Tutoring Teachers - Building an Online Tutoring Platform for the Teacher Community

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Sten Govaerts[1], Yiwei Cao[2(✉)], Nils Faltin[2],
Faysal Cherradi[2], and Denis Gillet[1]

[1] EPFL, Lausanne, Switzerland
{sten.govaerts,denis.gillet}@epfl.ch
[2] IMC AG, Saarbrücken, Germany
{yiwei.cao,nils.faltin,faysal.cherradi}@im-c.de

Abstract. Knowledge sharing has been a trendy and recurring topic in technology-enhanced learning for years. Many advanced platforms have been developed. However face-to-face help session are still often preferred by people who want to enhance their skills. The Go-Lab project aims to engage school students with STEM topics by bringing online laboratory experiments into the classroom. To achieve this, teachers are the key to success. Accordingly, the teacher's knowledge and skills in inquiry learning with online labs are important, since it may be a hurdle for teachers to use such technical software and apply it in their lessons. To support and tutor teachers with this, we have developed the Go-Lab Tutoring Platform that offers teachers a peer assistance and expertise sharing platform. Teachers, lab owners, and pedagogical experts can help each other and share their skills and knowledge. To sustain this tutoring platform, we aim to set up a business model to support the community build-up in a sustainable way. This paper elaborates on the design, the first prototype and an early evaluation of the Go-Lab Tutoring Platform.

Keywords: Online labs · Inquiry learning · Tutoring · STEM · Social tutoring platform · Teacher professional development · Community building · Business model

1 Introduction

In our ever-changing world, technology is evolving at a very fast pace, both on the hardware / software and connectivity levels. Children start using smart phones and tablets at a younger and younger age and technology is penetrating more schools. This requires more adaptation and continuous training for teachers who use technology in the classroom. Bringing technology-enhanced science, technology, engineering, and mathematics (STEM) learning into the schools, is what the European Go-Lab project[1] is set out to do by integrating exciting online laboratory experiments into the courses to encourage students to study

[1] The Go-Lab project, http://www.go-lab-project.eu.

M. Ebner et al. (Eds): EiED 2014, CCIS 486, pp. 39–51, 2015.
DOI: 10.1007/978-3-319-22017-8_4

STEM. Teachers can create such learning activities with online labs by using the Go-Lab Portal[2]. Through this portal, teachers can find online labs and the necessary resources to build their inquiry activities and use online laboratories in the classroom straight from the browser with no setup cost [9,10].

Online labs and inquiry learning methods enable school students' creativity for science learning and bring them engagement and fun [11,12]. Such online labs can also be much more convenient than setting up physical experiments in the classroom itself. It can even bring experiments that would be impossible to conduct before, to the students. For instance, through the Go-Lab Portal teachers and students can operate the high-powered, robotic Faulkes telescope[3] located in Hawaii from the classroom to investigate astronomy, or students can investigate particle collisions using real data from the CERN Large Hadron Collider [13].

However, both students and teachers need to learn how to conduct inquiry learning with online labs. Teachers are key to bring this technology into the classroom, since they teach the students. Besides their conventional professional development, teachers are also required to master more ICT skills [1,2], e.g. to use the Go-Lab Portal and operate online labs. To overcome these barriers, the Go-Lab project provides a platform for peer assistance and tutoring teachers on how to use online labs and appropriate pedagogical methodologies. Knowledge sharing practices are considered important factors for learning by many educators [7,17]. Moreover, an inquiry learning case study shows that the teacher's expertise influences the success of their students greatly [3]. Thus, training teachers can be a very effective means to support students learning STEM.

The Go-Lab Tutoring Platform offers teachers assistance from lab owners, scientists and their peers who can share their expertise and experience with online labs, pedagogy and the Go-Lab Portal. For instance, a tutor can offer a help session on how to use an online lab or how to create an inquiry activity. After teachers have become more experienced, they can peer assist other teachers.

Thanks to the American *No Child Left Behind Act*, the US Department of Education pays the tutoring bills. In the European Go-Lab project, we are investigating incentives for experts and teachers to provide tutoring sessions in a sustainable way. To assess the usability and preferences towards such incentives, we have conducted two evaluations with 14 teachers and 7 researchers (the latter evaluation was already reported in [4]). The Go-Lab Tutoring Platform shows the potential to make teacher training scalable and sustainable.

First, this paper presents related online assistance platforms. After which we elaborate on our design and implementation. Then, the evaluations with teachers and researchers are presented and incentive mechanisms are discussed to sustain the tutoring platform. Finally, we conclude with our future plans.

2 Related Work

This section first surveys existing tutoring platforms with their business models and afterwards incentives to offer tutoring are discussed.

[2] The Go-Lab Portal, http://www.golabz.eu.
[3] The Faulkes Telescope Project, http://faulkes-telescope.com/.

The market for tutoring will boom according to the Global Industry Analysts (GIA) who predicts the global private tutoring market surpasses over 100 billion dollar by 2018[4] as private tutoring will be accepted by more and more students. *Tutor.com* with over 2500 online tutors is popular in the USA and charges monthly membership fees. This business model is also applied to the similar platforms *studyedge.com* and *instaEDU.com*. The latter also provides tutoring for Massive Open Online Courses (MOOC) [15]. *takelessons.com* offers tutoring services paid by attending local or online courses.

Specific teacher-focused tutoring platforms aim at teachers' professional development. *teacherspayteachers.com* is a marketplace for teachers to share lesson plans for free or by payment. *lessoncast.com* offers a free and paid membership and teachers can share their teaching resources, get coaching, and attend online professional development courses. Teachers are motivated to win the digital badges thanks to their collaboration with the Digital Innovation in Learning Awards.[5] These platforms are aimed at the American K12 teacher communities. Similarly, teacher tutoring has great potential as well. Many teachers invest time in attending courses & workshops (71 % of teachers), and conferences & seminars (44 % of teachers) for professional development [16].

There are also general-purpose tutoring platforms targeting all users. *Google Helpouts*[6] integrates the Google Hangouts video chatting functionality to offer free or paid help sessions with experts (e.g. in cooking or repairing your computer). Their business model is offering paid video consulting sessions of which Google retains a 20 % fee and pays the instructor 80 %. At its initial launch, Google manually selects experts for quality assurance. Amazon's *Mayday*[7] offers live tech support to Amazon customers. The development of tutoring platforms is more active in the USA than Europe. However, the European School Net offers the *eTwinning platform*[8] [6], where European teachers are able to collaborate and share teaching resources for free.

Second, different credit systems are surveyed to explore how the Go-Lab Tutoring Platform could evaluate and award teachers and tutors. For example, social media techniques (e.g. badges, ratings, comments, or credits) can highlight skills, achievements, or the engagement of an individual in online platforms [8].

The *Mozilla OpenBadges* platform[9] develops the Open Badges standard for online assessment. By collecting widely-accepted, portable Open Badges, learners keep motivation high to study. Social help platforms, such as the Q&A site StackExchange[10], often use social rating mechanisms to rate questions, answers and the authors. Limpens et al. [14] proposed a competence model using a decentralised virtual currency system as an incentive for self-regulated learner

[4] Forbes article, http://www.forbes.com/sites/jamesmarshallcrotty/2012/10/30/global-private-tutoring-market-will-surpass-102-billion-by-2018/.
[5] dila 2014, http://awards.edsurge.com/.
[6] Google Helpouts, https://helpouts.google.com.
[7] Amazon Mayday, http://amazon.com/maydaytv.
[8] eTwinning, http://www.etwinning.net/.
[9] Mozilla Open Badges, http://openbadges.org/.
[10] StackExchange, http://stackexchange.com/.

communities. Similarly, with *Credly*[11] user can earn Credly credits in various platforms, such as Facebook, Twitter and Moodle.

Chang et al. [5] use such ratings to compute an overall trust score of a tutor's expertise, which is often an extra incentive to these tutors. But even digital badges with their different granularity and different ways to obtain are deemed valuable by users [8]. Such decentralized credit granting can be useful for adult learning or professional development, as shown in EDUCAUSE that issues digital badges to recognise professional ICT achievements in higher education[12]. eTwinning assigns quality labels at national and European levels to motivate teachers to participate in more European teaching projects. However these badges are not portable to other platforms. Class Badge[13] is a free online platform for teachers to award students with badges.

Based on this state of the art, the Go-Lab Tutoring Platform aims to build a teachers' community for online labs and inquiry learning activities. It tackles the potential business model and employment of a credit system.

3 Realisation of the Go-Lab Tutoring Platform

This section presents the requirements analysis, architecture and the user interface of the Go-Lab Tutoring Platform.

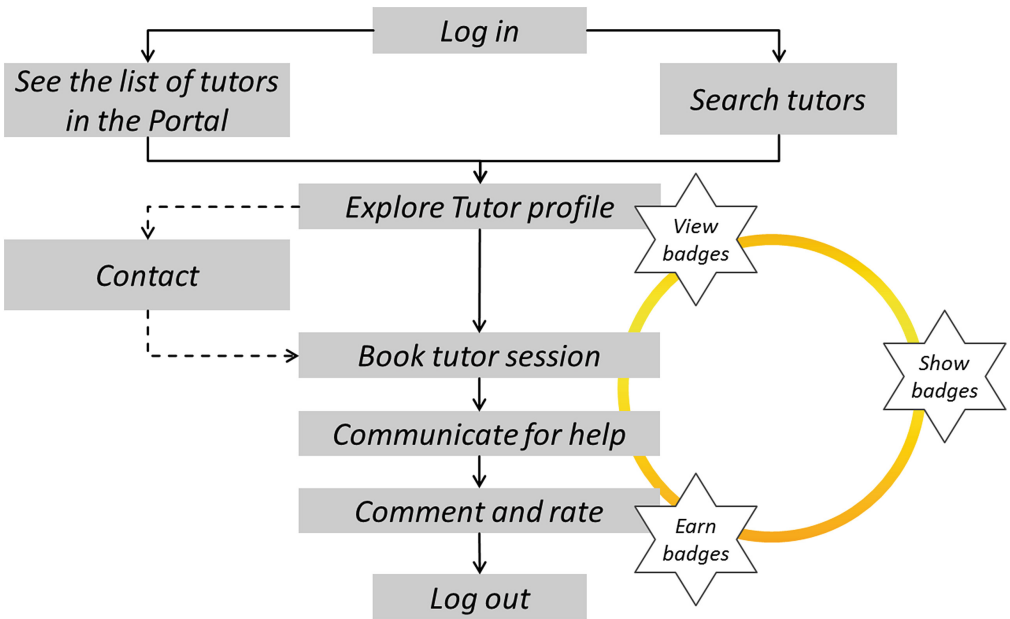

Fig. 1. Workflow in the Go-Lab tutoring platform

[11] Credly, https://credly.com/.
[12] EDUCAUSE, https://www.educause.edu/.
[13] Class Badge http://classbadges.com/.

3.1 Requirements

Based on user scenarios we conducted a requirement analysis for Go-Lab Tutoring Platform (more details are in [4]).

The main functionality for novice teachers, who are looking for help, is summarised in Fig. 1. Imagine a novice teacher looking for help to use online labs in her class, she logs in, searches for tutors and explores several tutor profiles, books a session, communicates for help during the session, and comments and rates the tutor after the session. Such comments, ratings and digital badges may play a role to help novice teachers to find a trustworthy tutor. After a succefully completed help session, both the teacher and tutor can award each other badges, comments and ratings that are shown on their profile.

3.2 Architecture of the Go-Lab Tutoring Platform

Figure 2 depicts the architecture of the Go-Lab Tutoring Platform and its relationship to the Go-Lab Portal and Booking System. The Go-Lab Tutoring Platform is supported by a credit system and a set of components to find and book tutors. The social platform components manage user and tutor profiles and provide social features such as user comments and ratings on the user profiles and the help sessions. Users can write comments related to the help session and rate the help sessions and the tutor using a five star rating on each other's profile. The average rating is calculated and listed in each user profile. The contact & communication component provides different contact channels between users and tutors. Such channels are required for communication and to conduct the help session. They comprise emails, contact forms, chat rooms, screen-sharing, and video-chatting. For example, one can email a tutor to make an appointment, while the help session itself is done through the video chatting tool.

Users can book a help session with a tutor via the tutor booking component, which supports calendar-based booking through the Go-Lab booking system.

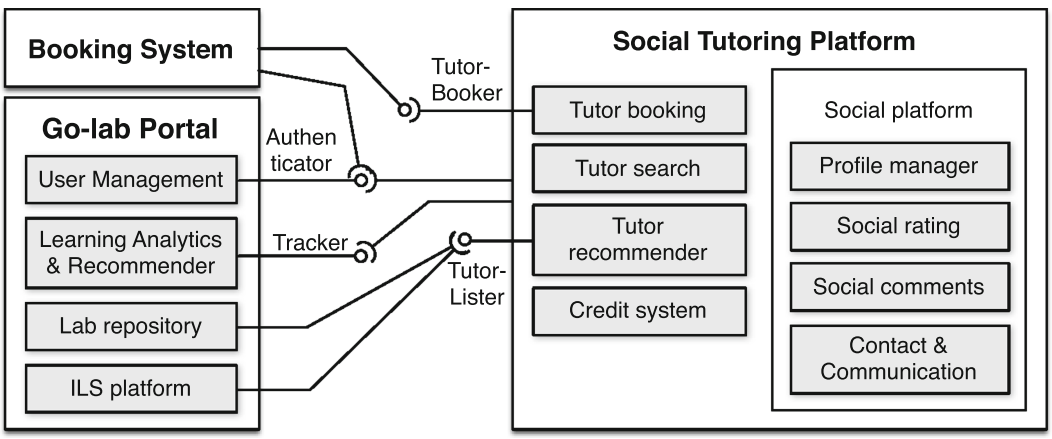

Fig. 2. The architecture of the Go-Lab Tutoring Platform

Users can search for tutors via the tutor search component and get recommendations of tutors on the portal through the tutor recommender component and the tutor search interface. The credit system provides mechanisms (digital badges) to award tutors for the provided help.

3.3 User Interface

The Go-Lab Tutoring Platform is accessible at http://tutoring.golabz.eu and implemented with Drupal 7. Figure 3 depicts the home page with user login information on right upper corner. The main top menu allows access to the user's profile, her calendar and booked session, which shows notifications of new actions that occurred since the last login. Those new actions can be:

- *As a tutor:* my help sessions that have been booked by other users.
- *As a tutor:* my booked help sessions that have been cancelled.
- *As a user:* my booked help sessions that have been cancelled by the tutor.

The search box in Fig. 3 enables search through both profiles and help offers of tutors. In the search results, each tutor with their name, ranking, and profile is listed, similarly as in Fig. 3 which is before the filtering.

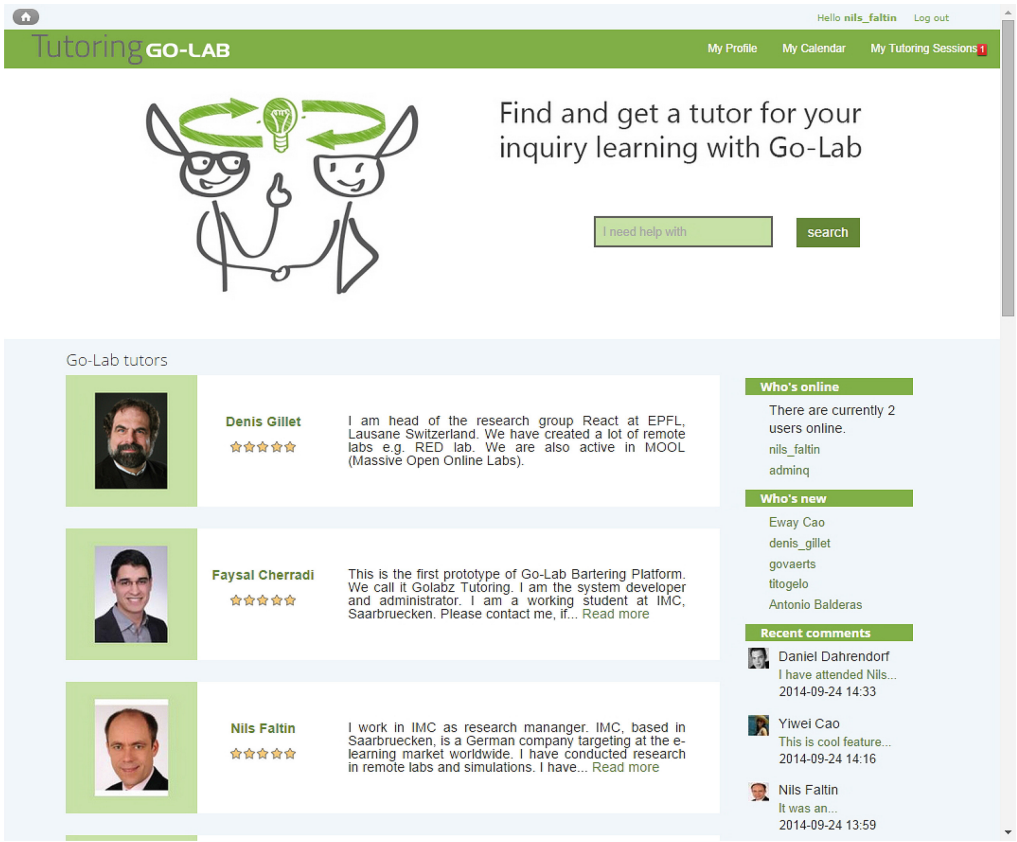

Fig. 3. Home page of the Go-Lab Tutoring Platform

When users come to the Go-Lab Tutoring Platform, they are required to register and login, either with their Google account or they can create a new account in the Go-Lab Tutoring Platform. Without login, they can only view tutor information but they are not allowed to create or book any help session.

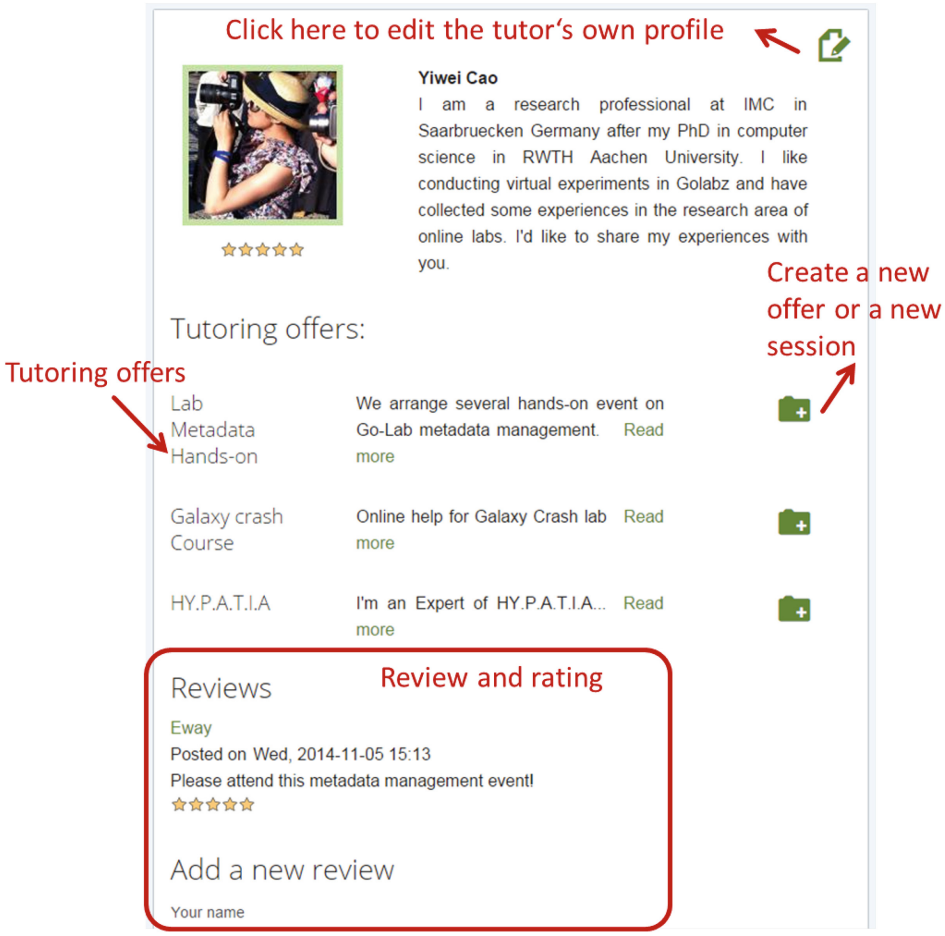

Fig. 4. Tutor profile management and display of help session offers

Each tutor's profile is managed on the platform as depicted in Fig. 4. It displays a basic description of the tutor with contact information and average ratings as well as labs and inquiry spaces in which the tutor has expertise. A tutor can list the help sessions she offers, which can be booked. Tutors have access to a centralised booking calendar, 'My calendar', by clicking the booking button on the upper-right corner. Users can comment and rate this tutor. The profile rating will be calculated as an average. More advanced and robust rating metrics can be considered when needed.

4 Evaluation

To evaluate the usability and usefulness of the platform, two user studies have been conducted. Apart from usability and usefulness assessment, participatory

design (PD) activities were conducted to assess preferences of teachers to guide our design. The first survey was conducted with 7 PhD students at the JTEL Summer School 2014. The students acted both as teachers and experts and offered and received help using the prototype. In this first survey, we enquired about the users' skills and knowledge about physical and online labs, and their preferences on how to receive experts' help and the appropriate incentives for tutors. The second survey was done with 14 teachers already acquainted with the Go-Lab Portal. The teachers followed a presentation of the purpose and how they could use the system. This format was chosen because the survey was conducted remotely. They could use the Go-Lab Tutoring Platform but were not obliged. Afterwards, we assessed again their preferences on the delivery of help and the incentives to provide help. Additionally, we questioned the usability and perceived usefulness of the tutoring platform. The remainder of this section elaborates on the results as summarised in Fig. 5.

Both the surveys of the JTEL students and Go-Lab teachers contained recurring questions, however some questions differ due to the focus of the survey and the fact we could get real teacher feedback. The usability (question 4 & 6) and usefulness (question 5) of the tutoring platform prototype was surveyed with the teachers. The difficulty of the functionality was perceived as easy to very easy (question 6) and almost all teachers would not need technical assistance (question 4, low median, but spread). The functionality features were perceived as useful (question 5, high median). Additionally, teachers provided suggestions for other functionality such as Google Docs integration, a multilingual user interface, and a Frequently-Asked-Questions (FAQ) section.

Using participatory design to guide the future developments of the Go-Lab Tutoring Platform, the participants were asked about their preferences on how they would like to get help (question 1) and which incentives would motivate them to help (question 2). Question 1 shows that both students and teachers prefer direct communication such as face-to-face help (a) and online meetings (b) (both (very) high to medians). However teachers seem to more willing to look for help via other means, such as a helpdesk (c), discussion fora (d), online search (f) and even social media (e) is liked by many. While the JTEL students prefer these solutions less (lower medians) and are less aligned about these (larger spread). Some teachers also provided other channels they would like to use, namely help videos (*'videos help a lot, we see someone using what we have to learn how to use and learn without effort.'*, webinars (*'also useful webinars or hangouts on air'*), email exchange (*'Why don't we have personal e-mail exchanges with a PPT/prezi attachments. ... And what is the most important - you know who uses the platform you stay in close contact with a group of people. Teachers like writing messages, share ideas.'*) and FAQ (*'Maybe some questions that may be recurring, can integrate a FAQ page for each specific lab/apps.'*).

The incentives that motivate people to help each other (question 2) seem to lean towards getting something in return, whether it is social media badges (high median), other tutoring session (preferred more by teachers than students), or financial incentives (high median). Giving tutoring for free was perceived a bit

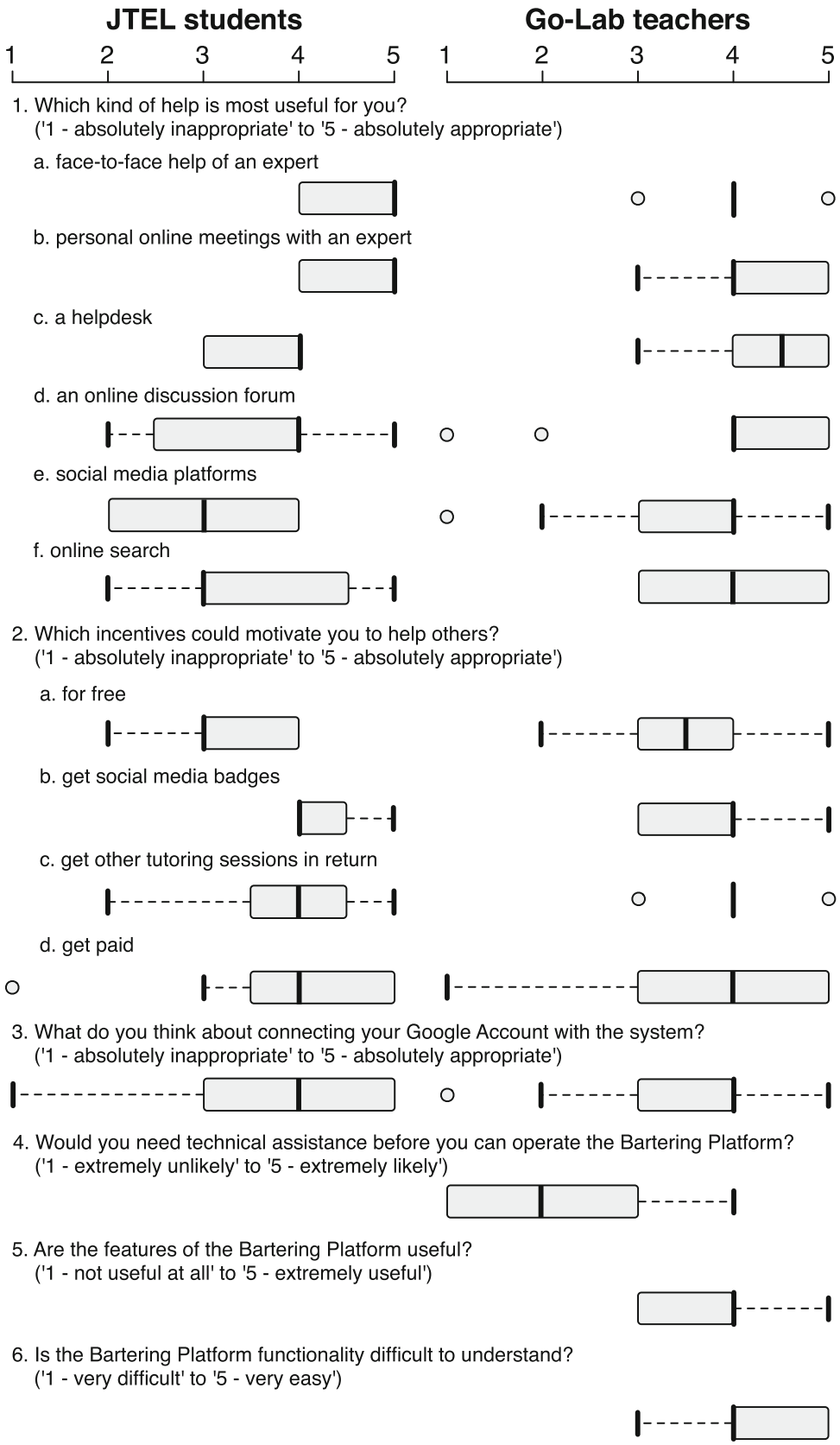

Fig. 5. Boxplots of the likert scales of the survey with JTEL students and Go-Lab teachers.

better by the teachers than the students. One teacher even said *'People LOVE meeting people, a face to face occasion is a wonderful way of sharing enthusiasm.'*

Since the prototype is implemented using Google Hangouts, which requires a Google account, we enquired whether participants found this problematic. However, most teachers and students did not object. Furthermore, most teachers have been using Google to various extent. Only one teacher does not have a Google account, but is ready to apply for one if necessary.

5 Discussion and Future Work

The prototype has been launched, but the credit system is still under development. Currently, only the rating and commenting show a level of trust and expertise of users. However, with the prototype, we are able conduct more concrete participatory design workshops where the preferences of novice and expert teachers can be assessed (see Sect. 4) to conceptualise a business model.

The conceptual diagram in Fig. 6 shows how the Go-Lab Tutoring Platform affects different stakeholders and the Go-Lab Portal, and how this can lead to a sustainable business model. Go-Lab organises participatory design workshops with teachers who evaluate the platform and provide feedback that is used to develop the next version of the Go-Lab Tutoring Platform. The help sessions are often related to user scenarios of the Go-Lab Portal. For this, the Go-Lab Tutoring Platform supports teachers' community building and professional development. Such training sessions and events have business potential and can contribute to the project sustainability. A successful business model will sustain both the platform and the teacher community, and could be based on the following resources:

- Ministries of education sponsor teachers' professional development.
- Institutions and schools sponsor teachers' professional development.
- Teachers help each other and earn some money.
- Lab owners promote their labs by offering help.
- Amateur scientists help novice teachers and earn money, but can also be interested in paying for expert tutoring.

Non-monetary incentive mechanisms (e.g. (portable) digital badges and well-recognised teacher certificates) will be used in conjunction with paid offers. To make the professional development certificates a success story support and collaboration with policy makers and organisations will be needed.

Go-Lab aims to build and support a teacher community through the Go-Lab Tutoring Platform and the Portal. Within the Go-Lab consortium, we already have teachers, lab owners and a school who promotes teachers' professional development, as a start of this effort. Furthermore, the participatory design activities lead to the involvement of more teachers and the iterative improvement of the Go-Lab Tutoring Platform in the future.

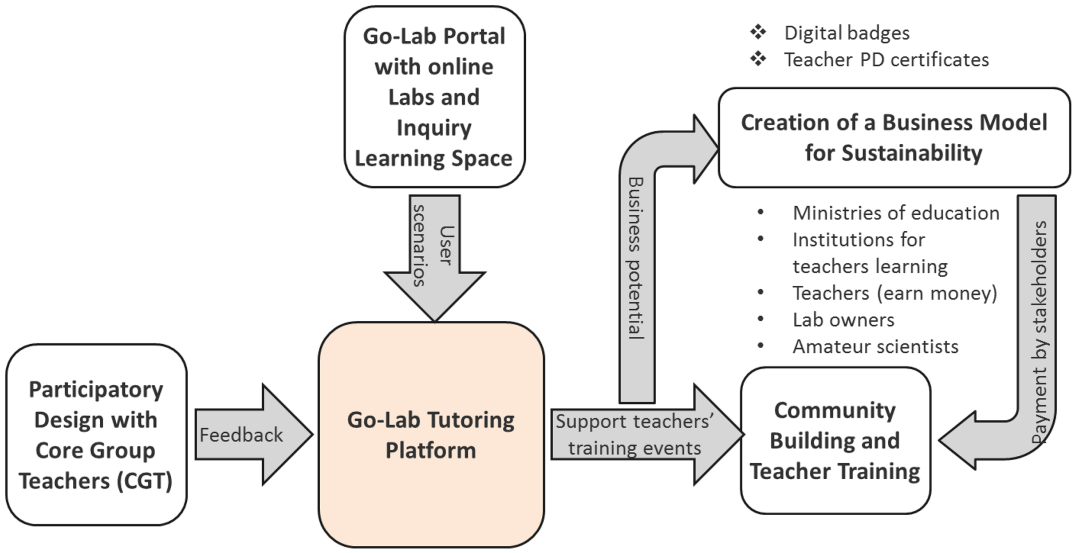

Fig. 6. Conceptual diagram leading towards a business model

6 Conclusion

Nowadays, teachers are life-long learners that continuously need to keep up with the latest technological and pedagogical innovations. We have created a peer assistance and tutoring platform for teachers who want to apply online labs and inquiry learning methods in STEM. The Go-Lab Tutoring Platform has multiple goals. First, it offers an effective community-building tool for teachers and experts to share and exchange their teaching expertise and knowledge. Second, it supports a dynamic professional development path for novice teachers who can through peer tutoring become expert teachers. Third, the potential business model can enable the Go-Lab Tutoring Platform and Portal to become a sustainable marketplace for knowledge and skill sharing on online labs and pedagogy. Finally, the Go-Lab Tutoring Platform serves as a support mechanism for the Go-Lab Portal by providing tutoring activities that can attract more teachers.

The evaluation results of the prototype prove the concept as a promising solution to support teachers with bringing online labs into the classroom. Through this evaluation, we have investigated incentives to motivate teachers and tutors, which provides an indication for a potential business model to involve diverse stakeholders: ministries of educations, teacher professional development organisations, teachers, and amateur scientists. In the future, we aim to improve the usability, include incentives, a credit system and other interesting features requested in the evaluation, as well as work on building up a STEM teacher community for online labs and inquiry learning.

Acknowledgments. This research work is partially funded by the European Union in the context of the Go-Lab project (Grant Agreement no. 317601) under the Information and Communication Technologies (ICT) theme of the 7th Framework Programme for

R&D (FP7). This document does not represent the opinion of the European Union, and the European Union is not responsible for any use that might be made of its content. We would like to thank Matthias Heintz and Effie L.-C. Law (University of Leicester) for their teacher survey support.

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