WebRTC In Open EdX: Making Live Communication and Collaboration in Language MOOCs real

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Abstract. In the past few years, we have seen a fast-growing interest in MOOCs connected to language learning. However, it seems that promoting live oral communication to foster language learning on MOOCs has not been a priority so far, mostly due to technological limitations. In this paper, I will outline the current lines of research of a project developed at the Norwegian University of Science and Technology (NTNU). I will first introduce the implementation process of WebRTC technology in the OpenEdX MOOC-platform version hosted at our University to show how it is possible to integrate live oral communication functionality on MOOC platforms. Secondly, I will present and define possible implications of the use of such technology for a more innovative learning design that can foster language learning through collaborative learning.

Keywords: WebRTC technology, Open EdX, MOOC for Language teaching and Learning, Oral interaction, Collaborative Learning.

1 Introduction

In the past few years, we have seen a fast-growing interest in MOOCs connected to language learning. While the general research literature on MOOCs is growing exponentially, the emergent body of specific research on MOOCs for language learning is still very limited [1, 2]. The conundrum for language courses, irrespective of their possible categorization as cMOOCs or xMOOCs, is that language learning is mainly skill-based, in that it involves the practice of receptive, productive and interactive verbal (and non-verbal) capabilities [3]. How does the technology available on MOOC platforms cater with such a challenge?

This paper positions itself on the border between the field of second language didactics and learning design for technology enhanced learning and is a result of my work as a researcher and MOOC developer at the Norwegian University of Science and technology (NTNU). Working currently with two of the largest MOOC technology platform providers, FutureLearn and Open EdX, I wish first to raise awareness about

the need for improved technology solutions in language MOOCs with special attention to live oral production/interaction and collaborative learning in self-instructed courses. I will then present the practical implementation of Web Real Time Communication Technology (WebRTC) in Open EdX as a possible solution to the problem. Finally, I will outline some of the implications the use of such technology may have for learning design with a critical look at how MOOC platform providers and course developers can build more interactive language courses to promote live oral interaction and collaborative learning, especially in the case of self-directed learning. In this project, a computer programmer helped develop the X-block necessary to integrate WebRTC in Open EdX.

2 Language MOOCs: What you are supposed to learn and what you are actually learning

According to The Common European Framework of Reference for Languages (CEFR), the categorization of the language learner and user's linguistic competence or *proficiency* is based on real-life language use and grounded in interaction and co-construction of meaning, encompassing the ability to perform communicative language activities stated as "*can do-s*" in four modes of communication: reception, production, interaction and mediation in written ***and*** oral context [4].

Even if MOOC platforms in general undoubtedly offer a considerable improvement on online language course development, the technological advancements are not sufficiently developed to meet the specific requirements of language didactics. For example, it is a fact that none of the major existing platforms has embedded technology which can enable course participants to fully develop their oral interaction skills [5]. Most of the course content relies on written interaction, with the exception of fully tutored Language MOOCs, where feedback on the participants' oral performance takes place with the aid of external technological resources such as videoconferencing and/or voice recognition devices for training pronunciation. In self-instructed courses there is neither the possibility for live oral interaction nor external feedback on the platform [5, 6]. It is important to note that many Language MOOCs are indeed self-instructed and based on the concepts of autonomous learning. In this case, platform technology is not necessarily synonymous with better teaching or learning. Learners are still studying language in a traditional way, following courses based on a cognitive behavioral pedagogical model and individual learning with extended use of instructional videos and pre-formatted learning sequences which focus on written comprehension and production but offer very limited possibilities to develop the learners' oral interaction skills and their actual capability of having a conversation in the target language [6, 7].

When the language learning environment fails to support solutions which cover live oral interaction, a question arises concerning the learner's actual possibility for fully developing the range of linguistic competences necessary in order to master the target language. Similarly, a concern becomes apparent about the integrity and validity of the

language course and the possibility for future assessment and accreditation. These are indeed pressing demands which need to be addressed by MOOC developing institutions and MOOC platform providers due to the increasing demand for course accreditation in private and HE sector.

Is it then possible to create better learning environments on self-instructed language MOOCs and open up for live oral communication directly on the platform, without having to rely on external programs and resources?

3 Better technological solutions?

In our MOOC working group at NTNU, we have tried to find answers and possible solutions to this challenge. We know videoconferencing has traditionally been used in fully tutored language MOOCs to assess the learner's oral performance in the target language. This, however, requires installing a dedicated application external to the MOOC platform, such as Skype, and hiring a dedicated teacher to the task.

The frame of self-instructed language MOOCs, however, needs a different approach. Because it's extremely difficult to keep track of participants' actions on language MOOCs when the required language tasks, based on communicative or collaborative tools, are external to the platform [7 in 5, 8], there is a definite need for implementing functions internal to the MOOC platform to serve these purposes. By integrating WebRTC technology and Xblock-functionality in Open EdX, we believe we can deliver better technological solutions which benefits language MOOCs and other MOOCs alike[1].

3.1 WebRTC technology

Google released WebRTC (Web Real Time Communication) as an open source project to bring video conferencing to browsers back in 2011. As a result of its addition in popular browsers such as Chrome and Firefox, numerous web-based videoconferencing services were launched during the past few years. WebRTC enables real-time communication over peer-to-peer connections and applications such as video conferencing, file transfer, chat, or desktop sharing without the need of either internal or external browser plugins or external software.

In order to integrate this technology on a MOOC platform, the platform itself must support customization using HTML and Javascript. An example is the Xblock-functionality on OpenEdX. Xblocks are fully customizable extensions or plug-ins that add functionality to OpenEdX platform and can provide interactive content to the learning objects in the course.

[1] Unfortunately, at the moment FutureLearn doesn't offer course developers the possibility to include such convergent technology for tailoring learning objects' functionalities, as the platform is rigidly preformatted and does not support custom extensions.

At NTNU, we have currently designed a prototype bespoke Live Language Training (LLT) Xblock which provides access to a WebRTC platform through an Application Program Interface (API). The implementation of WebRTC can be done by integrating existing conferencing services. Suppliers of such services are for instance the American *Tokbox*, the Singapore based *Temasys* or, as in our project, open source providers like *Jitsi*. These suppliers offer Javascript APIs which are used on web sites together with a "conference bridge" which browsers will then connect to in order to deploy videoconference functionality. The integration of the above-mentioned technologies in our Open EdX installation enables us to provide real time live oral interaction for our learners in our language MOOCs.

The implementation of our WebRTC technology based LLT-Xblock in learning design for MOOCs gives rise to different learning scenarios. In the following, I will describe the course of actions our work group at NTNU has taken to create a better learning environment that supports live oral communication and fosters collaborative learning on the platform.

4 Live Language Trainig (LLT), Open EdX and Learning Design

In Language Didactics and Pedagogy in general [9] there is a consensus that small groups of learners work better than large groups. Small groups' environment supports cooperative and collaborative learning through problem-solving learning tasks [9] that can be carried on in and out of class, on and off campus [10]. The teacher is seen as a facilitator and a moderator in the group, but remains a background voice.

In the digital MOOC environment on Open EdX, it is possible to create "cohorts" or smaller learner groups where course participants are assigned different learning tasks. The first logical approach is therefore to match the existing language learners on the course so that they can start to practise their oral skills with each other. When participants start the course, a mandatory step will include the LLT-XBlock. In this step, the participants consent to share their name (or a nickname) with their course peers. They also select five timeslots where they know they are available to do a videoconference. The participants will also see previous peers available timeslots, and they will be encouraged to select a timeslot that suits a peer. Once two peers are found that share the same timeslot, they are matched up. A notification is then sent out to the peers to announce that they have been matched. This process will enable the establishment of a database of *virtual tandem partners* (VTP). Learners in each cohort will then have to solve problems together with their VTP and can be asked to complete different learning tasks and peer review each other's work in the target language. This will encourage the creation of a self-sustained learning community based on cooperative and collaborative learning beyond the boundaries of traditional teaching [11].

4.1 LLT, assessment, certification and accreditation

Certification and accreditation are notoriously a challenge for MOOCs [12]. In Language MOOCs the challenge is even greater. Finding solutions to enable live oral interaction in Language MOOCs have simply not been a priority so far. However, this needs to be taken into consideration due to the pressing demand for course accreditation in the HE sector. How is it possible to give credits or provide certificates of accomplishments when a course is simply not teaching the learners one of the most important skills they need to know when learning a language?

When integrating LLT in MOOCs new forms of assessment come to light and offer interesting solutions, particularly in self-instructed courses. This can be illustrated by the Open Response Assessments (ORA) functionality in Open EdX where learners submit different text responses to open questions or assignments. Responses can be submitted in different file formats and learners are guided through a series of assessment steps that can include a training step, peer assessment, self-assessment, and even staff assessment in fully tutored courses. In self-instructed courses, constraints and conditions define the assignments in ORA. For instance, a learner can be required to deliver 30 to 45 min. work/week in oral communication skills in a chosen format (film of individual or group work, audio file or videoconference). In this case the work is recorded in the MOOC platforms' analytics system, which means that the platform registers the learner's participation, and the learning task is then marked as completed for future certification/accreditation. The WebRTC service used in our project, Jitsi Meet, is able to log metrics on how long certain videoconference participants were available in a specific meeting. These parameters can be pulled into OpenEdX by the LLT-XBlock, and then recorded in the analytics system. A further development could add liveness detection using in-browser video and audio analysis in order to ensure that language training has taken place. However, this is out of scope for the first iteration of the system.

LLT's and ORA's cornerstone in language MOOCs, particularly in self-instructed MOOCs, is peer-to-peer assessment. What LLT in combination with ORA functionality allows is the emergence of a learning community based on cooperation and collaboration where learner's tasks are not simply collected and stored in analytics, as it happens with regular multiple choice or predefined exercises, but are an intrinsic part of a learner's development. The rigid boundaries between informal and formal assessment fluctuate; the learner's assessment of his/her own achievements is continuous and progressive thanks to the feedback from the VTP, the learning community and the automated analytics functionality on the platform.

5 Discussion and conclusion

The need for successful Language MOOCs which can present learners with quality ad hoc technological solutions and appropriate language didactics is high due to multilingualism and multiculturalism being paramount aspects in our modern

globalized society. Language MOOCs necessarily face specific challenges intrinsic to language didactics, such as how to enable live oral interaction on the platform. This is particularly important for self-instructed Language MOOCs. However, most Language MOOCs so far have not fully provided for oral interaction functionality. This aspect certainly is an issue which needs to be addressed, especially with regards to the pressing demands for course accreditation in HE. Implementation of WebRTC technology based Live Language Training on MOOC platforms could challenge the classic teaching paradigm still predominant even in advanced technological learning environments and could open the way for assessment processes more suitable to learning in the digital age.

Research in this specific field is not yet available, and the main scope of our project is therefore to pave the way ahead and examine the impact the use of such technology has for teaching and learning languages in digital environments. An array of research possibilities lies ahead for genuine innovative language didactics in MooCs.

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