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Towards More Human-Centered openHPI Collab Spaces

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Abstract Since their inception, Massive Open Online Courses (MOOCs) have generated significant attention from students and particularly lifelong learners. This has led to increased interest from academic institutions to develop their own online platforms or to collaborate with other existing platforms, such as edX, to offer their MOOCs. This chapter focuses on openHPI, the MOOC platform offered by the Hasso Plattner Institute in Germany. One of the platform's important features is the Collab Space, a virtual private space for groups and teams in which they can interact and collaborate on assignments and projects using a set of communication and collaboration tools. The conducted study examines the current state of the Collab Space from a learner's perspective by assessing the functionality of its communication and collaboration tools and how they are being used by the participants. We applied a design thinking approach to carry out the study and to develop solutions for some of the platform deficiencies revealed by the study. During the study, we observed teams while performing tasks and interacting together in the Collab Space, and evaluated how the teams used their tools. Semi-structured interviews were conducted during two stages of the study. We argue that by applying the design thinking methodology and putting participants at the center of our research, new insights on how to improve the user-centeredness of the Collab Space can be achieved. We conclude this chapter by outlining next steps for research and potential future opportunities.

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1 Introduction

openHPI is a MOOC platform offered by the Hasso Plattner Institute in Potsdam, Germany. The platform has been providing life-long learners with courses in a wider IT context since 2012 (Meinel and Willems 2013), and recently introduced its first MOOC on Design Thinking. openHPI offers courses in German and English. The basic structure of the openHPI courses follows the xMOOC model with structured learning activities such as video lectures, interactive self-tests and assignments. The platform, as well as most of the courses' teaching teams, encourage social interaction among students through the main discussion board of each course. Some of the teaching teams actively trigger the participants' large group collaboration in the course-wide discussion boards in various ways (Staubitz et al. 2018). Fewer courses further enrich this basic interaction model by emphasizing the social learning approach. Students are either encouraged to form interest groups of their own or, in some cases, the instructors form small teams in which the participants are asked to interact and collaborate while working on a given project. These interactions take place within the platform's Collab Space, a virtual private space for teams or groups equipped with a set of communication and collaboration tools.

As we will be differentiating between teams and groups throughout the rest of the chapter, we will shortly present our definition of these terms in the given context. Groups are a loosely coupled assembly of course participants that share a Collab Space based on a given commonality, e.g. speaking the same language (differing from the official course language), coming from the same school or company, or just knowing each other from a different context. Teams, in contrast, are a more tightly coupled assembly of course participants that share a Collab Space as they are collaboratively or cooperatively[1] working on a given task. While the members of groups, in the majority of cases, are either joining on their own or are invited by the participant who started the group, teams in most cases are formed by the instructors (Staubitz and Meinel 2017).

A study by Zheng et al. shows that although many MOOC platforms have tried to implement team-based learning, little collaborative success has been achieved (Zheng et al. 2015). Mak et al. also argue that despite the different learning activities within xMOOCs, these activities lack the beneficial group dynamics, especially if the students' interaction is limited to discussion forums (Mak et al. 2010). However, earlier research shows the advantages of group learning over individual learning on both cognitive and social levels (Baker and Lund 1997; Strijbos 2004). These advantages include increased attendance, improvement in academic results, and the development of social and team skills (Wen 2016). Other studies demonstrate that "deep learning and the development of critical and higher order thinking skills only occur through interaction and collaboration" (Staubitz et al. 2015; Brindley et al. 2009; Laal and Ghodsi 2012). Only a few of the current xMOOCs providers have implemented or are working on incorporating a collaborative team-based learning

[1] See (Staubitz and Meinel 2018a) for our definition of these terms.

component. One of the few examples besides openHPI, is NovoEd,[2] a platform that was established from the outset on a collaborative team- and project-based approach.

This chapter focuses on the openHPI MOOC platform in particular, and reports on our study in which we applied the design thinking methodology to evaluate the current state of the platform's Collab Space feature from a human-centred perspective. Our study examined how users work together within teams and to what extent the communication and collaboration tools provided in the Collab Space are serving the users' identified needs.

2 The Collab Space

The Collab Space feature (Fig. 1) of the openHPI MOOC platform was implemented in 2013 as one of the core features of the platform to offer student groups a private space in which they can interact with each other in a more private setting than the wilderness of the course forum (Staubitz et al. 2015). Later on, in 2016, the Collab Space was enhanced with the option of allowing instructors to add assessable team assignments to their courses. It is important to keep in mind here that both, the matching of the teams and the assessment of the teamwork need to be scalable as the courses on the openHPI platform often have tens of thousands of participants (Staubitz and Meinel 2017).

When we started our research, the following tools had been provided in the Collab Spaces:

- **Discussions**: A discussion forum where students can discuss topics, post questions and reply to those of their teammates. Other than the course-wide forum, this forum is only accessible for the members of the Collab Space and the instructors.
- **Etherpad**: A collaborative open source text editor similar to Google Docs.
- **Tele-Board**: An interactive virtual board where students can share ideas and do brainstorming.
- **Google Hangout**: Allows synchronous communication within the team.
- **Use openHPI Together**: Synchronizes the browsers of the participants in the session. Participants can also see each other's mouse movements.

At that time, the Collab Space interface was structured as follows. On the left side, a navigation bar includes from top to bottom: Dashboard, Files, Discussions, Peer Assessment, Etherpad, Tele-Board and Administration. The middle section is dedicated for viewing content-related to the option chosen from the navigation bar. The right side of this version of the Collab Space had two sections: A Hangout button for starting a video call, and another button for using openHPI together.

In some of openHPI's MOOCs, 'team work' is required to submit assignments and work on projects. Students are usually assigned to teams by the course administrators/teachers based on different criteria usually decided by the course instructor.

[2] https://novoed.com.

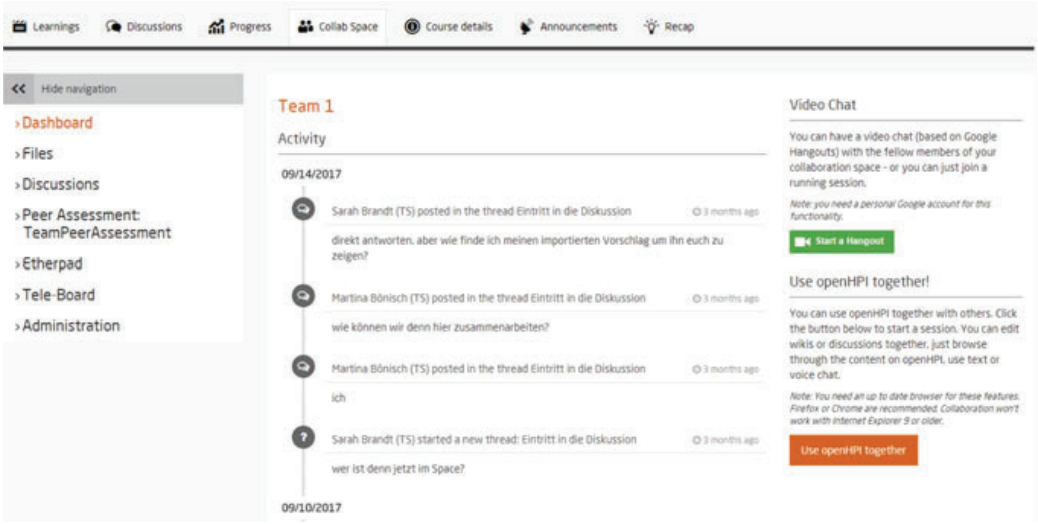

Fig. 1 The Collab Space interface

However, all of openHPI's courses—whether they require team work or not—offer students the option of forming learning groups themselves. These groups can be open or closed. Open groups can be joined by any student, while closed groups are controlled by their administrators and participants need to request membership. Both group types are accessible by the teaching teams and platform administrators.

3 Research Approach

There is little agreement in the literature about the exact definition of design thinking (DT) (Koh et al. 2015). Dunne and Martin suggest that "design thinking is the way designers think: the mental processes they use to design objects, services or systems, as distinct from the end results of elegant and useful products" (Dunne and Martin 2006). According to Brown, DT is "a human-centered approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success." (Brown 2009). Other researchers define design thinking as "a heuristic, a series of steps or as strategies that scaffold people to have the ability to solve complex or 'wicked' problems or to create an innovative product" (Koh et al. 2015; Razzouk and Shute 2012). MacFadyen suggests that "design thinking uses divergent and convergent thinking to 'flesh out' potential solutions for problems at any level" (Koh et al. 2015; MacFadyen 2014).

Design thinking has been widely implemented in different sectors such as Information Technology (IT), economics, education, government, healthcare, non-for-profit organizations and others. Many models have been developed using the methodology to address the challenges each sector faces. The essential first step in the design

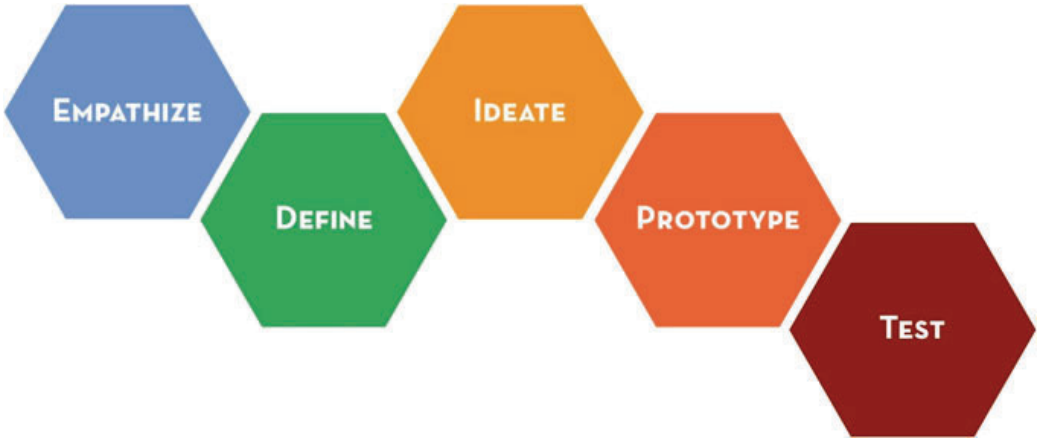

Fig. 2 The Design Thinking Model—Image by Stanford d-school (https://dschool.stanford.edu/resources/the-bootcamp-bootleg)

thinking process in all models focuses on *understanding the problem*. The process then proceeds to conceive and develop a solution that has the user's needs at its core.

For our research purposes, we will use a model developed by The Hasso Plattner Institute of Design at Stanford. According to Stanford's professor David Kelly, the process of design thinking consists of five steps: Empathize, Define, Ideate, Prototype and Test (Fig. 2). Although these five steps are often described in a linear way, design thinking is an iterative process (Mononen 2017) in which the designer can go back and forth to different phases throughout the process depending on the needs of the challenge that is being tackled.

In order to solve a problem, designers first need to understand the challenge and the users for whom they are designing. This understanding is built through *Empathy*. At the Empathy phase, which is "the centerpiece of a human-centered design process" ("An introduction to design thinking" 2010), designers observe the users within the context of the challenge to get a better understanding of their behavior, how they do things, or how they use the service/product designers intend to improve or redesign. Designers also interview users to understand their points of view, and may also immerse themselves in the challenge to appreciate the same experiences and feelings as those of users. The next step is to *Define* the users' needs and the challenge/problem itself. In the *Ideation* phase, designers challenge assumptions, and go wide in creating concepts and generating ideas for innovative solutions. This phase creates a smooth transition into the *Prototyping* phase in which designers create solutions based on the ideas that show potential, and *Test* them with the users to get direct feedback and see what worked well and what did not, so that they can iterate their solution until they reach a satisfactory outcome.

Since design thinking has been proven to be an effective approach to tackle challenges that involve human factors, we used it in our study to better understand the user experiences in openHPI's Collab Space and to redesign these experiences to better meet the users' real needs and expectations.

3.1 The MOOC 'Object-Oriented Programming in Java' as a Field of Experiment

Object-Oriented Programming in Java is a course offered in German on openHPI and ran from March 27, 2017 through May 14, 2017. Halfway through the course, 9242 participants were enrolled. By course end this number had risen to 10,402. The basic structure of the course consisted of instructional videos, each followed by a short multiple-choice test and three auto-graded programming assignments in several levels of difficulty. The tests were offered with the help of a browser-based auto-grading tool that has been developed by the openHPI team particularly for this purpose (Staubitz et al. 2016).

The teaching team strongly and successfully encouraged the participants to use the whole variety of the platform's communication tools to engage in social constructivist discussions to gain competence in programming. The success here can easily be measured in the comparably high forum participation and the high quality of discussion (Staubitz and Meinel 2018a).

Additionally, the course offered an optional team assignment on object-oriented modeling. This task offered only few bonus points and required a sufficiently high amount of work, which scared off many of the participants at the beginning. Despite this setting, about 1500 participants registered for the team assignment.

The assignment required team collaboration and the extensive use of the Collab Space by participants to work on their assignments, submit their final project and perform peer reviews at the end of the course. Teams in this course were formed in an interventionist way (Kizilcec 2013) by the instructors. Diversity of professional background, gender and age and homogeneity of the participants' time commitment for the given task served as the main matching criteria.

For our study, we wanted to assess the Collab Space feature from the user's perspective, by observing and asking a group of users how they use the space when collaborating with their teammates, which of the Collab Space tools they used the most and which they believe were not supporting their learning journey and team work. Our goal is to enable teams to collaborate more efficiently and to support them on their learning journey. We aim to improve the *user friendliness* and *user/human centeredness* of openHPI's Collab Space feature. For this purpose, we started by interviewing some of the participants who completed the course. We collected data from 14 participants, two of whom had belonged to the same team when they attended the course. Therefore, our data reflects the interaction among members of 13 teams in total. We interviewed 4 participants face to face, and the other 10 via video calls (6 via Skype, 4 via Hangout). We carried out semi-structured interviews with several open questions that focused on the participants' experience with the platform and with their teammates during the course. We also asked participants about each of the communication tools implemented in the Collab Space and how they used them.

Four of the interviewees are in their 40s, 4 are in their 50s, 3 are in their 30s and the last 3 are still in their teens (16, 17, 19 years old). While 6 of the participants come from an IT background, the others have the following backgrounds: high school,

mechanical engineering, sales management, biology, media, and insurance. Most of the participants claim that programming is a hobby and that they joined the course to improve their skills or to learn more about java programming. This composition of the interviewees closely reflects the socio-demographic structure of the course participants in total. Immediately following each interview, and as part of the design thinking empathy phase, we ran an observation exercise. Participants were provided with usernames and passwords that were set up in advance by the researchers. Participants were instructed to log into the Collab Space and perform some tasks while the researchers were able to observe and record the participants' activities. The features of the Collab Space were explored and evaluated from the users' perspective and the results were recorded and analyzed. In total we spent a minimum of 1 h with each of the interviewees. The ratio between interview and observation within the total session differed from case to case.[3]

3.2 Feedback on the Different Collaboration Tools

Discussion Board: While the vast majority of participants (n = 11) used the discussion board, they stated that they used it either to arrange meetings or as a tool for communication (chat tool) because there are no other alternative tools for chatting. Participant said, "..we used the internal discussion space to say hello and chat regarding our assignments, ask questions and so on.." However, almost all participants mentioned that they were confused between the discussion board offered inside the Collab Space and that of the main course page (Fig. 3).
Etherpad: Many of the interviewed participants (n = 8) used the Etherpad feature and no major complaints were expressed (Fig. 4).
Hangout: Most of our participants (n = 11) did not use Hangout. While some claim to have privacy concerns, the majority used other video call tools from outside the platform, and insisted on the importance of having a video call option available for use. Few participants expressed their desire to use Hangout in particular but they did not know how to use it. One of the major obstacles is the need for a Google account to use the feature. Another issue that popped up regularly is the need to schedule a meeting before going to the hangout. Many of the interviewees stated that they just started a hangout and then wondered why nobody joined them there. They also expressed the desire to be able to see who else is currently online on openHPI. However, all of those who mentioned this issue (at some point during the interview or observation) realized that even if the option existed of seeing which other team member is currently online, they would need to schedule a meeting first before just going there.

[3]In addition to this user-centered qualitative approach, we have evaluated a quantitative survey among the teamwork participants, which has been published separately (Staubitz et al. 2018). Furthermore, the actual interaction of the participants as documented by the captured learning analytics data of our platform was evaluated and published separately (Staubitz and Meinel 2018b).

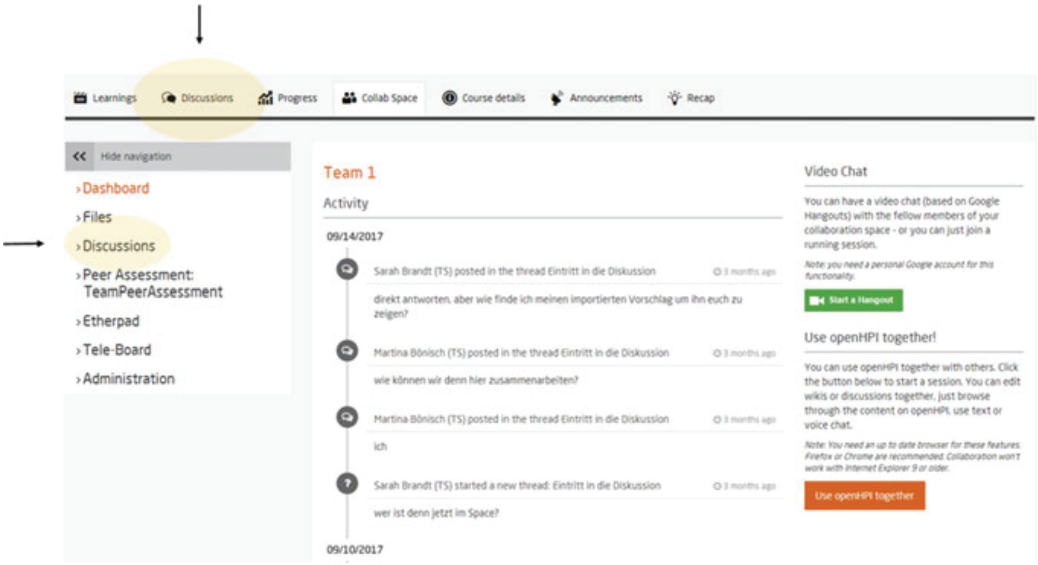

Fig. 3 Discussions board in the Collab Space

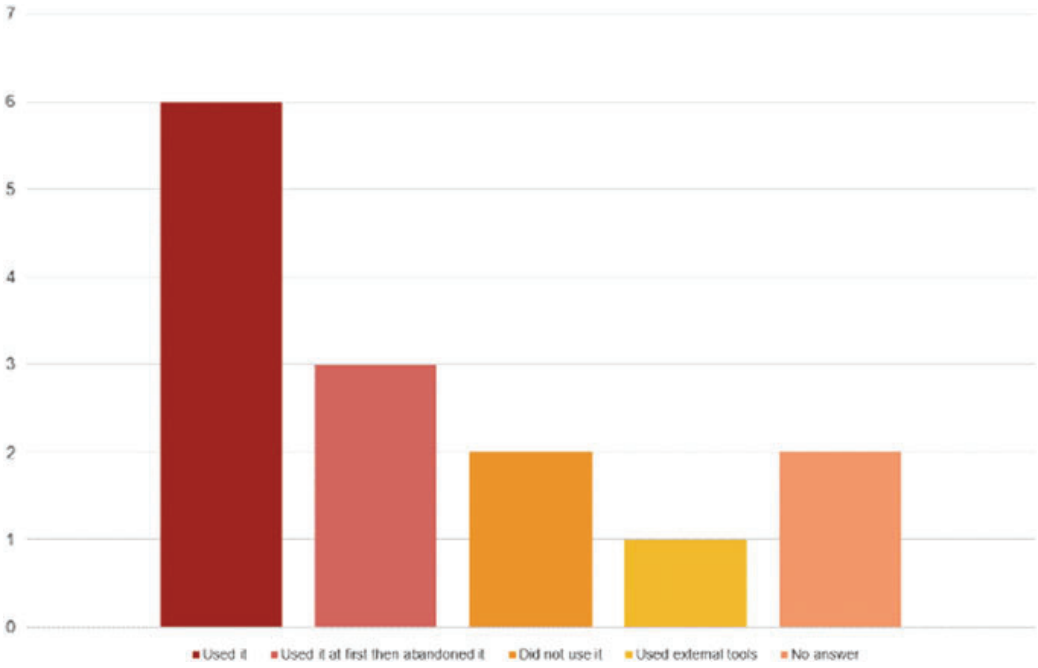

Fig. 4 Reported usage of the Etherpad feature

> We tried to use it (hangout) but it didn't work out because we couldn't agree on a time to talk.
>
> We could have used Google Hangouts, but we didn't really need it, and you also do not want to let everybody see your living room.

Tele-Board: Nine participants claimed that they tried to use the Tele-Board feature but found it too difficult or complicated to use. Two of those who used it said that it was not the optimal solution for course assignments.

> We (the team) used Tele-Board when we did our assignments. At first, I had to try it and had to learn how it works. And my first thought was it's too complicated!
>
> I didn't get what I can do with it!… Probably if we could use a pen instead of a mouse, it would have been easier.
>
> The Tele-Board is too complicated, I tried it but I never used it! … It would have been better if there had been another tool where we could use circles or lay out a model or that had the capability of drawing specific shapes.

We support the participants' view as the Tele-Board feature implemented on the platform is a web version which limits the feature's richness. Tele-Board is designed to be used on interactive boards and being operated with a computer mouse is not exactly its strength. The employed prototype also was not supported in use via smartphone or tablets, which would have offered a more natural way of interaction. Finally, the tool is not the optimal solution for all phases of the given task. While it has its benefits for the early stages of collaborative modeling, there are more suitable tools available to develop the final structure of the model.

Use openHPI together (Fig. 5): None of our interviewees used this feature. Even when they were asked to try it during our observation phase, participants had many problems and did not much like it.

3.3 Patterns and Findings

In design thinking, patterns from the gathered data are identified (Liedtka et al. 2013). Some hidden needs and real insights may be exposed by observing consistent and repeated expressions from different participants. By recognizing these patterns, potential solutions to the problem may start to emerge.

We identified *three* major categories based on the quotes made by interviewees and the recurrence of some direct requests or expression of needs.

1. **Team Interaction**: Many of our interviewees expressed that it was not clear how to start the initial conversation with their teams or how to work together. The following statements are a few examples:

> Getting started was slow! Triggering the initial discussion would be helpful
>
> It was hard to find my team or to start communicating with them
>
> A little more info. on how to work together would be helpful!

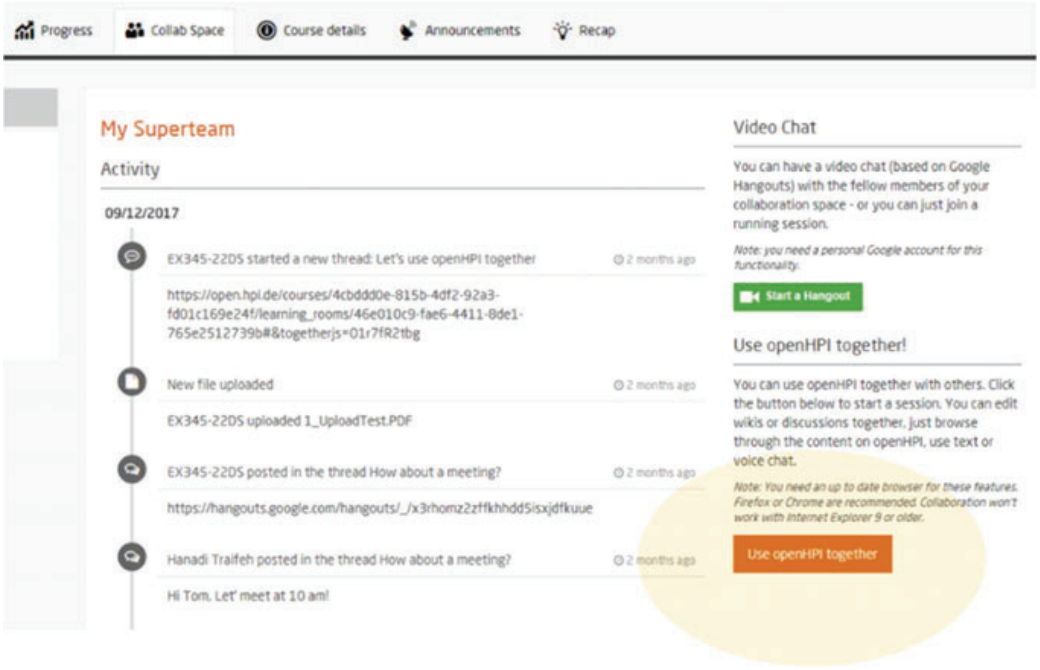

Fig. 5 Use openHPI together feature

2. **The Collab Space**: A large number of interviewees made clear statements about the design and structure of the Collab Space itself. They noted that entering the space was "overwhelming" and that they did not know which tool to use first or what exactly they were supposed to do once there.

> I looked through the platform and couldn't figure out what to do!
>
> One should have been exposed to the platform tools before starting the 'real' work!
>
> There was no explanation on "How to Use the Collab Space"

3. **Short introductory video**: The first two interviewees expressed their wish to have a short video on the platform that guides the participants through the use and functionalities of the different tools of the Collab Space.

> It is very important to know how to start using the Collab Space. Everybody should be able to understand the process. I wish there was a short video about this.
>
> It would be really helpful to have a video when you open the Collab Space that explains its features. This would definitely make life easier

We decided to act on this request and started to ask the other interviewees about the idea. The strong support for the idea expressed by the vast majority of the interviewees shifted our focus towards prototyping an introductory video and testing it as a next step (Fig. 6).

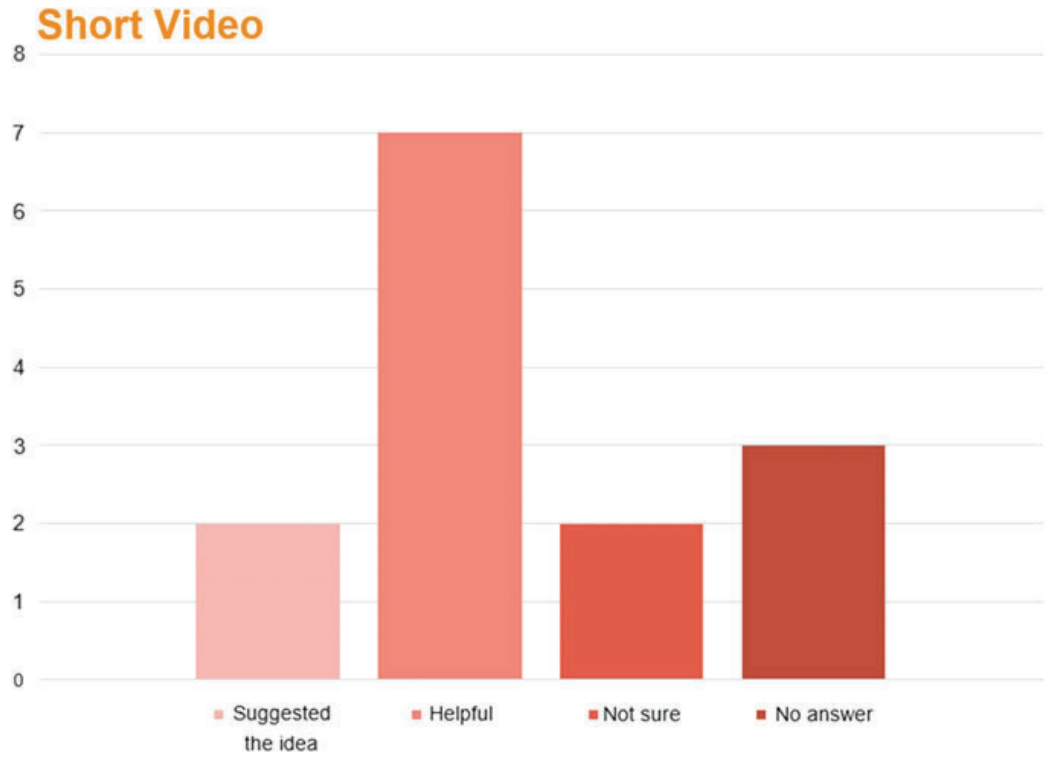

Fig. 6 Most interviewees agreed that the short introductory video would be helpful

3.4 Prototyping and Testing

We created a 7 min introductory video that introduces the features of the Collab Space. We then tested the video prototype in a workshop held during the d.confestival event, which took place at the Hasso Plattner Institute in Potsdam, Germany on September 14, 2017. We designed a new course titled 'Food is Life' that follows the same structure of openHPI MOOCs (Fig. 7) specifically for the purpose of the test and for conducting further research. We aimed for eight participants but only four joined the workshop. While this might be considered one of the limitations of our study, the small number of participants allowed for more time to discuss the collaborative team-based learning topic, do more observation and dive deeper into the users' needs. The participants were divided into two teams (2 members each) and were provided with laptops that had pre-set usernames and passwords to record their activities. None of the participants had attended any MOOC on the openHPI platform before, which makes this their first encounter with the platform. The new course (Food is Life) served as a base for the experiment. In the course, the participants' task was to collaborate in teams to create a dish recipe for a social gathering. One team was shown the video before performing the task. The other team logged into the platform and was expected to start working on the task right away.

Our observation shows that the team that watched the video performed better than the team that did not. For example, the team members who watched the video were

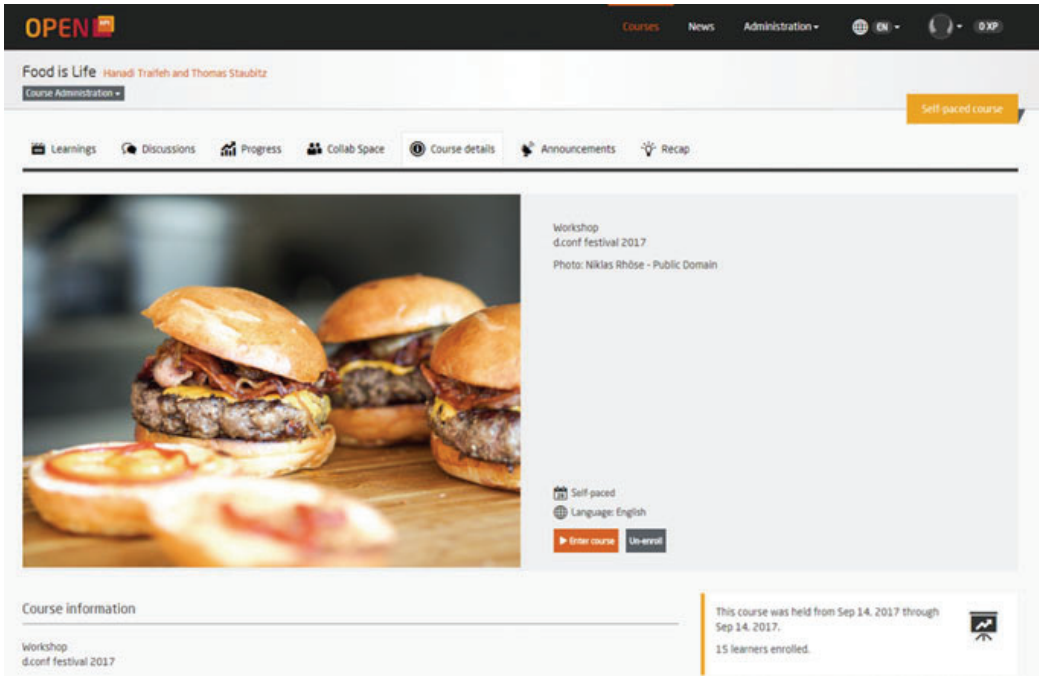

Fig. 7 'Food is Life' course

able to find each other faster than those who did not. Moreover, the team that watched the video utilized the Etherpad feature right away, while it took the other team over 20 min to discover the tool. Overall, the ability to quickly use and benefit from the collaboration tools enabled the team that watched the video to complete the task (creating the dish recipe) successfully within the allotted time period (30 min). The team that did not watch the video clearly struggled in collaborating, and was finally not able to complete the task.

All participants also expressed their need for an instant messaging feature (a chat window). They believed that if that option were available, starting the initial conversation would have been much easier. Compared with the results of our first part of the study, we noticed that most of our participants used the 'Discussion Board' feature as a communication (chat) tool even though it did not have the full capability to serve this purpose. This highlights the importance of either including a chat tool within the platform or enhancing the discussion board with more chat-like features to satisfy users' needs.

4 The Iteration Phase

Based on the results of our study, we took further steps to improve the experience of using the Collab Space for openHPI users:

1. Removal of the 'Use openHPI together' section and feature permanently as none of the first or second groups of users have ever used it or reported any willingness to do so. Observing the participants struggling with the feature and our own difficulties using the feature made the decision to remove it relatively easy.
2. The Hangout feature is moved to the navigation bar on the left side and has been re-named "Start a Video Chat". An additional page explaining the need to schedule a meeting before starting the hangout video call and providing some technical instructions on how to sign into hangout was added as part of this change. The original 'Video Chat' section and the 'Start a Hangout' button have been removed.
3. An enhanced version of the Collab Space introductory video was recorded to be introduced at the beginning of all courses. The initial version that was used in our experiment was only a prototype to validate our assumptions about the importance of including an introductory video. Participants also gave valuable feedback about the video itself, which was incorporated in our next iteration.
4. Recently, a commercial version of the Tele-Board was developed. While the Tele-Board has been a research prototype, the NexBoard builds on the results of this research and adds the advantages of a commercially offered software, such as maintenance, support and improved stability. One of the most important improvements that comes with this switch to the new tool is improved support for tablets. The course administrator always had the option of turning the feature on or off according to the course content. In the future, there will also be improved administration options, such as the provision of different templates for different courses.
5. A new wording structure replaced the old version of the navigation bar items. Verbs are used instead of abstract words that confused the users. The sentences themselves were also simplified. Table 1 gives a few examples.
6. The items of the navigation menu have been rearranged according to their logical order (Fig. 8).

Table 1 Old and new structure of the navigation bar

Old	New
Dashboard	View recent activity
Discussions	Discuss with your team
Etherpad	Collaborate on texts
Tele-Board	Brainstorm ideas
(Hangout)	Start a video chat
Files	Share Files
Peer Assessment: [Name of the assignment]	Submit your team work and evaluate your peers
Administration	Manage your Collab Space

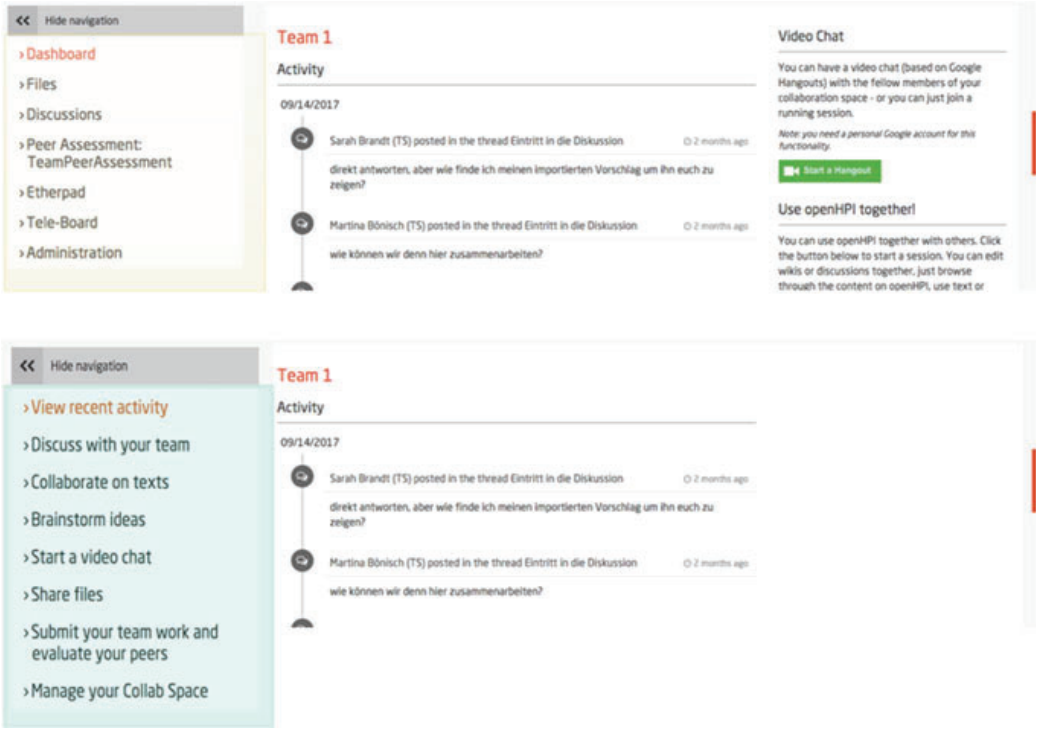

Fig. 8 Re-wording and rearranging of the Collab Space items

7. Although having an 'instant messaging/chat' feature seemed important to our users, we decided to develop and probably implement this feature in a next iteration.

The new design of the Collab Space has been tested with new teams through a MOOC called Intrapreneurship—Make your business great again :-)[4] (30 October 2017–26 March 2018). This course featured two tracks: a fast track and a full track. The full track added a small team-based project on top of the fast track. The participants had to develop a pitch for fictitious business ideas that were provided by the course participants themselves. Working on the pitch required the usage of the Collab Space. Furthermore, we are working with the new Collab Space in an iteration of the Java course, which is offered in a version that has been particularly refined to serve the need of schools: Object-oriented programming in Java—School-Cloud-Edition 2018[5] (26 February 2018–11 June 2018)

The results of these tests are still being evaluated and will be published separately.

Once these courses have been evaluated, further iteration may be carried out after gathering new feedback and observing the new users' experience within the platform.

[4] https://mooc.house/courses/bizmooc2018.

[5] https://open.hpi.de/courses/javaeinstieg-mint-ec-2018.

5 Conclusion

This chapter presented an assessment of the current state of the Collab Space at openHPI MOOC platform from a human-centered design perspective. A design thinking (DT) approach was followed to evaluate the functionality of the different communication tools implemented in the Collab Space. Our study results show that DT facilitated the discovery of the Collab Space users' needs and the development of better solutions that may encourage teams to work better together and improve their learning experience. The prototype designs we tested following the DT approach resulted in clear improvement in user collaboration and better engagement with the openHPI MOOC platform.

We aim to continue our exploration and the prototyping of iterative designs for improving the engagement models and approaches on MOOC platforms in particular, and in digital learning in general. We will support our DT-based study with quantitative evidence from the platform's usage statics and logs. We also intend to expand the scope of our studies to further validate our findings and test our insights through a more diverse participant population.

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