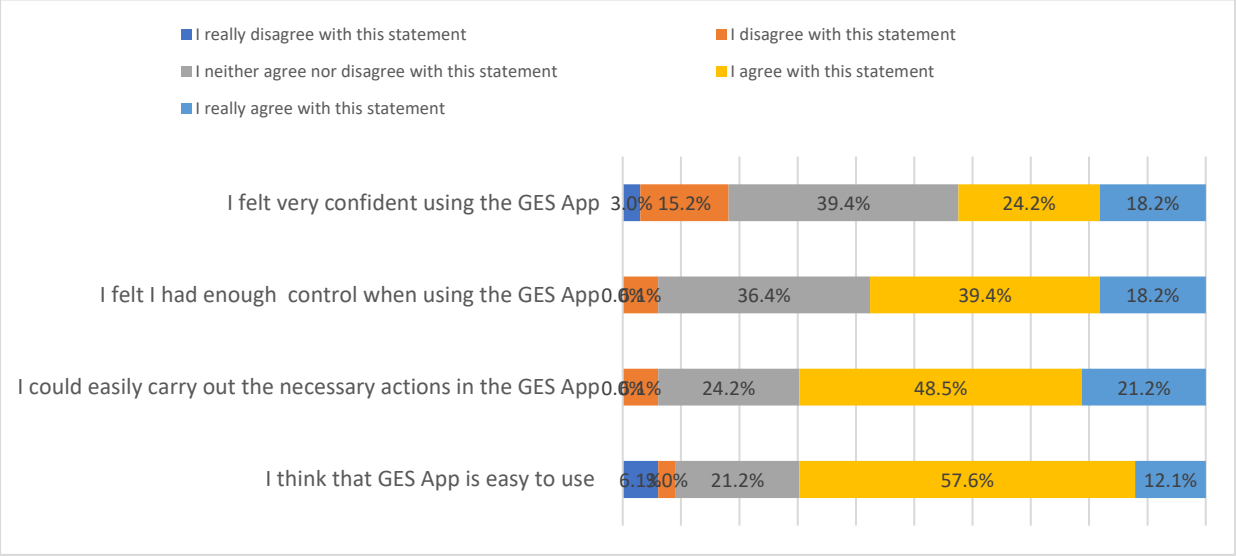

Figure 9. Percentages of students' responses about GES-App easiness to use

Table 6. Students' perceptions of the GES-App easiness to use

Items	Mean	SD
I think that GES-App is easy to use	3.67	0.96
I could easily carry out the necessary actions in the GES-App	3.85	0.83
I felt I had enough control when using the GES-App	3.70	0.85
I felt very confident using the GES-App	3.39	1.06
Overall mean	3.65	

5.4.4. User interaction features

The fourth dimension consisted of six items regarding students' perceptions of the app interaction with end user and the provided feedback (Figure 10). The descriptive statistics in Table 7 indicates that the majority of the participants were particularly positive to the items of this dimension. The mean values were ranging from 3.03 up to 3.79 (Overall mean = 3.43).

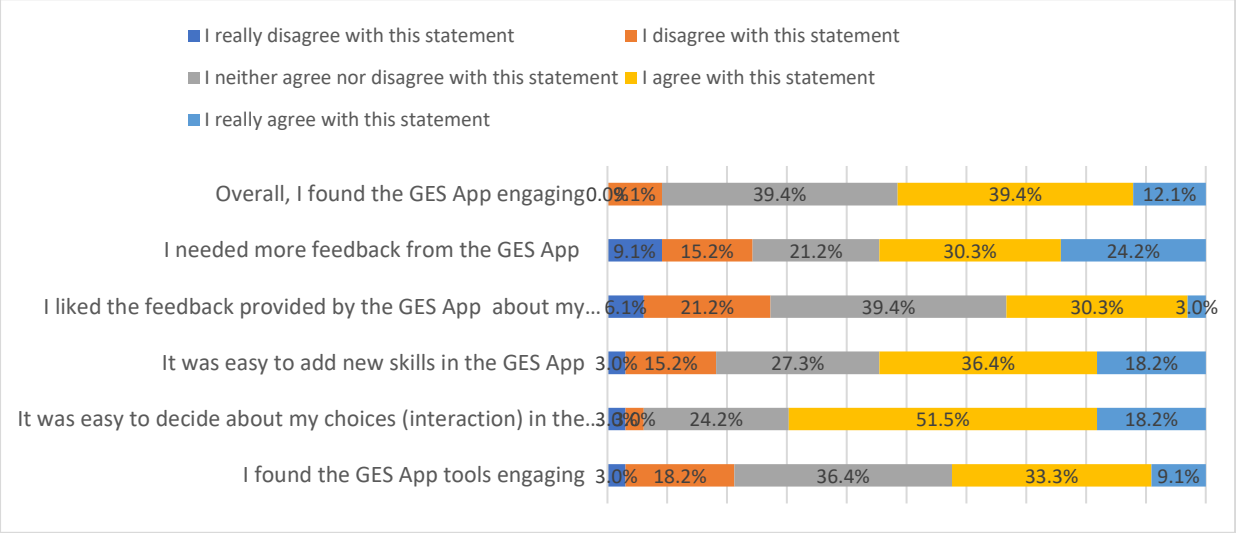

Figure 10. Percentages of students' responses about user interaction and feedback

Table 7. Students' perceptions of GES-App user interaction features

Items	Mean	SD
I found the GES-App tools engaging	3.27	0.98
It was easy to decide about my choices (interaction) in the GES-App	3.79	0.89
It was easy to add new skills in the GES-App	3.52	1.06
I liked the feedback provided by the GES-App about my choices	3.03	0.95
I needed more feedback from the GES-App	3.45	1.28
Overall, I found the GES-App engaging	3.55	0.83
Overall mean	3.43	

5.4.5. Usability

The fifth dimension is related to students' feelings about the usability of the GES-App (Figure 11). Table 8 indicates that the majority of the participants found the app interesting and effective despite that the early features and functionality of the app were perceived as complex. The overall mean value of the items in this dimension found to be 3.39.

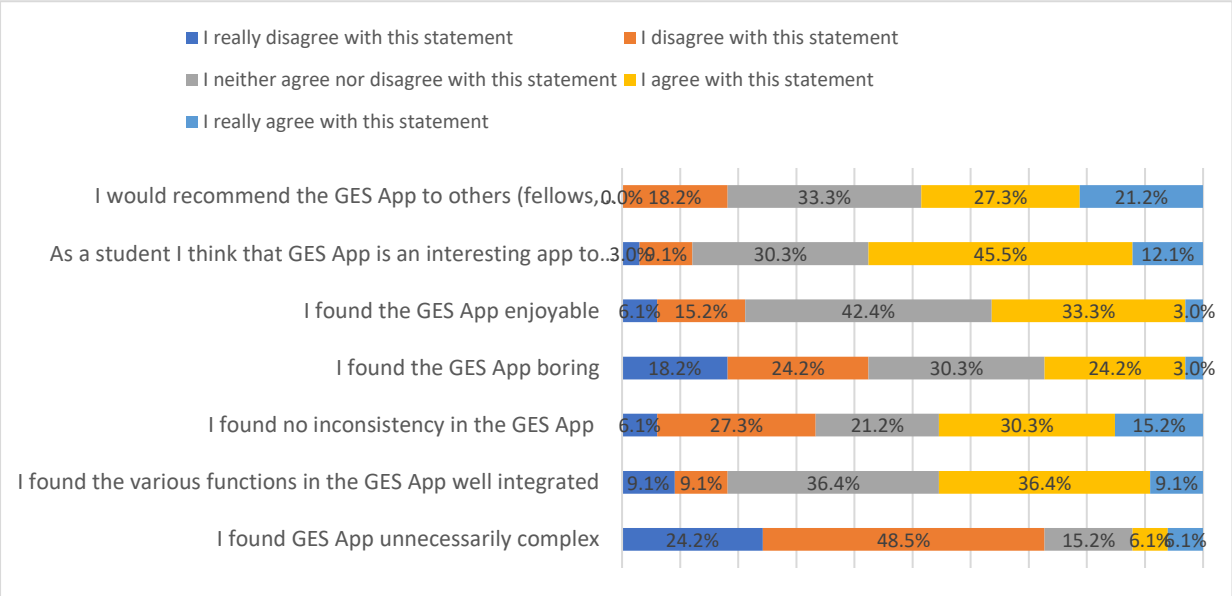

Figure 11. Percentages of students' responses about usability factors

Table 8. Students' perceptions of the GES-App usability

Items	Mean	SD
I found GES-App unnecessarily complex	3.79 (2.21)	1.08
I found the various functions in the GES-App well integrated	3.27	1.07
I found no inconsistency in the GES-App	3.21	1.19
I found the GES-App boring	3.30 (2.70)	1.13
I found the GES-App enjoyable	3.12	0.93
As a student I think that GES-App is an interesting app to use	3.55	0.94
I would recommend the GES-App to others (fellows, students)	3.52	1.03
Overall mean	3.39	

5.4.6. Content

The sixth dimension is related to items representing students' estimations about the App content (Figure 12). Table 9 indicates that the majority of the participants approve the app content and flow. The overall mean value of the items of this dimension was 3.32.

The students rated higher the idea to connect their skills, projects, artefacts, experiences and references about employability (M=4.00) and the suitability of the GES-App for university courses (M=3.79).

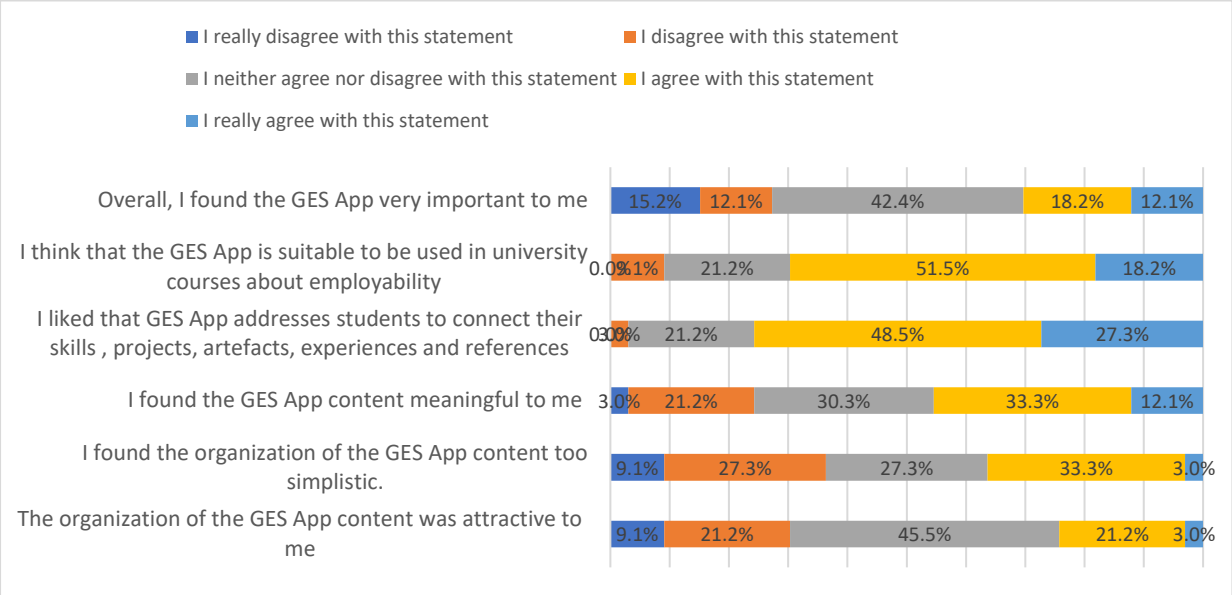

Figure 12. Percentages of students' responses about the GES-App content

Table 9. Students' perceptions of the GES-App content

Items	Mean	SD
The organization of the GES-App content was attractive to me	2.88	0.96
I found the organization of the GES-App content too simplistic.	3.06 (2.94)	1.06
I found the GES-App content meaningful to me	3.30	1.05
I liked that GES-App addresses students to connect their skills , projects, artefacts, experiences and references	4.00	0.79
I think that the GES-App is suitable to be used in university courses about employability	3.79	0.86
Overall, I found the GES-App very important to me	3.00	1.20
Overall mean	3.34	

5.4.7. Added value of the GES-App

The last dimension of the evaluation scale includes eleven items regarding students' perceptions of the added value of the GES-App (Figure 13). The participants were positive about all items in this sub-scale and the overall mean value was 3.47 (Table 10).

The positive outcomes of using the GES-App that the participants rated higher concern a) the ability to rethink about their employability skills, b) their reflection on experiences related to employability skills and c) the opportunity to think about the skills that they need to pay more attention in their

future plans. These findings are in line to the main project objectives, i.e. the GES-App was designed with the aim to help students' reflection and rethinking about their employability skills.

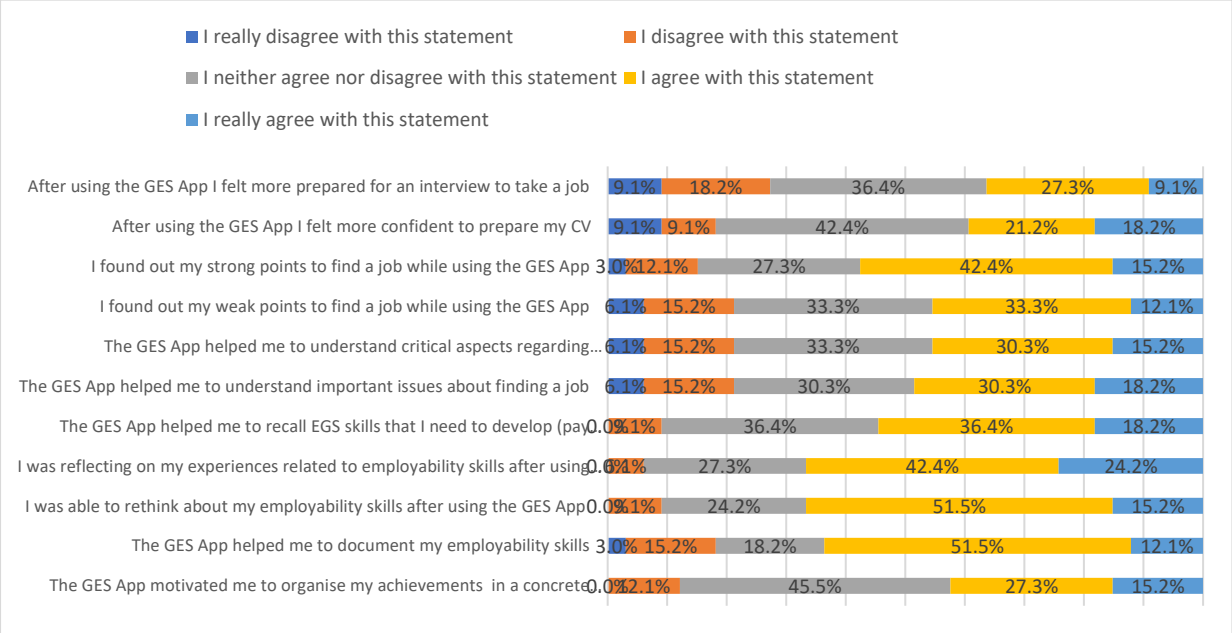

Figure 13. Outcomes - Added value of the GES-App

Table 10. Students' perceptions of the added value of the GES-App

Items	Mean	SD
The GES-App motivated me to organize my achievements in a concrete manner	3.45	0.90
The GES-App helped me to document my employability skills	3.55	1.00
I was able to rethink about my employability skills after using the GES-App	3.73	0.84
I was reflecting on my experiences related to employability skills after using the GES-App	3.85	0.87
The GES-App helped me to recall EGS skills that I need to develop (pay more attention) in the future	3.64	0.90
The GES-App helped me to understand important issues about finding a job	3.39	1.14
The GES-App helped me to understand critical aspects regarding employability skills	3.33	1.11
I found out my weak points to find a job while using the GES-App	3.30	1.07
I found out my strong points to find a job while using the GES-App	3.55	1.00
After using the GES-App I felt more confident to prepare my CV	3.30	1.16
After using the GES-App I felt more prepared for an interview to take a job	3.09	1.10
Overall mean	3.47	

5.4.8. Qualitative findings

Table 11 summarizes the key findings and the factors revealed through content analysis of the participants written responses to the questionnaire in the rigorous piloting of the early GES-App prototype. According to the participants' views and perceptions; i.e., the strong aspects and the weak points of the GES-App. In addition, the early users indicated some areas for future improvement of the App and they also provided specific suggestions to this direction.

Table 11. Positive features of the GES-App

Categories	Key factors	Transcripts from written responses
Central idea of the GES-App	*Organizing employability skills*	*Q24: ''Categorised skills, organisation and planning."* *Q6: ''The app helps students arrange their skills and experiences that are vital for job searching process.''* *Q4: ''The fact that they can start collecting their achievements from the very beginning of their career in the convenient form of an app."*
	Connecting dream jobs and the skills required	*Q21: ''The app highlights the necessary skills in order to find a quality job with potential.''* *Q18: ''GES-App helps students to deepen the skills and experience required by the job market."*
	Reflection and thinking about employability skills *Improving employability skills*	*Q7: ''It can help to organise your skills and calculate what would be the best choice for you. It can also make you rethink how many abilities you have so far and how much you should work on some in the future.''* *Q25: ''Applications are indeed an appealing means as to attract young people's attention towards an issue. Having an app at their disposal to help them realise their weaknesses and strengths in terms of their CV is an attempt to "translate" career orientation activities into their language."* *Q23: ''Organizing your documents, reflection on the skills needed.''* *I think that students have got "check list" of their skills and they know what they should improve.''*
Positive aspects of GES-App	*Engaging App (personal feeling, the coach option)*	*Q33: ''The convenience of an App allows individuals to engage far better than other means. Providing more efficiency when evaluating participant skills."* *Q28: ''I liked that it felt personal, through the advice coming from an avatar/character.''* *Q21: ''The choice of emotion was interesting as it takes into account the mental state of the student.''* *Q17: ''I liked the character choice, the different skills that existed as a choice and the above information that it requested about myself."* *Q32: ''The option to pick a coach which allowed you to match personalities was something I found very interesting."* *Q7: ''I think it's interesting option to choose your coach, pretty original idea."*
	List of skills *Description of skills* *The concept of dream job*	*Q21: ''The list of skills is essential to motivate the student to improve them.''* *Q29: ''The list of skills may be used as a road map"* *Q26: ''Everything is linked to the skills meaning you can see what experience you gained in a particular domain and thanks to who or thanks to which experience. If the dream jobs are correctly updated with current professional demands this could hugely help students toward improvement and help the anxious ones to feel ready.''*

Expected students' outcomes	*Organising personal skills and achievements*	*Q2: ''Organising your achievements and skills is useful, because you do a surprising amount of things during your studies. This overview might give you confidence to pursue a job that you realize you are almost qualified for.''* *Q27: ''I think organising your skills and their relevant experience, projects, and references would be helpful for organising a CV."*
	Matching skills with experience and references	*Q18: ''The skills and the match of the skills with the experience and the reference offered many different abilities and students could cultivate further on these skills.''* *Q16: "Matching your skills with experience and references."*
	Reflecting on existing skills	Q1: *''It helps to reflect on existing skills and how they can be improved.''Q20: ''The self-awareness of skills and experiences."* *Q15: ''The added value of the application is that it points out to students their strengths and weaknesses.''* *Q20: ''The added value is that a student reflects on their experiences related to employability skills after using the GES-App."* *Q11: ''I think that students have got "check list" of their skills and they know what they should improve."* *Q33: ''It had allowed me to recognise some skills I would have otherwise not have put on my CV. "*
	Get a deeper look into the labour market *Connecting skills and jobs* *Motivation for a 'good' job*	*Q13: ''I think that you have knowledge about your abilities."* *Q25: ''What I liked the most is that the user can get a deeper look into the jobs in which they might be interested as well as themselves in terms of suitability for those jobs. They can get a clearer view of the range of skills they have acquired and the range that is required to actually succeed in getting those jobs.''* *Q28: ''I think it could help highlight the skills and abilities that the student has and needs to work on in order to get there dream job"* *Q26: ''They will know thanks to this app what skills they need for this job, what they already have and what they don't."* *Q10: ''Employability skills which is good tip, what is important in job."* *Q11: ''I can see my job from holistic way."* *Q6: ''Having chosen the dream job, students get to know about the skills that are needed "* *Q2: ''It may give the students motivation to pursue a job they almost qualify for, that is, to put in the effort and become qualified.''*

Table 12. Comments and suggestions for improvements

Categories	Key factors	Transcripts from written responses
App interface and functionalities	*Improvement of the user interface*	*Q1: ''Interface is so basic. It can be improved by improving color scheme and styling of buttons.''* *Q30: ''(The interface) could be more attractive/engaging.''* *Q20: ''I found it a little boring. I used the demo App and I found it extra simple. You should change the format, colors, maybe insert pictures etc.''* *Q1: ''Improve the interface. It will be nice to have a usable and attractive interface.''* *Q7: ''I would pay more attention to the aesthetic of graphics.''* *Q6: ''More colours, more instructions and more pictures."*
	Improvement of the graphics, aesthetics, styling of buttons etc.	*Q7: ''I think graphics could be more aesthetic. Now they seem to be typical and rather boring.''* *Q25: ''The technical part, graphics and structure of the app, which is still in process, though.''* *Q13: ''The graphics can become more attractive with more colors and pictures.''* *Q17: ''The graphic speech and the structure"*
	Enhance feedback to the user	*Q8: ''Graphics, too little feedback and interaction."* *Q3: ''The app said nothing and recommended nothing based on my choices. I would expect direct and obvious feedback from such an application (e.g., employability score for various careers).''* *Q30: ''provide more feedback."*
	Provide a guide (helpdesk)	*Q16: ''I found difficult to understand how to add projects.''* *Q18: ''that someone first had to guide you so that you could explore it better and delve deeper into it.''* *Q24: ''A bit chaotic at beginning.''* *Q10: ''Intuitive step-by-step transitions and more instructions and tips."* *Q26: ''Maybe a bit simplistic but could already be a great help for students. Everything should be compartmented as the student will (preferred skills, or alphabetical or by job domain, most important in dream job, most personal, most teached, etc.)''*

Suggestions for improvements	*App usability and functionalities*	*Q15: "It's somewhat trivial what I noticed, but I did not like the structure as much. I would like it a little more enriched.''* *Q29: ''It's confusing to use, Very few jobs, jobs are weirdly specific (like primary schools teacher instead of just teacher), To add new job user is asked to press "+", however there are two "+" icons just next to each other (Dev build), Once job is chosen it seems to be impossible to change it + there is no confirmation."* *Q2: "I would remove the global + button and only allow adding items in the relevant screens/contexts."* *Q28: "I think it could be helpful to navigate the individuals next move when utilizing the app for the first time.''* *Q31: ''General suggestions:* • *Lack of feeling choices when opening the app* • *Should be able to add experiences, projects and references from their sections on the home page instead of it just being a list* • *Should be able to edit or delete content that has been added* • *Need a quick way to copy existing projects/experiences to newly created skills"* *Q27: ''Scrolling with the scroll wheel on desktop was very, very slow. When a skill is added, and one selected but the user wishes to return from adding a skill, the back arrow stops functioning. For example, I add the skill ""Ability to accept Criticism"", but change my mind about adding a skill, i must clear the search box before I can use the back arrow in the top left. A similar issue occurs when an artefact type is selected, but I change my mind about adding an artefact.* *Additional comments seem to be required when adding experiences, despite them not always being applicable.* *There is no way to remove skills, experiences, projects, or references that may have been added incorrectly.* *Selecting the arrow beside an experience, project, or reference does not expand to show the previously input details. The search function on the "Add a Skill" page does not seem to work, even when searching for keywords visible in the list."*

Changes in GES-App content and organization	*Connecting dream jobs to specific skills*	*Q2: ''I did not quite understand how the dream job screen connects to the skills I register myself. In general, I felt that I did not understand how all the data was connected… I would want the skills tracker for the dream job to be updated automatically based on the skills I register manually. Since it seems I can only select one dream job, I think the dream job info and the list of required skills might as well be shown on the home screen directly."* *Q16: ''I would like, skills to be organized in 4-5 sectors (for example, organizational skills, communication skills, etc.) and when you click above the sectors, to appear in your screen. 2. I wouldn't like that the comments in the sector of experience were mandatory."* *Q31: ''I think the app needs to focus on how to obtain skills that people don't have yet. It's all well and good to recognise that you don't have a skill, but learning how and where to develop them is important to make progress."* *Q26: ''Great app for a 1st draft. A few things can be modified:* • *Skills could be classifiable by activity (law, education, etc.) or alphabetically (as it already is)* • *Skills could be selected together and then marked later on or one by one as it is done right now (developing wise it would require 2 skills scenes).* • *It would be great to be able to add skills through Experience adding as this category allows to remind ourselves of what we learn in our experiences.* • *Projects (Files) should not be accessible without any dream jobs or skills selected.* • *Current app allows to work on dream jobs only 1 by 1. Selecting a dream job "blocks" the dream job until you fully select all the skills related to it. There should be a submit button that allows to come back to that job later on to see what we are missing. That would allow to work on several dream jobs."*
	Make clear the role of the coach	*Q27: ''The avatar is interesting, but the coach I chose at the start shows up nowhere within the app once it has started."* *Q2: ''I don't know why I need a coach or why the coach needs to know how I am feeling today.''*
	App version in national language	*Q13: ''The language, i prefer it also in national language because i can fell more familiar"*
Technical issues	*Mobile vs desktop version*	*Q2: ''The web-mobile is best, I think, because the gestures and controls seemed more suited for that platform. Scrolling with the mouse wheel does not really work, for instance.''* *Q4: ''Both, I think the browser version would be much more convenient to use.''* *Q7: ''I would say both, but rather mobile version as I'm more used to use smartphone.''* *Q15: ''I prefer the web-mobile of this application.''* *Q29: ''Only tested pc version but obviously must provide better experience web-mobile "* *Q23: ''The PC for having access to my documents."*

	Solve technical problems, bugs	*Q16: ''The app is very difficult to use.''* *Q10: ''Is unintuitive, on the computer it is problem with scrolling.''* *Q14:''It was very slow for me, the option "project" didn't have anything in order to choose.''* *Q31: ''The app is very buggy at the moment, and many features are incomplete. Copying existing projects and experiences to newly added skills takes time to do as there is no way to quickly assign existing ones. This makes going between adding skills, experiences, projects, etc. tedious to do. 'General suggestions for bugs:* • *My Dream Job doesn't let you change options once one is selected from the first menu. Once one is picked, clicking on the button on the home page takes me to the check boxes* • *The numbers tracking references didn't update correctly on the Files screen when adding a reference. It updated correctly when reloading the page* • *Can't add a project with no skills. The process completes but it's not listed and there is no user feedback to explain what has happened* • *Links don't seem to work yet* • *The "no results found" plus sign at the bottom of the skills list doesn't open anything. Instead to add a skill you need to search for one and press the "no results found" plus sign there* • *It's possible to add the same skill multiple times if you select a different proficiency level, this shouldn't happen."*

5.5. Conclusions and suggestions for improvement

Written responses and suggestions were given in specific key areas of Stage 2 evaluation. Below is a list of considered changes that were made towards Stage 3 evaluation. The core factors considered were:

- Improvement of the User Interface
  - This wasn't highly prioritised but was considered especially in the sense of navigation and further improvements were made to help improve the functionality and fluidity of the app.
  - Colour scheme was considered further in the line of development.
- Improvement of the graphics, aesthetics, styling of buttons etc.
  - In reference to the user interface points, this was considered to an extent but was not priority. Some minor changes were made to graphics and overall aesthetics to make certain activities look better.
- Connecting Dream Jobs to specific skills
  - The core functionality of this 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.
- App Functionality
  - General functionality was improved, and further development of activities was done.
  - The core selection of Dream Job was improved.
  - The Dream Job was considered more, and removal of the "custom" dream job was implemented. Having this removed was a decision to save on implementation and getting the app out.

    - Scrolling on PC version sluggish – this was brought up but seems to be a certain individual problem. Tested on multiple devices and no problem from developer end.
- Coach
    - The role of the coach was considered for these stages. It was decided to keep in as is for the time being while further thought was given to the purpose or further implementation of the coach.
- Mobile vs Desktop
    - There were some moments about mobile vs desktop in relation to navigating through the app effectively.
    - 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.

Stage 2 included a vast step up from the stage 1 evaluation. The second stage was prompted to attempt including more variety in the activities. These includes activities 1, 2, 3, and 5. Between evaluation stages, development of the GES continued in conjunction with feedback provided from the previous evaluation stages. This included core functionality progression and amended errors occurred. Design flaws or navigation issues were arisen. Elements were carefully evaluated and fixed for the final stage of evaluation. It was decided that these were the four core activities that would be in the final build.

6. Phase 3: Large scale evaluation of the final GES-App version

6.1. Procedure and participants

The aim of the large scale evaluation was to explore the effectiveness of the GES-App in supporting students' thinking about and reflection on their employability skills. A quantitative quasi-experimental design was adopted by using a pre- and post-survey analysis of students' attitudes and perceptions about employability skills. The design of the large scale evaluation was based on the idea of exploring students' perceptions and beliefs about employability, before and after the intervention with GES-App.

The students were invited to participate in the study in a voluntary manner and informed consent was obtained. As is true of many educational interventions, the allocation of participants to groups was not truly random as it was based on timetabling availability of the students.

Initially, the students' were asked to respond to the online questionnaire before the instructional intervention with the GES-App. Two weeks later, the same questionnaire was distributed to the students who had completed the questionnaire at pre-test. They were asked to respond again to the GES scale form their personal place. We expected thus to explore possible differences in students' beliefs and the impact of using the GES-App to their thinking about their employability skills.

Data analysis of the large scale evaluation was based on 213 complete student questionnaires that received before and after intervention with the GES-App from the partners' institutions (i.e., University of Peloponnese, Cardinal Stefan Wyszyński University, University of the West of Scotland, and the Norwegian University of Science and Technology). The participants reflected a balanced representation of social science, psychology, humanities, business, engineering, and computer science. A total of 133 students participated in and responded to the pre-test questionnaire before the instructional intervention and their engagement in using the GES-App. Two weeks later, 80 of them responded also to the post-test questionnaire. Table 13 presents in more details the demographic information of the participants in both phases of the survey (pre- and post-).

Table 13. Participants' demographic information

Demographic characteristics	Pre-test		Post-test	
	Frequencies (N=133)	Relative Frequencies	Frequencies (N=80)	Relative Frequencies
Gender				
Female	99	74.4%	99	74.4%
Male	33	24.8%	33	24.8%
Prefer not to say	1	0.8%	1	0.8%
University				
UKSW	56	41.4%	56	41.4%
UoP	50	30.8%	50	30.8%
UWS	23	10.5%	23	10.5%
NTNU	4	6.8%	4	6.8%
Subject of studies				
Social sciences	73	54.9%	73	54.9%
Psychology	24	18.0%	24	18.0%
Humanities	13	9.0%	13	9.0%
Computer science	10	7.5%	10	7.5%
Educational sciences	3	2.3%	3	2.3%
Engineering	3	2.3%	3	2.3%
Business/management	4	3.0%	4	3.0%
Science	2	1.5%	2	1.5%
Nursing	1	0.8%	1	0.8%
Level of studies				
Bachelor	65	48.9%	65	48.9%
Master	68	51.1%	68	51.1%
Job experience				
Full time	38	28.6%	38	28.6%
Part time	53	39.8%	53	39.8%
Unemployed	42	31.6%	42	31.6%
Digital skills/competence				
Novice	7	5.3%	7	5.3%
Advanced beginner	28	21.1%	28	21.1%
Competent	57	42.9%	57	42.9%
Proficient	32	24.1%	32	24.1%
Expert	9	6.8%	9	6.8%
Familiarity with social media				
Novice	4	3.0%	4	3.0%
Advanced beginner	22	16.5%	22	16.5%
Competent	73	54.9%	73	54.9%
Proficient	34	25.6%	34	25.6%

6.2. The questionnaire

Pre- and post- questionnaires were used to record students' perceptions of the functionality and the effectiveness of GES App in relation to their employability awareness and skills. The instrument was an online anonymous questionnaire specifically developed for the evaluation needs of the GES-App (Appendix D). The development of the scale was based upon the existing literature on graduate employability and the project output O1. In addition, partners' practical knowledge and research experience regarding online educational environments was also helpful to the development of the GES scale.

The first part of the questionnaire used to record demographic information of the participants in both phases. The second part contained 52 scale items, i.e. close-ended questions that presented statements asking students' perceptions and beliefs towards employability skills. The items were worded in 5-point Likert scale (1 = I really disagree, 5 = I really agree).

The statements were grouped within three sub-dimensions repressing students' beliefs about:

- University studies and employability (i.e., in terms of knowledge, skills and abilities)
- Understanding the labour market
- Preparation for the labour market.

The internal consistency of the scale was calculate for each subscale, before and after the intervention with GES-App. Table 14 presents the results of Cronbach's alpha coefficients. The results indicate that the internal reliability of the survey items is high. Therefore, the scale used is adequately reliable to measure students' rating of their employability skills (DeVellis, 2003).

Table 14. Reliability coefficients for the three used scales before the teaching intervention

GES subscales	Number of items	Pre-survey Cronbach's alpha	Post-survey Cronbach's alpha
University studies: knowledge, skills and abilities	14	0.861	0.882
Understanding the labour market	14	0.884	0.909
Preparing for the labour market	24	0.922	0.938

6.3. Strategy of data analysis

The analysis of the participants' responses was carried out in the SPPS version 28. Descriptive statistics was used to present the distribution of the participants' responses, in terms relative frequencies, mean (M), standard deviation (SD), and the median (Mdn). In addition, for each participant we calculated the aggregate scores (i.e., the average of students' responses) in each of three subscales in the questionnaire, before and after intervention with the GES-App. Subsequently, we conducted Shapiro-Wilk test to investigate the normality of the distribution of variables in the scale. In addition Mann-Whitney test and t-test were used to explore possible statistically significant differences in students' rating.

6.4. Results

6.4.1. University studies and employability

The first dimension of the GES scale represents students' beliefs and perceptions regarding their university studies and employability, in terms of knowledge, skills and abilities for a job. The results in Table 15 shows that the majority of the participants were positive about all the variables in this subscale. The recorded values of the medians indicate that more than half of the participants rated high all items in this dimension (selecting 4=agree or 5=really agree) thus projecting a positive view of their studies at the university in relation to the knowledge, skills and abilities they have developed. This is also confirmed by the median in each statement, since students' responses exceeded the mid-scale value. Similarly, students' responses to the post-survey were also positive in all 14 statements with median values equal to 4 (Table 16).

Table 15. Pre-survey responses to the subscale "university studies and employability" (N-133)

Item	1	2	3	4	5	Median
1. I feel my university studies helped me to develop the skills needed to get employment	4.5%	18.0%	24.1%	40.6%	12.8%	4
2. I believe that my degree will improve my career prospects	1.5%	5.3%	12.8%	48.1%	32.3%	4
3. I believe that I can get a job in my field when I graduate	3.8%	8.3%	22.6%	42.9%	22.6%	4
4. My degree is generally perceived as leading to a 'good' job	2.3%	9.0%	28.6%	45.1%	15.0%	4
5. I know that my subject knowledge will be valued by employers	2.3%	8.3%	27.1%	43.6%	18.8%	4
6. I am able to use my skills in future employment	1.5%	5.3%	15.0%	51.1%	27.1%	4
7. I think that my university studies helped me to develop critical thinking skills	0.8%	3.8%	9.8%	49.6%	36.1%	4
8. I think that my university studies helped me to develop collaboration/team working skills	3.0%	6.8%	21.1%	46.6%	22.6%	4
9. I think that my university studies helped me to develop self-management skills	3.8%	8.3%	21.8%	45.1%	21.1%	4
10. I am able to accomplish tasks/solve problems beyond my discipline	1.5%	3.0%	25.6%	51.9%	18.0%	4
11. I am able to deal with unknown challenges within a given context	1.5%	6.8%	26.3%	51.9%	13.5%	4
12. I feel comfortable in ambiguous/changing situations	3.8%	17.3%	28.6%	42.1%	8.3%	4
13. I know how to learn new things	1.5%	3.0%	12.0%	47.4%	36.1%	4
14. I am able to evaluate my own progress	1.5%	3.8%	12.8%	53.4%	28.6%	4

Note: 1= really disagree to 5= really agree

Table 16. Post-survey responses to the subscale "university studies and employability" (N-80)

Item	1	2	3	4	5	Median
1. I feel my university studies helped me to develop the skills needed to get employment	3.8%	6.3%	35.0%	37.5%	17.5%	4
2. I believe that my degree will improve my career prospects	0.0%	6.3%	11.3%	50.0%	32.5%	4
3. I believe that I can get a job in my field when I graduate	0.0%	11.3%	18.8%	53.8%	16.3%	4
4. My degree is generally perceived as leading to a 'good' job	0.0%	8.8%	30.0%	40.0%	21.3%	4
5. I know that my subject knowledge will be valued by employers	0.0%	1.3%	30.0%	53.8%	15.0%	4
6. I am able to use my skills in future employment	0.0%	6.3%	8.8%	62.5%	22.5%	4
7. I think that my university studies helped me to develop critical thinking skills	0.0%	2.5%	17.5%	46.3%	33.8%	4
8. I think that my university studies helped me to develop collaboration/team working skills	1.3%	7.5%	16.3%	43.8%	31.3%	4
9. I think that my university studies helped me to develop self-management skills	2.5%	12.5%	25.0%	42.5%	17.5%	4
10. I am able to accomplish tasks/solve problems beyond my discipline	0.0%	2.5%	25.0%	52.5%	20.0%	4
11. I am able to deal with unknown challenges within a given context	0.0%	6.3%	25.0%	47.5%	21.3%	4
12. I feel comfortable in ambiguous/changing situations	3.8%	13.8%	33.8%	36.3%	12.5%	4
13. I know how to learn new things	0.0%	3.8%	11.3%	53.8%	31.3%	4
14. I am able to evaluate my own progress	0.0%	5.0%	11.3%	61.3%	22.5%	4

Note: 1= really disagree to 5= really agree

Table 17. Descriptive statistics of the subscale "university studies and employability"

Item	Pre-test (N=133) Mean (SD)	Post-test (N=80) Mean (SD)
1. I feel my university studies helped me to develop the skills needed to get employment	3.4 (1.1)	3.6 (1.0)
2. I believe that my degree will improve my career prospects	4.1 (0.9)	4.1 (0.8)
3. I believe that I can get a job in my field when I graduate	3.7 (1.0)	3.8 (0.9)
4. My degree is generally perceived as leading to a 'good' job	3.6 (0.9)	3.7 (0.9)
5. I know that my subject knowledge will be valued by employers	3.7 (0.9)	3.8 (0.7)
6. I am able to use my skills in future employment	4.0 (0.9)	4.0 (0.8)
7. I think that my university studies helped me to develop critical thinking skills	4.2 (0.8)	4.1 (0.8)
8. I think that my university studies helped me to develop collaboration/team working skills	3.8 (1.0)	4.0 (0.9)
9. I think that my university studies helped me to develop self-management skills	3.7 (1.0)	3.6 (1.0)
10. I am able to accomplish tasks/solve problems beyond my discipline	3.8 (0.8)	3.9 (0.7)
11. I am able to deal with unknown challenges within a given context	3.7 (0.8)	3.8 (0.8)
12. I feel comfortable in ambiguous/changing situations	3.3 (1.0)	3.4 (1.0)
13. I know how to learn new things	4.1 (0.9)	4.1 (0.8)
14. I am able to evaluate my own progress	4.0 (0.8)	4.0 (0.7)
Total mean	**3.8 (0.6)**	**3.8 (0.5)**

Using the non-parametric Mann-Whitney test, we found no statistically significant difference in students' responses to this subscale items, between pre- and post- survey. Moreover, since the total scores (i.e., the aggregate score that is the average of students' responses to all items in this subscale) appeared to have a normal distribution. So, the two samples can be considered independent and t-test can be applied. The t-test showed that there is no statistically significant difference in students' rating before and after the GES-App intervention.

6.4.2. Understanding the labour market

The second dimension of the GES scale represents students' beliefs and perceptions regarding their university studies and employability, in terms of knowledge, skills and abilities for a job. The results in Table 18 shows that the majority of the participants were positive about all the variables in this subscale. The recorded values of the medians indicate that more than half of the participants rated positively the items in this dimension and provided their agreement (selecting 4=agree or 5=really agree).

Students' responses to the post-survey rated higher all statements in this dimension thus providing a strong indication that using the GES-App helped students to achieve a more thorough view of the labour market as well as of their planning to find a job (Table 19).

Table 18. Pre-survey responses to the subscale "understanding the labour market" (N=133)

Item	1	2	3	4	5	Median
1. I know what skills and abilities are important for employment	0.0%	9.8%	19.5%	42.9%	27.8%	4
2. I know what attitudes and values are important for employment	0.0%	5.3%	16.5%	57.9%	20.3%	4
3. I know what skills I need to improve to get a job relevant to my studies	1.5%	9.8%	25.6%	44.4%	18.8%	4
4. I know what skills, attributes and behaviours are required for different types of employment	0.0%	14.3%	22.6%	48.9%	14.3%	4
5. I can identify distinctive achievements that make me stand out for a job position	1.5%	9.0%	36.8%	39.1%	13.5%	4
6. I think that I have sufficient knowledge of the labour market	9.0%	30.8%	33.1%	21.1%	6.0%	3
7. I know how to improve my knowledge about employability	1.5%	27.8%	31.6%	30.8%	8.3%	3
8. I think that I have the skills that most employers are looking for	2.3%	16.5%	33.1%	36.1%	12.0%	3
9. I feel confident in job-seeking	15.0%	23.3%	21.8%	30.1%	9.8%	3
10. I know a range of sources to find job opportunities	2.3%	24.1%	21.8%	39.8%	12.0%	4
11. I can identify what employers value most in graduates	1.5%	19.5%	29.3%	42.1%	7.5%	3
12. I can locate specific jobs of interest to me	3.8%	14.3%	24.8%	40.6%	16.5%	4
13. I know how to find important information about job market for graduates	5.3%	24.1%	36.1%	27.1%	7.5%	3
14. I am open to change my thinking about employability skills	0.8%	2.3%	12.0%	43.6%	41.4%	4

Note: 1= really disagree to 5= really agree

Table 19. Post-survey responses to the subscale "understanding the labour market" (N=80)

Item	1	2	3	4	5	Median
1. I know what skills and abilities are important for employment	0.0%	2.5%	18.8%	52.5%	26.3%	4
2. I know what attitudes and values are important for employment	0.0%	2.5%	20.0%	50.0%	27.5%	4
3. I know what skills I need to improve to get a job relevant to my studies	0.0%	2.5%	22.5%	53.8%	21.3%	4
4. I know what skills, attributes and behaviours are required for different types of employment	0.0%	6.3%	25.0%	53.8%	15.0%	4
5. I can identify distinctive achievements that make me stand out for a job position	1.3%	10.0%	22.5%	53.8%	12.5%	4
6. I think that I have sufficient knowledge of the labour market	7.5%	22.5%	35.0%	23.8%	11.3%	3
7. I know how to improve my knowledge about employability	2.5%	15.0%	31.3%	40.0%	11.3%	4
8. I think that I have the skills that most employers are looking for	5.0%	12.5%	26.3%	41.3%	15.0%	4
9. I feel confident in job-seeking	7.5%	16.3%	31.3%	32.5%	12.5%	3
10. I know a range of sources to find job opportunities	0.0%	13.8%	27.5%	41.3%	17.5%	4
11. I can identify what employers value most in graduates	1.3%	7.5%	30.0%	50.0%	11.3%	4
12. I can locate specific jobs of interest to me	0.0%	10.0%	12.5%	61.3%	16.3%	4
13. I know how to find important information about job market for graduates	2.5%	16.3%	30.0%	38.8%	12.5%	4
14. I am open to change my thinking about employability skills	0.0%	0.0%	13.8%	42.5%	43.8%	4

Note: 1= really disagree to 5= really agree

Table 20 presents comparatively students' mean ratings the items constructing the dimension "understanding the labour market", before and after the intervention with the GES-app. Overall, we recorded statistically significant improvement in students' views. More specifically, after the intervention, the participants who responded to the post-survey, rated higher their ability to understand the labour market compared to the students in pre-survey ($t(211)=-2.426$, $p=.016$).

The calculation of Mann-Whitney test values revealed statistically significant differences with regards to higher scores provided by the students after the GES-App intervention compared to the pre-test in the following items of this subscale (see Table 20):

a) I can identify what employers value most in graduates, ($U=4457$, $z=-2.114$, $p=.035$)

b) I can locate specific jobs of interest to me ($U=4417$, $z=-2.220$, $p=.026$)

c) I know how to find important information about job market for graduates. ($U=4287$, $z=-2.473$, $p=.013$).

Table 20. Descriptive statistics of the subscale "understanding the labour market"

Item	Pre-test (N=133) Mean (SD)	Post-test (N=80) Mean (SD)
1. I know what skills and abilities are important for employment	3.9 (0.9)	4.0 (0.7)
2. I know what attitudes and values are important for employment	3.9 (0.8)	4.0 (0.8)
3. I know what skills I need to improve to get a job relevant to my studies	3.7 (0.9)	3.9 (0.7)
4. I know what skills, attributes and behaviours are required for different types of employment	3.6 (0.9)	3.8 (0.8)
5. I can identify distinctive achievements that make me stand out for a job position	3.5 (0.9)	3.7 (0.9)
6. I think that I have sufficient knowledge of the labour market	2.8 (1.1)	3.1 (1.1)
7. I know how to improve my knowledge about employability	3.2 (1.0)	3.4 (1.0)
8. I think that I have the skills that most employers are looking for	3.4 (1.0)	3.5 (1.1)
9. I feel confident in job-seeking	3.0 (1.2)	3.3 (1.1)
10. I know a range of sources to find job opportunities	3.4 (1.0)	3.6 (0.9)
11. I can identify what employers value most in graduates*	3.4 (0.9)	3.6 (0.8)
12. I can locate specific jobs of interest to me*	3.5 (1.0)	3.8 (0.8)
13. I know how to find important information about job market for graduates*	3.1 (1.0)	3.4 (1.0)
14. I am open to change my thinking about employability skills	4.2 (0.8)	4.3 (0.7)
Total subscale mean*	**3.5 (0.6)**	**3.7 (0.6)**

** p<0.05*

6.4.3. Preparation for the labour market

Table 21 and Table 22 present the descriptive statistics regarding students' responses to the items of the third scale dimension concerning their views about preparation for the labour market before and after the intervention. In general, the participants were positive about most of the variables in this subscale. The recorded values of the medians were higher in many items as well. The results provided clear evidence of improvement, since the participants in the post-survey rated higher their abilities to prepare themselves for the labour market with the aim to find a 'good' job.

Table 21. Pre-survey responses to the subscale "preparation for the labour market" (N=133)

Item	1	2	3	4	5	Median
1. I have a clear career plan	9.0%	18.0%	30.8%	24.8%	17.3%	3
2. I know what is important to me in my career	1.5%	8.3%	23.3%	41.4%	25.6%	4
3. I can project/articulate my employability skills	3.8%	12.8%	33.8%	40.6%	9.0%	3
4. I can project my experiences that are of value to find a job	1.5%	12.8%	29.3%	44.4%	12.0%	4
5. I know how to document my employability skills to find a job	3.8%	20.3%	35.3%	28.6%	12.0%	3
6. I know how to document my experiences to find a job	3.8%	15.8%	27.8%	36.1%	16.5%	4
7. I know my strengths for an employment position	0.8%	12.0%	28.6%	40.6%	18.0%	4
8. I can identify my weaknesses for an employment position	0.8%	6.0%	24.8%	48.1%	20.3%	4
9. I am able to understand my needs/areas of skills' developmental	0.0%	6.0%	24.1%	51.9%	18.0%	4
10. I am optimistic about gaining a 'good' job	3.0%	12.8%	27.8%	35.3%	21.1%	4
11. I am able to judge whether a specific job is suitable to me	1.5%	4.5%	24.8%	48.1%	21.1%	4
12. I keep a record of my employability skills	15.0%	21.8%	24.8%	27.1%	11.3%	3
13. I keep a record of my personal development achievements	12.8%	19.5%	24.1%	30.8%	12.8%	3
14. I know what should be included in a CV for a job application	2.3%	11.3%	23.3%	42.9%	20.3%	4
15. I know how to improve my CV to find a 'good' job	5.3%	19.5%	28.6%	30.8%	15.8%	3
16. I know how to prepare for an interview	9.8%	24.1%	28.6%	27.1%	10.5%	3
17. I feel confident that I can perform well in a job interview	8.3%	20.3%	28.6%	33.8%	9.0%	3
18. I feel confident I can present myself well in a job sector I am interested for	6.0%	16.5%	26.3%	41.4%	9.8%	4
19. I can give concrete examples of my achievements which would interest employers	4.5%	17.3%	28.6%	39.8%	9.8%	3
20. I can recognise opportunities for personal development	0.8%	6.8%	27.1%	48.9%	16.5%	4
21. I have a personal development plan for employability	12.0%	21.1%	23.3%	33.1%	10.5%	3
22. I am able to create a self-development plan for employability	9.0%	15.0%	27.8%	38.3%	9.8%	3
23. I have an online career profile (e.g. LinkedIn, Indeed)	42.9%	10.5%	6.0%	20.3%	20.3%	2
24. I have contacts with possible employers	27.1%	21.8%	21.8%	19.5%	9.8%	3

Note: 1= really disagree to 5= really agree

Table 22. Post-survey responses to the subscale "preparation for the labour market" (N=80)

Item	1	2	3	4	5	Median
1. I have a clear career plan	3.8%	16.3%	28.8%	35.0%	16.3%	4
2. I know what is important to me in my career	1.3%	5.0%	22.5%	43.8%	27.5%	4
3. I can project/articulate my employability skills	2.5%	5.0%	23.8%	57.5%	11.3%	4
4. I can project my experiences that are of value to find a job	1.3%	8.8%	22.5%	52.5%	15.0%	4
5. I know how to document my employability skills to find a job	3.8%	5.0%	32.5%	37.5%	21.3%	4
6. I know how to document my experiences to find a job	3.8%	5.0%	23.8%	47.5%	20.0%	4
7. I know my strengths for an employment position	1.3%	7.5%	20.0%	52.5%	18.8%	4
8. I can identify my weaknesses for an employment position	0.0%	6.3%	12.5%	58.8%	22.5%	4
9. I am able to understand my needs/areas of skills' developmental	0.0%	6.3%	13.8%	56.3%	23.8%	4
10. I am optimistic about gaining a 'good' job	5.0%	8.8%	22.5%	40.0%	23.8%	4
11. I am able to judge whether a specific job is suitable to me	1.3%	1.3%	20.0%	55.0%	22.5%)	4
12. I keep a record of my employability skills	8.8%	7.5%	27.5%	36.3%	20.0%	4
13. I keep a record of my personal development achievements	7.5%	6.3%	17.5%	48.8%	20.0%	4
14. I know what should be included in a CV for a job application	1.3%	5.0%	25.0%	38.8%	30.0%	4
15. I know how to improve my CV to find a 'good' job	1.3%	12.5%	27.5%	36.3%	22.5%	4
16. I know how to prepare for an interview	7.5%	17.5%	25.0%)	36.3%	13.8%	4
17. I feel confident that I can perform well in a job interview	6.3%	13.8%	25.0%	40.0%	15.0%	4
18. I feel confident I can present myself well in a job sector I am interested for	5.0%	15.0%	21.3%	40.0%	18.8%	4
19. I can give concrete examples of my achievements which would interest employers	5.0%	8.8%	22.5%	45.0%	18.8%	4
20. I can recognise opportunities for personal development	0.0%	10.0%	16.3%	55.0%	18.8%	4
21. I have a personal development plan for employability	5.0%	17.5%	35.0%	30.0%	12.5%	3
22. I am able to create a self-development plan for employability	3.8%	7.5%	31.3%	40.0%	17.5%	4
23. I have an online career profile (e.g. LinkedIn, Indeed)	33.8%	10.0%	8.8%	25.0%	22.5%	3
24. I have contacts with possible employers	22.5%	18.8%	21.3%	26.3%	11.3%	3

Note: 1= really disagree to 5= really agree

Table 23. Descriptive statistics of the subscale "preparation for the labour market"

Item	Pre-test (N=133) Mean (SD)	Post-test (N=80) Mean (SD)
1. I have a clear career plan	3.2 (1.2)	3.4 (1.1)
2. I know what is important to me in my career	3.8 (1.0)	3.9 (0.9)
3. I can project/articulate my employability skills*	3.4 (1.0)	3.7 (0.8)
4. I can project my experiences that are of value to find a job	3.5 (0.9)	3.7 (0.9)
5. I know how to document my employability skills to find a job*	3.3 (1.0)	3.7 (1.0)
6. I know how to document my experiences to find a job*	3.5 (1.1)	3.8 (1.0)
7. I know my strengths for an employment position	3.6 (0.9)	3.8 (0.9)
8. I can identify my weaknesses for an employment position	3.8 (0.9)	4.0 (0.8)
9. I am able to understand my needs/areas of skills' developmental	3.8 (0.8)	4.0 (0.8)
10. I am optimistic about gaining a 'good' job	3.6 (1.1)	3.7 (1.1)
11. I am able to judge whether a specific job is suitable to me	3.8 (0.9)	4.0 (0.8)
12. I keep a record of my employability skills*	3.0 (1.2)	3.5 (1.2)
13. I keep a record of my personal development achievements*	3.1 (1.2)	3.7 (1.1)
14. I know what should be included in a CV for a job application	3.7 (1.0)	3.9 (0.9)
15. I know how to improve my CV to find a 'good' job*	3.3 (1.1)	3.7 (1.0)
16. I know how to prepare for an interview	3.1 (1.2)	3.3 (1.1)
17. I feel confident that I can perform well in a job interview	3.2 (1.1)	3.4 (1.1)
18. I feel confident I can present myself well in a job sector I am interested for	3.3 (1.1)	3.5 (1.1)
19. I can give concrete examples of my achievements which would interest employers*	3.3 (1.0)	3.6 (1.0)
20. I can recognise opportunities for personal development	3.7 (0.8)	3.8 (0.9)
21. I have a personal development plan for employability	3.1 (1.2)	3.3 (1.1)
22. I am able to create a self-development plan for employability*	3.3 (1.1)	3.6 (1.0)
23. I have an online career profile (e.g. LinkedIn, Indeed)	2.7 (1.7)	2.9 (1.6)
24. I have contacts with possible employers	2.6 (1.3)	2.9 (1.3)
Total subscale mean*	**3.4 (0.6)**	**3.6 (0.7)**

** p<0.05*

Table 23 presents the results of the descriptive statistics before and after the intervention with the GES-app. The findings showed statistically significant improvement in the total mean of the subscale "preparation for the labour market" as well as in many items therein. The participants who responded to the post-survey rated higher their ability to prepare themselves for the labour market, compared to their responses in pre-survey (t(211)=-2.744, p=.007).

Using the Mann-Whitney test, statistically significant differences in students' higher scores, after the GES-App intervention, were also revealed with regards to the following items in this subscale (see Table 23):

a) I can project/articulate my employability skills (U=4268, z=-2.592, p=.010)

b) I know how to document my employability skills to find a job (U=4050.5, z=-3.038, p=.002)

c) I know how to document my experiences to find a job (U=4467, z=-2.054, p=.040)

d) I keep a record of my employability skills (U=4014, z=-3.084, p=.002)

e) I keep a record of my personal development achievements (U=3896.5, z=-3.391, p=.001)

f) I know how to improve my CV to find a 'good' job (U=4434, z=-2.108, p=.035)

g) I can give concrete examples of my achievements which would interest employers (U=4378, z=-2.275, p=.023)

h) I am able to create a self-development plan for employability (U=4432.5, z=-2.133, p=.033).

6.5. Final Development

Leading from the evaluation, we had to consider the final version of the GES App. Features and general factors were considered of changed as following:

- Coach Selection
  - This was removed from the final app.
  - It was decided that there wasn't enough fluidity in the plan for it, so it was completely removed.
- Activity 4: Networking & Ethics
  - This activity never made development in the app.
  - The activity focused highly on the use of Google Firebase due to the design ideas and nature of it along with development timeline. It would have never been developed in time due to the constraints.
- Activity 2: Dream Job – adding custom dream job
  - The addition of a custom dream job was not added in the final version.
  - This became too complex and due to time constraints, there was no time to work on developing this into the app.
- User Interface
  - Elements of the user interface were improved on a short basis of time. Some colour elements were added, not as much as preferred. Changed were made to some navigation and the operations of certain areas was improved.
- Languages
  - It was intended to have the app translated natively into the partner languages and beyond, but it never fell into plan due to time and development constraints.
- Further Authentication
  - The GES App stuck with using email and password as a way of authenticating users. It was considered to add third-party login services such as Google and Apple but due to the constraints at hand, this wasn't available in the final version.
- Final App
  - The app was decided to be Android platform only due to certain security reasoning with Apple. Due to the nature of this, not all people will have an Android device. It was decided to run a WebGL (Browser) version of the app. Google Firebase had to be stripped from the project for this in consideration for the final version of the GES App and getting it to as many students as possible.

Table 24 represents the key differences between each evaluation stage through the GES-App development process.

Table 24. Outline of the GES-App evaluation stages

Stage 1 (March 2022)	Stage 2 (April 2022)	Stage 3 (May 2022)
Individual Interviews	App Prototyping	Full App Prototype
Participants: 3 individuals from each partner institution (Undergraduate, Postgraduate, Staff Member)	**Participants:** Data collection from control groups prototyping the app and/ or watching video recording of an app walkthrough with the completion of a questionnaire.	**Participants:** Data collection from control groups on prototype demo of the app supported by paper and pencil questionnaires.
Activity 1: Self-Reporting GES	Activity 1: Self-Reporting GES Activity 2: Dream Jobs	All activities except Activity 4: Networking & Ethics

7. Summary and conclusion

Employability appeared as a set of achievements (knowledge, skills, attitudes, understandings, personal values or attributes, etc.) that make graduates more likely to gain employment. A list of skills will not be sufficient to achieve the diverse range of student abilities that higher education need to respond upon effectively. The design and the development of the GES-App was based on existing theoretical models and the systematic literature review concerning employability and graduates employability skills.

The goal of the GES-App was to provide students enhanced opportunities, through employability related activities, to rethink and reflect on the necessary skills, knowledge, understanding and personal attributes with the objective to understand current labour market and prepare themselves to address their job careers. Using a rigorous framework of design and evaluation and harnessing both qualitative and quantitative data collected by students and staff from the partners' institutions, we reached at significant improvements that ensured content quality, acceptability, usability, students' engagement and usefulness of the GES-App.

Finally, the large scale evaluation and the intervention with the final version of the GES-App explored its effectiveness toward supporting students to track, rethink and reflect on employability skills as well as to think about their preparation for the labour market. The findings showed significant changes in students' responses, from before to after the intervention with the GES-App, in two key dimensions: a) understanding the labour market and b) preparing for the labour market. In particular statistically significant improvements in students' rating were recorded in the following variables of employability skills:

- I can identify what employers value most in graduate
- I can locate specific jobs of interest to me
- I know how to find important information about job market for graduates
- I can project/articulate my employability skills
- I know how to document my employability skills to find a job
- I know how to document my experiences to find a job
- I keep a record of my employability skills
- I keep a record of my personal development achievements
- I know how to improve my CV to find a 'good' job
- I can give concrete examples of my achievements which would interest employers
- I am able to create a self-development plan for employability.

Since the students, who participated in the study, had no previous learning experience based on educational apps, further research is necessary to examine more engaging, effective and integrative ways of incorporating employability in the context of higher education. Rather than an alternative to traditional lectures, the GES-App may be regarded not as a substitute but as an additional tool for educating, counselling and supporting graduates about employability.

The GES-App is innovative in terms of the key idea behind and the approach adopted to promote graduates' awareness, thinking and preparation for the labour market. The results of the evaluation provided evidence that the present project envisioned an innovative idea that could be applied in the reality of higher education aiming at students' reflection on employability skills and supporting positive attitudes and their planning for good jobs and employment in the future.

Given the specific context of the partners' institutions, further research, ideally longitudinal in nature, is necessary to explore the effect GES-App to students' and graduates' views as well as to the paths they follow towards developing their employability skills and preparing themselves for their career. Issues of research interest might include exploring the effectiveness of the GES-App in relation to students' factors like, gender, discipline studies, national and/or social factors etc.

References

Abbas, A., Iqbal, M., Boyle, L., Baxter, G., Williams, A., Petersen, S. A., ... & Scott, G. (2022). Graduate employability learning through Self-Determined Learning Model of Instruction (SDLMI) driven digital app. *In INTED2022 Proceedings* (pp. 3934-3943). IATED.

AQF (2019). *Review of the Australian Qualifications Framework*. Canberra: Parliament House.

Arnab, S., Lim, T., Carvalho, M. B., Bellotti, F., de Freitas, S., Louchart, S., et al. (2015). Mapping learning and game mechanics for serious games analysis. *British Journal of Educational Technology*, 46(2), 391-411.

Bennett, D. (2019). Graduate employability and higher education: Past, present and future. *HERDSA Review of Higher Education*, 5, 31-61.

Bennett, D. (2020). *Embedding employABILITY thinking across higher education*. Final Report 2020. Australian Government .

Bennett, D., Knight, E., & Rowley, J. (2020). The role of hybrid learning spaces in enhancing higher education students' employability. *British Journal of Educational Technology*, *51*(4), 1188-1202.

Cohen, L., Manion, L., & Morrison, K. (2018). *Research Methods in Education. (8th Ed.).* Routledge, New York.

CTE (2015). *Employability Skills*. U.S. Department of Education, Office of Career, Technical, and Adult Education, https://cte.ed.gov/initiatives/employability-skills-framework

Dam, R. F., & Siang, T. Y. (2020). *Design thinking: A quick overview*.

de Freitas, S., & Oliver, M. (2006). How can exploratory learning with games and simulations within the curriculum be most effectively evaluated?. *Computers and Education*, 46(3), 249-264.

Dimitriadis, Y., & Goodyear, P. (2013). Forward-oriented design for learning: Illustrating the approach. *Research in Learning Technology*, 21, Art. 20290, http://dx.doi.org/10.3402/rlt.v21i0.20290

Du, X. (2020, October). Embedding LinkedIn Learning MOOCs to Enhance Students' Educational Experience and Employability. In *European Conference on e-Learning* (pp. 163-172). Academic Conferences International Limited.

European Commission (2014). *Report to the European Commission on new modes of learning and teaching in higher education*. Luxembourg: Publications Office of the European Union.

Florida Chamber Foundation (2019). *Employability Skills Framework: Defining and Integrating Employability Skills*. Florida: Florida Chamber Foundation.

Goodyear, P. (2004). Educational design and networked learning: Patterns, pattern languages and design practice. *Australasian Journal of Educational Technology*, 21(1), 82-101.

Hasso-Plattner Institute (2022). Design thinking. Stanford, https://hpi.de/en/school-of-design-thinking/design-thinking.html

Hirsh-Pasek, K., Zosh, J. M., Golinkoff, R. M., Gray, J. H., Robb, M. B., & Kaufman, J. (2015). Putting education in "educational" apps: Lessons from the science of learning. *Psychological Science in the Public Interest*, 16(1), 3-34.

Hora, M. T., Benbow, R.J., & Smolarek, B. B. (2018). Re-thinking soft skills and student employability: A new paradigm for undergraduate education. Change: *The Magazine of Higher Learning*, 50(6), 30-37.

Lee, J. S., & Kim, S. W. (2015). Validation of a tool evaluating educational apps for smart education. *Journal of Educational Computing Research*, 52(3), 435-450.

Lee, J., & Jang, S. (2014). A methodological framework for instructional design model development: Critical dimensions and synthesized procedures. *Educational Technology Research and Development*, 62(6), 743-765.

Mayes, T., & de Freitas, S. (2004). *Review of E-Learning Theories, Frameworks and Models*. London: Joint Information Systems Committee.

Mishra, S. (2002). A design framework for online learning environments. *British Journal of Educational Technology*, 33(4), 493-496.

NACE (2017). *The Key Attributes Employers Seek on Students' Resumes*. National Association of Colleges and Employers Retrieved June 21st 2020, from https://www.naceweb.org/about-us/press/2017/the-key-attributes-employers-seek-on-students-resumes

NOC (2013). *The Skills and Competencies Taxonomy*. National Occupational Classification, Government of Canada.

OECD (2019). *OECD Employment Outlook 2019: The Future of Work*. OECD Publishing, Paris.

Pordelan, N., & Hosseinian, S. (2022). Design and development of the online career counselling: a tool for better career decision-making. *Behaviour & Information Technology*, 41(1), 118-138.

Sampson, J. P., & Osborn, D. S. (2015). Using information and communication technology in delivering career interventions. In P. J. Hartung, M. L. Savickas, & W. B. Walsh (Eds.), *APA handbook of career interventions* (Vol. 2, pp. 57–70). Washington, DC: American Psychological Association.

Yorke, M., & Knight, P. (2006). *Embedding employability into the curriculum. Learning and employability series 1.* York: Higher Education Academy.

Appendix A. Research Informed Consent

Title of Project: GES-App Evaluation stage 3 Ethics Approval Number: 17943

Principal investigators
Dr. Graham Scott Researcher Email: graham.scott@uws.ac.uk
Prof. Athanassios Jimoyiannis Researcher Email: ajimoyia@uop.gr

Please read the following statements and, if you agree, initial the corresponding box to confirm agreement:

I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	
I understand that my participation is voluntary and that I am free to withdraw at any point of the questionnaire without giving any reason.	
I understand that my data will be treated confidentially and any publication resulting from this work will report only data that does not identify me.	
I freely agree to participate in this study.	

Participant Information Sheet

You are being invited to take part in a research study. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Please ask me if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

What is the purpose of this study?
The purpose of this study is to assess your opinion of the prototype of the GES-App we are developing in order to try to improve it.

Why have I been chosen?
You have been chosen to take part in this study because you are a student at a university.

Do I have to take part?
No. It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time until the end of the questionnaire without giving a reason.

What will happen to me if I take part?
You will be asked to interact with a prototype of an app which is currently in development which will allow students to track and record their employability skills throughout their university journey. You will then be asked to fill in an online questionnaire asking you about your experience which consist of around 50 questions and will take around 10 minutes to complete.

What are the possible disadvantages and risks of taking part?
There are no obvious disadvantages.

What are the possible benefits of taking part?
You may learn more about graduate employability skills.

Data Protection Privacy Notice
The data controller for this project will be University of the West of Scotland (UWS). The UWS Data Protection Office provides oversight of UWS activities involving the processing of personal data, and can be contacted at dataprotection@uws.ac.uk. UWS's Data Protection Officer is Emma Cockrow and she can also be contacted at dataprotection@uws.ac.uk.

Your personal data will be processed for the purposes outlined in this notice. The legal basis that would be used to process your personal data will be the provision of your consent.

Your personal data will be processed so long as it is required for the research project. If we are able to anonymise or pseudonymise the personal data you provide we will undertake this, and will endeavour to minimise the processing of personal data wherever possible. Or we will anonymise or pseudonymise the personal data you provide by a fortnight after data collection.

If you are concerned about how your personal data is being processed, please contact UWS in the first instance at dataprotection@uws.ac.uk. If you remain unsatisfied, you may wish to contact the Information Commissioner's Office (ICO). Contact details, and details of data subject rights, are available on the ICO website at: https://ico.org.uk/for-organisations/data-protection-reform/overview-of-the-gdpr/individuals-rights/

What will happen to the results of the research study?
The results of the study will be used to improve the prototype of the App, and may also be published as part of a conference paper or research article.

Who has reviewed the study?
ESS Ethics Committee – Approval Number: 2022-17943

Contact for further information
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Thank you for taking part in this study

Appendix B. Semi-structured interview guide of the early piloting (Phase 1)

Section 1: Participant demographic information

Participant (staff/student)
Gender
Age Group
University/Institution
Subject of studies
Job experience
Familiarity with computers
Level of proficiency regarding digital skills
Familiarity with social media
Awareness about employability
Any other personal information related

Section 2: GES App Mechanics factors

2.1. Can you shortly describe your experience of using the GES App?

Prompt: *To what extend this App was interesting-challenging for you?*

2.2. App interface, design layout

To what extent are you happy with the GES App interface and layout?

Prompts

For example, graphics, text form, navigation, user interactions etc.
Can you give any comment or suggestion that could improve user interface and user control, layout, interactions-feedback etc.?

2.3. Usability

2.3.1. To what extent the GES App was easy to use?

Prompts

Was it easy for you to understand the scenarios and the rules of the GES App?

2.3.2. The GES App tools were effective?

Prompts

Adding and projecting skills, projects, experiences, references, artefacts.
Operating the GES App was clear? Were any frustrating parts in the App?
Can you provide any comment or suggestion that could improve the usability of the GES App?

2.4. Learnability-easiness to use

2.4.1. To what extent the GES App was for you easy to understand and use?

Prompts

To what extent the GES App has clear objectives (reason behind the actions)?
Did you feel that you keep control from the first time you were using the GES App?

2.4.2. Does GES App include immediate feedback? To what extent the feedback available was sufficient to you

2.5. Engagement

2.5.1 To what extent the features of the GES App affected your motivation/encouraged you to use the App?

Prompts

To what extent did you feel of having control of the App, the tools included etc.

2.5.2. To what extent the GES App reinforced you to engage with your employability skills and achievements?

2.6. Overall, what features of the App were appealing to you? Give any idea or suggestion that could make the GES App more engaging and easy to use.

Section 3: App Content and Flow

3.1.1. Do you think that the GES App provides useful and sufficient information about employability issues? Can you give any good example or issue missing?
3.1.2. To what extent the GES App topics/activities were interesting and meaningful to you? What topics are important for you?
3.1.3. To what extent the GES App did reinforced your motivation to be engaged and upload information/project your employability skills.
3.1.4. Your cognitive effort during the App activities was reasonable? Did you feel overloaded by some aspects of the App?
3.2. Provide any idea and suggestion for improving the App content and activities.

Section 4: Outcomes of the GES App

4.1.1. To what extent do you think that the GES App promoted your reflection and self-awareness about employability?
4.1.2. Did the GES App help you to rethink about employability skills and see some of them differently?
Prompt: *Can you give any example?*
4.1.3. After using the GES App, do you think that you improved your knowledge or changed your thinking about employability skills?
Prompt: *Give any example of changing your view on an issue related to employability (e.g., in terms of knowledge, attitudes, values)?*

4.2. Overall, do you think that the GES App was helpful toward self-development of employability skills?
Prompt: *Can you give any specific examples?*
4.3. According to your perspective, what is the most interesting part of the GES App?
4.4. According to your perspective, what are the strongest and the weakest parts of the GES App?
4.5. Overall, provide any idea or suggestion that could improve the GES App.

Appendix C. Questionnaire of the rigorous piloting (Phase 2)

Section 1: Participant demographic information

1.1 Gender

Male, Female, Prefer not to say

1.2. Age Group

under 20, 21-25, 26-30, over 30

University/Institution

UWS, UoP, NTNU, UKSW

Nationality

British, Scottish, Greek, Norwegian, Polish

Other, please specify _____.

Level of studies

Bachelor, Master

Subject of studies

Humanities, Social sciences, Business, Computer science, Science, Engineering

Other, please specify _____.

Job experience

Full time, part time, unemployed

Familiarity with computers

Digital skills/competence (5 levels: Novice – advanced beginner – competent – proficient – expert)

Familiarity with social media

FB, Instagram, LinkedIn

(4 levels: Novice – advanced beginner – competent – proficient)

Section 2: GES-App usability scale

The statements below represent your possible opinions about various features of the EGS App.
Please consider each statement in turn and rate these 1 to 5, where:

1 means "I really disagree with this statement"
2 means "I disagree with this statement"
3 means "I neither agree nor disagree with this statement"
4 means "I agree with this statement"
5 means "I really agree with this statement"

Part 1

The Home screen of the GES-App was engaging
I found the graphics of the GES-App relevant (appropriate)
I found the graphics of the GES-App attractive
I found the layout of the GES-App engaging
Overall, I found the GES-App challenging
It was clear to me what the aim of the GES-App was.
I can rapidly start using the GES-App
It was easy to find what to do with GES-App without any training
It was easy to understand how to navigate across the GES-App
I knew what to do next in the GES-App
The metaphors used in the GES-App interface were quite clear/straightforward
The structure of the GES-App was difficult to understand.

Part 2

I think that GES-App is easy to use
I could easily carry out the necessary actions in the GES-App
I felt to have enough control when using the GES-App
I felt very confident using the GES-App
I found the GES-App tools engaging
It was easy to decide about my choices (interaction) in the GES-App
It was easy to add new skills in the GES-App
I liked the feedback about my choices provided by the GES-App
I needed more feedback from the GES-App
Overall, I found the GES-App engaging
I found GES-App unnecessarily complex
I found the various functions in the GES-App well integrated
I found no inconsistency in the GES-App
I found the GES-App boring
I found the GES-App enjoyable
As a student I think that GES-App is an interesting app to use
I would recommend the GES-App to others (fellows, students)

Part 3

The organization of the App content was attractive to me
I found the organization of the App content too simplistic.
I found the GES-App content meaningful to me
I liked that GES-App addresses students to connect their skills, projects, artefacts, experiences and references
I think that the GES-App is suitable to be used in university courses about employability
Overall, I found the GES-App very important to me
The GES-App motivated me to organise my achievements in a concrete manner
The GES-App helped me to document my employability skills
I was able to rethink about my employability skills after using the GES-App
I was reflecting on my experiences related to employability skills after using the GES-App
The GES-App helped me to recall EGS skills that I need to develop (pay more attention) in the future
The GES-App helped me to understand important issues about finding a job
The GES-App helped me to understand critical aspects regarding employability skills
I found out my weak points to find a job while using the GES-App
I found out my strong points to find a job while using the GES-App
After using the GES-App I felt more confident to prepare my CV
After using the GES-App I felt more prepared for an interview to take a job

Part 4

Provide freely your ideas and thoughts in English or in your national language.

1. Overall, what do you think is the added value of the GES-App towards students' preparation to find a 'good job'?
2. What did you like about the GES-App? What are the most interesting or outstanding aspects of the GES-App?
3. What did you not like about the GES-App? What are the weakest parts of the GES-App?
4. Do you prefer to use the Web-Mobile version of the GES-App, the PC one or both?
5. Provide any comment, idea or suggestion that could improve the GES-App.

Thank you very much for taking part!

Appendix D. Graduates Employability Scale (Phase 3)

Section 1: Demographic information

Gender

Male, Female, Prefer not to say

Age (Enter you age)

University/Institution

UWS, UoP, NTNU, UKSW

Nationality

British, Scottish, Greek, Norwegian, Polish

Other, please specify _____.

Level of studies

Bachelor, Master

Subject of studies

Humanities, Social sciences, Business, Computer science, Science, Engineering

Other, please specify _____.

Job experience

Full time, part time, unemployed

Familiarity with computers

Digital skills/competence (5 levels: Novice – advanced beginner – competent – proficient – expert)

Familiarity with social media

FB, Instagram, LinkedIn (4 levels: Novice – advanced beginner – competent – proficient)

Section 2: GES Scale

The statements below represent your possible opinions about various employability issues concerning graduates. Please consider each statement in turn and rate these 1 to 5, where:

1 means "I strongly disagree with this statement"
2 means "I disagree with this statement"
3 means "I neither agree nor disagree with this statement"
4 means "I agree with this statement"
5 means "I strongly agree with this statement"

2.1. University studies and employability (knowledge, skills, abilities)

1. I feel my university studies helped me to develop the skills needed to get employment
2. I believe that my degree will improve my career prospects
3. I believe that I can get a job in my field when I graduate
4. My degree is generally perceived as leading to a 'good' job
5. I know that my subject knowledge will be valued by employers
6. I am able to use my skills in future employment
7. I think that my university studies helped me to develop critical thinking skills
8. I think that my university studies helped me to develop collaboration/team working skills
9. I think that my university studies helped me to develop self-management skills
10. I am able to accomplish tasks/solve problems beyond my discipline
11. I am able to deal with unknown challenges within a given context
12. I feel comfortable in ambiguous/changing situations
13. I know how to learn new things
14. I am able to evaluate my own progress.

2.2. Understanding the labour market

15. I know what skills and abilities are important for employment
16. I know what attitudes and values are important for employment
17. I know what skills I need to improve to get a job relevant to my studies
18. I know what skills, attributes and behaviours are required for different types of employment
19. I can identify distinctive achievements that make me stand out for a job position
20. I think that I have sufficient knowledge of the labour market
21. I know how to improve my knowledge about employability
22. I think that I have the skills that most employers are looking for
23. I feel confident in job-seeking
24. I know a range of sources to find job opportunities
25. I can identify what employers value most in graduates
26. I can locate specific jobs of interest to me
27. I know how to find important information about job market for graduates
28. I am open to change my thinking about employability skills

2.3. Preparing for the labour market

29. I have a clear career plan
30. I know what is important to me in my career
31. I can project/articulate my employability skills
32. I can project my experiences that are of value to find a job
33. I know how to document my employability skills to find a job
34. I know how to document my experiences to find a job
35. I know my strengths for an employment position
36. I can identify my weaknesses for an employment position
37. I am able to understand my needs/areas of skills' developmental
38. I am optimistic about gaining a 'good' job
39. I am able to judge whether a specific job is suitable to me
40. I keep a record of my employability skills
41. I keep a record of my personal development achievements
42. I know what should be included in a CV for a job application
43. I know how to improve my CV to find a 'good' job
44. I know how to prepare for an interview
45. I feel confident that I can perform well in a job interview
46. I feel confident I can present myself well in a job sector I am interested for
47. I can give concrete examples of my achievements which would interest employers
48. I can recognise opportunities for personal development
49. I have a personal development plan for employability
50. I am able to create a self-development plan for employability
51. I have an online career profile (e.g. LinkedIn, Indeed)
52. I have contacts with possible employers