Designing a Human Centred Chatbot to Mentor Teachers in Developing Contexts

Abstract:

Quality education, the fourth of the United Nations' "Sustainable Development Goals", is poor in developing contexts (more than 60% of primary school students fail to achieve grade-appropriate learning in low and middle-income countries)[1], and even worse in rural and isolated areas[2]. Although teachers intend to help their students, they lack the mentoring and support to really be able to support them[3] . Our research aims to learn about teacher training and aspirations, as well as opportunities for technology to promote a social change to improve education in developing contexts. We conducted our research study in the Côte d'Ivoire during the introduction of a new teaching method (Teaching at the Right Level). We used ethnography, interviews, surveys, and information collected from teachers, school directors, and academic advisors to generate ideas for mentoring teachers. In addition, we developed and deployed a *conversational chatbot* to mentor and support 30 teachers on WhatsApp as they implement this new teaching method. We expect a three month deployment will help us generate ideas for mentoring teachers and understanding practical challenges in the use of technology. The goal of this project is to help mitigate the effects of isolation between advisors and the teachers using smartphones.

Introduction: Context and Needs Assessment

In 2018, the UNESCO Institute for Statistics found that only 48% of students in the Côte d'Ivoire achieved the minimum proficiency level in reading (and only 27% in mathematics) at the end of primary education[4]. NGO Pratham's educational approach, Teaching at the Right

[1] World Bank, 2018. "LEARNING to Realize Education's Promise". Retrieved from https://www.worldbank.org/en/publication/wdr2018
[2] UN Resolution 70/1. (2015). Goal 4: Quality education. Retrieved from https://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-4-quality-education.html
[3] World Bank, 2018. "LEARNING to Realize Education's Promise". Retrieved from https://www.worldbank.org/en/publication/wdr2018
[4] United Nations Educational, Scientific and Cultural Organization, UNESCO Institute for Statistics, & UN Sustainable Development Goals. (2018). PDF. Montréal, Quebec. Retrieved from http://uis.unesco.org/sites/default/files/documents/sdg4-data-digest-data-nurture-learning-2018-en.pdf

Level (TaRL), has provided evidence of learning improvement[5]. TaRL was first implemented in the Côte d'Ivoire in 2017 with promising results. This project aims to amplify the positive aspects of TARL using technology to support rural and isolated communities.

Methods:

Following a human-centered approach, focused on the region of Méagui, we learned about stakeholders' experiences through ethnographies, surveys, individual interviews[6], and data from the conversational chatbot. The field team (consisting of an Ivorian researcher and a researcher from the United States of Indian origin) performed ethnographies during several activities.

Image 1:
Méagui Region, Côte d'Ivoire

Source: en.Wikipedia.org

First, researchers attended and participated in a week-long TaRL training involving teachers from the entire Méagui region. This activity served as an ethnographic base for contextualizing our future work, allowed the teachers to familiarize with the research team to possibly reduce social distance and bias, and made participants accessible for future research.

Image 2: Training Session, Directors Explaining TaRL to Teachers

Source: Author, Méagui (Côte d'Ivoire), January 2020

Later, they observed the deployment of ASER tests (TaRL education-level tests taken by students) and the first week of TaRL application. Our field team collected photos, videos, and a diary of events (including challenges, motivations, social cohesion mechanisms, cultural elements, etc.). 38 in-person surveys were conducted (29 teachers, 6 school directors, and 3 advisors) that included discussion questions about perceptions of TaRL and technology usage. 16 individual interviews of between 1-1.5 hours were performed, with our field team conversing personally with ten teachers, four directors, and two advisors.

[5] See the Appendix for more information on TaRL's approach
[6] Both the interview and the surveys were designed based on a previous visit to Adzope and Soubre, other rural region of the country.

Lastly, we deployed the chatbot on WhatsApp to 30 teachers in the Méagui region, to mentor teachers on TARL practices. This process included walking them through setup and answering any immediate questions.The bot initializes with an introductory survey, afterwards engaging in basic conversation and answering questions. If the chatbot fails to answer the question, the teachers can choose to request an answer from the researchers, who refer to the TaRL manual or the internet.

Image 3: Surveys and Interviews Performed

Source: Author, Méagui (Côte d'Ivoire), January 2020

We are still in the process of both collecting and analyzing the data, and are reporting preliminary results for the purposes of this summary. We hope to have more results available by the time of the symposium.

Preliminary Results:

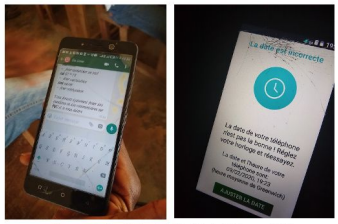
Participant Demographics

Half of the teachers' ages were between 33 and 40 (mean of 9.3 years of teaching experience), and a majority stated their first career choice as teaching. While largely motivated by children's academic improvement, they also mentioned being passionate about sports and music. Their aspirations also included progressing to teaching higher grade levels and maintaining consistency and currency in their own education.

Stated use of technology

87% of stakeholders communicated having a smartphone (highest utilization rate among other tools), most of those stating a daily use. However, not all smartphone users connect to the internet daily. From survey results, we believe that about 60% of the population interviewed connected their smartphones to the internet on a daily basis.

Image 4: Teachers Cracked Smartphones and Outdated Apps

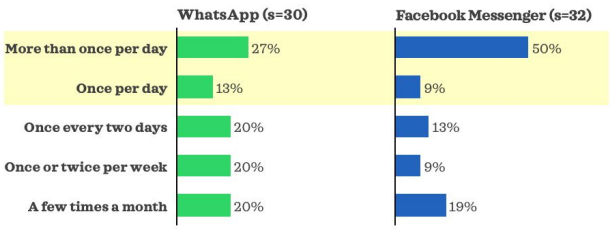


Source: Author, Méagui (Côte d'Ivoire), January 2020

Some of the schools we visited had little access to the telephone/data network, so teachers used the internet primarily in their own homes or when visiting the city, teachers also used several SIM cards to workaround this. In schools with working network connection, teachers often didn't keep data enabled on their phones and said they bought *daily bundles*: a small volume of data for a low price. Three quarters of smartphone users mentioned spending less than 1000 CFA (1.65 USD) per week on mobile internet. Additionally, teachers' and their smartphones had cracked screens and outdated applications (Image 4).

Teachers stated that they primarily use the internet for accessing social media and researching to prepare for classes. 91% of smartphone users said they had WhatsApp (97% Facebook Messenger) installed on their phones. However, only 40% of Whatsapp users (59% of Facebook Messenger users) mentioned connecting to the platform once per day.

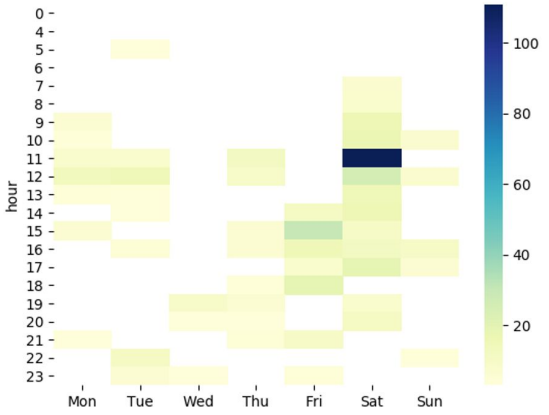
Image 5: Connection Frequency to Social Media



Source: Survey. À quelle fréquence vous vous connectez à Facebook Messenger / Whatsapp?

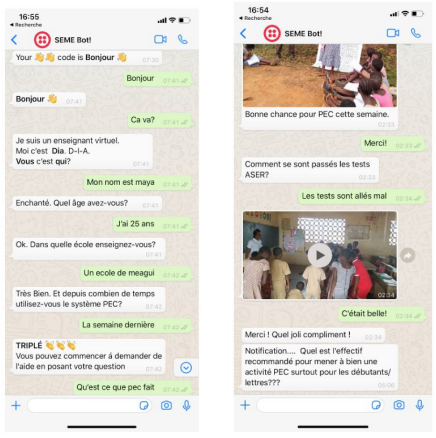
Although we intended the bot to be teaching focused, teachers also asked general questions about football to finance. We also conducted surveys of TaRL implementation and sent motivational messages to the teachers. The graph above shows the usage of the chatbot over the course of 3 weeks.

Image 6: Three Weeks Use of the Chatbot



Source: metadata from the chatbot

Image 7: Example usage of the chatbot



Source: metadata from the chatbot

Teachers communicated most on Saturday afternoons, during their breaks (12:30-2), or after class.

Training Perceptions and Teacher Aspirations

Modeling off of prior work on subject aspirations[7], we learned that teachers want their students and children in the Côte d'Ivoire to improve academically, especially in French. A few explicitly mentioned that they believe TaRL is helping them achieve these results:

"It (TaRL) helps children, and children prefer it. Earlier this year the children asked us if there was going to be TaRL this year... There are children who are irregular in school ... but when there is TaRL those children are always here."[8]

Discussion:

We expect to collect data over a three month longitudinal deployment to keep exploring the potential of chatbots for mentoring teachers in developing rural contexts. We will (1) build a longitudinal dataset of teachers' dialogues, (2) better understand teachers' online smartphone usage through chatbot logs and (3) evaluate the effects of this technology deployment in teachers satisfaction and understanding of this new teaching method.

Limitations

The field researchers introduced themselves as TaRL collaborators whose goal was to implement a technological solution. This might have created a pro-technology bias in respondents' answers. Additionally, teachers may have piloted the chatbot just to be agreeable. Many teachers installed WhatsApp or enabled data just for setting up the chatbot, with one even buying a phone just to use it.

Open Questions for HCIxB?

[7] Kentaro Toyama (2018) From needs to aspirations in information technology for development, Information Technology for Development, 24:1, 15-36, DOI: 10.1080/02681102.2017.1310713
[8] Director Interview #1, translated from French

From this research, several questions remain. Teachers aspire for their children to learn but they also want to achieve their career goals. How do we align TaRL's objectives with teacher aspirations? How can we design a conversational chatbot able to address both? From an academic perspective, can we use our research to discover the educational-technology readiness of CI?

Acknowledgements

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APPENDIX

Teaching at the Right Level:

Teaching at the Right Level is a program that was first implemented by an NGO named Pratham in India. The goal of this program is to test students' abilities and restructure their schooling so that they are able to continue learning at a level that is appropriate to the knowledge they have, rather than the ambitious age-grade curriculum that is currently in place. This process enables students to find motivation and feel as though they are able to achieve, rather than expecting them to know more than they do, which discourages them and lowers already lacking attendance rates.

TaRL is implemented using a top-down structure, where TaRL experts teach government employees, who then teach the teachers how to test their students for placement as well as learning activities and methods they should be using and focusing on in their classrooms. This learning structure encourages the community to support itself and be receptive to the changes rather than having TaRL advisors, who are unknown to the community, come into teachers' classrooms and schools.

The stakeholders in this situation are the ministry of the Côte d'Ivoire, the advisors, directors, teachers, and the students themselves. Before TaRL, similar teaching structures and methods were implemented by NGOs, but none before had been accepted and implemented by the region and/or country's government employees and teachers. Since the ministry of the Côte d'Ivoire is supporting this change, the depth of change from using TaRL methodology will hopefully be long-lasting and effective. If TaRL does succeed, children in the Côte d'Ivoire will have a stronger, longer education and much more opportunity going into their teenage years and adulthood.

Currently, pedagogical advisors travel to the schools with a goal of visiting at least once a month to check in and answer questions about the program. In urban areas this is easy, but in rural areas

that lack infrastructure and transportation, the low number of pedagogical advisors available can make it hard to access the schools in a timely manner. During their visits, advisors observe teachers while they implement TaRL, sometimes even participating with the students, and clarify anything the teachers are having trouble with. School directors also provide direct support to the teachers, but if they cannot help with a problem, there is no second line.

Images 8 and 9: TaRL Methodology in the Classroom

Source: Author, Méagui (Côte d'Ivoire), January 2020