An AI-Driven Virtual Teacher That Can Upskill Anyone on a One-to-One Basis Tested From Refugee Camps in Iraq to India

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Abstract
Through AI modeling work done with Otermans Institute, Dev Aditya has built several conversational AI-driven virtual teachers, some as Bots and some using humanlike form through technologies like deepfake, to provide one-to-one teaching and training to some of the most underserved learners in society. His first major humanlike prototype, OI AI, was a virtual teacher and trainer built to interact with and teach almost anyone globally. The first version of the virtual trainer was tested in a UNHCR BCF camp in Kurdistan, Iraq. Preliminary results have shown that this virtual trainer can provide continuous upskilling for such learners and has been considered to be warm and humanlike by its users. With smartphone and internet penetration now increasing in such camps, the potential of it upskilling internally displaced and refugee learners is massive especially when over 500 million people are displaced by either violence or war globally. This presentation will discuss this study briefly, its preliminary findings, and the next steps that have included teaching 5,000 such learners by embedding his latest model OTTO to the virtual teacher, which can generate questions, grade answers given by users, and create study summaries from any learning content given to it in close to real-time.

Keywords: Artificial Intelligence, Virtual Teacher, Upskilling

Introduction

Otermans Institute (OI) is a global company upskilling unserved and underserved populations with the vision of upskilling a generation and make them employable. OI is providing a possible and likely solution physically, digitally and using AI. From remote schools, foundation-run organisations to United Nations camps in Iraq, OI has supported over 30,000 underserved learners to date. OI is aiming to upskill a vast number of learners by 2025 to make them more employable. The world has a shortage of teachers and millions of children do not have access to high-quality education especially in underdeveloped and developing countries. In addition, one billion young people will join the workforce in underdeveloped & developing countries by 2030 (Cann, 2020). In more detail, 520 million people are affected by violence, war or disaster and unable to skill themselves with 71 million displaced (United Nations, 2019). Furthermore, 1 million learners turn 18 every month in India without employability & transferable skills training (O'Connor, 2016) & 400 million young people in the MENA region will likely not have transferable skills training in the next two decades (WGBC, 2019). To solve this problem, and to be able to give everyone access to good, appropriate education, OI has created a conversational AI virtual trainer that can upskill learners at scale in their own time and based around individual learning and training needs. This solution called OI AI will offer a conversational AI virtual trainer providing continuous upskilling for such learners. With smart phone and internet access now increasing in such camps, the potential of it upskilling internally displaced people and refugee learners is massive especially when millions of people are displaced by violence or war globally. We conducted a usability study to evaluate the humanness of the virtual trainer.

Methods

Participants

This study was a pilot study. The study and the lesson were conducted in English, however English is not the participants' first language. A total of four participants who lived in a United Nations Refugee camp in Iraq took part in the study. The study received Ethical approval by the College of Health, Medicine and Life Sciences Research Ethics Committee at authors' institution. OI has provided weekly digital lessons via Zoom to the learners in the camp and therefore access to participants was not an issue.

Materials

The conversational AI Virtual Trainer

The conversational AI virtual trainer was developed using Deepfake which is a fake video created using digital software, machine learning and face swopping and two iterations were conducted. The first iteration had a structured dialogue flow which designed the lesson revision structure from start to finish. Once this was tested and a smooth dialogue flow was established, a separate open domain dataset was added to build conversational ability to address questions and comments from students that were outside the dialogue flow. The second iteration used unsupervised techniques including Natural Language Understanding (NLU) and CORE to handle intents and entities which are structured pieces of information inside a user message displayed in Figure 1.

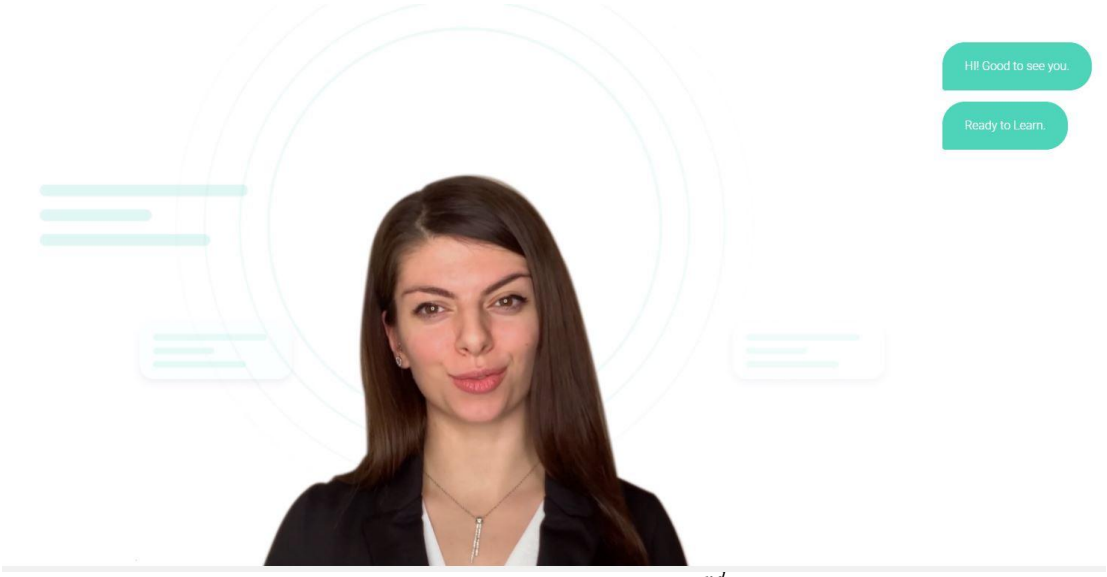

Figure 1. Virtual Trainer (2nd Iteration).

The virtual teacher (from now referred to as "she") was programmed to greet users and ask them if they were happy to begin learning. If users interacted with her without starting the learning process, she interacted with them like answering their questions and prompted them to start the lesson. Once the user started learning and the learning mode was enabled, she started the lesson. The lesson was on 'Setting Goals' using SMART. She started by asking learners about what they thought goals were and moved onto asking them about each element of SMART: Specific, Measurable, Achievable, Realistic and Time-bound. Once the lesson ended, she gave an overview of the correct answers.

Due to low academic and English spoken abilities of the users, as they have been displaced from their homes and are non-native English speakers, the probability of them giving incorrect answers to the questions asked by her was high. For this reason, she has been programmed to encourage users when they made mistakes and also to keep focus on the lesson until it is completed. These encouragements can be seen in Figure 2. These encouragements were appreciated by the users as they got excited as soon as they started interacting with her.

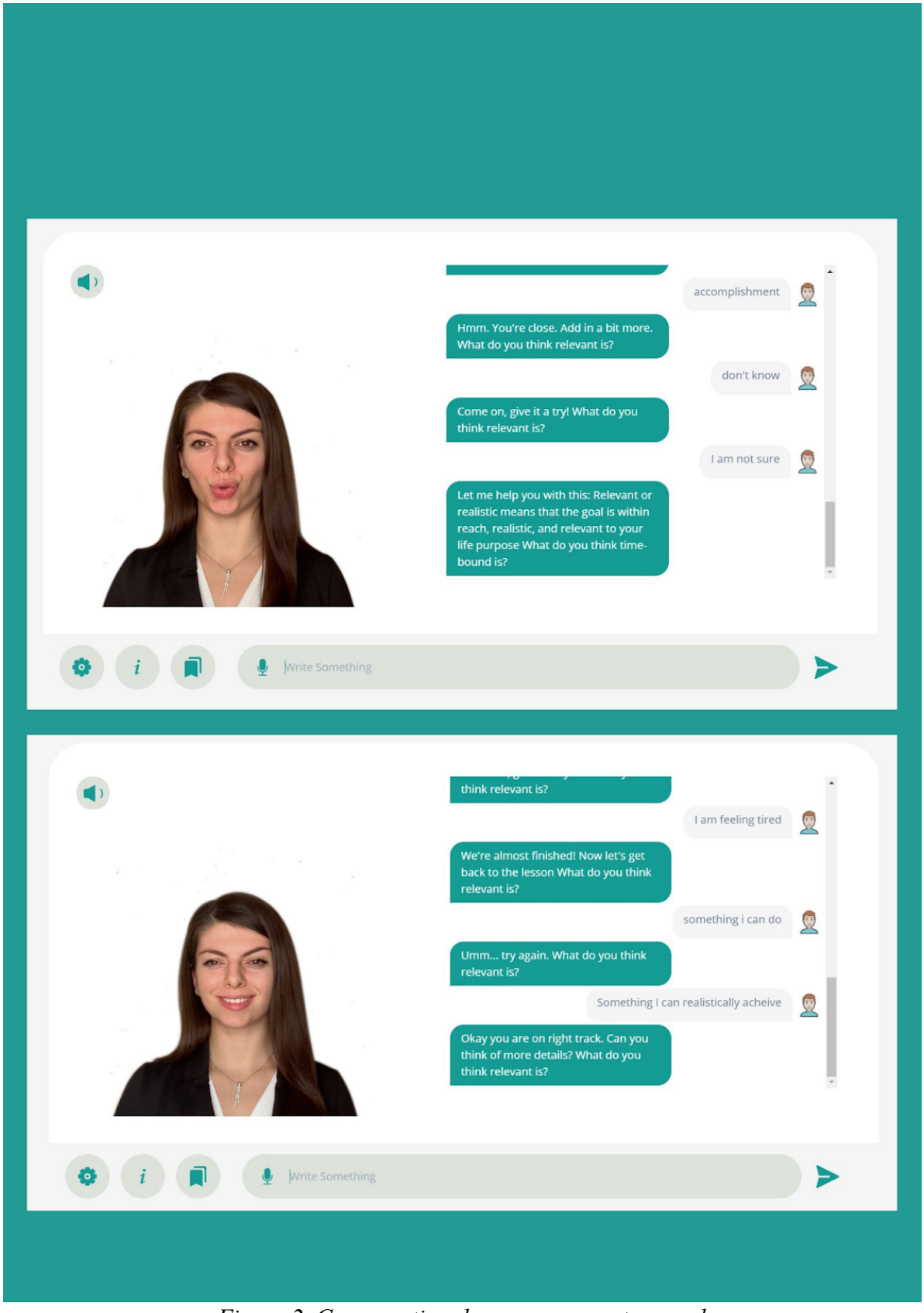

Figure 2. Conversational encouragement example.

Questionnaires

Participants were asked to complete an online survey using Qualtrics consisting of four sections to measure how they perceived the conversational AI virtual trainer.
System Usability Scale. The system usability scale (SUS) was used to assess how 'usable' the conversational AI virtual trainer was (Brooke, 1996). Usability of the conversational AI virtual trainer can be described as how easy to use and understand the receiver perceives the conversational AI virtual trainer. The SUS is a 10-item questionnaire using a 5-point Likert scale for each item that range from (1) 'strongly disagree' to (5) 'strongly agree'. This scale is commonly used to assess the usability of a range of systems. A high numeric value produced by ratings suggests that the system is usable. The benchmark for an unusable system is below 68 and a rating below 50 is cause for concern. Additional questions were added to evaluate the usability of the conversational AI virtual trainer which included:

a) To what extent do you think the virtual trainer is understandable from a trainee perspective?
b) How easy do you think it might be to use this virtual trainer in the future?

Question a) was rated on a 5-point Likert scale ranging from (1) 'very difficult to understand' to (5) 'very easy to understand'. Question b) was rated on a 5-point Likert scale ranging from (1) 'very difficult' to (5) 'very easy to use' in the future.

Competence and Warmth Scales. The competence and warmth scale (CSW) was used to investigate whether the participants thought that the conversational AI virtual trainer was both competent and warm (Fiske, 2012). The competence and warmth scale contains of 9 items where 5 items measure competence (competent, confident, independent, competitive and intelligent) and 4 items which measure warmth (tolerant, warm, good natured and sincere). The higher the score the higher the rated competence or warmth.

Social Attractiveness and Trustworthiness. The Social Attractiveness and Trustworthiness scale (SATS) was used to measure the participants perception of the conversational AI virtual trainer's social attractiveness and trustworthiness (Nass, 2000). The scale is comprised of 6 items 4 of which relate to social attractiveness (likeable, sociable, pleasant and friendly) and 2 of which relate to trustworthiness (trustworthy and reliable). The higher the score the higher the rated social attractiveness or trustworthiness.

Social Presence Measure. The Social Presence Measure (SPM) was used to investigate how users perceived the conversational AI virtual trainers' social presence following an interaction (Li, Kizilcec, Bailenson, & Ju, 2015). The scale is comprised of 5 items each are rated on a 5-point Likert scale ranging from (1) 'not at all' to (5) 'very strong'. The higher the score the higher the rated social presence.

Procedure

On the day, users were given a simple lesson on 'What are SMART goals?' by a member of the OI team which lasted 30 minutes. An extra 15 minutes were given to account for set-up, connection issues. The learning outcomes of the session was to get students to understand what goals are, understand the importance of setting goals, understand what SMART goals are, and be able to set their own SMART goals.

Following this session on goals, participants were given the opportunity to engage with the conversational AI virtual trainer whereby she would ask students questions which pertained to the lesson for 20 minutes. Following this, participants were sent a link to Qualtrics which contained a participant information sheet and were given the opportunity to ask questions before the consent form was signed; all participants gave consent to take part in the study. Then, participants filled in the questionnaires in the following order: SUS, CSW, SATS and SPM. Finally, participants were given a debrief and were thanked for their participation in the study.

Results

Results from the SUS showed that the users found the conversational AI virtual trainer was below benchmark, set at 68, for the usability of a program. However in relation to the other scales (CSW, SATS and SPM), the users found the conversational AI virtual trainer to competent, tolerant, have a sense of social presence when interacting with the conversational AI virtual trainer and found the trainer to be trustworthy. The results for all users can be seen in Table 1 below.

Table 1. User Evaluation of Conversational AI Virtual Trainer.

	Usability	Competence	Tolerance	Social Presence	Trustworthiness	Social Attractiveness
User 1	62.50	25	20	18	11	17
User 2	35	25	20	21	10	15
User 3	62.50	25	19	20	20	26
User 4	62.50	25	20	21	10	15

Participants also expressed that they found the conversational AI virtual trainer difficult to understand (2 users), better to understand (1 user) and easy to understand (1 user). In addition, users expressed that they found the conversational AI virtual trainer difficult to use (2 users), okay to use (1 user) and easy to use (1 user). When they were asked how likely they were to use the conversational AI virtual trainer again participants expressed that they were unlikely to use this again (1 user), neutral (1 user) and were likely to use this again (2 users).

Discussion

The aim of this user study was to evaluate how users perceived our conversational AI virtual trainer which will facilitate further development to provide unsupervised teaching to underserved learners globally. Overall, users reported positive feelings after being introduced to the conversational AI virtual trainer. The results showed that users found the conversational AI virtual trainer to be trustworthy, socially attractive, demonstrates a sense of social presence, tolerable and competent. However, they found the usability of the conversational AI virtual trainer to be the only limitation, which could be due to some some language barriers. Using Deepfake in the conversational virtual teacher was very successful as participants reported the conversational AI virtual trainer as socially present, trustworthy and socially attractive.

There were some limitations of the current study. Th user evaluation was conducted using an online survey only which means there is an absence of (non)verbal communication. Future work could conduct a focus group to gather information about the perceptions of the conversational AI virtual trainer for a deeper understanding. This user study was the first of

many in the development of the conversational AI virtual trainer that meets individual user's needs.

Future research will also explore the usability of our conversational virtual teacher with a different group of users. Currently, conversations are ongoing to conduct a similar study with 50 underserved learners in India.

Finally, work is ongoing to implement additional features in the design of the virtual teacher. This includes generating questions, grading answers given by users, and creating study summaries from any learning content given to it in close to real-time. Once this has been implemented, the aim is to test this revision tool with 5,000 users.

Conclusion

OI has a vision to promote access to learning in underserved countries and communities. To achieve this vision, a conversational AI virtual trainer has been developed to equip such global with employability skills. The aim of this study was to evaluate this conversational AI virtual trainer from four users in a UN refugee camp in Iraq. The users expressed that the conversational AI virtual trainer was socially attractive, warm, competent, trustworthy, tolerant and socially present. However, the usability of the conversational AI virtual trainer will need to be improved. Future work could investigate this further using focus groups or interviews to explore the usability of the conversational AI virtual trainer with detailed questions and conversations with the users. The implications of this work are important to upskill a generation of learners globally.

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