




Facilitated Collaborative Group Co-Design of Hypothetical Digital Tools to Understand University Students' Well-being Support Needs and Requirements

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Abstract

The number of students in higher education encountering issues with their well-being is increasing every year, with many struggling to seek appropriate support due to reasons such as stigma or lack of access to services. Consequently, digital well-being support tools may be best placed to address their needs; however, few of these tools involve students in the design process, and thus, there is a lack of clarity as to whether these tools meet the needs of students. Therefore, the aim of the present research was to provide a series of design considerations that should be incorporated in the design and development of digital tools to support student well-being. Co-design methods were used to develop these design considerations by understanding the well-being domains in which students want support, their views on existing digital supports, and their desired features in a digital support tool. Undergraduate students enrolled in a well-being module at an Irish University completed a facilitated group assignment in which they were required to co-design a hypothetical digital tool to support other students' well-being. Deductive thematic analysis of the 10-min presentations of their tools was carried out. The overall findings were that:

- Students recognize all well-being domains as interconnected and view social connectedness and time management as crucial for them to find good balance in their lives and to thrive;
- Current digital well-being tools do not appropriately meet their needs, being too expensive, unmotivating, not suited to the student lifestyle and perceived as untrustworthy;
- Students desire a digital well-being tool that can give them structured and streamlined support and that clearly relates to their specific university environment;
- Specific desired features include the ability to log and visualize data, personalization capabilities, a motivational rewards system, and trustworthy educational information, tips and advice.

Keywords Well-being · Digital tools · Higher education · Co-design

Introduction & Related Work

Introduction

Student well-being is gradually declining year on year, with significantly more students in higher education (HE) experiencing issues with anxiety, depression, stress, burnout and other mental health issues than ever before [1, 2]. A report by the World Health Organization (WHO) found that amongst first year undergraduate students globally, 35% of them presented with at least one diagnosable mental health disorder [3]. In Ireland, around one-fifth of students in HE reported experiencing severe depression and/or anxiety [4].

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COVID-19 and the associated effects of isolation and remote learning have contributed to a further deterioration in student well-being and caused students to feel more detached from their higher education institutions (HEIs) and their fellow peers than ever before [5–7]. If these well-being issues remain unaddressed, they can have negative consequences on student success at both the institutional (e.g. academic attainment) and individual (e.g. personal development) level [8–13].

Current support systems are unable to cope with the rising demand being put on their services [14, 15] with many students facing routine long waiting times before they can access the necessary support [16]. Such practical and structural barriers to accessing support can discourage students from attempting to seek help in the first place [17]. Ideally students should be supported in acquiring and developing key skills such as effective time management, improved well-being literacy, and the ability to self-identify and manage stress before they fall into crisis. Mental health as conceptualized by the WHO encourages the promotion of mental health and well-being in a way that pre-emptively and holistically supports people to develop key personal skills and psychological strengths [3]. Such an approach should function in parallel with existing preventative approaches to mental health disorders [18]. However, many of the services currently provided by HEIs are primarily reactive in nature and only catch those students who have already reached crisis point [19]. There is a need to look beyond these kinds of services and to find ways of developing proactive supports that can pre-emptively equip students with the necessary skills to avoid falling into crisis in the first place [17]. Research suggests that implementing early preventative approaches helps to safeguard against the negative consequences of low well-being [20, 21].

Digital platforms such as those hosted on the web or via mobile applications may be best placed to facilitate the delivery of such support, being cost-effective, familiar to students, and easily accessible by large numbers of people [22–25]. University students may have a preference for supports which are partially or wholly “self-help” in nature as they become increasingly independent and self-reliant in the transition from secondary to third-level education and beyond [26]. Furthermore, students generate a lot of useful data related to health, social and academic behaviours which could be harnessed to support the necessary skills related to these.

Consequently, increasing emphasis is being placed on the importance of directly involving students in the collaborative creation of HEI policies, programs and activities relating to their well-being. Too often students have been left out of this process, resulting in poor engagement with supports that do not adequately address their needs, having failed to understand the full context of their

journey throughout higher education [27]. More generally, there is a problem with digital well-being tools that seek to change or support certain behaviours not being appropriately designed according to behaviour change theories [28, 29]. According to Self-Determination Theory (SDT) people are motivated to engage in certain behaviours when they believe that those behaviours will benefit them in a positive way [30]. SDT posits that there are three key basic psychological needs that need to be fulfilled in order for motivation to engage with positive behaviour change to occur: competence (the ability to learn new skills and master tasks), autonomy (feeling in control of your own behaviours and goals), and relatedness (feeling attached to other individuals) [31]. Motivation is a crucial factor influencing users’ experiences with digital tools [32], therefore such tools need to be designed in a way that supports individuals’ experiences of autonomy, competence, and relatedness in order to bring about effective positive behaviour change related to well-being.

One way to do this is via the utilisation of co-design practices when developing student supports. “Co-design” is the process by which diverse actors (e.g. researchers, designers, potential users) come together to “cooperate creatively” on a design project [33]. Potential users are considered to be “experts of their experiences” [34] and have valuable and meaningful contributions to make throughout the design process, despite not being designers themselves [35]. Directly involving users in such a way leads to the development of more innovative and higher quality systems, improved synergy between the system and users’ needs, higher user satisfaction, and reduced system development time [36, 37]. Furthermore, it helps to promote a sense of autonomy, self-determination and user empowerment, which are all key to developing successful well-being promotion programs. Indeed, the process of seeking out and acting on students’ suggestions has been shown to foster their sense of inclusion and empowerment [13]. This is critical given that the goal of improving student success and well-being can only be achieved through an effective partnership between students and HEI actors, who both bring key expertise to the support design process [38]. Such student co-design practices have proved valuable and effective in the past, enabling researchers to collect accurate and applicable data in the context of student-oriented design practices [39, 40].

The aim of the present research was therefore to involve university students in the design of hypothetical digital support tools via a co-design process, so that the student voice may be amplified to:

- Understand the well-being domains in which students want support
- Explore students’ views of existing digital well-being supports

- Understand students' specific needs relating to the university context
- Examine students preferred features in an idealized digital support for well-being
- Recommend components for a student-led digital well-being tool

Related Work

Students are increasingly being required to possess a wide range of “human skills” in order to cope with the challenges they face [41]. However, they do not feel that they are well-supported in acquiring these skills in the transition from secondary to third-level education or throughout third-level education [42, 43]. In a related study [44], although students recognized the importance of developing holistic well-being and personal development skills in order to thrive, the supports currently offered in HEIs feel impersonal and unapproachable to them and require more intuitive signposting. Other barriers to help-seeking include feelings of stigma, financial constraints, and concerns around privacy and lack of time [45]. Similar results have been reported by students in other studies globally, indicating that such supports are not intuitively or adequately integrated as part of the student experience in HE and that their visibility needs to be improved to make students more aware of them [17].

Although results from previous studies indicate that the use of digital platforms may improve how students engage in help-seeking practices and increases mental health and well-being literacy [46–48], currently there remains a gap in our understanding around the kind of data that university students create and find meaningful, the specific needs that they have in relation to this, and how they can best be supported in their well-being and personal development throughout HE and beyond [49].

Real-world implementation of digital well-being supports has been a challenge, particularly in HEIs. Studies examining the real-world uptake and engagement with such supports have largely shown low engagement and completion rates [50]. This is mostly due to a disproportionate focus on the clinical efficacy of student well-being supports rather than on their ability to be successfully implemented and integrated in real-world settings [22]. Increasing importance is being placed on the need to assess the user experience (e.g. usability, acceptability) of these supports to identify and overcome any factors that might limit an individual's desire to continue engaging with them [51, 52]. Through this, problems have emerged around apps not being designed with users in mind and not addressing the issues about which they care most [50, 53], and students in particular are skeptical of digital well-being supports' efficacy and of their ability to provide genuine human connection [54].

Methodology

Study Design & Ethics

This study falls under the FLOURISH (“Fitness for Life in Our Universities: Realising Informatics for Students to Thrive”) project which was developed at the Insight SFI Research Centre for Data Analytics, based at University College Dublin (UCD), Ireland. One of the overarching goals of FLOURISH is to design and develop a digital tool that can support university students' well-being, and the recommendations made by students in the present research will be used as part of this development process. FLOURISH seeks to help students be well, life-manage and reach their goals, all within the context of the digital world.

Under this project, an open elective student well-being module called “Sort Your Life Out & Thrive” (SYLO) was developed and made available to all students at UCD, with space for 50 students. SYLO was developed in accordance with the themes from the UCD Strategy for 2020–2024 [55] to explore the unmet needs of university students, their perceptions of their digital footprint, and the potential for technology to address those needs. SYLO aims to teach students about the science of health and well-being, encouraging their self-knowledge through practical skills like reflection, and to help them develop an understanding of their data. The SYLO module has been run a total of three times across three different semesters at UCD. At the end of the module, all registered students were provided with an information sheet with the option of voluntarily giving written, informed consent for none, some or all of the assignments they completed over the course of the module to be analysed as part of the research. Ethical approval was granted by the UCD Human Research Ethics Committee.

Module Outline

The module information as provided to all students is presented below.

Module Descriptor

SYLO is a module that focuses on your well-being, personal growth and coping with stress, so that you can equip yourself with lifelong skills for learning, working and being well. You will spend 10 weeks developing yourself to thrive in university life and beyond—including leadership skills for future employment—through fostering physical, cognitive, emotional and social skills that will support your well-being. Your assignments will provide you with the opportunity to focus on yourself, working towards your personal goals that

you will identify as part of the module, while also practicing self-care and self-compassion. The module will be delivered in the context of our digital world: understanding your data and finding digital supports and strategies for life management. Expert speakers will join us for sessions around areas such as nutrition, sleep and mental health and you will have the opportunity to track your own personal data and progress in areas of your choice (e.g. emotional well-being, study habits, time management, exercise). The weekly in-person classes will be conversational in tone, where you will undertake a variety of activities that will enhance your personal development. You will prepare for class each week by watching pre-recorded material. You will reflect on how your values and goals map onto the way you are currently living your life and you will be facilitated in exploring how you wish to reach your potential.

Learning Outcomes

On completion of this module students will have demonstrated the ability to:

1. Understand and discuss well-being, personal development and behaviour change within the context of their own experiences
2. Formulate personal aspirations and identify the skills and resources required to progress these aspirations, using a personalised, evidence-based approach
3. Develop digital strategies to monitor their progress, revisiting and revising their personal plans as appropriate to their lives
4. Critically evaluate the design of digital tools that support well-being
5. Reflect upon their feelings, learnings, goals and behaviours through an on-going process of self-enquiry

Module Assessment

Portfolio-This portfolio will include the students' personalised "Areas for Growth" plan (Assignment 1) and their reflection on the execution of their plan along with their reflections on the learning accrued in the module (Assignment 3).

Group Project-Students will be grouped together based on a common interest in a target behaviour/area for growth. They will co-create a preliminary design for a digital tool that can support this behaviour (Assignment 2).

Procedure

For the purpose of the present research, the focus is on the "co-design" group project that students completed as part of Assignment 2. This assignment was specifically designed to

solicit hands-on, practical involvement from students in the design process of a hypothetical digital tool to maximize their creative and innovative potential as well as to amplify the student voice. The full research methodology is summarized in the diagram below (Fig. 1), with further details being provided in the subsequent sections.

In groups of five to six, students were asked to propose a concept for a digital solution that would help support other university students in a domain of their choice (e.g. sleep, study, exercise, social). Students were asked to submit their top 3 preferences for which domain they would like to design a digital support tool. The groups were then constructed on that basis. If many students chose the same domain, then more than one group worked on this domain. Students were introduced to their groups over email and were asked to ensure they all attend the next two in-class design sessions (two hours each), and if not, to make arrangements with their group. There was a three-week period between students being grouped together and presenting the digital support that they had designed via ten-minute PowerPoint oral presentation. During this three-week period, there were two two-hour facilitated in-class design sessions, and students met in their own time as they desired. The guidelines students received for the assignment structure were as follows:

- Introduction-Introduction to the domain area, some perspectives on why it was selected, and what a digital solution could add in this area.
- Critique-Critique of existing digital solutions.
- Proposal-Proposal for a digital solution that would be useful for university students, including visual presentations and an explanation of how each key feature would work.
- Design Process-Documented design process, providing a rationale for the concept and a discussion of the process by which decisions were made.
- Hypothetical User-Presentation of a hypothetical user and discussion of how they might interact with the tool.
- Limitations-Limitations of their tool.

Presentations from the Spring & Autumn semesters of 2021 were conducted over Zoom and audio recorded due to remote teaching during the pandemic. In Spring 2022 they were conducted in person and were not recorded. Each group also submitted a copy of the PowerPoint slides used during their presentation.

Participants

A total of 22 groups (5–6 members in each) consented to having their co-design assignments used as part of the research. Students included in this sample came from a wide range of different courses, including medicine, health and

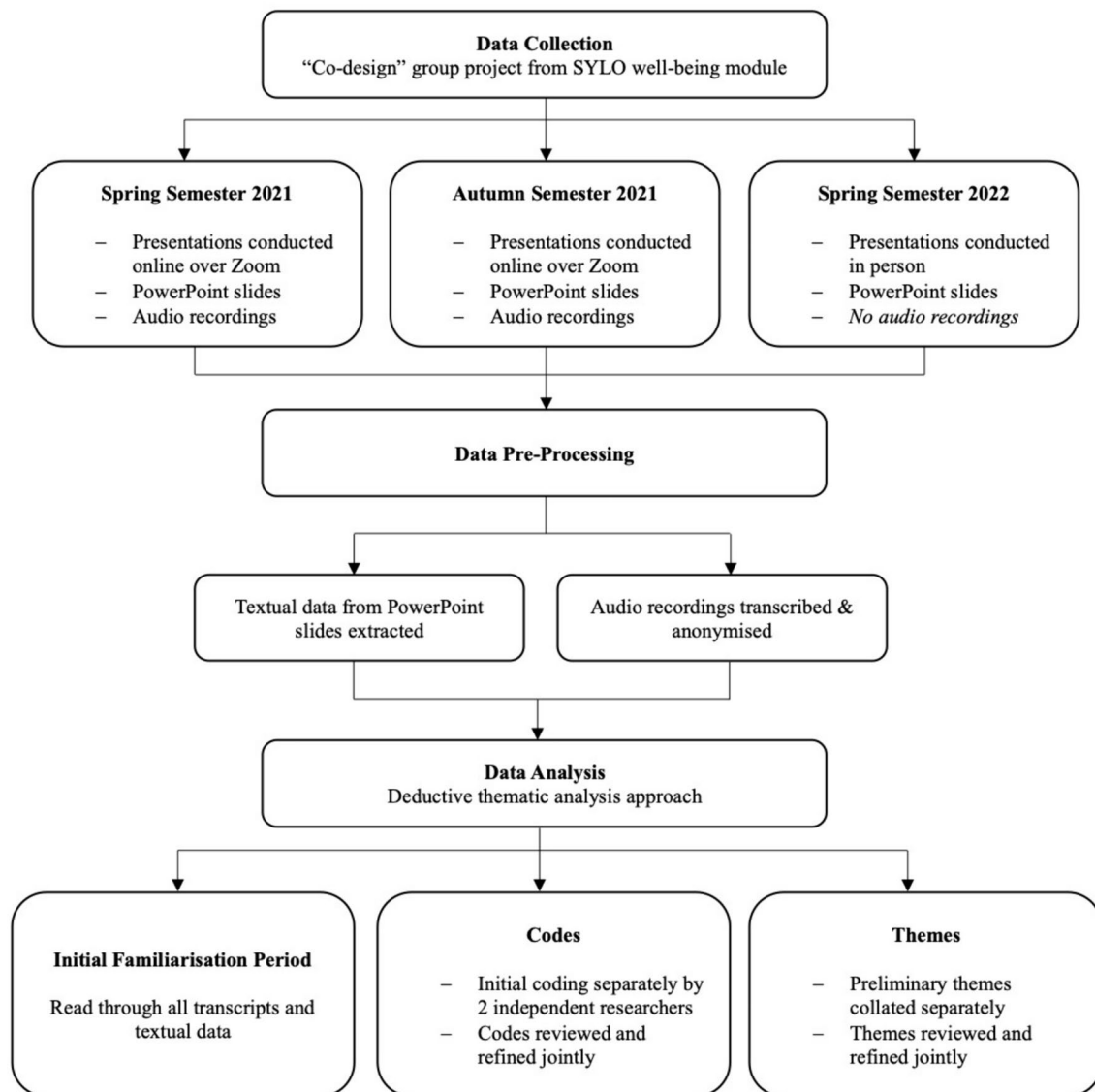


Fig. 1 Research methodology flow diagram

performance science, statistics, social policy and sociology, veterinary medicine, sociology and philosophy, physiotherapy, psychology, law, film and history, creative writing, physiology, agricultural science, commerce, animal science, and biomedical science. Students also came from a wide range of different stages of study, including 1st year undergraduate (30), 2nd year undergraduate (32), 3rd year undergraduate (17), 4th year undergraduate+(10).

Data Analysis

The recorded presentations were transcribed verbatim into separate Word documents, with all transcripts deidentified to protect participants' privacy. For the assignments which were not recorded, the analysis was conducted exclusively

on the written material in the slides they submitted (i.e. all textual material provided was copied from the PowerPoint slides submitted by students and transferred to a Word document for subsequent coding and analysis). A deductive thematic analysis approach [56] was applied to the transcripts and the textual data on PowerPoint slides with the intention of answering the following questions:

- What domains do students most need support in, and why?
- What are students' attitudes towards existing tools?
- What needs do students have relating specifically to the university student lifestyle?
- What specific features do they desire from a tool, and why?

After an initial familiarisation period with the data, initial codes relevant to the proposed questions were generated independently by two researchers and later reviewed and refined jointly. These codes were then used to identify common patterns across all transcripts according to their relevance towards answering the proposed questions outlined previously, which were then collated into a preliminary set of themes. These themes were then reviewed jointly, some new themes being added and other themes being collapsed together, and renamed for inclusion.

Results

The students’ design proposals presented here are a key contribution of the present study. Through qualitative analysis of their proposals, fourteen key themes were extracted relating to each of the research aims:

- Students view domains as interconnected (Theme 1), have a desire to kick bad habits and find good balance (Theme 2), consider good time management crucial in order to thrive at university (Theme 3), and consider social connectedness as essential to the overall student experience (Theme 4).
- Existing supports are not appropriately suited to the student lifestyle (Theme 5), are not motivating enough to use (Theme 6), and students have concerns around the trustworthiness of the advice provided by such supports (Theme 7).
- Students need support that is streamlined for the busy student lifestyle (Theme 8), desire something that will

give them guided structure (Theme 9), and something that is specific to their university environment (Theme 10).

- Students want the ability to log, visualize and reflect on their data and progress (Theme 11), a flexible tool that can be personalized (Theme 12), that will motivate them through rewards, quotes and healthy competition (Theme 13), and that will provide them with education, information, tips and advice (Theme 14).

What Domains Do Students Most Need Support in, and Why?

The domains to be addressed by their proposals, as self-selected by all 23 student groups across all three semesters that SYLO was run, included time management (n = 7), mental health & well-being (n = 5), sleep (n = 4), exercise (n = 3), nutrition (n = 3), and social connectedness (n = 1), as summarized in Fig. 2.

Consent was obtained to analyse and include 22 of these groups’ proposals as part of the present research, the details for which can be found in Table 1.

Theme 1: Domains are Interconnected

Though each group focused on one specific domain, these were all recognized as being interconnected and having significant influence on each other. As noted by Group 12’s description of a hypothetical user who would need support for poor time management, “Stress is causing negative mental well-being. She has been underperforming in her sports due to over-tiredness. She has also been isolating

Fig. 2 Proportion of well-being domains selected by student groups across all SYLO semesters

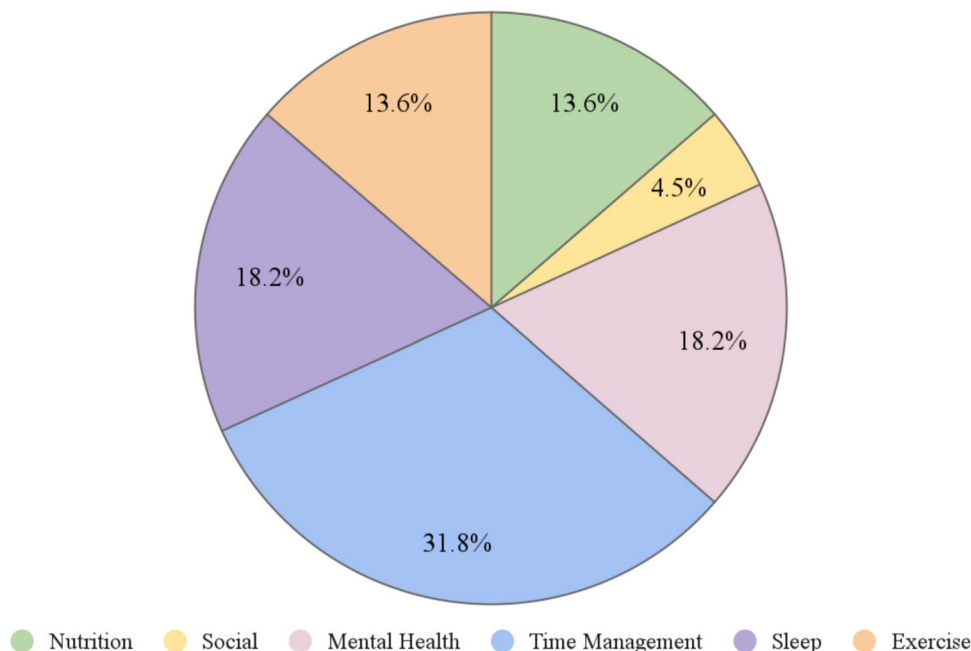


Table 1 Summary of students' design proposals for digital tools

Tool name	Description	Domain	Type
1. Food Log	Diet/calorie tracker, recipe suggestions	Nutrition	Mobile app
2. My Table	Diet/calorie tracker, nutritional information, nutrition education, social feed, recipe suggestions	Nutrition	Mobile app
3. Youtrition	Diet/calorie tracker, nutritional information, nutrition education, well-being tips, mood tracker, diary entries, recipe suggestions	Nutrition	Mobile app
4. UCD BFF	Friendship matching, individual /group chats, video/audio calls	Social	Mobile app
5. Little Buddy	Mood tracker/manager, diary entries	Mental health	Smart home device+mobile app
6. Mooed	Mood tracker, personalized mascot, streaks	Mental health	Mobile app
7. Self-Me	Social feed, well-being tips, affirmations	Mental health	Mobile app
8. Unload	Stress management, mood tracker, well-being tips/education, affirmations, goal setting, diary entries	Mental health	Mobile app
9. SYTO ("Sort Your Time Out")	Sleep tracker, calendar, virtual study rooms	Time management	Mobile app
10. UniPlanner	Calendar, academic timetable, activity suggestions	Time management	Mobile app
11. UCD Buzzy Bee	Academic timetable, university resource booking, rewards, study tracker	Time management	Mobile app
12. DueDate	Academic timetable, checklist, rewards	Time management	Mobile app
13. Silence	Disable push notifications, productivity modes, focus timer	Time management	App/browser extension
14. TaskMasters	To-do list, social feed, diary entries, leaderboard	Time management	Mobile app
15. Ducking Work	Timetable, task prioritization, social feed, relaxation tips, streaks, rewards	Time management	Mobile app
16. Sleepify	Sleep tracker, sleep tips, to-do list, alarm puzzle	Sleep	Mobile app
17. SNUZ	Sleep tracker, questionnaire, night mode, sleep tips, social feed	Sleep	Mobile app
18. ZEN	Sleep tracker, questionnaire, well-being tips	Sleep	Mobile app
19. Sleepie	Sleep tracker, sleep tips, monitor phone activity, rewards, share with friends	Sleep	Mobile app
20. Thrive	Exercise tracker, timer, exercise tips, social feed, rewards	Exercise	Mobile app
21. Tone	Exercise tracker, goal setting, synced wearables, music integration, joint workouts	Exercise	Mobile app
22. rUn	Running route planner, joint runs, mood tracker, goal setting, synced wearables, safety features	Exercise	Mobile app

herself from her friends in order to get her study done.", demonstrating how time management can influence mental well-being, sleep, exercise, and social connectedness. Likewise, Group 16 chose to focus on sleep because of the many benefits it can have on nutrition, mental well-being, time management, and exercise: "There's lots of many extra health benefits associated with getting a good night's sleep [...] preventing weight gain, boosting one's immune system, heart strengthening, improved mood, productivity and memory, and maximization of athletic performance.". Similarly, exercise was linked to positive mental well-being, "Exercise is so integral to us as humans, and it's intrinsically linked with well-being and good mental health." (G20), and balanced nutrition was linked to better sleep, "The small efforts to improve his diet has improved other aspects of his life, e.g. he has more energy and sleeps better." (G1) and improved mental well-being, "Mental health and nutrition habits are interlinked." (G3).

Theme 2: Desire to Kick Bad Habits and Find Good Balance

Given that these domains are so interconnected, students desired support across all of them due to the unhealthy habits they commonly develop as result of the busy student lifestyle which prevents them from having the time to balance everything in a healthy way: "In this generation we all agreed that it's very easy to slip into survival mode and not take care of yourself" (G7). These bad habits include working late and eating poorly due to poor time management, "She often doesn't do her work until late at night and studies until the early hours of the morning without taking breaks or making a proper meal." (G12), an over-reliance on social media which negatively impacts mood and self-esteem, "[Her] infatuation with likes and popularity on these platforms alters her mood and makes her question her own online presence." (G7), over-consumption of caffeine, alcohol, and technology, "Using laptops right before bed, the caffeine in his system from the day, consumption

of alcohol before going to sleep, just a few factors that can affect his sleep.” (G16), unhealthy eating and unwillingness to exercise, “Students [see] takeaways as the easy option.” (G3), “Her old habits will be to just sit in front of the TV with some snacks.” (G20), development of an unhealthy sleep schedule, “She often finds it hard to get sufficient sleep and goes to bed late most nights.” (G18), and procrastination, “It’s also very easy to put off tasks, leaving them to pile up until the end of the day, week or even the deadline. Some tasks might not even get done at all.” (G9). There is a strong desire from students to have something to help them balance their lives better, “We’re all busy students. We all know what it’s like to try and balance university life, social life, and we know how difficult this is.” (G10), so that they can return to healthier habits.

Theme 3: Good Time Management is Crucial for Students to Thrive

Time management was the most popular topic chosen by students as the domain they wanted their proposed tool to focus on, as one third of the groups (7 out of 22) did so. Indeed, having good time management appears to be especially crucial in managing the busy student lifestyle, “As students, efficient time management is critical in order to balance social life, work, exercise, college and study”

(G12), “It is important as it allows us to meet deadlines and obligations, while still giving us enough free time to do all the things we enjoy.” (G9). It is also viewed as being essential beyond academia and in other areas of life, “Time management is one of those things, it’s applicable not just to college, but to everything. So if you get into good habits now using the help of a digital tool, then it will translate into much more productive use of your time in other areas, which can translate [into] achieving goals, whether that’s financial or [...] meeting people or whatever you want to do.” (G9). Helping students foster good time management skills is therefore essential in order for them to thrive in the HEI environment and beyond.

Theme 4: Social Connectedness is Essential to the Student Experience

Finally, though only one of the groups proposed a tool which focused specifically on supporting social interactions at university, almost every single proposed tool across all domains included a social feature (e.g. Fig. 3): nutrition, “It would suggest cafes or restaurants to go to and you can invite your friends and [...] if you invite friends, you get a group discount.” (G1), exercise, “Allowing collaboration with friends and the opportunity to sync your runs together and [to] meet at a common space for some refreshments,

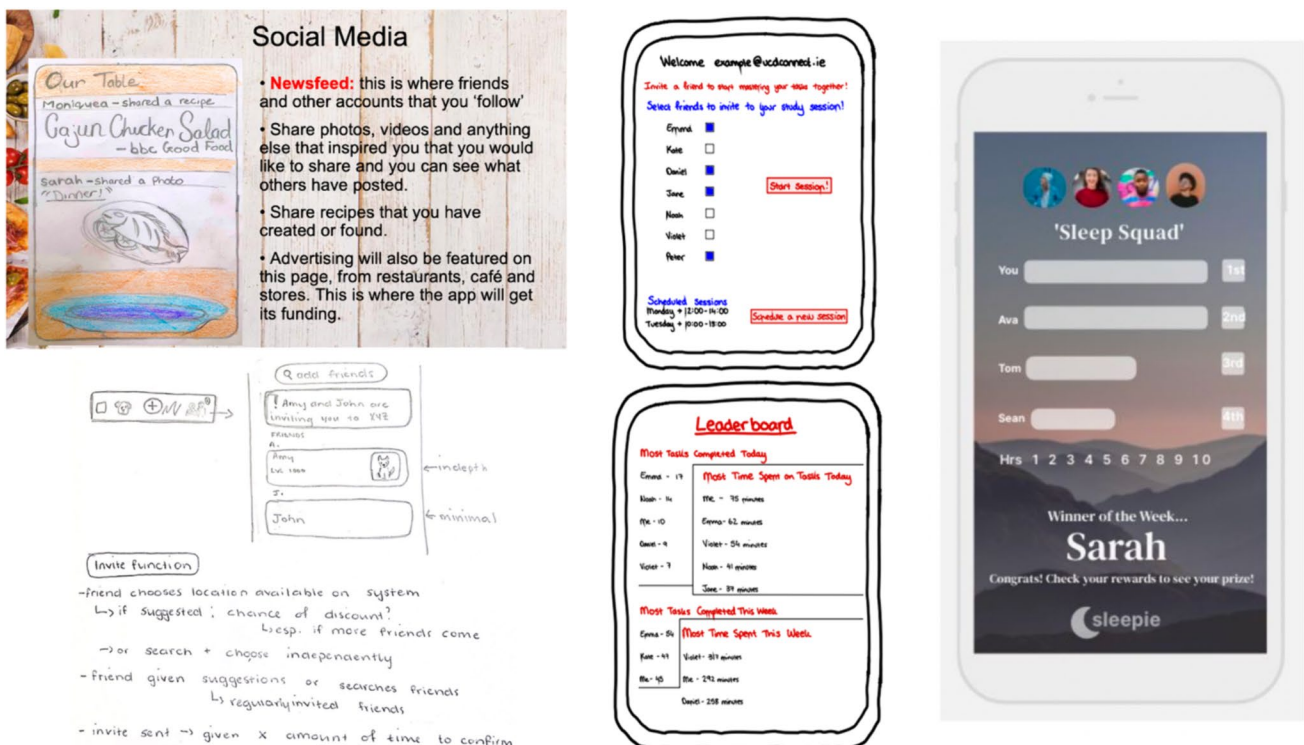


Fig. 3 Example social features from “My Table”, “Food Log”, “TaskMasters” & “Sleepie”, created by students

sight-seeing or just a catch-up.” (G22), sleep, “You can also see your friends’ streaks so it becomes like a mini competition for your group to have the longest sleep streak.” (G19), time management, “Friends can share their to-do lists and whether or not they have succeeded in completing them.” (G14). Indeed, the ability to make social connections at university was viewed as essential to the student experience, particularly in the early stages when just starting out at university: “As [...] students it’s important to be able to socialize and make friends, especially when in a new environment and most specially when you’re starting the university experience.” (G4). Fostering positive social interactions in HEIs is therefore important to include in any support tool, no matter what the primary focus is.

What Are Students’ Attitudes Towards Existing Tools?

Theme 5: Not Appropriately Suited to the Student Lifestyle

Many existing tools are viewed as ill-suited to the student lifestyle and associated needs. Firstly, students have a high preference for tools which are low in cost or free to use: “One of the biggest pros about ‘Headspace’ is that it offers a student discount rate. So instead of 60 euro per year, it’s 10 euro per year.” (G16). With the cost of living and tuition fees, many students do not have the means to pay expensive subscription fees to access premium capabilities, “Most [tools] require expensive monthly subscriptions. These expenses are not suited for university students with multiple expenses and bills.” (G18), so many are unable to fully benefit from these. Secondly, students find that certain existing tools can be distracting and have disruptive notifications and reminders, “some of these apps could be very distracting to us [and have] loud indiscreet reminders which may distract others around the user[...]if we’re in a lecture or something, and we might have our phone ping”(G11). Finally, many existing tools can be overly-complex to learn how to use, “Some apps can be difficult to navigate; too many settings or steps leading the user to disengage and give up” (G11), which students often do not have time to do, “particularly for [college students], it can be difficult to find the time and the effort to add all the assignments into the app” (G9). They will be more likely to engage with a tool that they feel caters specifically to their needs as students: “We’re more likely to subscribe to a service or purchase a product when it caters specifically to [our] identified needs as students” (G18).

Theme 6: Not Motivating Enough to Use

Existing tools can be un motivating and even demoralizing for students, “the usual diet monitoring apps, they’re not

very encouraging, they can kind of tell you, ‘Oh, you’re eating bad food and you should feel bad.’ And [...] that’s not really motivating to students.” (G1), leading to low engagement and even abandonment, “It can also be a struggle to keep people motivated to stay on the app [...] they just end up being deleted after a while” (G20). Furthermore, students feel that many existing tools do not have a reward or other appropriate motivation system: “Other apps don’t give you incentives or a general ‘well done’ when you do a task or tick off a to-do list. We think that this would be rewarding and it’s important to keep us students motivated.” (G12). This is problematic given that students already struggle with finding the motivation to develop and maintain healthy habits: “When you’re at home, it’s hard to find motivation to get up [...] you can get easily distracted. It’s easy to be like, ‘Oh, I’ll just [...] do this later’.” (G9), “while you’re working out, you can often feel an urge to stop, maybe you’re tired, maybe you’ve just had enough” (G20). They would need a tool that is compassionate and can provide them with motivation.

Theme 7: Trustworthiness of Advice

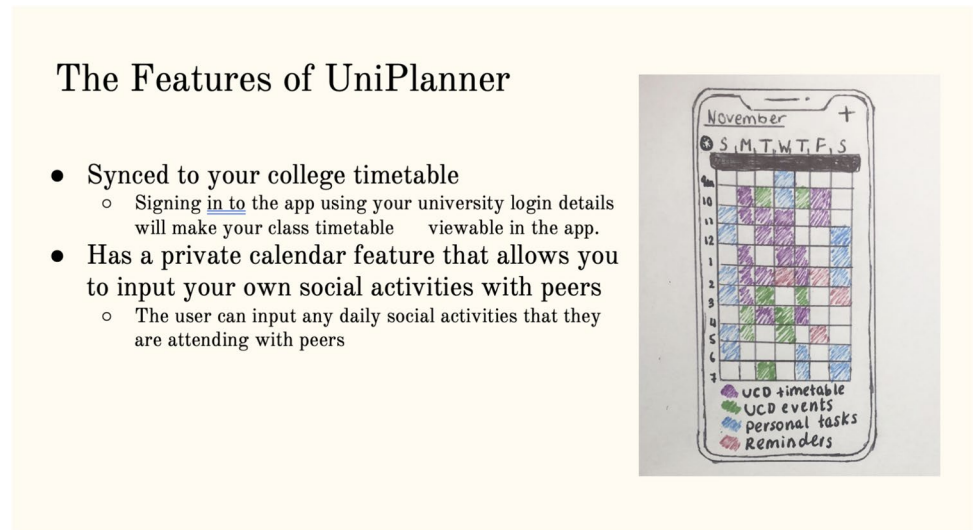
Finally, students are unsure whether they can trust the information and advice that is given to them by the existing tools they use: “In the making of these apps, we don’t know how much actually goes into it by professionals and by people who do this for a living [...] we don’t know if that what they’re telling us to do is actually applicable.” (G5). They have higher confidence in and are more likely to use tools which are explicitly branded as being based on sound scientific advice and the most current best-practice: “Like the masterclasses from chefs [...], like discoveries from doctors and labs and stuff. So they would be trustworthy sources.” (G2).

What Needs Do Students Have Relating Specifically to the University Student Lifestyle?

Theme 8: Streamlined Support for Busy Student Lifestyle

As discussed previously, students have a busy lifestyle. They are often too busy trying to balance all of these domains to be able to devote much time to setting up a tool that will support them. They want something that is straightforward and easy to use, with many of their proposed tools having features that streamline the processes related to the different domains (e.g. Fig. 4): “As a student myself, I know it’s hard to organize with a friend when to meet up, so by having a feature that notifies you when your friends are free, it gives you the chance to [...] not waste time trying to organise a meetup” (G10), “Makes the preparation of healthy food easier, caters to

Fig. 4 “UniPlanner” feature designed by students to allow students’ schedules to partially auto-populate with class timetables, college-organized events & society events that they have subscribed to



ingredients, equipment and time available [as students]” (G3), “Set run plans around college campuses, how many times they have been ran by others and other people’s reviews of the route.” (G22). Furthermore, almost every single group proposed a tool that took the form of a mobile application (e.g. Fig. 5). Indeed, students favour this format as it is convenient to have access to everything through their mobile device which they often carry with them everywhere: “I think the fact that you can get it on

your phone, it’s just always going to be accessible.” (G5), “In this generation, more people have mobile phones than don’t,” (G16). Additionally, students have a strong desire for a tool that is a ‘one-stop shop’ which was a theme that came up repeatedly, “[Our app] has a range of different exercise workouts [...] it’s a one-stop shop, it has everything she needs.” (G20), as they find that they currently use multiple different tools for everything that they need, “Different aspects of it exist in different apps, but it’s

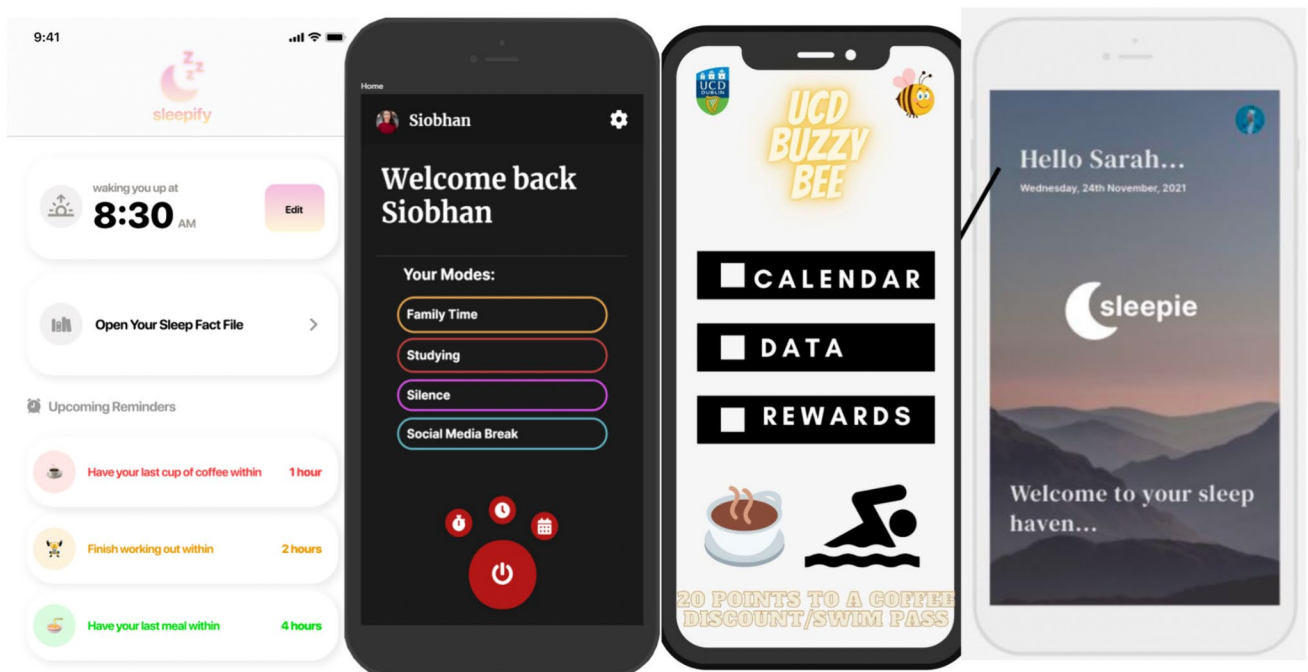


Fig. 5 “Sleepify”, “Silence”, “UCD Buzzy Bee” & “Sleepie” mobile app design examples created by students

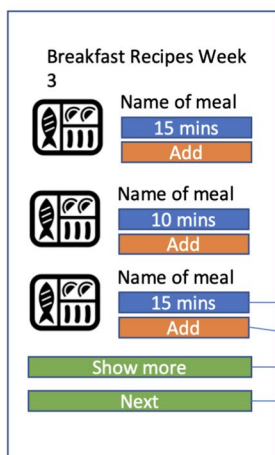
putting all of it together that we think would be great, you know, having one space to access all of this, instead of going here and there and everywhere” (G11). It would be more convenient for them to have all of their desired features consolidated into a single app, “Each feature is unique to our needs as university students and because we are often in a rush, and we needed an app that had it all.” (G20), “We thought it would be a good idea to introduce something that would have everything we want in one place. [It’s] handy to have everything in one place just as university students do want everything to be as easy and as accessible as possible.” (G19).

Theme 9: Desire for Guided Structure

Students often feel overwhelmed by everything required of them to maintain a healthy, balanced lifestyle, “I hate going shopping, because everything is so overwhelming and I never know what to get” (G1), as well as good academic performance, “One problem that I have is that I’ll view my work as a whole. So instead of seeing a bunch of different assignments I have to do, I’ll just see it as this one massive mountain of work to do.” (G12). They need something that can provide them with this structure automatically or at least semi-automatically, thereby reducing feelings of stress and being overwhelmed, and indeed many of the groups incorporated such a sense of structure into the design of their proposed tool (e.g. Fig. 6): “At the beginning of the week, you’ll be able to go in and choose which recipes you want to make for the week. And then it’ll produce a shopping list for you.” (G2), “[Our app] guides her through the whole way [...] she just had to put it up against the mantelpiece and that was it, she was ready to go with her workout.” (G20).

Fig. 6 “Food Log” feature designed by students to allow streamlined recipe selection, groceries & meal preparation

FAST AND EASY TO USE (PLANNING)



- Meal planning features for students interested in making their own meal.
- The option will show all possible meals for each mealtime for a particular week, and the user add 7 meals (1 week), which will appear as the meal options for next week.
- The app generates all ingredients needed (grocery list)
- Estimated meal prep time
- To add meal to list (likely a checkbox)
- Show more meal options
- Go to next mealtime (Lunch or Dinner)

Theme 10: Specific to Their University Environment

Many groups also proposed a tool that was to some extent integrated with their specific HEI. For instance, one group proposed having the student union and student societies involved in the app to facilitate social events and connections on campus: “The app would suggest events on campus that actually fit directly into your timetable. So societies, clubs, obviously the student union, can update their calendars, which will then inform the subscribers and the students of the event taking place on campus.” (G10). Another group proposed a feature which allows the automatic booking of both library and gym slots to streamline and improve time management: “You can add library slots onto the app, and it’ll automatically book you a seat saving you some hassle. And the exact same system is in place with the UCD gym as well in regard to booking a gym slot.” (G11). Many others also proposed the automatic syncing of their college timetable with their tool, again to streamline and improve time management: “So one of the features that our app would have would be that it would sync to your college timetable. So all your UCD lectures would be on your timetable.” (G10). Acknowledging that it can be hard to make connections with other students on campus, the social connectedness group also proposed a feature that would allow students to automatically match with each other based on shared interests, “You can create friendships by providing your interests, your hobbies, anything else, and [...] the algorithm of the app would match you with people with similar interests with you, making it really easy to make friends with people who are [...] in the same university” (G4), and that is UCD-exclusive, “We don’t want outsiders joining this app, because it is exclusive for UCD students.” (G4). It seems important to students to have a tool which is contextualized within their specific HEI environment, making it feel more

tailored to them and making them feel better understood and supported.

What Specific Features Do Students Desire from a Tool, and Why?

Theme 11: Ability to Log, Visualize and Reflect on Data and Progress

Across almost all groups and domains, students’ proposed tools included a feature (e.g. Fig. 7) allowing users to log, “You can also log which modules you’re studying to allow the app to generate graphs and data on what modules you don’t spend enough time on.” (G11), visualize, “And at the end of every day, you will get a breakdown of what you did during the day, how many hours you spent on social media or studying or playing sports [...] this gives you a good overview” (G12), and reflect on their data, “You can set your goals, you can watch your progress and learn from the information that you’re given.” (G1). The ability to track progress in such a way seems highly valued by students in the furthering of their personal development journeys, “We also believe that by adding a progression feature into the app’s features, it will allow users to gauge their personal development in real time.” (G6), by helping them to identify patterns and areas where they may need to change their

habits, “Keeping track of progress enables the user to look back and notice patterns.” (G3).

Theme 12: Tool is Flexible and Can Be Personalized

Students value a tool that is flexible enough that they can tailor it to their own needs, either relating to its physical appearance, “It has [...] customizable chassis and multiple colour options so that you can really make it your own.” (G5) or its various functionalities such as tailored recommendations, “She fills in her details, her height, her weight, medications, what kind of exercise she enjoys, and her goal as to where she’d like to be in a few weeks’ time. And so this personalizes a plan that’s specific to her.” (G20), and notifications, “The user has the option to turn off certain features [...] for example, if you would not like [the app] to notify you on your quality of sleep for the previous night this can be switched off.” (G17). This makes the tool feel more personal and as if it is something that really caters to them specifically, which fosters motivation, “If I think that something is more personalized to me [...] I’m more committed to actually putting time into it, because it does feel more special to me.” (G12), and positive engagement with the app, “By adding a cosmetic feature to [our app], it will allow users to impart a piece of themselves onto the app. This will in turn incentivize users to engage with the app more.” (G6).



Fig. 7 Features designed by students in “Food Log”, “ZEN” & “UCD Buzzy Bee” allowing users to track and visualize their data

Theme 13: Motivation Through Rewards, Quotes and Healthy Competition

As discussed previously, students often struggle with finding the motivation to develop and sustain healthy habits as well as to stay engaged with the tools that are supposed to support them. To combat this, many groups proposed tools which include a feature to help users stay motivated and engaged over time. For instance, in the form of a reward system giving real life benefits, *“There is a reward system in place whereby you receive points for attending lectures or library slots, etc. which can result in you being able to redeem coffee discounts in campus cafes, or free swim passes at the gym.”* (G11), or virtual benefits for a customizable digital avatar (e.g. Fig. 8), *“The level-up feature in [our app] allows users to obtain limited edition cosmetics for their [digital animal avatar] as a reward for using the app.”* (G6). Another form of motivation included the integration of motivational quotes: *“The app also provides pop-up quotes that can appear on your phone at any given time throughout the day that gives you motivation and encouragement.”* (G19), *“Our digital tool will provide you with a wide variety of quotes from Olympic and professional athletes from your chosen sport, which [...] will ensure that you don’t stop and that you are kept motivated.”* (G20). And finally, relating to the social element of the tool, some groups proposed the idea of incorporating healthy competition between friends

as a motivational tool: *“Getting notifications of others completing tasks could influence/motivate you to complete your own.”* (G14), *“You can also have competitions with your friends [...] we thought it’d be a good idea to compare who got the best quality sleep.”* (G19).

Theme 14: Education, Information, Tips and Advice

Students value tools which provide them with educational and informational content relating to the domain they wish to be supported in. Many groups included such a feature in their proposed tool, *“You’ll get the nutritional information for the whole recipe, and you’ll also be able to click on a specific ingredient and it’ll give you the nutritional information for that.”* (G2), *“It also has the option to listen to [...] podcasts in general about sleep.”* (G19), as it can help deepen their understanding of a topic they may not previously have given as much consideration to, *“It’s a good introduction into mental health if you’ve never really thought about it, or maybe you’ve ignored it.”* (G5). They also value tools which give them helpful tips and advice, *“It also compiles information on techniques that you should practice before you sleep.”* (G9), to ensure that they are not doing more harm to themselves by completing an activity without proper instruction, *“It will provide video demos of your selected exercise to enhance your performance and*

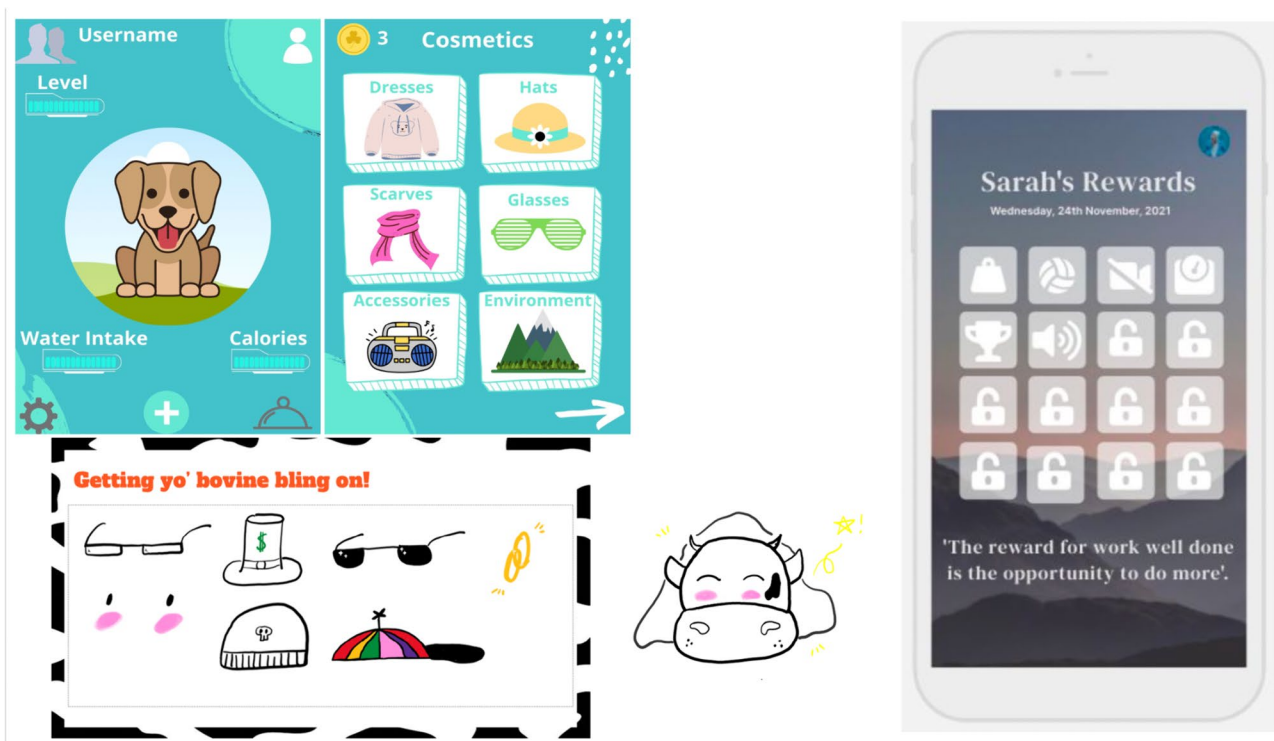


Fig. 8 Reward features from “Food Log”, “Mooded” & “Sleepie” designed by students

also importantly, to prevent injury. And also ensuring form is correct.” (G20).

Discussion & Conclusion

Discussion

The overall aim of this study was to employ co-design methods to involve and amplify the student voice in understanding the well-being domains in which they want support, their views on existing digital supports, and their desired features in an idealized digital support.

In terms of the domains in which they want support, students recognize that time management, mental health, well-being, sleep, exercise, nutrition, and social connectedness are all intrinsically linked, and therefore desire support that touches on all of these in some way. The tools that they proposed, though focusing on a single domain, frequently included features relating to or having a subsequent effect on other domains. As discussed earlier many students are struggling with issues relating to their mental health, however these issues can also extend to physical health and other personal circumstances (e.g. finances, housing, food insecurity, personal relationships, social and cultural pressures) [57–59]. These findings reflect calls for a re-conceptualisation of our understanding of “well-being”, moving beyond the one-dimensional view of it being singularly related to mental health in the clinical sense and towards a more holistic approach that encompasses multiple domains [60]. While research indicates that there are numerous benefits to holistically supporting students [61, 62], more research is needed on how HEIs can take steps towards effectively implementing such an approach, potentially via the integration of holistic digital support tools as part of a larger whole-institution approach.

The ability to effectively manage their time while forming social connections on campus is of particular importance to university students. This is in line with much of the previous research demonstrating that many students struggle to effectively manage their time, which leads to poorer academic performance, stress and burnout [63–65]. This problem may arise from the lack of appropriate support given to students in the transition from secondary to tertiary education, as secondary education is often much more structured without students needing to independently manage their time themselves [66, 67]. Effective time management is a crucial skill for students to acquire not just within academia but beyond university as well, allowing students to better manage their workloads and to balance academic and non-academic commitments [68, 69]. It is therefore crucial that they have a support tool that helps them foster good time management skills, as research suggests that actively helping students

foster these skills positively impacts their academic behaviours and experiences [70].

The findings are also in line with much of the research demonstrating the lack of social connectedness and sense of belonging amongst university students, particularly the first-year cohort [71, 72]. These issues also extend to those who have been negatively impacted by the effects of COVID-19 and the associated social distancing and remote-learning practices [73–75]. A sense of belonging and social connectedness within a student’s HEI environment are significant indicators and determinants of their educational success [58]. In order to feel like they “belong”, students need to feel connected to and supported by their environment and their peers, and to feel that they are respected, valued and cared about by individuals within the HEI structure (e.g. staff, faculty, peers) [76]. When HEIs do take steps to foster positive social connections amongst students and their peers, for instance through student-led societies, athletic clubs or peer mentorship programs, students start to feel more connected to and comfortable within their HEI environment, are better able to integrate into campus life, and improve academically [62, 77–80]. However, these effects have been shown to fade over time. Digital student supports may offer longevity by being less resource intensive and enabling changing user preferences to be accommodated over time.

Furthermore, as students described the impact of a busy lifestyle which causes them to develop unhealthy habits across all domains, it is necessary to provide them with a tool that can help them strike better work-life balance and return them to healthier, sustained habits. Poor work-life balance can lead to increased feelings of depression, anxiety and burnout, lower academic performance, and lower overall well-being [81], while effective work-life balance positively impacts well-being by facilitating an individual’s ability to satisfy their personal needs [82]. Ideally, this kind of support should be easily accessible by students via a mobile device or app which consolidates all of their desired features into a single tool. Research suggests that when support services are provided in such a format (ie. web or mobile application), it can help students overcome barriers related to perceived stigma when wanting to access the help that they need [83]. Given that the majority of students’ time is allocated between academic work, extracurriculars and trying to maintain meaningful social relationships, such a mobile tool would function best for them by providing as much structure as possible in as streamlined and automatic a manner as possible (e.g. automatic population of college timetables) [84].

Students felt that existing digital supports are not currently well-adapted to their specific context and needs, do not find them motivating enough to use for a sustained period of time, and do not always trust where the advice being given is coming from, which leads to many of them

being abandoned. Other studies, primarily relating to the use of “telemental health” tools (i.e. tools used to digitally access mental health information, advice and support), have found similar results, with issues arising related to privacy concerns, feelings of discomfort and a perceived “lack of personalized care” [85–87]. Based on the present research and research on digital tools in general, to improve engagement and encourage sustained use, a well-being support tool should be transparent about the sources from which it draws information and advice to increase users’ trust. It should also be able to motivate students to engage with it for sustained amounts of time, and should feel relevant to them and their lived experiences as university students.

Regarding their desired features in an idealized digital support, students want a tool that is low in cost, straightforward to set up and use, and which can motivate them through a rewards system (e.g. redemption of points for real or virtual benefits) or friendly competition with other users (e.g. maintained ‘streaks’), or some other form of motivation that appeals to their specific interests or identities as students (e.g. motivational quotes). Similar results have been observed across other studies, with students having a clear preference for digital tools that are useful and easy to use [88]. More research is needed around which kind of reward system may be most effective, as conflicting results have been previously reported. In a systematic review conducted by Davies, Morriss, and Glazebrook [83] looking at computer- and web-based interventions to support depression, anxiety, and psychological well-being in university students, the effectiveness of such a system varied depending on the area being targeted by the intervention, with higher preference for no incentive for interventions targeting depression vs. higher preference for an incentive for interventions targeting anxiety, weight loss and goal-setting, notably a financial incentive [89]. This may be related to self-determination theory, according to which rewards and incentives can sometimes be perceived as “controlling” and are therefore less intrinsically motivating [90]. In order to trigger more effective intrinsic motivation in students, care should be taken with how rewards and incentives are presented and framed. In line with the importance of their identities as students, they also have a strong desire for a tool that is embedded within their specific HEI’s context and that can be tailored to their specific needs. In this way, they would feel more valued, understood, and supported as individuals within the larger HE context, leading them to be more motivated to use a tool for a sustained period of time and benefit from it in the long term.

Strengths, Limitations & Future Work

Finally, there are some strengths and limitations to the present study that are worth discussing. Firstly, it is worth

noting the many benefits that arise from involving the student voice via the medium of facilitated co-design. Capturing the student voice using this process helped to establish the necessary foundation for a validated, theory-based approach to app design rooted in self-determination theory. On the participants’ side, many students noted that simply having the chance to participate in group work, such as was required for the assignment described here, allowed them to forge strong bonds with their peers and to develop necessary collaborative skills that they will continue to benefit from in the future. On the designers’ side, the active participation of stakeholders in the design process allows for the expansion of ideas and results that may not have otherwise been considered, as has been noted in previous instances where co-design has been used [36, 37]. Stakeholders such as the students involved in the present study were able to bring a unique perspective as experts of their own lived experiences which the designer may not otherwise be aware of [34]. To bring both stakeholder and designer ideas together cohesively and to extract the desired engagement and creativity from stakeholders, however, requires implementing methods which most effectively facilitate the co-design process. This is an area which is still growing and requires further exploration adding on to the methods explored in the present study.

In terms of limitations, while the methods employed here involved students designing a hypothetical tool in separate groups, other useful methods may involve having all stakeholders working collaboratively as a whole to strive towards one unified design goal. Future studies could achieve this via hands-on, facilitated co-design workshops led by designers who wish to derive specific design outcomes for an actual proposed tool from the session. The goal then would be to move away from hypothetical abstraction towards something more directly tangible to which stakeholder input can be directly applied. The results presented here will be used to develop a tool to support student well-being according to their own recommendations. Further co-design sessions will be carried out between the students and a design team to expand on the features proposed here, balancing student needs and wants with what can realistically be achieved within the context and timeframe of the research. It is intended to act as an early-stage, beta version of a tool to be deployed amongst a sample of the student population, which can then be further developed and improved based on user feedback.

Regarding the generalisability of the results presented here, it should be noted that the research involved a primarily female, Caucasian group of students from a Western university and therefore may not be representative of all higher education students worldwide. Ideally, this co-design process would be applied across other institutions worldwide in order to diversify the participant pool.

Conclusion

In summary, students face considerable challenges to their well-being during tertiary education and HEIs struggle to provide them with appropriate preventative tools. The present study highlighted that students have a very good understanding of their own well-being needs and how they would like them to be addressed, being both in-touch with their own experiences in the HEI context and well-embedded within the digital world with their extensive use of other digital tools that they used to inform their own proposals. Their attitudes towards existing tools provide valuable insight into what does or does not work for them, which can serve as a guide in the future design of tools to know which features to prioritize and which to potentially avoid. If we truly wish to create well-being support tools that foster meaningful, sustained development in the students that we are designing for, it is crucial to involve and amplify the student voice in all stages of the brainstorming, design, development, and evaluation of these tools.

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Declarations

Conflict of Interest The authors declare that they have no conflict of interest.

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