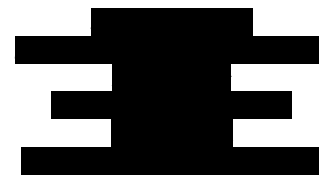
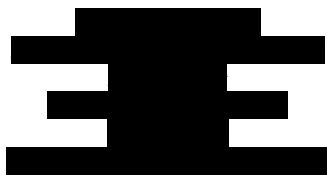


WebXR to support student wellbeing and anxiety



Abstract— The COVID-19 pandemic social distancing measures had immense evidenced impact on student life in higher education affecting their mental health in many ways. In addition, remote working measures taken by Higher Education organizations to protect students and staff created an additional barrier for students seeking support at a stage they feel the most vulnerable. This paper presents a work in progress study that focuses on investigating ways of designing an online system for self-assessment symptoms of anxiety based on which available support is provided in a personalized and emotionally engaging manner. The project builds and compares three prototypes: a conventional web site; a VR immersive environment with a single virtual human playing the student life advisor; and an immersive environment with more than one virtual humans interacting with the user aiming to study which system engages and assists vulnerable students more effectively engaging and contributes to a better user experience. The paper presents that project motivations, its aims and objectives, the proposed research methodology and the expected contributions to knowledge.

Keywords—WebXR, Virtual Humans, mental health, anxiety, user experience

I. INTRODUCTION AND PROBLEM STATEMENT

The emergence of the coronavirus (COVID-19) pandemic, the lockdown and social distancing measures evidently impacted mental health. Data released by the Office of National Statistics in the UK, based on indicators from the “Opinions and Lifestyle Survey” in Great Britain showed that almost one in five adults (19.2%) were likely to be experiencing some form of depression during the coronavirus (COVID-19) pandemic in June 2020; this had almost doubled from around 1 in 10 (9.7%) before the pandemic (July 2019 to March 2020) [1][2]. Research showed that the pandemic affected mostly the mental health of the younger populations (ages 18-25), who developed symptoms of post-traumatic stress disorder, anxiety, depression, and other symptoms of distress.

University student life is considered by many as the happiest years of one’s life. However, the Student Academic Experience Survey, 2020 [3], showed that the personal wellbeing of undergraduate students in the UK has declined on the following domains: life satisfaction; life worthwhile; happiness; low anxiety. The Student Academic Experience Survey (SAES) of students surveyed after 16 March 2020 (when most universities stopped face-to-face teaching) reported significantly lower levels of happiness than those surveyed before that date, while the remaining three well-being measures levels did not differ significantly. Internal survey at the [redacted] showed that severity and complexity of presenting problems have increased resulting in students needing support over a longer term.

Universities value their students’ mental health and wellbeing which are very closely interlinked and often placed under the same umbrella as university services. However, for students to take advantage of available help, support, advice and guidance they need to be aware and understand the available tools and services to them and how those can be accessed. Most Universities direct their students to their university’s website to find information about available support within the campus, or other organisations and support charities.

The most personal, emotionally effective way for students seeking support at a moment they may feel the most vulnerable is to talk to a student life advisor, or counsellor who works with students to assess how their mental health difficulties might impact their education and offer support accordingly. However, due to the lockdown and the social distancing measures such a direct way of communication may not be so easily accessible. The current waiting time again at the [redacted] for students to receive initial appointment with a student life advisor is approximately 2-2.5 weeks. From this perspective, VR technology and mobile devices assume important role to decrease those negative effects of the pandemic. These tools present benefits that could improve the service to students seeking mental health support online offering an environment that simulates a face-to-face interaction with a student life advisor. VR/AR [4] can leverage all aspects of “Patient Empowerment” as defined by the European Patent Forum (self-efficacy; self-awareness; confidence; coping skills; health literacy) [5]. In addition, WebXR [6] democratizes and simplifies dramatically the distribution of a VR/AR as this advanced technology becomes affordable and accessible by all.

This work in progress project focuses on investigating ways of improving the student wellbeing service, using the [redacted] website as case study, designing a WebXR prototype that supports students to self-assess anxiety symptoms proposing respectively available support in a personalized and emotionally engaging manner. The paper compares the effect of conventional web versus WebXR technology to effectively assist students seeking for mental health support. It also examines the effect of virtual humans in emotionally engaging students particularly when they are feeling the most vulnerable.

The rest of this paper presents the research questions driving this study and the proposed methodology to address those research questions, it describes the research instruments that have been created to support the study and concludes by discussing expected contributions to knowledge and future work.

II. RESEARCH QUESTIONS

The ultimate goal of this project is to evaluate if immersive WebXR can effectively support students in fragile state of mind and help them to overcome the difficulty they are facing until they are able to interact with a mental health coach. The research questions addressed by this research project are the following:

- RQ 1 Do users feel more confident to use a conventional web site versus a WebXR interface involving virtual humans to review their mental health status?*
- RQ 2 Do users feel more confident to share confidential information about their mental health and engage better interacting in a WebXR environment with one or more virtual humans taking the role of a virtual life advisor*
- RQ3 Does the use of SCUBA framework [8] supports the creation of VR experiences that have emotional resonance and impact?*

III. RESEARCH METHODOLOGY

This paper proposes a rigorous methodology to study the aforementioned research questions and address the project aims that consists of the following stages:

- it builds a mental health self-assessment resource based on the NHS depression and anxiety self-assessment quiz [7] to allow students review their mental health state and suggest University support accordingly;
- it compares a conventional web site to a WebXR environment supported by virtual humans to evaluate their effectiveness for online counselling;
- it compares a WebXR environment supported by a single virtual human taking the role of a virtual life advisor to one supported by multiple virtual humans to evaluate their effectiveness in supporting online counselling;
- the WebXR prototypes are designed following the SCUBA VR design framework [8] that supports the creation of VR experiences that have emotional resonance and impact;
- immersive user satisfaction is evaluated using the User Experience Questionnaire (UEQ) [9] that measures usability aspects (efficiency, perspicuity, dependability) and user experience aspects (originality, stimulation), and immersion based on the Immersive Experience Questionnaire (IEQ)[10].

The following sections elaborate on the VR framework that has been used to create the WebXR prototypes and present the research instruments that are being created to support the study.

IV. THE VR DESIGN FRAMEWORK

The design of the WebXR prototypes is based on the SCUBA VR framework [8] which encounters with each part of the VR experience, accommodating the user needs and acclimating at each stage and it stands for:

- S:** Setting Expectations and a comfortable environment that the users feel safe;
- C:** Crossing Threshold, allow the transition with comfort, curiosity and calmness in a new world;

- U:** Underwater: Undergoing the experience in VR;
- B:** Back to "Ordinary World", get ready to make a transition;
- A:** Apply new discoveries and reflect in the ordinary world, where you are transformed.

The design of the WebXR prototypes followed this spiral U model of the user journey to the VR experience and back to the real world.

V. PROTOTYPE DESCRIPTION

Three research instruments are created to support the study, all of which aiming to help students to self-evaluate their mental health symptoms and direct them to the most appropriate service evaluating the severity of their situation:

- an extension of the university web page with an online mental health self-assessment questionnaire;
- a WebXR immersive environment with one virtual human taking students through the online mental health self-assessment questionnaire in a form of a conversation with a student life advisor;
- a WebXR immersive environment with multiple virtual humans meeting the student and taking him through the online mental health self-assessment questionnaire in a form of a conversation with a student life professionals.

After completing the questionnaire, the user receives a score that determines the severity of his/her symptoms. Based on the score they receive users are grouped in one of the three following categories suffering [7]: anxiety; anxiety/stress; self-harm. Accordingly users are guided to the correct information that will further assist them and also the urgency of the type of support they need to receive.

The web questionnaire is built using HTML, CSS and JavaScript. The WebXR prototypes are designed in Unity.

In the single virtual human VR prototype the scenario precedes with the user entering their name and student ID, which allows the virtual human who takes the role of a virtual life advisor to refer to them in person and have a connection to them when proceeding with the following tasks. The virtual life advisor approaches the user and engages him/her in a dialogue using the self-assessment questionnaire (as shown in Fig. 1). Following the completion of the self-assessment questionnaire the virtual life advisor gives two options to the user:

- in the case of *low mental health severity* the virtual human makes the user aware of available information and different help avenues that the university offers;
- in case the user mental health evaluation shows results of *immense mental health severity*, the virtual life advisor ensures the user that there is available help and asks permission from the user to be contacted by the student counselling team, upon granted student permission the system sends a priority message to student counselling with the student details. The virtual life advisor continues engaging with the student offering further information to educate the him/her to cope with anxiety and stress.

In the multiple virtual humans VR prototype (as shown in Fig2.) the scenario precedes similarly to the single virtual humans VR prototype with the difference that when the users

enter the virtual environment are met by a non-player character (NPC) who explains the activity. After the NPC provides instructions to the user, he/she can freely move in the environment and go to meet another virtual actor who takes the role of the virtual life advisor and goes through the process of completing the self-assessment mental health questionnaire with the user. At the end of the process the virtual life advisor introduces two more advisors. The first virtual life advisor offers information about the university's services, while the other gives further knowledge about anxiety. The virtual life advisors communicate with the user with voice as well as text.

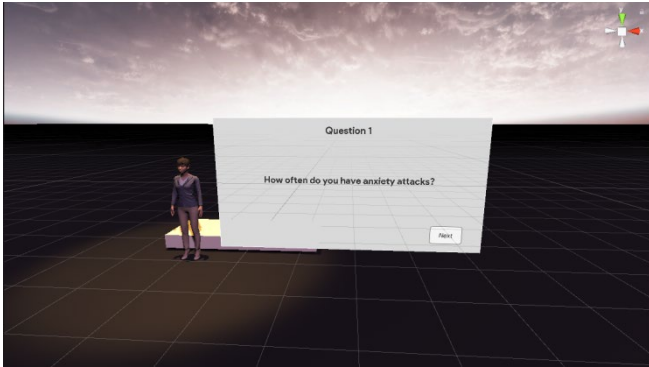


Fig. 1. The virtual life advisor engages the user with the mental-health self-assessment questionnaire.



Fig. 2. Different virtual actors take different advisory roles to engage and support the users.

VI. THE STUDY

This is a comparative study that evaluates the user satisfaction in effectively conducting mental health self-assessment and receiving advice accordingly using three different tools as stated earlier. The study aims to recruit approximately 80 participants to secure statistically valid results. The participants will split in two groups each of which group will use two prototypes in random order:

- Group A: the web site and the WebXR environment supported by one virtual life advisor;
- Group B: the web site and the WebXR environment supported by multiple virtual life advisor.

Following their interaction with the web prototype they will complete the UEQ [9], while following their interaction with the WebXR prototype they will be asked to complete the UEQ and the IEQ [10]. The data will be analysed using between as well as within subject statistical analysis to evaluate UX and immersion and evaluate the research questions. The study will run online. The participants will be

provided with a video explaining the scope of the study and the tasks to be completed. The researchers will work closely with the mental health support group at the [REDACTED] to recruit members/students of this group who at some point during their study went through the process of seeking life coaching and fall in this vulnerable demographic required for the study.

VII. EXPECTED CONTRIBUTIONS TO KNOWLEDGE

The main expected contributions to knowledge of this research impact the educational community and the WebXR development industry and are outlined below:

- evidence based analysis comparing conventional web systems versus a WebXR interfaces to support online student Life coaching;
- evidence based analysis comparing best way of engaging virtual humans to support student Life coaching in WebXR;
- research informed design guidelines for the creation of WebXR environments that can effectively engage vulnerable users and make them feel secure to share personal information and seek mental health support.

In addition this project will offer a resource that could enhance student experience seeking mental health support.

VIII. CHALLENGES, DISCUSSION AND FUTURE WORK

The present stage of the project is the development of the research instruments, planning the study to run online and granting ethics approval. Although running the study online is feasible as all the research instruments can be accessed online, recruiting the necessary number of participants, particularly of the required demographic to collect the statistically valid data in the current unprecedented times is challenging.

The future development of this project will involve extending the second part of the WebXR resources providing Life coaching and supporting students to deal with anxiety. This part it will also integrate gamification that may support students better to set goals to help them deal with anxiety.

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