FindMyself: A Mobile Self-Reflection App to Support Students in Career Decision-Making

Sarah Aragon-Hahner
sarah.aragon-hahner@ifi.lmu.de
LMU Munich
Munich, Germany

Jonas Körber
JonasKoerber@t-online.de
LMU Munich
Munich, Germany

Mario Schneller
mario_schneller@yahoo.com
LMU Munich
Munich, Germany

Sven Strickroth
sven.strickroth@ifi.lmu.de
LMU Munich
Munich, Germany

ABSTRACT

Career choice is a life-changing decision for young adults. Online career guidance systems facilitate information access and provide recommendations for career paths. However, they bear the risk of imposed decisions, as they often neglect the non-cognitive processes of career decision-making. Mobile apps are promising for supporting career choices, since smartphones are a constant companion of adolescents. Following a user-centered design process, we developed "FindMyself", a mobile app helping users discover their personal strengths and interests. FindMyself includes multiple sessions, prompting users with short challenges and reflection tasks building a personal profile. Our approach leaves time for self-reflection and discussion with peers. In a field study ($N = 46$), we found that FindMyself was perceived as easy, flexible, and fun to use, and was able to support self-reflection. For future iterations, some users requested specific career recommendations. We discuss these results and derive implications for further research on career decision support tools.

CCS CONCEPTS

• **Information systems** → *Decision support systems*; • **Human-centered computing** → *Smartphones*; *User studies*.

KEYWORDS

self-reflection, self-awareness, self-reflection support system, decision support system, mobile application, career decision-making, study program choice

ACM Reference Format:
Sarah Aragon-Hahner, Jonas Körber, Mario Schneller, and Sven Strickroth. 2023. FindMyself: A Mobile Self-Reflection App to Support Students in Career Decision-Making. In *International Conference on Mobile and Ubiquitous Multimedia (MUM '23), December 03–06, 2023, Vienna, Austria.* ACM, New York, NY, USA, 14 pages. https://doi.org/10.1145/3626705.3627774

MUM '23, December 03–06, 2023, Vienna, Austria

ACM ISBN 979-8-4007-0921-0/23/12…$15.00
https://doi.org/10.1145/3626705.3627774

1 INTRODUCTION

Choosing a career path is one of the most important yet complex decisions for young adults. High school students often face problems choosing a career among the plethora of options offered by today's job market [3]. Related difficulties range from lack of information on available career options or on the individual's personal abilities and interests to lack of readiness or missing knowledge on how to approach the career choice process [22]. Due to uninformed choices, the final decision often contradicts the preferences and expectations of young people, which is one reason for university drop-outs (e. g., see [30, 58]).

The Internet offers ubiquitous access to career information. This leads to a growing number of online career guidance tools that aim to assist people in making better career decisions [22, 61]. The majority of these tools are web-platforms designed for desktop use, while mobile apps are still rather unexplored. Since smartphones have become an everyday companion for most adolescents [31] – one of the main groups facing career choice – they hold great potential for mobile career guidance apps. In this paper, we explore this potential, following a user-centered design process.

We conducted a high-school workshop with senior students discussing the challenges of career decision-making and developing concept sketches for mobile apps to overcome related problems. As indicated by research on career decision-making difficulties [22], students identified the lack of awareness of their own strengths and interests as one major problem. As a solution, the "FindMyself" app concept arose from the workshop, which forms the basis of this work. The goal of the app is to improve the users' self-awareness by asking reflective questions and proposing "challenges" to find out their strengths and interests. Following the concept of microtasking, our app accompanies students over several days and leaves time for self-reflection between sessions. In contrast to common aptitude tests, the system does not give users specific career recommendations but is designed to help them make informed decisions on their own.

Our first contribution is the conception of "FindMyself", a mobile self-reflection app for career decision support. We are not aware of any comparable interactive smartphone apps or web-based platforms specifically designed to support self-reflection in this domain. The concept was developed following a user-centered design process involving high-school students ($N = 6$) and Human-Computer Interaction (HCI) experts ($N = 6$) and is complemented by related

literature. Our second contribution is the evaluation of the app concept in a field study with $N = 46$ participants. The study addresses the following research questions:

- RQ1: What are the benefits and drawbacks of a mobile app for career decision support?
- RQ2: How can designers stimulate self-reflection with the help of a mobile app?
- RQ3: How do users perceive the influence of self-reflection techniques on their career decision-making process?

2 RELATED WORK

In this section, we discuss the career choice process and related difficulties. We then present technological approaches to support career decision-making and motivate our decision to develop a mobile app. We highlight the potential of microtasking and self-reflection support systems for the design of career guidance apps.

2.1 Challenges in the Career Choice Process

In a recent literature review, Gati and Kulcsár [22] provide valuable insights in the career decision-making process, discuss related problems and present emerging challenges of the 21st century.

Research applying general decision-making models to the vocational domain suggests that the career choice process can be divided into several sequential stages [22]. In 2001, Gati et al. [20] have introduced the "PIC model" defining three core stages of career decision making: In the *Prescreening* stage, the individual needs to identify a set of promising alternatives matching their interests. This selection is further explored and refined in the *In-depth exploration* phase. In this stage, it is important for the individual to verify that the promising alternatives are compatible with their preferences, abilities, and personality. Finally, in the *Choice* phase, people need to select one of the alternatives. Gati and Kulcsár argue that the majority of career decision-making models can be classified into this three-stage scheme [22].

The authors emphasize that career decision-making is complex and highly individual [22]. Various difficulties can hinder the process, stop it before a proper decision is made, or lead to hasty, uninformed decisions [39]. The main problems that can occur include lack of readiness, lack of information (about oneself or about different professions), lack of knowledge about how to approach career decisions, anxiety, internal or external conflicts, and lack of resources [22]. In addition, the challenges of today's job market, e. g., the increasing number of vocational options and the need for more frequent workplace transitions, call for dynamic solutions to provide guidance throughout the subsequent steps of the career choice process.

In order to support students in the prescreening and in-depth exploration stages, our app aims to improve individuals' self-awareness by stimulating reflection on their strengths and interests. We thereby address the problem of lack of information about the self.

2.2 Technology to Support Career Choices

HCI research provides several approaches to overcome the difficulties described in the previous section. The approach of using technology to support career decisions dates back to the late 1960's [28]. Nowadays, the Internet offers the possibility of accessing information anywhere and at any time. It has therefore created new opportunities to expand the range of technologies supporting career choices [22, 50, 61]. Early approaches of Internet-based career guidance systems directly transferred established pen-and-paper tests to a digital form [36] or designed career development interventions [29]. More recent examples explore the potential of online career mentoring [59], implement chatbots for career counseling [41, 57], use AI for career planning [25], or provide educational guidance through IoT systems [19]. Due to their content-heavy nature, most current systems are optimized for desktop use.

The ubiquity of smartphones lends itself to an examination of mobile applications for career counseling [22, 28]. For young people in particular, the smartphone has become a daily companion that is an integral part of their lives [51]. To date, there are only a few research approaches to mobile apps for vocational decision support. Shipepe and Peters developed a mobile career guidance game for Namibian high school students [55]. Aragon Bartsch et al. provide insights on a professional's work routine through scheduled mobile chat-messages [2]. While mobile apps offer great potential to support decision making as an ongoing process, they also bring some challenges, such as limited screen size or the short-term nature of smartphone interaction [2, 22]. Gati and Kulcsár emphasize that current approaches to career decision support need to be adapted in terms of length and complexity to avoid information overload [22]. They suggest providing brief and interactive feedback to the decision maker to account for the limited attention span of smartphone users. However, they do not provide concrete examples of how these goals can be implemented in practice. In this work, we develop and evaluate a mobile app, addressing the above challenges by applying the concept of microtasking, which is explained next.

2.3 Microtasking for Mobile Career Guidance Apps

"Microtasking" or "chunking" refers to the concept of breaking down complex issues or tasks into multiple, shorter units, to help people solve them one piece at a time [12]. This reduces task complexity and potentially leads to better results [12]. It also addresses the problem of limited screen size on mobile devices [1] and makes task completion more resilient to interruptions [12, 42, 48]. Originally developed for crowdsourcing systems (e. g., [40, 62]), microtasking is today applied in various fields, such as microproductivity, mobile learning, or personal informatics (PI). Microproductivity apps are designed to help users work on the go and use their time productively by dividing up complex tasks, such as writing and editing documents [4, 27, 33] or programming [63]. When applied in the learning domain, this approach is called "microlearning" [34, 45]. In microlearning apps, the learning units are presented to the learner in an appropriate size so that they can be processed more easily [45]. Chunking has proven particularly useful for mobile language learning, as vocabulary training can be reduced to single items, facilitating use on the go [16, 17, 54]. PI systems help people collect and review personal data to improve self-awareness [37]. The data-driven insights are intended to help users change unhealthy behavior patterns. Jimenez Garcia et al. introduce the concept of "micro-cycles of self-reflection" to provide brief but engaging interactions with

the collected data [35]. This can lead to a better understanding of complicated issues and ultimately to more informed decisions. In the domain of career decision support, Aragon Bartsch et al. apply the concept of microtasking to present users short chat-messages about a professional's work routine to provide them with realistic insights on different occupations [2].

In summary, microtasking provides the ability to break down complex tasks and processes into smaller units that better fit the limited attention span caused by today's fast-paced world [12, 22] and allows for flexible use on the go. In our app, chunking is applied by gathering information on the user through small sets of reflective questions or short challenges (see Section 3.1.3).

2.4 Self-Reflection Support Systems for Decision-Making

There is a plethora of non-profit and commercial websites offering aptitude tests for career guidance, e. g., *JobQuiz*[1], *CareerExplorer*[2], *Check-U*[3] . These tests often provide users with suggestions for suitable career paths. There are also some scientific approaches proposing recommender systems to facilitate career decision-making [52, 64]. The problem of such systems is that the recommendations are mostly based on the assessment of objective, measurable criteria, such as school grades, previous knowledge, or personality tests. However, research suggests that non-cognitive, unconscious processes also play an important role in career decision-making [23, 38]. In fact, individuals may have the right "gut feeling" about which alternative to choose, which may not always coincide with the outcome of a systematic process [22]. To avoid imposed decisions, novel career guidance tools should focus more on actively supporting users during the career choice process, e. g., by asking the "right" questions, rather than taking the decision away from them [22]. In contrast to recommender systems, self-reflection support systems offer the opportunity to help users increase their self-awareness, which can ultimately lead to better decisions [35].

A recent systematic literature review by Bentvelzen et al. [8], which builds on an earlier survey paper by Baumer et al. [6], underlines that designing for self-reflection is an emerging topic in HCI research. Common reflection support systems are often found in the application areas of microtasking, as this approach is well-suited to allow time for self-reflection between sessions. They are applied in the learning domain, e. g., in self-regulated learning [11, 43, 44] or reflective learning [53], as well as in PI systems, e. g., on food intake [56], sleep [13], or physical activity [24]. They are also implemented in other domains, such as decision making in business environments [26] or sustainability [32]. To date, there are only a few recent publications on supporting self-reflection in the area of career choice: In their work with underrepresented job-seekers, Dillahunt et al. [15] discuss the potential of tools that incorporate positive feedback and self-reflection. Aragon Bartsch et al. [2] aim to stimulate self-reflection by providing realistic job insights.

Bentvelzen et al. [8] identified four key aspects that describe how support for reflection is implemented in state of the art systems: (1) Offer users a new point of view through a *temporal perspective*, e. g., by reflecting on the past or the future, (2) include *conversations* with others or with technology to add a social dimension, (3) let users *compare* their current status to an ideal (absolute reference) or to others (social reference). (4) Help users *discover* something new or change their perspective on something known.

In this work, we consider all four factors when specifying the content of the FindMyself app (see Section 3.2): (1) we prompt users with reflective questions on their past experiences and speculations on the future, (2) include a social challenge, (3) let users compare themselves to a fictional character and their peers, and (4) help them discover their strengths and interests. We deliberately refrain from making recommendations in order to investigate how an app designed solely to support self-reflection is received by users. Our app thus represents a novel approach and differs from common technical solutions for career decision support.

3 CONCEPT DEVELOPMENT

The "*FindMyself*" app concept was developed and refined in an iterative design process. First, we conducted a workshop with upper-grade high school students ($N = 6$). The workshop aimed to evaluate difficulties in career decision-making and tackle these problems by creating app ideas. Based on the student workshop and related work, we came up with an app concept that was refined in an expert focus group with HCI research associates ($N = 6$). Both pre-studies contributed to the final concept of the "FindMyself" app.

3.1 High School Workshop

We conducted a 90-minute workshop in cooperation with a secondary school in Bavaria, Germany. Via personal contact, we were able to recruit six eleventh-grade students from a media design elective class (all female, aged between 16 and 17). Participation in the workshop was completely voluntary and the students did not face any disadvantage if they chose not to join. The final six participants were enthusiastic about technology and showed interest in designing new ideas.

3.1.1 Procedure. A few days before the workshop, we provided the students with an information sheet, our privacy policy as well as a consent form. The form had to be signed by the participants and their parents or guardian. The consent form included an agreement to be audio-recorded and photographed during participation.

The workshop consisted of two parts – a brainstorming and a paper prototyping session. At the beginning of the workshop, we again explained the project and the purpose of the workshop. We then gave a short introduction to the professional field of user experience design to make a connection from the topic of career decision-making to the methods applied in the workshop. We then asked the students whether they had already started to think about their professional careers after school and how far in the decision process they were.

We started the first part of the workshop with a problem interview according to the user-centered design process as described by Maurya [46]. We then asked the participants to perform rankings on three factors: (1) career decision-making criteria, (2) sources of information used for career orientation, and (3) topics they need additional information on to make an informed career decision. We prepared a list for each factor based on literature and an online

[1]JobQuiz, https://www.jobquiz.com, last accessed 2023–10–25
[2]CareerExplorer, https://www.careerexplorer.com, last accessed 2023–10–25
[3]Check-U, http://www.check-u.de, last accessed 2023–10–25

search, and the students had the possibility to add their own answers to the lists. For each ranking, the students should distribute nine voting points among their most relevant options.

In the second part of the workshop, we asked the students to develop app concepts to support career decision-making. We showed them modern app designs and gave them a brief introduction to paper prototyping and wireframing. We handed out preprints for smartphone app sketches as well as example storyboards and wireframes. Based on the issues previously determined by the problem interview and rankings, students collaboratively discussed potential solutions in teams of two. Then they created sketches of their own mobile app design. To conclude the workshop, each team gave a short presentation on their idea.

3.1.2 Interview and Ranking Results. When asked whether the students had already started to inform themselves about the possibilities of their future career, all six participants agreed. However, none of the participants felt certain about what they wanted to do after school. Also, half of the students had already used an online tool for career orientation, but without satisfactory results.

The evaluation of the problem interview revealed the following difficulties that participants reported facing in their career decision-making process:

- The large number of different possibilities (10 votes)
- Uncertainty about one's own interests (9 votes)
- Lack of insight into the future profession (7 votes)
- No overview of all possibilities (5 votes)
- Fear of making the wrong decision (3 votes)
- No insight into the training contents (2 votes)

The ranking of career decision-making criteria showed that the participants' profession should underline their personal aptitude (10 votes). The students also aim for jobs that offer good chances for personal development (8 votes), have excellent employment opportunities (7 votes), and match their interests (6 votes). Contact with other people (6 votes) and the prospect of high income (5 votes) were also important, followed by the ability to help others (4 votes) and occupational reputation (3 votes). The advice of others (parents and acquaintances (2 votes), professional advisors (2 votes), or friends (1 vote)) was also of interest for part of the participants.

The discussion about the sources of information they would like to use for career orientation emphasized that the media (such as the Internet, apps, television, and specialist literature) (13 votes) and practice-oriented sources (internships, authorities, and companies) (13 votes) are of utter importance. The personal environment of the students (like parents, friends, and teachers) (8 votes) and professional information services (8 votes) also play a role in the acquisition of information. Higher education information sources (such as information materials, university information days or university rankings) got less votes (4 votes).

In the third ranking, students had to indicate in which areas they needed additional information to be able to make a better decision. The responses revealed the following top criteria: overview of all study/professional opportunities (11 votes), clarity about own abilities/strengths (7 votes), finding their own interests (7 votes), and information on study/training contents (5 votes).

3.1.3 App Concept Sketches. Based on the interview and ranking results, the students identified potential app features and clustered them into different concept ideas. Groups of two then created sketches of their app concept. The first app idea, "CareerBuddy," represents a tandem program connecting two peers who share the same interests in order to exchange experiences. The concept includes a specification of the users' interests, a chat function and an overview of internships that can be reviewed with the help of the "career buddy". The second concept, "JobTinder," is modeled after the popular dating app with the goal of matching people with suitable career paths. Users can review different career options based on short videos and job profile pages and browse the data using swipe gestures. By deselecting careers, the various professions can be narrowed down to represent the user's interests. The third app idea served as a basis for the final "FindMyself" prototype. Figure 1 shows the app concept: Users can complete daily/weekly challenges (Figure 1a), helping them to increase their self-awareness, e. g., by finding their own interests (Figure 1b). Moreover, regular recaps are implemented to help users reflect on their progress (Figure 1c).

After presenting and discussing the three app ideas in an advanced seminar of our HCI Master's program, we identified the "FindMyself" concept as most promising for further development. A search of related work showed that self-reflection support tools are promising but have not been sufficiently explored in the context of career decisions. In addition, the concept allows for a flexible usage period, and the content can be modeled without the dependency on external sources (e. g., internship providers).

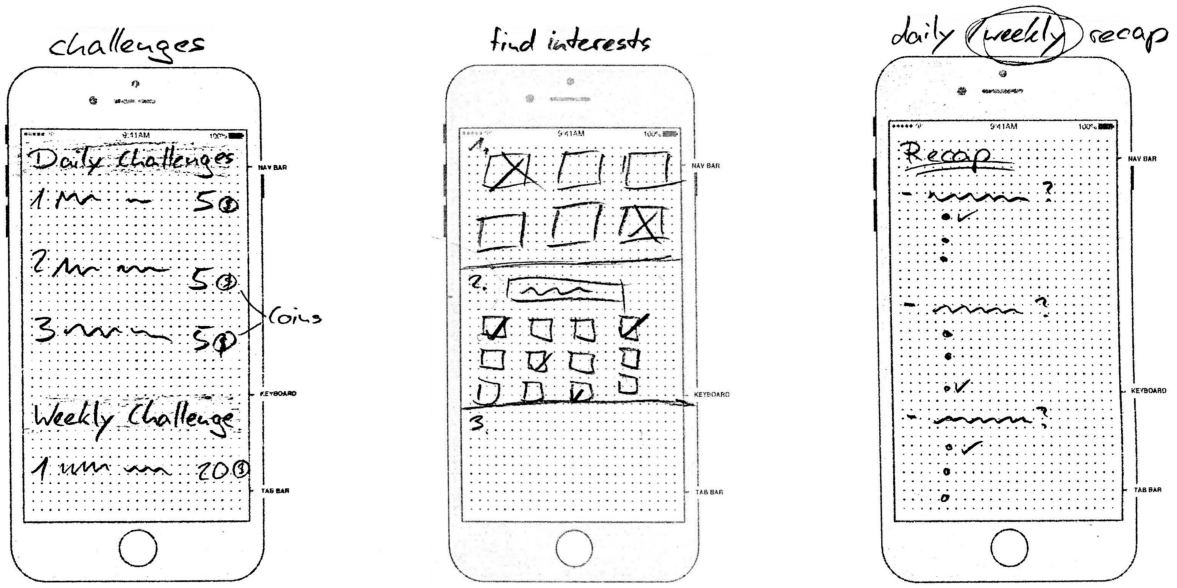
3.1.4 Implications for the Concept Development. The student workshop confirmed our choice of developing a mobile app for career guidance: The media, especially the Internet and apps, were rated as one of the most desirable sources of career information. Moreover, all participants showed motivation to actively participate in the workshop and develop app ideas.

We found that the highest-rated criteria for career decision-making were a combination of personal prerequisites (e. g., aptitude or interests), external criteria (e. g., employment opportunities or high income), and advice from others (e. g., parents or career counselors). However, we identified uncertainty about one's interests as one of the major problems in young people's career choices. When asked in what areas they needed more information, participants again named clarity about their own skills and interests as the most important factor.

We selected the app concept presented in Section 3.1.3 for further development, since the "challenges" can be designed in a way that users are prompted to reflect on their strengths and interests. In addition, the concept offers the possibility to incorporate peer feedback and external factors. Moreover, through the challenges, the app's content is split into multiple sessions and therefore leaves time for self-reflection and facilitates flexible use on a mobile device. The "recap" thereby serves as a summary of the acquired contents and can potentially provide additional impulses for reflection.

3.2 Focus Group with HCI Research Associates

To refine the app concept presented in Section 3.1.3 through expert feedback, we conducted a focus group with HCI researchers ($N = 6$). The goal of the session was to discuss the results of the high school



(a) (b) (c)

Figure 1: Concept sketch developed in the student workshop: (a) challenges, (b) find interests, (c) recap

workshop, set the scope for a first prototype, and develop concrete content ideas. All six participants were doctoral students in the field of HCI with a research focus on app design, technology for self-reflection and/or data visualization.

3.2.1 General App Structure. To kick off the focus group, we gave a short presentation of the results from the high school workshop. We then discussed the general structure of the app. The experts considered the concept to be promising and saw potential in evaluating a novel app that promotes self-reflection on career decisions. Since too extensive reflection tasks may lead to stress, the group came to terms with a lower frequency and smaller scope of user tasks. They specified a total of **six tasks** for the implementation of an app prototype: **three critical questioning rounds** and **three short challenges**. The group decided for **bi-daily tasks** to leave enough time for reflection and task completion.

3.2.2 Self-Reflection Provoking Questions. In preparation for the workshop, we retrieved examples of self-reflection-inducing questions from the literature, e. g., Dunlap's work on reflective journaling [18], and well-established commercial tools such as the Purpose Project[4], the German Federal Employment Agency[5], or the Question Diary app[6]. The resulting list was presented to the participants, who added more ideas in a brainstorming session. The group then sorted the items by relevance to determine a final set of questions for our prototype. The following list shows an overview of the 20 top questions after sorting and revising 32 ideas. To avoid overloading users and given the limited scope of a first prototype, the authors selected a subset of these items (highlighted in bold).

(1) What activity can you spend the most time with at a stretch?
(2) What difficult situation are you especially proud of mastering last year?
(3) **What would you like to do if time and money were unlimited?**
(4) What is the most interesting thing you read last week?
(5) **If you were a person from a popular TV series, who would you be? Why?**
(6) What three things are you grateful for?
(7) **What was your best subject in school last year? Why?**
(8) **Which job would not fit you? Why not?**
(9) What did you (not) enjoy doing last week?
(10) **Which task is fun for you that others do not like?**
(11) What did you want to be when you were little?
(12) **What was the best advice you ever got or gave?**
(13) What is your favorite hobby and why do you like it?
(14) What skills did you gain outside of school? Do you think you can apply them in your professional career?
(15) What is something that your friends appreciate about you?
(16) **If you had a superpower, what would it be?**
(17) **What do you think is your best character trait?**
(18) Which activity helps you to completely tune out?
(19) **What was the last interesting video you watched, for example, on YouTube?**
(20) **Imagine you are 80 years old and your grandchildren ask you about your life. What do you want to be able to tell them?**

[4]The Purpose Project, https://www.thepurposeproject.org, last accessed 2023–10–25
[5]Bundesagentur für Arbeit, https://www.arbeitsagentur.de/, last accessed 2023–10–25
[6]Question Diary on the App Store, https://apps.apple.com/us/app/question-diary/id1261734566, last accessed 2023–10–25

The questions were chosen by a joint effort and discussion to cover all relevant aspects of self-reflection support systems [8] (see Section 2.4). They cover the *temporal perspective* through questions on the past (7, 12, 19), present (10, 17) and the future (3, 20) and motivate a *comparison* with an ideal (5) as well as with social peers (10). In addition, most questions evolve around peoples' skills (7, 8, 16), interests (3, 8, 10, 19), and character traits (5, 16, 17) and thereby aim to address the problem of lack of information about the self (see Section 2.1). We excluded questions primarily related to individuals' leisure activities, e. g., (1, 13, 18), to focus on professional development. We also avoided questions that might lead to too generic or emotionally demanding answers, e. g., (2, 6).

3.2.3 Self-Reflection Challenges. In addition to these questions, the focus group came up with a set of "challenges", i. e. tasks that can potentially trigger self-reflection processes and thereby raise users' self-awareness. Nine challenges were discussed in detail in the proceedings of the meeting. The authors selected three challenges for the first implementation of the FindMyself app (highlighted in bold) to evaluate a variety of different task types in the user study. We focused on both users' interests (1) and strengths (3, 6) and included challenge (6) to provide a social collaborative task [8]. In addition, the chosen subset has a clear and limited input or output, i. e., slider positions (1), a photo (3), or three keywords (6), and is therefore presumably well-suited for smartphone interaction.

(1) **Move the sliders: How much are you interested in these topics (e. g., building, serving customers)?**
(2) Choose your favorite from two opposing things (e. g., rather read or do sports)
(3) **Take a picture of your role model, what is the biggest strength both of you have in common?**
(4) Different personas are given and users must decide to what extent they resemble them.
(5) Which city do you find interesting? Do some research about universities/training opportunities available there.
(6) **Ask three friends or relatives about your top three strengths.**
(7) Write a message to a friend and explain where you see them in five years. Ask them to do the same for you.
(8) Discuss with three friends their after-school career decision.
(9) Discuss with a chatbot about career decision-making.

3.2.4 Visualization of User Input. We elaborated on visualization ideas to mirror the input collected during the tasks back to the user, as presented in the "recap" view of the paper prototype (see Figure 1c). Several suggestions were debated, i. e., data representation via diary entries, social media feeds, mindmaps, and profile views. After ranking the alternatives, participants agreed on the **profile view** (Figure 2c) as it can expand over time and users can easily review their progress while using the app. They also voted to include **motivational quotes** (see Figure 2a) to further stimulate self-reflection.

3.2.5 Implications for the Final Prototype. The focus group was able to make important design decisions for the first working prototype. The experts agreed on a total of six tasks: three rounds of questions and three short challenges. Every two days, users are supposed to complete one of the tasks. The group also created a ranked list of potential questions and challenges that served as the basis for further task selection by the authors. Finally, the focus group agreed on a dynamic personal profile to provide an overview of gathered user data and voted for an inclusion of motivational quotes. These design decisions are just one way to explore the initial concept. The goal of the focus group was to create the framework for a first carefully designed prototype that could form the basis for further iterations.

3.3 Prototype

Based on the results from the student workshop and the expert focus group, we implemented an iOS app (build target 12.4, suitable for iPhone SE, iPhone 6, or later). We used Google Firebase[7] to store user inputs and logging data. The first time the app is started, each user is given an unique ID, and all information is saved using this key in the database. To enable a photo upload function, we used Google Firebase Cloud Storage.

We distributed the app via TestFlight[8], Apple's official beta testing program. By using this service, the app can remain unlisted in the official AppStore and still easily be distributed over an invitation link. Furthermore, the beta program provides useful features, such as a feedback system, remote updates, detailed usage statistics, and versioning.

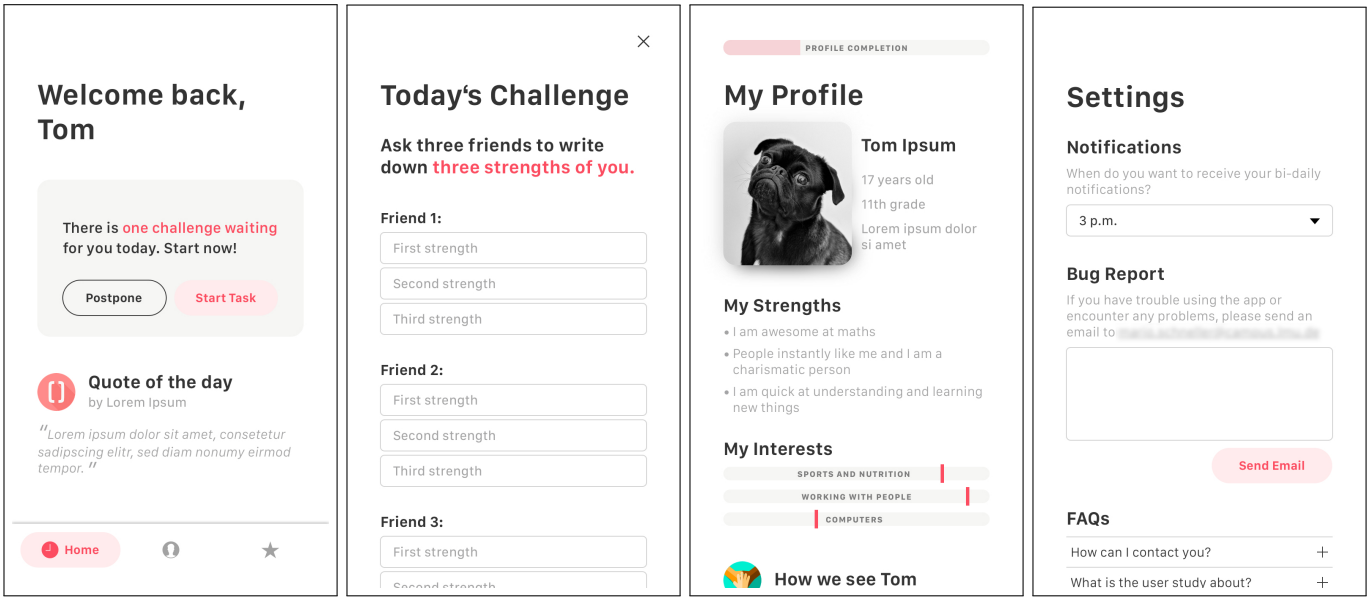
3.3.1 Content. During first-time setup, users are asked to provide basic personal information: participant number, nickname, age, and year of birth. Furthermore, they can specify their preferred time to receive push notifications for new tasks. Users are then forwarded to the standard app interface. To keep the FindMyself app as simple as possible, there are only three views: *Home*, *My Profile* and *Settings* (navigation bar shown in the lower part of the home screen; see Figure 2a). A welcome message is displayed on the *Home* screen. Below, new tasks are listed when available. If there are no current tasks, a link to the profile view is shown. Furthermore, motivational quotes by famous personalities are displayed at the bottom.

In the *My Profile* tab (see Figure 2c), all user inputs are presented in an overview similar to a profile on a social network. The purpose of the profile is to allow users to reflect on all their previously entered data. Initially, the profile is empty except for name, age, and grade, which are entered during registration. The more tasks the user finishes, the more detailed the profile gets, which is also indicated by a progress bar at the top of the overview page. After completing all tasks, the overview includes name, age, grade, users preferences', strengths and interests as well as peer feedback and a self-chosen picture of a role model.

The *Settings* screen (see Figure 2d) can be used to change notification settings, report bugs or contact the researchers for any questions. Furthermore, it contains a FAQ section including information about privacy and data security.

Every other day, starting with the first day after registration, users are prompted with a new set of questions or a challenge (see Figure 2a and 2b). To remind users of these new tasks, a push notification is sent at the time specified during setup. Users have the flexibility to respond immediately or take time to reflect, engage in

[7] Firebase, https://firebase.google.com, last accessed 2023–10–25
[8] TestFlight - Apple Developer, https://developer.apple.com/testflight, last accessed 2023–10–25



(a) Home Screen **(b) Challenges** **(c) Personal Profile** **(d) Settings Menu**

Figure 2: Final app concept based on the focus group results

discussions with family and friends, and submit their answers later. Based on the results of our pre-studies, we implemented a total of six tasks for the first evaluation of the FindMyself app concept. The tasks alternate between questioning rounds and challenges. The order is determined randomly for each user.

Reflective Questions 1 (R1):

- What was your best subject in school last year and why?
- If you had a superpower, what would it be?
- What do you think is your best character trait?

Reflective Questions 2 (R2):

- What was the best advice you ever got or gave?
- Which task is fun for you that others do not like?
- What was the last interesting video you watched, for example, on YouTube?

Reflective Questions 3 (R3):

- Which job would not fit you? Why would this job not fit?
- What would you like to do if time & money were unlimited?
- Imagine you are 80 years old and your grandchildren ask you what you have done in life. What do you want to be able to tell them?

Challenge 1 (C1): Ask three friends or family members to write down three of your strengths. Please enter them into the input fields.

Challenge 2 (C2): If you were a person from a popular TV series, who would you be?

- What is the person's name?
- What is the biggest strength both of you have in common?
- Please upload a picture of your chosen person.

Challenge 3 (C3): Please move the sliders from uninteresting to interesting: How exciting are the following topics for you? *Example topics (excerpt)*: cultivation & harvesting; building; documenting & managing; interpreting & translating; educating & teaching; creating, designing & drawing; calculating & computing.

3.3.2 Data Collection. We implemented logging functionalities for task completion time, app usage, and profile views: Every time the app is started, timestamps are stored to evaluate the frequency of use and to find out whether students use the app apart from planned sessions prompted by notifications. To compute task completion time, we log timestamps when users start or finish a question round or challenge. Another event logging occurs when a student accesses the profile page. We record how often students view the profile overview and how long they stay on that screen. Furthermore, we applied the Experience Sampling Method (ESM) [60] for in-app evaluation. We describe the content and purpose of the experience sampling questionnaires (ESQs) in Section 4.1.

4 USER STUDY

To evaluate the prototype, we planned and conducted a field study. Since the majority of our $N = 23$ participants in the first run were female, we recruited $N = 7$ additional participants and tried to explicitly target male participants in the study call. Shortly after the second run, the Technology Supported Reflection Inventory (TSRI) [7] was published by Bentvelzen et al., so we followed up with a third run ($N = 16$) to evaluate the potential of our app to support self-reflection more precisely using this standardized questionnaire. In the following sections, we will discuss the methodology and results in an aggregated form, as we used the same methods and prototype for all parts of the study.

4.1 Procedure

We conducted the user study online: We sent the students an e-mail containing the participant information sheet, our privacy policy as

well as a consent form. The form had to be signed by the participants and, if they were under 18, their parents or legal guardian. After that, we assigned an ID to each user and sent them instructions for setting up TestFlight and the FindMyself app.

During the first-time setup, participants had to enter their ID and complete a pre-study questionnaire. The questionnaire had questions on demographics, smartphone use, familiarity with career guidance methods, and experience with journaling. It also contained three 5-point Likert scale items: (1) *I am aware of my own strengths and interests*, (2) *I know what a study program/professional career should look like to fit me*, (3) *I am sure what I want to do after finishing school.* The last item was an open-ended question on how the participants imagined their life after school. Finally, users could choose their preferred time for in-app notifications.

We asked participants to use the app for twelve days and perform six tasks in random order. They received a new task every other day and were reminded via push notifications at the time selected during the initial setup. If necessary, they could change the notification time in the settings menu. The app sent a reminder the next day if a task was not completed within 24 hours.

After they completed a task, users had to answer an ESQ consisting of three questions: (1) *The task helped me learn something about myself.* (5-point Likert scale), (2) *The task was fun.* (5-point Likert scale), (3) *I spent around ... minutes on the task.* (numeric value). The users' personal profile was automatically updated based on the input provided during each task.

The app also triggered an ESQ whenever they viewed their profile overview page for at least five seconds (with a five-minute cooldown), asking: *Why are you looking at your profile right now? - (a) To view the progress, (b) To reflect on it, (c) To show it to someone, (d) I opened it by accident, (e) Other reason (please specify).*

After finishing the last task, we asked participants to answer a post-study questionnaire. We again used the Likert scales from the pre-study questionnaire as well as the question on how they imagined their after-school life. We included the System Usability Scale (SUS) [10] and three additional 5-point Likert scale items to further evaluate our concept: (1) *The app helped me reflect on my study program and career choice*, (2) *Using the app was fun*, (3) *I would use such an app if it was available on the market.* In the third run of the study, we exchanged these three Likert items with the TSRI [7] to get a more precise assessment of the app's ability to support self-reflection. Finally, we asked four open-ended questions on how users generally liked the app, which advantages and disadvantages they see in comparison to other means for career orientation and if they had any suggestions for improvement.

We skimmed the data entered into the app and questionnaires to verify their quality and reviewed the usage logs before confirming the successful completion of the study. The participants were then compensated with a 20 Euro voucher for an online store.

4.2 Participants

We recruited a total of $N = 46$ high school students from senior classes (Median grade $\tilde{x} = 12$, $min = 10$, $max = 13$) over personal contacts and social media. Although we explicitly tried to target male students in our second and third study calls, 38 of the final participants were female, while only eight were male. The participants' average age was 17.4 ($min = 16$, $max = 21$). All students studied for their *Abitur*, which is the the highest possible school-leaving qualification in Germany. They were experienced iPhone users and reported using their phones on average 3.7 hours/day ($min = 1.3$, $max = 8$). Only five were regularly keeping a diary.

5 RESULTS

In this section, we will first report the quantitative results gathered from the app usage logs, the ESQs, and the Likert ratings of the pre- and post-questionnaires. We will then elaborate on the qualitative user feedback given in the open-ended questions of the post-questionnaire.

5.1 Quantitative Results

5.1.1 App Usage and Usability Rating. On average, users started the app 50.46 times ($SD = 23.42$, $min = 13$, $max = 114$) from installation until one week after finishing their last task. They opened their profile on average 21.20 times ($SD = 11.25$, $min = 6$, $max = 54$). Experience sampling on why users viewed their profile was triggered 127 times in total. The most frequently named reasons were "to view the progress" (53.5 %), "to reflect on it" (20.5 %) and "to show it to others" (9.4 %). Five people wanted to check for new tasks (3.9 %), two users wanted to familiarize themselves with the app (1.6 %), and another two had problems with completing one of the tasks (1.6 %). The remaining twelve users opened it by accident (5.5 %) or for no particular reason (3.9 %).

To assess the usability of the FindMyself app, we applied the original version of the SUS [10]. The app scored an average of 87.07 ($SD = 9.62, min = 50, max = 100$), implying "excellent" usability according to the adjective rating scale by Bangor et al. [5].

5.1.2 Task Evaluation. For each task, we evaluated the ESQs on users' perceived fun, self-awareness improvement, and completion time. The results of the Likert ratings are depicted in Figure 3.

Regarding fun, participants enjoyed all tasks about the same and gave them high median scores of 4. A Friedman's test showed no statistically significant differences between the fun ratings of the different tasks ($\chi^2(5) = 4.457$, p=.486). For self-awareness improvement, task C1 ("Ask three friends or family members to write down three of your strengths.") scored best with a median value of 4, whereas all other tasks were rated with a median value of 3. Friedman's test indicated that there are significant differences between the self-awareness scores of the different tasks ($\chi^2(5) = 25.980$, p<.001). Pairwise post-hoc Wilcoxon signed-rank tests with a Bonferroni-adjusted alpha-level of .00333 (.05/15) showed that the scores of C1 were significantly higher than C2 ($W = 412.500, z = 3.702, r = 0.774, p < .001$), R1 ($W = 353.000, z = 3.416, r = 0.739, p < .001$), and R2 ($W = 416.000, z = 3.292, r = 0.677, p < .001$). No other differences were statistically significant ($p > .014$). The average values of the subjective assessment of the time spent on each task are: C1: 20.1 minutes ($SD = 18.0$), C2: 14.7 minutes ($SD = 15.8$), C3: 4.2 minutes ($SD = 3.4$), R1: 7.1 minutes ($SD = 10.6$), R2: 10.0 minutes ($SD = 8.1$), and R3: 7.4 minutes ($SD = 6.4$).

5.1.3 Self-Reflection Support. Figure 4 shows the distribution of the three Likert scales contained in both the pre- and the post-study questionnaires. Wilcoxon signed-rank tests showed no statistically

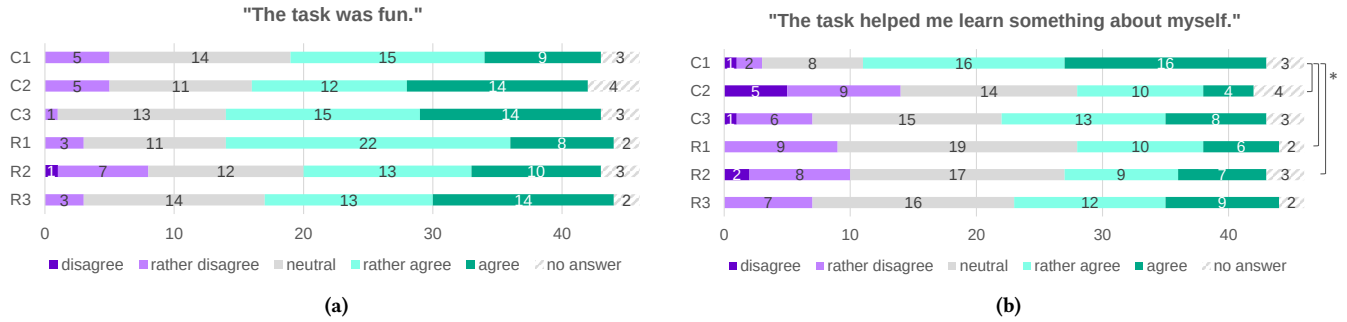


Figure 3: Likert ratings provided through ESQs: (a) "The task was fun.", (b) "The task helped me learn something about myself."

significant results for the three items (1) "I am aware of my own strengths and interests." ($W = 128.5, z = -1.194, r = -.268, p = .211$), (2) "I know what a study program/professional career should look like to fit me." ($W = 227.0, z = -.692, r = -.140, p = .476$), and (3) "I am sure what I want to do after finishing school." ($W = 168.5, z = -.786, r = -.17, p = .410$). Looking at individual users, for the first statement (strengths/interests), 15 participants (33 %) raised their score after using the FindMyself app, 20 gave the same rating (43 %), and 11 rated lower (24 %). For the second statement (job criteria), 20 people gave higher ratings (43 %), 14 rated the same (30 %), and 12 lowered their scores (26 %). Finally, for the third statement (career certainty), 17 participants gave higher (37 %), 18 the same (39 %), and 11 gave lower scores (24 %) than before using the app.

To evaluate users' perceived self-reflection support, we used a five-point Likert scale ("The app helped me reflect on my study program and career choice.") in the first and second run of the study (see Figure 5).

In the third run, we applied the TSRI [7]. This standardized questionnaire on technology-supported reflection consists of nine items clustered in three subscales (*Insight*, *Exploration* and *Comparison*) that are rated on a seven-point Likert scale from 1="fully disagree" to 7="fully agree," see Table 1. The sum of the unweighted items represents the TSRI score with a minimum value of 9 and a maximum of 63. The FindMyself app achieved an average TSRI score of 39 ($SD = 7.11, min = 28, max = 51$) with the highest scores in the *Exploration* subscale (Median $\tilde{x} = 6$ for Q4, Q5, and Q6). A detailed overview is shown in Table 1.

Looking at the answers to the open-ended question "This is how I imagine my life after school", we found that 20 people gave a different description after using the FindMyself app. Eleven of them named concrete fields or study programs they were interested in and four participants pictured themselves studying at a university instead of doing vocational training. Of the remaining five people, two gave a more detailed description of their plans, one changed her mind about the field she wanted to work in, one changed her answer from private goals to career goals, and the last one was no longer focused on a specific study program.

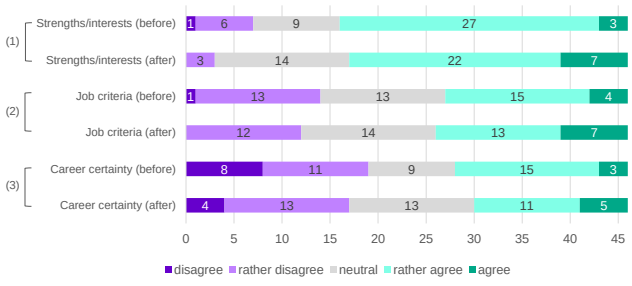


Figure 4: Likert ratings before/after using the app: (1) "I am aware of my own strengths and interests.", (2) "I know what a study program/professional career should look like to fit me.", (3) "I am sure what I want to do after finishing school."

5.2 Qualitative Feedback

We performed an exhaustive Thematic Analysis [9, 49] of the four open-ended questions: The written answers were coded by two researchers resulting in strong to almost perfect agreement for all questions [47]. Cohen's kappa is reported for each individual question below. All discrepancies were discussed by the raters to complete the classification.

5.2.1 General Feedback. For the question *"What is your general impression of the FindMyself app?"* ($\kappa = 0.83$), we extracted 104 statements, with the great majority comprising positive feedback (93.3 %). Almost half of the participants answered that their general impression of the FindMyself app was either "very good" (11) or "good" (10); five stated that it was "pretty good" and three found it "okay". Users particularly highlighted that the content was well-structured (9), interesting (8), and diverse (3). Some people stated

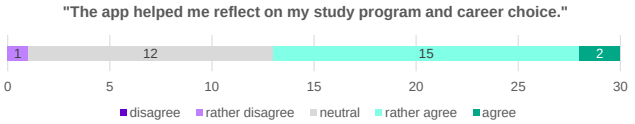


Figure 5: Likert ratings provided in the post-study questionnaire of the first and second study run ($N = 30$) for the item "The app helped me reflect on my study program and career choice."

Table 1: Our app's Median $\tilde{x}$, minimum and maximum scores of individual TSRI items on a seven-point Likert scale (1="fully disagree", 7="fully agree"), aggregated over the $N = 16$ participants of the third study run.

Subscale/Item	$\tilde{x}$	min	max
Insights			
Q1: Using the app has led to a wake-up call to make changes in my life.	**3**	2	6
Q2: As a result of using the app, I have changed how I approach career choice.	**3**	1	5
Q3: Using the app gives me ideas on how to overcome challenges.	**3**	1	7
Exploration			
Q4: I enjoy exploring my data with the app.	**6**	3	7
Q5: The app makes it easy to get an overview of my personal data.	**6**	4	7
Q6: The app makes it easy to review my long-term personal data.	**6**	4	7
Comparison			
Q7: I reflect on my data in the app with others.	**4**	1	7
Q8: The app helps me to discuss my data with others.	**4**	1	7
Q9: The app makes me think about how my personal data relates with that of others.	**5**	1	7

that they liked the citations on the start page (4) and one positively commented on the notifications. They also liked the personal profile (4), giving them a good overview (2). Participants found the app easy (13) and fun (5) to use. They also described it as helpful (4), engaging (2), and targeted (1).

> *"It was very easy to use and it was nice to see the progress and profile develop."* (P45)

Five users stated that using the app triggered reflection processes. Finally, eight participants liked the app's design. Three participants criticized that the app was not helpful for career choice, and two said, it was not (always) fun to use.

> *"(...) but it was a bit boring in the long run, because there were 'only' the tasks and nothing else."* (P45)

One user stated that the connection between the app's content and career choice was not always clear. Another one felt disrupted by the ESQs.

5.2.2 Advantages. We coded 88 statements for the question *"Which advantages do you see in the FindMyself app compared to other means for career orientation?"* ($\kappa = 0.84$). Participants stated that a smartphone app is an advantage in itself (4), being more modern and up-to-date (2). Two users positively highlighted that the app was free of charge, while another one commended that a smartphone app is accessible to a broader audience. Using the FindMyself app was perceived as more flexible (12), easy (5), and practical (2).

> *"The inhibition threshold to deal with the topic is (...) lower, because you can simply open the app in a free minute and work on your daily task."* (P37)

The personal profile gave the participants a good overview of their progress (7). Furthermore, eight participants positively named the recurring sessions, which leave room for reflection (4) while being perceived as less time consuming (6) and less tiring (2).

> *"It is not a 10 hour test with questions, but a long process in which you think more and the concentration is always fully there."* (P43)

Users emphasized that the content differed from common career guidance tools (8): they described it as more personal (4), more specific (3), more detailed (2), as well as more clear and goal-oriented (1). Overall, the tasks helped them learn something about themselves (8) in a fun way (4). One user stated that the app helped her make a decision on her own and another one said she felt motivated by the app.

5.2.3 Disadvantages. We also asked participants *"Which disadvantages do you see in the FindMyself app compared to other means for career orientation?"* ($\kappa = 0.80$). We extracted 54 statements, of which four contained the answer "none". The most commonly mentioned disadvantage was that the app did not provide personal contact to career advisors (12). Moreover, some people criticized that the app provides less specific results (3) and does not give concrete career recommendations (11). The connection between the app's content and career choice was unclear for two participants.

> *"What I missed was an evaluation of the tasks. That is, suggestions for different courses of study (...). However, this can also be an advantage, because you are not pigeonholed, but you simply learn things about yourself by dealing with the tasks."* (P23)

Six users highlighted the drawbacks of recurring sessions, e. g. requiring regular engagement (2) or the risk of motivation loss (2). Another five participants stated that the app was only theoretical and could not replace practical work experience. Six users mentioned the limited scope of the app, i. e., its restricted specific content, and another two users described the app as superficial, i. e., short and little detailed. One participant found the questions hard to answer and asked her parents for help. Finally, one user criticized that the content of the profile page was not editable after submitting the input.

5.2.4 Suggestions for Improvement. We finally asked participants *"Do you have any suggestions for improvement for the app?"* ($\kappa = 0.79$). Coding resulted in 52 statements, including six answers without any suggestions. About one third of the participants wished for a conclusion after finishing all tasks (16), e. g. concrete career recommendations, matching professional fields or an outlook.

> *"I think you could get a 'conclusion' or something at the end, where, for example, results or occupational fields are displayed that could apply to you. I learned a lot about myself, but I don't know how or where I can use my strengths."* (P24)

Moreover, 14 participants asked for more content, i. e. more tasks and challenges. Seven users were in favor of more concrete questions and one user suggested shorter tasks. In terms of usability, four people suggested making the content of the personal profile editable and one person wished for the possibility to save the progress

and continue working on a task later. The remaining suggestions comprised a more condensed schedule (1) and improving the app's layout (2).

6 DISCUSSION

We will now consider the limitations of our evaluation, discuss the results of our user study with regard to our research questions, and provide thought-provoking impulses for further research on self-reflection apps.

6.1 Limitations

A limitation of our user study is that 83 % of the participants were female, even though we explicitly tried to encourage male participants in our study call. Since the initial app concept was developed with female participants, it is possible that the FindMyself app concept rather is appealing to female users. Research on gender roles indicates that women are generally more open to introspection than men [14]. However, our concept may specifically be used to empower women in male-dominated professional environments such as STEM by highlighting their strengths and interests.

Another constraint is that the educational system may have large structural differences depending on the country. Job opportunities and entry barriers in higher education vary widely. The FindMyself app was developed by and evaluated with students who aiming for the highest possible school-leaving qualification in Germany: *Abitur*. This means that the majority of them belong to the upper middle class and generally do not expect problems related to their level of education or social status when choosing a career. Other socioeconomic groups may have different career choice requirements and selection criteria. Thus next, we need to be investigated whether they, too, can benefit from self-reflection support systems. Related work indicates that the lack of information about oneself is a problem that many young adults share regardless of their background as they face their career choices [22]. The difference might rather be whether they can give equal priority to their own interests when choosing a career.

Another limitation is the use of experience sampling questionnaires. Despite being an established research method in HCI, ESQs can always potentially influence users' ratings. In our study, participant P2 stated in the post-study questionnaire that they found the ESQ "How much time did you spend on the task?" unnecessary, i. e., it had a negative influence on her personal user experience. On the other hand, experience sampling itself can also trigger reflection processes. Therefore, it might have also had a positive influence on users' ratings of the app's self-reflection support and TSRI scores.

The scope of our evaluation is limited regarding the number and random order of the tasks and the duration of the study. Although the content was derived from the literature and established commercial tools, the selection of other questions and challenges would likely have yielded different results. The concept needs to be optimized with more experts, such as counselors and educators. The results of our focus group, e. g., the unexplored tasks, can provide a starting point for further investigation. The aim of our study was to open the design space and investigate what a self-reflection app for career choice could look like and which features are generally perceived as helpful by users. Considering the lack of comparable applications for a fair assessment, we conducted an exploratory study without a baseline. In the future, our app should be evaluated alongside other novel career guidance tools. The prototype currently lacks response editing, which was intentional for a focus on short-term reflection in the user study. However, self-reflection is a process that needs a long time period to show its full potential. Future versions should consider enabling edits to capture insights from long-term reflective processes. It would be beneficial to accompany students during their entire career orientation phase and beyond to analyze the app's influence on the user's final career choice.

6.2 The FindMyself App was Positively Perceived by Users [RQ1]

The overall user feedback on the FindMyself app was positive. It got an excellent rating on the SUS. Additionally, users highlighted that the app was fun to use, shown by the ESQs and the post-study questionnaire (Likert rating and open-ended questions). Moreover, users named more advantages (88 statements) than disadvantages (50 statements) of the FindMyself app compared to other means for career orientation. In particular, they highlighted the flexibility of the app. The logging data also showed that the app was used frequently over the course of the study. The app's content was described as well-structured, interesting, and diverse in the general feedback section of the post-study questionnaire. Users also liked the citations on the home screen as well as the profile overview page. The ESQ revealed that some users even showed their progress to others.

6.3 The FindMyself App Has the Potential to Support Self-Reflection [RQ2]

Our results indicate that the FindMyself app has the potential to support self-reflection. This is shown by our quantitative measures (logging data, ESQ answers, Likert scales on reflection support, and self-awareness improvement) as well as the qualitative user feedback gathered in the post-study questionnaire.

The logging data showed that users frequently opened the profile view. In about 20 % of the cases, the reason was to reflect on its content. The personal profile was perceived as helpful, since it gave users a good overview of their progress. When asked about advantages of the FindMyself app, participants highlighted that recurring sessions leave time for reflection. This is also shown by the overall high ratings for the Likert item "The app helped me reflect on my study program and career choice". Since the TSRI scale "is not suited to scoring refection in absolute terms" [7], we cannot draw any straightforward conclusions from our prototype's score of 39. This value can only be used as a reference for future app designs. Looking at the TSRI's subscales, we found that the FindMyself app achieved high median values in the *Exploration* scale, yet only medium scores in the *Insight* and *Comparison* scales. This indicates that the limited scope of our prototype (six bi-daily tasks, with only one task being a social collaborative challenge) could not yet sufficiently serve all dimensions of self-reflection. However, users' Likert ratings indicate that all six tasks helped users learn something about themselves – with the social collaborative challenge C1 getting the highest score.

From the results, we conclude that future app designs should explore more diverse content, in particular social collaborative tasks. It is important to find a balance between self-reflection and peer feedback, as suggestions from family and friends can help with career indecision but do not necessarily support the decision-maker's preferred alternative [22]. Other social dimensions, e. g., connecting (unknown) app users or establishing contact to career counseling experts, could also be investigated. In summary, we identified (1) the implemented microtasks, (2) recurring sessions, and (3) the personal profile overview as the main features that have the potential to support self-reflection processes.

6.4 Self-Reflection Does Not Always Improve Decision-Making Certainty [RQ3]

One surprising result of the evaluation is that the Likert scores on users' self-awareness (strengths & interests and job criteria) as well as career decision-making certainty did not significantly improve over the course of the study. Eleven users even lowered their certainty scores after using the app.

A possible explanation for this might be that some users discovered new traits and job opportunities they did not consider before using the app. It can be assumed that more options have a negative influence on decision-making certainty. However, a clear understanding of the self and all potential options is the major goal of the Prescreening phase in the PIC model for career decision-making by Gati et al. [20, 21]. To be noted positively is that 17 participants improved their decision-making certainty. Nine of them changed their description of how they envisioned their lives after high school. Therefore, we conclude that the FindMyself app benefited the users' self-image and career plans. So altogether, we do not see it as a failure of the app that decision certainty levels were not significantly improved overall. One may even see this as an indication that a reflection process was triggered successfully which is also visible from users' Likert ratings (Figure 5).

In conclusion, we think that self-reflection apps can lead to "better" decisions in the long run, since a comprehensive Prescreening phase is the basis for the following steps of the career decision-making process. However, a profound self-image is only one of the prerequisites for successful career choices [22]. To contribute to a holistic approach, future research should investigate technological support for all three stages of the career choice process to provide solutions for the multitude of problems that may arise.

6.5 Users Want Recommendations [RQ1, RQ3]

An unexpected result is that the main suggestion for improvement was to give concrete career recommendations. This contradicts the initial motivation of our research to encourage self-reflection **instead of** giving concrete recommendations. One potential explanation is that giving recommendations is the logical next step to support the career decision-making process: in the in-depth exploration phase, people need to reduce options and weigh different alternatives in order to make the final decision [20, 21].

A rather daring hypothesis is that people might be used to getting recommendations since the great majority of aptitude tests result in a more or less concrete career recommendation. Also, making one's own decision is not only empowering but can also be challenging. So should or should we not include recommendations in self-reflection support systems? In general, there are ethical risks for all life-decision-supporting systems and even personal counseling. The presented information needs to be accurate and must not result in false impressions. This might even be more crucial when it comes to (automated) recommendations – they need to be reliable, valid, and tested, because students might trust the results more than their own feelings as "the recommendation was provided by experts". Therefore, systems focusing on reflection might be superior, even if they have not shown any significant improvement of decision-making certainty in our study, as they allow students to explore more facets of possible careers and their own traits.

We argue that it is of utter importance for researchers to carefully decide when to give recommendations and how to phrase them. Suggestions that underline the personal "gut feeling" may improve decision-making certainty without patronizing the user through technology [22]. In this context, it would be interesting to translate the users' input into a recommendation-like form and mirror it back to them. Users should be encouraged to reflect on a recommendation given by any system. We can imagine an iterative process of self-reflection and recommendations, in which the user is actively asked to review and reflect on the recommendation itself. It could also be an option to point out the next steps and give rather "soft" recommendations, e. g. "We think job X might be interesting for you, here's some more information for you to review."

7 CONCLUSION

In this work, we presented the user-centered design and evaluation of "FindMyself", a mobile self-reflection app for career decision support. We used an exploratory approach to open the design space for future career guidance systems. In a twelve-day field study ($N = 46$), the FindMyself app received positive user feedback, since it was easy, flexible, and fun to use. Participants described the app's content as well-structured, interesting, and diverse. Moreover, results indicate that the app supported self-reflection processes through the nature of the implemented tasks, the interaction method of recurring sessions, and the personal profile as an overview. Surprisingly, we found that users still ask for concrete job recommendations in addition to reflective activities. In this regard, we think that it is important for researchers to carefully decide when to give recommendations and how to phrase them. We also suggest motivating users to reflect on the recommendation itself.

Important life decisions are complex and depend on very individual factors. They cannot be made in one moment but need time to evolve corresponding to a person's self-image. Our goal is to support decision-making as a process: By giving users time and the necessary tools to reflect and revise opinions, we want to empower them to make better, informed decisions in line with their "gut feeling." Future work should aim for a holistic approach to support users' career decision-making. This can be achieved by exploring different types of content with a focus on social interactions.

REFERENCES

[1] Naveed Ahmad, Aimal Rextin, and Um E Kulsoom. 2018. Perspectives on usability guidelines for smartphone applications: An empirical investigation and systematic literature review. *Information and Software Technology* 94 (2018), 130–149. https://doi.org/10.1016/j.infsof.2017.10.005

[2] Sarah Aragon Bartsch, Christina Schneegass, Florian Bemmann, and Daniel Buschek. 2021. A Day in the Life: Exploring the Use of Scheduled Mobile Chat Messages for Career Guidance. In *20th International Conference on Mobile and Ubiquitous Multimedia* (Leuven, Belgium) *(MUM 2021)*. Association for Computing Machinery, New York, NY, USA, 24–34. https://doi.org/10.1145/3490632.3490637

[3] Ekaterini P Argyropoulou, Despina Sidiropoulou-Dimakakou, and Elias G Besevegis. 2007. Generalized self-efficacy, coping, career indecision, and vocational choices of senior high school students in Greece: Implications for career guidance practitioners. *Journal of Career Development* 33, 4 (2007), 316–337. https://doi.org/10.1177/0894845307300412

[4] Tal August, Shamsi Iqbal, Michael Gamon, and Mark Encarnación. 2020. Characterizing the Mobile Microtask Writing Process. In *22nd International Conference on Human-Computer Interaction with Mobile Devices and Services* (Oldenburg, Germany) *(MobileHCI '20)*. Association for Computing Machinery, New York, NY, USA, Article 26, 12 pages. https://doi.org/10.1145/3379503.3403541

[5] Aaron Bangor, Philip Kortum, and James Miller. 2009. Determining what individual SUS scores mean: Adding an adjective rating scale. *Journal of Usability Studies* 4, 3 (2009), 114–123.

[6] Eric P.S. Baumer, Vera Khovanskaya, Mark Matthews, Lindsay Reynolds, Victoria Schwanda Sosik, and Geri Gay. 2014. Reviewing Reflection: On the Use of Reflection in Interactive System Design. In *Proceedings of the 2014 Conference on Designing Interactive Systems* (Vancouver, BC, Canada) *(DIS '14)*. Association for Computing Machinery, New York, NY, USA, 93–102. https://doi.org/10.1145/2598510.2598598

[7] Marit Bentvelzen, Jasmin Niess, Mikołaj P. Woźniak, and Paweł W. Woźniak. 2021. The Development and Validation of the Technology-Supported Reflection Inventory. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (Yokohama, Japan) *(CHI '21)*. Association for Computing Machinery, New York, NY, USA, Article 366, 8 pages. https://doi.org/10.1145/3411764.3445673

[8] Marit Bentvelzen, Paweł W. Woźniak, Pia S.F. Herbes, Evropi Stefanidi, and Jasmin Niess. 2022. Revisiting Reflection in HCI: Four Design Resources for Technologies That Support Reflection. *Proc. ACM Interact. Mob. Wearable Ubiquitous Technol.* 6, 1, Article 2 (mar 2022), 27 pages. https://doi.org/10.1145/3517233

[9] Virginia Braun and Victoria Clarke. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology* 3, 2 (2006), 77–101. https://doi.org/10.1191/1478088706qp063oa

[10] John Brooke. 1996. SUS-A quick and dirty usability scale. *Usability Evaluation In Industry* 189, 194 (1996), 4–7.

[11] Richard Allen Carter Jr, Mary Rice, Sohyun Yang, and Haidee A Jackson. 2020. Self-regulated learning in online learning environments: strategies for remote learning. *Information and Learning Sciences* 121, 5/6 (2020), 321–329. https://doi.org/10.1108/ILS-04-2020-0114

[12] Justin Cheng, Jaime Teevan, Shamsi T. Iqbal, and Michael S. Bernstein. 2015. Break It Down: A Comparison of Macro- and Microtasks. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (Seoul, Republic of Korea) *(CHI '15)*. Association for Computing Machinery, New York, NY, USA, 4061–4064. https://doi.org/10.1145/2702123.2702146

[13] Eun Kyoung Choe, Bongshin Lee, Matthew Kay, Wanda Pratt, and Julie A. Kientz. 2015. SleepTight: Low-Burden, Self-Monitoring Technology for Capturing and Reflecting on Sleep Behaviors. In *Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing* (Osaka, Japan) *(UbiComp '15)*. Association for Computing Machinery, New York, NY, USA, 121–132. https://doi.org/10.1145/2750858.2804266

[14] Patricia AR Csank and Michael Conway. 2004. Engaging in Self-Reflection Changes Self-Concept Clarity: On Differences Between Women and Men, and Low- and High-Clarity Individuals. *Sex Roles* 50, 7 (2004), 469–480. https://doi.org/10.1023/B:SERS.0000023067.77649.29

[15] Tawanna R. Dillahunt and Joey Chiao-Yin Hsiao. 2020. Positive Feedback and Self-Reflection: Features to Support Self-Efficacy among Underrepresented Job Seekers. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (Honolulu, HI, USA) *(CHI '20)*. Association for Computing Machinery, New York, NY, USA, 1–13. https://doi.org/10.1145/3313831.3376717

[16] Tilman Dingler, Dominik Weber, Martin Pielot, Jennifer Cooper, Chung-Cheng Chang, and Niels Henze. 2017. Language Learning On-the-Go: Opportune Moments and Design of Mobile Microlearning Sessions. In *Proceedings of the 19th International Conference on Human-Computer Interaction with Mobile Devices and Services* (Vienna, Austria) *(MobileHCI '17)*. Association for Computing Machinery, New York, NY, USA, Article 28, 12 pages. https://doi.org/10.1145/3098279.3098565

[17] Fiona Draxler, Julia Maria Brenner, Manuela Eska, Albrecht Schmidt, and Lewis L Chuang. 2022. Agenda- and Activity-Based Triggers for Microlearning. In *27th International Conference on Intelligent User Interfaces* (Helsinki, Finland) *(IUI '22)*. Association for Computing Machinery, New York, NY, USA, 620–632. https://doi.org/10.1145/3490099.3511133

[18] Joanna C Dunlap. 2006. Using guided reflective journaling activities to capture students' changing perceptions. *TechTrends* 50, 6 (2006), 20–26. https://doi.org/10.1007/s11528-006-7614-x

[19] Hicham El Mrabet and Abdelaziz Ait Moussa. 2019. Smart School Guidance and Vocational Guidance System Through the Internet of Things. In *Proceedings of the 2nd International Conference on Networking, Information Systems & Security* (Rabat, Morocco) *(NISS19)*. Association for Computing Machinery, New York, NY, USA, Article 70, 5 pages. https://doi.org/10.1145/3320326.3320404

[20] Itamar Gati and Itay Asher. 2001. Prescreening, in-depth exploration, and choice: From decision theory to career counseling practice. *The Career Development Quarterly* 50, 2 (2001), 140–157. https://doi.org/10.1002/j.2161-0045.2001.tb00979.x

[21] Itamar Gati and Itay Asher. 2005. The PIC model for career decision making: Prescreening, in-depth exploration, and choice. In *Contemporary models in vocational psychology*. Routledge, 15–62.

[22] Itamar Gati and Viktória Kulcsár. 2021. Making better career decisions: From challenges to opportunities. *Journal of Vocational Behavior* 126 (2021), 103545. https://doi.org/10.1016/j.jvb.2021.103545

[23] Itamar Gati, Nimrod Levin, and Shiri Landman-Tal. 2019. Decision-making models and career guidance. In *International handbook of career guidance*. Springer, 115–145. https://doi.org/10.1007/978-3-030-25153-6_6

[24] Nanna Gorm and Irina Shklovski. 2017. Participant Driven Photo Elicitation for Understanding Activity Tracking: Benefits and Limitations. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing* (Portland, Oregon, USA) *(CSCW '17)*. Association for Computing Machinery, New York, NY, USA, 1350–1361. https://doi.org/10.1145/2998181.2998214

[25] Chiara Grosso, Noorie Sazen, and Roberto Boselli. 2022. AI-Implemented Toolkit to Assist Users with Career "Configuration": The Case of Create Your Own Future. In *Proceedings of the 26th ACM International Systems and Software Product Line Conference - Volume B* (Graz, Austria) *(SPLC '22)*. Association for Computing Machinery, New York, NY, USA, 158–165. https://doi.org/10.1145/3503229.3547043

[26] C Dominik Guess, Sarah J Donovan, and Dag Naslund. 2015. Improving dynamic decision making through training and self-reflection. (2015).

[27] Nathan Hahn, Shamsi T. Iqbal, and Jaime Teevan. 2019. Casual Microtasking: Embedding Microtasks in Facebook. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, Scotland Uk) *(CHI '19)*. Association for Computing Machinery, New York, NY, USA, 1–9. https://doi.org/10.1145/3290605.3300249

[28] JoAnn Harris-Bowlsbey. 2013. Computer-assisted career guidance systems: A Part of NCDA history. *The Career Development Quarterly* 61, 2 (2013), 181–185. https://doi.org/10.1002/j.2161-0045.2013.00047.x

[29] Steve Herman. 2010. Career HOPES: An Internet-delivered career development intervention. *Computers in Human Behavior* 26, 3 (2010), 339–344. https://doi.org/10.1016/j.chb.2009.11.003

[30] Ulrich Heublein. 2014. Student Drop-out from German Higher Education Institutions. *European Journal of Education* 49, 4 (2014), 497–513. https://doi.org/10.1111/ejed.12097

[31] Josh Howarth. 2022. *Time Spent Using Smartphones (2022 Statistics)*. Retrieved August 11, 2022 from https://explodingtopics.com/blog/smartphone-usage-stats

[32] Yitong Huang, Anya Skatova, Benjamin Bedwell, Tom Rodden, Victoria Shipp, and Emma Bertenshaw. 2015. Designing for human sustainability: The role of self-reflection. In *Proceedings of the 17th International Conference on Human-Computer Interaction with Mobile Devices and Services Adjunct*. 1042–1045.

[33] Shamsi T. Iqbal, Jaime Teevan, Dan Liebling, and Anne Loomis Thompson. 2018. Multitasking with Play Write, a Mobile Microproductivity Writing Tool. In *Proceedings of the 31st Annual ACM Symposium on User Interface Software and Technology* (Berlin, Germany) *(UIST '18)*. Association for Computing Machinery, New York, NY, USA, 411–422. https://doi.org/10.1145/3242587.3242611

[34] Isa Jahnke, Yen-Mei Lee, Minh Pham, Hao He, and Linda Austin. 2020. Unpacking the inherent design principles of mobile microlearning. *Technology, Knowledge and Learning* 25, 3 (2020), 585–619. https://doi.org/10.1007/s10758-019-09413-w

[35] JC Jimenez Garcia, NA Romero Herrera, David V Keyson, and Paul Havinga. 2014. Reflective Healthcare Systems: micro-Cycle of Self-Reflection to empower users. *Interaction Design and Architecture(s),(23), 2014* (2014).

[36] Lawrence K Jones and Merry C Ward. 2002. Equivalence of Three Versions of The Career Key™ among High School Students. (2002).

[37] Elisabeth T Kersten-van Dijk, Joyce HDM Westerink, Femke Beute, and Wijnand A IJsselsteijn. 2017. Personal informatics, self-insight, and behavior change: a critical review of current literature. *Human–Computer Interaction* 32, 5-6 (2017), 268–296. https://doi.org/10.1080/07370024.2016.1276456

[38] Thomas S. Krieshok, Michael D. Black, and Robyn A. McKay. 2009. Career decision making: The limits of rationality and the abundance of non-conscious processes. *Journal of Vocational Behavior* 75, 3 (2009), 275–290. https://doi.org/10.1016/j.jvb.2009.04.006

[39] Viktória Kulcsár, Anca Dobrean, and Itamar Gati. 2020. Challenges and difficulties in career decision making: Their causes, and their effects on the process and the decision. *Journal of Vocational Behavior* 116 (2020), 103346. https://doi.org/10.1016/j.jvb.2019.103346

[40] Thomas D. LaToza, W. Ben Towne, Christian M. Adriano, and André van der Hoek. 2014. Microtask Programming: Building Software with a Crowd. In *Proceedings of the 27th Annual ACM Symposium on User Interface Software and Technology* (Honolulu, Hawaii, USA) *(UIST '14)*. Association for Computing Machinery, New

York, NY, USA, 43–54. https://doi.org/10.1145/2642918.2647349
[41] Terri Lee, Krithika Jagannath, Nitin Aggarwal, Ramamurti Sridar, Shawn Wilde, Timothy Hill, and Yu Chen. 2019. Intelligent Career Advisers in Your Pocket? A Need Assessment Study of Chatbots for Student Career Advising. In *Proceedings of the Twenty-fifth Americas Conference on Information Systems* (Cancun, Mexico).
[42] Luis Leiva, Matthias Böhmer, Sven Gehring, and Antonio Krüger. 2012. Back to the App: The Costs of Mobile Application Interruptions. In *Proceedings of the 14th International Conference on Human-Computer Interaction with Mobile Devices and Services* (San Francisco, California, USA) *(MobileHCI '12)*. Association for Computing Machinery, New York, NY, USA, 291–294. https://doi.org/10.1145/2371574.2371617
[43] Dastyni Loksa, Benjamin Xie, Harrison Kwik, and Amy J. Ko. 2020. Investigating Novices' In Situ Reflections on Their Programming Process. In *Proceedings of the 51st ACM Technical Symposium on Computer Science Education* (Portland, OR, USA) *(SIGCSE '20)*. Association for Computing Machinery, New York, NY, USA, 149–155. https://doi.org/10.1145/3328778.3366846
[44] Ista Maharsi. 2018. Developing EFL Students' Learning Reflection and Self-Regulated Learning through Google Classroom. In *Proceedings of the 2018 The 3rd International Conference on Information and Education Innovations* (London, United Kingdom) *(ICIEI 2018)*. Association for Computing Machinery, New York, NY, USA, 62–66. https://doi.org/10.1145/3234825.3234841
[45] Amanda Major and Tina Calandrino. 2018. Beyond chunking: Micro-learning secrets for effective online design. *FDLA Journal* 3, 1 (2018), 13. https://nsuworks.nova.edu/fdla-journal/vol3/iss1/13
[46] Ash Maurya. 2012. *Running lean: iterate from plan A to a plan that works.* " O'Reilly Media, Inc.".
[47] Mary L McHugh. 2012. Interrater reliability: the kappa statistic. *Biochemia medica* 22, 3 (2012), 276–282. https://hrcak.srce.hr/89395
[48] Stacey F. Nagata. 2003. Multitasking and Interruptions during Mobile Web Tasks. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* 47, 11 (2003), 1341–1345. https://doi.org/10.1177/154193120304701105
[49] Lorelli S. Nowell, Jill M. Norris, Deborah E. White, and Nancy J. Moules. 2017. Thematic Analysis: Striving to Meet the Trustworthiness Criteria. *International Journal of Qualitative Methods* 16, 1 (2017). https://doi.org/10.1177/1609406917733847
[50] Laurel W Oliver and Susan C Whiston. 2000. Internet Career Assessment for the New Millennium. *Journal of Career Assessment* 8, 4 (2000), 361–369. https://doi.org/10.1177/106907270000800405
[51] Caroline Pitt, Ari Hock, Leila Zelnick, and Katie Davis. 2021. The Kids Are / Not / Sort of All Right*. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (Yokohama, Japan) *(CHI '21)*. Association for Computing Machinery, New York, NY, USA, Article 352, 14 pages. https://doi.org/10.1145/3411764.3445541
[52] Tajul Rosli Razak, Muhamad Arif Hashim, Noorfaizalfarid Mohd Noor, Iman Hazwam Abd Halim, and Nur Fatin Farihin Shamsul. 2014. Career path recommendation system for UiTM Perlis students using fuzzy logic. In *2014 5th International Conference on Intelligent and Advanced Systems (ICIAS)*. IEEE, 1–5. https://doi.org/10.1109/ICIAS.2014.6869553
[53] Verónica Rivera-Pelayo, Valentin Zacharias, Lars Müller, and Simone Braun. 2012. Applying Quantified Self Approaches to Support Reflective Learning. In *Proceedings of the 2nd International Conference on Learning Analytics and Knowledge* (Vancouver, British Columbia, Canada) *(LAK '12)*. Association for Computing Machinery, New York, NY, USA, 111–114. https://doi.org/10.1145/2330601.2330631
[54] Christina Schneegass, Nađa Terzimehić, Mariam Nettah, and Stefan Schneegass. 2018. Informing the Design of User-Adaptive Mobile Language Learning Applications. In *Proceedings of the 17th International Conference on Mobile and Ubiquitous Multimedia* (Cairo, Egypt) *(MUM 2018)*. Association for Computing Machinery, New York, NY, USA, 233–238. https://doi.org/10.1145/3282894.3282926
[55] Annastasia Shipepe and Anicia Peters. 2018. Designing an Interactive Career Guidance Learning System Using Gamification. In *Proceedings of the Second African Conference for Human Computer Interaction: Thriving Communities* (Windhoek, Namibia) *(AfriCHI '18)*. Association for Computing Machinery, New York, NY, USA, Article 31, 4 pages. https://doi.org/10.1145/3283458.3283481
[56] Zhida Sun, Sitong Wang, Wenjie Yang, Onur Yürüten, Chuhan Shi, and Xiaojuan Ma. 2020. "A Postcard from Your Food Journey in the Past": Promoting Self-Reflection on Social Food Posting. In *Proceedings of the 2020 ACM Designing Interactive Systems Conference* (Eindhoven, Netherlands) *(DIS '20)*. Association for Computing Machinery, New York, NY, USA, 1819–1832. https://doi.org/10.1145/3357236.3395475
[57] Nalina Suresh, Nkandu Mukabe, Valerianus Hashiyana, Anton Limbo, and Aina Hauwanga. 2021. Career Counseling Chatbot on Facebook Messenger Using AI. In *Proceedings of the International Conference on Data Science, Machine Learning and Artificial Intelligence* (Windhoek, Namibia) *(DSMLAI '21')*. Association for Computing Machinery, New York, NY, USA, 65–73. https://doi.org/10.1145/3484824.3484875
[58] Abdelhamid Tayebi, Josefa Gómez, and Carlos Delgado. 2021. Analysis on the Lack of Motivation and Dropout in Engineering Students in Spain. *IEEE Access* 9 (2021), 66253–66265. https://doi.org/10.1109/ACCESS.2021.3076751
[59] Maria Tomprou, Laura Dabbish, Robert E. Kraut, and Fannie Liu. 2019. Career Mentoring in Online Communities: Seeking and Receiving Advice from an Online Community. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, Scotland Uk) *(CHI '19)*. Association for Computing Machinery, New York, NY, USA, 1–12. https://doi.org/10.1145/3290605.3300883
[60] Niels van Berkel, Denzil Ferreira, and Vassilis Kostakos. 2017. The Experience Sampling Method on Mobile Devices. *ACM Comput. Surv.* 50, 6, Article 93 (dec 2017), 40 pages. https://doi.org/10.1145/3123988
[61] Katy Vigurs, Julia Everitt, and Tom Staunton. 2017. The evidence base for careers websites. What works? (2017). http://hdl.handle.net/10545/622043
[62] Edgar R. Q. Weidema, Consuelo López, Sahand Nayebaziz, Fernando Spanghero, and André van der Hoek. 2016. Toward Microtask Crowdsourcing Software Design Work. In *Proceedings of the 3rd International Workshop on CrowdSourcing in Software Engineering* (Austin, Texas) *(CSI-SE '16)*. Association for Computing Machinery, New York, NY, USA, 41–44. https://doi.org/10.1145/2897659.2897664
[63] Alex C. Williams, Harmanpreet Kaur, Shamsi Iqbal, Ryen W. White, Jaime Teevan, and Adam Fourney. 2019. Mercury: Empowering Programmers' Mobile Work Practices with Microproductivity *(UIST '19)*. Association for Computing Machinery, New York, NY, USA, 81––94. https://doi.org/10.1145/3332165.3347932
[64] Tanya V Yadalam, Vaishnavi M Gowda, Vanditha Shiva Kumar, Disha Girish, and M Namratha. 2020. Career recommendation systems using content based filtering. In *2020 5th International Conference on Communication and Electronics Systems (ICCES)*. IEEE, 660–665. https://doi.org/10.1109/ICCES48766.2020.9137992