Next-Lab

Next Generation Stakeholders and Next Level Ecosystem for Collaborative Science Education with Online Labs

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Deliverable 4.3

Report on participatory design activities, adoption, and technological readiness level

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Executive Summary

This deliverable D4.3 presents the Participatory Design (PD) activities in the Next-Lab project from month 9 to 17. The goal of these activities was to actively include end-users in the design process to gather their feedback, input, and improvement suggestions. The results are presented to the partners to support their software redesign and other project activities.

Section 1 gives an introduction, followed by basic concepts presented in Section 2. An overview of the PD activities performed in face-to-face and remote settings with end-users and by HCI specialists in the form of analytical walkthroughs is presented in Section 3. Details are described in Section 4, Section 5, and Section 6 respectively.

The results are summarized regarding the different Go-Lab ecosystem artefacts in Section 7. Major themes identified during the sessions or in the results can be found in Section 8.

How the findings are adopted by developers and end-users is presented in Section 9.

Section 10 presents the Technology Readiness Level of the Go-Lab ecosystem and the underlying components.

Finally, in Section 11 and 12 the deliverable is concluded and an outlook on upcoming PD activities in the Next-Lab project is given.

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1. Introduction

Participatory Design (PD) activities in the Next-Lab project do not have a dedicated work package (WP), but are interwoven with different WPs (mainly WP4, but also WP1 and WP2). PD workshops and remote studies with end-users and analytical walkthrough by Human Computer Interaction (HCI) specialists are performed on demand. Whenever a partner has information needs that could be fulfilled through a PD activity they can approach the University of Leicester (ULEIC) PD team. In collaboration with the partner, to make sure their requirements are met, the team will then plan, conduct, and analyse an appropriate PD activity (see Section 1 in the deliverable D4.1 (Heintz and Law, 2017) for a detailed description of the general process, which has been adapted to the different cases of PD activities presented in this deliverable according to specific constraints).

Besides increasing the usability and user experience of the Go-Lab ecosystem, its Technology Readiness Level was increased, to make Next-Lab more suitable for use in schools all over Europe and beyond.

2. Participatory Design (PD) Approaches

2.1 Basic concepts

The basic concepts of Participatory Design and when and how to apply it have been the same as for the first eight month of the Next-Lab project (detailed information can be found in Section 2.1 of deliverable D4.1). To sum it up, the main goal is to actively include end-users in the design process to reach tailored solutions and interfaces for them.

2.2 Approaches

2.2.1 Face-to-face user Studies: Workshops and Events

PD workshops are the most common way to apply Participatory Design (see Section 2.2.1 in Deliverable 4.1 for details). The PD approach applied in these events depends on several factors, like nature of the artefact evaluated, information needs, and time constraints. An overview of the face-to-face PD activities performed in month 9 to 17 of the Next-Lab project can be found in Table 2 in Section 3, details can be found in Section 4.

2.2.2 Remote User Studies: Next-Lab Core Group and PD Teachers

The Core Group Teachers (CGT) (see Section 2.2.2 in D4.1 for details) respond to biweekly tasks which are sent to them via email (see Table 3 in Section 3 for an overview and Section 5 for details). The size of the CGT group has grown from 7 to 35 members through recruiting members of the Graasp authoring environment (see Appendix R for details). The average response rate of the CGT group to a given task was 40%, ranging from 20% to 71%. The rate varied with the complexity of the task and with the workload the CGT members experiencing at a particular point of time. The support of this dedicated group has significantly helped us co-create the Next-Lab ecosystem, enabling high usability and user experience of individual interactive artefacts such as StudentWork Viewer, Table Tool, Go-Lab Recognition Scheme, to name just a few.

2.2.3 Researcher-based Analytical Studies

Beside activities with end-users, we as HCI specialists conducted analytical studies (see Table 4 in Section 3 for an overview and Section 6 for details). In these studies we evaluated the artefacts using our HCI expertise to find usability and UX issues, for example violations of usability heuristics (Nielsen, 1994), as well as assuming the role of end-users (see Section 2.2.3 in D4.1 for reasoning and additional information).

The general process followed in these studies was as follows: HCI specialists from the University of Leicester (ULEIC) performed common interactions and inspected the different screens to check for any usability issues or bugs. Several tasks and sequences were tried out to ensure the correct performance of the tool under different circumstances. Two approaches to exploring the artefact were used:

- screen driven – i.e. based on what could be seen, and
- process driven – i.e. based on assumed end-user goals and how a user would try to achieve them.

The HCI specialists adopted the teacher and student roles, while being aware of a wide range of computer expertise among these populations who have fair knowledge of the Go-Lab/Next-Lab system. Some concepts closely related to usability and user experience (such as the aesthetic and affective factors) were also taken into account when conducting the evaluations.

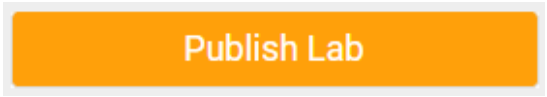
Observations made during the analytical walkthrough were documented. After the session, the usability observations were circulated around the PD team so that all could independently assign importance levels (H - high / M - medium / L - low) for fixing each issue:

- Low importance (L) rating is given for issues, which would be noticed by end-users, and might affect their overall sense of the quality of the interface, but would not hinder them significantly from achieving their objectives.
- Medium importance (M) rating is given for issues, which would be noticed by end-users and may confuse, delay or distract them briefly and temporarily.
- High importance (H) rating is given for issues, which would be an obstacle for end-users, either preventing them from achieving their goals, or causing significant delay, disruption, confusion or annoyance.

Finally, discrepancies in “importance” scores were discussed and consensus was achieved for each usability observation.

This resulted in a table of usability observations and recommended modifications with importance ratings (see Table 1 for an example). Such detailed results were provided for the developers as part of a report on the activity.

Table 1. Excerpt of the list of usability observations for the reworked Go-Lab sharing platform (see Appendix GG for details).

	Usability Observation	Recommended Modification	Import-ance
1	Interface element to publish lab looks like a button, but only the text is interactive.  This is inconsistent to other interface elements (e.g. “Sort” button) and thus unexpected for the end-user.	Make the interface element work like a button (whole coloured area can be clicked).	**M**
2	The “Publish your Lab” page (http://dev.golabz.eu/labs/publish) has several typos and the layout could be improved (e.g. space above the second heading). 	Fix the typos on this page and check if some of the descriptions could be improved.	**H**

	Usability Observation	Recommended Modification	Import-ance
3	On the “Publish your Lab” page the textual description of how to get help / contact us could be improved.	Add a picture of said button to the text.	**L**
4	…		

3. Next-Lab PD and User Studies in month 9 to 17

The Next-Lab PD and user evaluation activities collected feedback and input from over 100 teachers. Altogether, 26 sessions were performed: 8 face-to-face PD sessions (see Table 2 for an overview and Section 4 for details), 12 remote studies (see Table 3 for an overview and Section 5 for details), and 6 analytical studies (see Table 4 for an overview and Section 6 for details).

Table 2. An overview of face-to-face PD studies in month 9 to 17 of the Next-Lab project.

Event ID	Date	Location	No. of participants	Comments / components covered
LEIC-10112017	10/11/2017	Fulneck School, Leeds	21 teachers	Next-Lab project and Go-Lab resources in general
LEIC-20112017	20/11/2017	Brookvale Groby Learning Campus, Leicester	9 teachers	Next-Lab project and Go-Lab resources in general
LEIC-09122017a	09/12/2017	Brussels	20 teachers	Concept Mapper and Dashboard
LEIC-09122017b	09/12/2017	Brussels	20 teachers	StudentWork Viewer mock-ups
LEIC-09122017c	09/12/2017	Brussels	20 teachers	Table Tool, Questioning and Hypothesis Scratchpad
LEIC-0802018	08/02/2018	Leicester	0	*Had to be cancelled last minute because of lack of participants*
LEIC-25042018a	25/04/2018	Bilbao	27 primary school teachers	Learning Analytics apps *(this workshop was conducted by UCY)*
LEIC-25042018b	25/04/2018	Bilbao	27 primary school teachers	Data Viewer Tool
LEIC-25042018c	25/04/2018	Bilbao	27 primary school teachers	Conclusion Tool
LEIC-18062018	18/06/2018	Brookvale Groby Learning Campus, Leicester	TBD	Follow-up of LEIC-20112017 to discuss with teachers their experiences and issues encountered when using Go-Lab resources

Table 3. An overview of remote studies in month 9 to 17 of the Next-Lab project.

Event ID	Date	Components covered
LEIC-01092017	01/09/2017	LA apps for teachers
LEIC-15092017	15/09/2017	LA apps for students
LEIC-29092017-1	29/09/2017	Updated Hypothesis Scratchpad

LEIC-13102017-1	13/10/2017	Updated Table Tool
LEIC-27102017	27/10/2017	Updated Table Tool (repeated LEIC-13102017-1 to gather more feedback)
LEIC-13112017	13/11/2017	Support
LEIC-24112017	24/11/2017	Event registration
LEIC-07122017	07/12/2017	StudentWork Viewer
LEIC-02032018	02/03/2018	Graasp User Warnings
LEIC-21032018	21/03/2018	Go-Lab recognition scheme
LEIC-13042018	13/04/2018	Quest / Survey app
LEIC-11052018	11/05/2018	Timeline app
LEIC-25052018	25/05/2018	Timeline app (repeated LEIC-11052018 to gather more feedback)

Table 4. An overview of analytic studies in month 9 to 17 of the Next-Lab project.

Event ID	Date	Components covered
LEIC-06092017	06/09/2017	New GoLabz Sharing Platform
LEIC-29092017-2	29/09/2017	Hypothesis Scratchpad 2 updated
LEIC-04102017	04/10/2017	Questioning Scratchpad 2 updated
LEIC-09102017	09/10/2017	Table Tool 2 updated
LEIC-13102017-2	13/10/2017	Concept Mapper 2 updated
LEIC-09022018	09/02/2018	Graasp User warnings

All but one of the formal PD events were conducted by the PD team at the University of Leicester, UK. One of the face-to-face workshops at the Go-Lab Spring School in Bilbao was conducted and reported by the University of Cyprus (UCY) (LEIC-25042018a). Details about the studies (in chronological order) can be found in Section 4, 5, and 6 respectively. The results are presented in Section 7. To make it easier for developers and partners to quickly identify the outcome they are interested in, the results are not presented by study but grouped by the artefacts evaluated.

4. Face-to-face Participatory Design Studies: Events

4.1 Next-Lab workshop session for teachers as part of the HMC / Ogden trust head of physics event at Fulneck School (LEIC-10112017)

On 10/11/2017 the ULEIC team presented the Next-Lab project and Go-Lab resources and performed PD activities via a questionnaire in a two-hour teacher workshop which was part of the HMC (the Headmasters' & Headmistresses' Conference) / Ogden trust head of physics event at Fulneck School in Leeds, UK. Twenty-one teachers were attending the event to learn about and discuss ways to improve their physics teaching.

The Next-Lab workshop contained a presentation covering the following topics:

- Educational Vision of the Go-Lab and Next-Lab project
- Resource portal ("Go-Lab sharing platform"), including hands-on
- Authoring facility ("Graasp authoring environment"), including hands-on
- Benefits and opportunities of collaborating with the Next-Lab project team.

The results are reported in Section 7.2.1, details can be found in Appendix A.

4.2 Next-Lab workshop for teachers at Brookvale Groby Learning Campus (LEIC-20112017)

On 20/11/2017 from 15:30 to 16:30 the ULEIC team presented the Next-Lab project and Go-Lab resources in a one-hour twilight session for teachers at the Brookvale Groby Learning Campus. Nine teachers (including the organiser, who was a teacher as well) attended the event. The workshop consisted of a presentation of the following topics with a hands-on session afterwards:

- Educational Vision of the Go-Lab and Next-Lab project
- Resource portal ("Go-Lab sharing platform"), including demos of labs
- Authoring facility ("Graasp authoring environment")
- Hands-on with an ILS
- Benefits and opportunities of collaborating with the Next-Lab project team
- More hands-on activities with apps.

At the end of the session teachers filled in a questionnaire, the results of which are reported in Section 7.2.1. Details can be found in Appendix B.

4.3 PD workshop with Ambassador Teachers as part of an Ambassador Teacher weekend training event in Brussels (LEIC-09122017a & b & c)

On 09/12/2017 from 11:30 to 12:30 the ULEIC team performed a Participatory Design (PD) session for the Next-Lab Ambassadors as part of a weekend training event for them in Brussels. Twenty teachers participated in the workshop, which was structured as follows:

- Presentation with a short introduction of PD and of the workshop organizers
- Collecting PD ideas on the reworked Concept Mapper and Concept Mapper Dashboard application
- Collecting input on the planned StudentWork Viewer app
- Comparison of previous and current version of the Table Tool, Questioning Scratchpad, and Hypothesis Scratchpad

The Concept Mapper[1] (Figure 1) and Concept Mapper Dashboard[2] (Figure 2) apps were presented in an ILS[3] so that teachers could interact with them and experience them inside the learning environment where they would also use them.

[1] http://go-lab.gw.utwente.nl/experiments/2017-12-brussels/tools/cm2/cm2.html
[2] http://go-lab.gw.utwente.nl/experiments/2017-12-brussels/tools/cm2/cmdb.html
[3] http://www.tinyurl.com/pdconceptmapper2

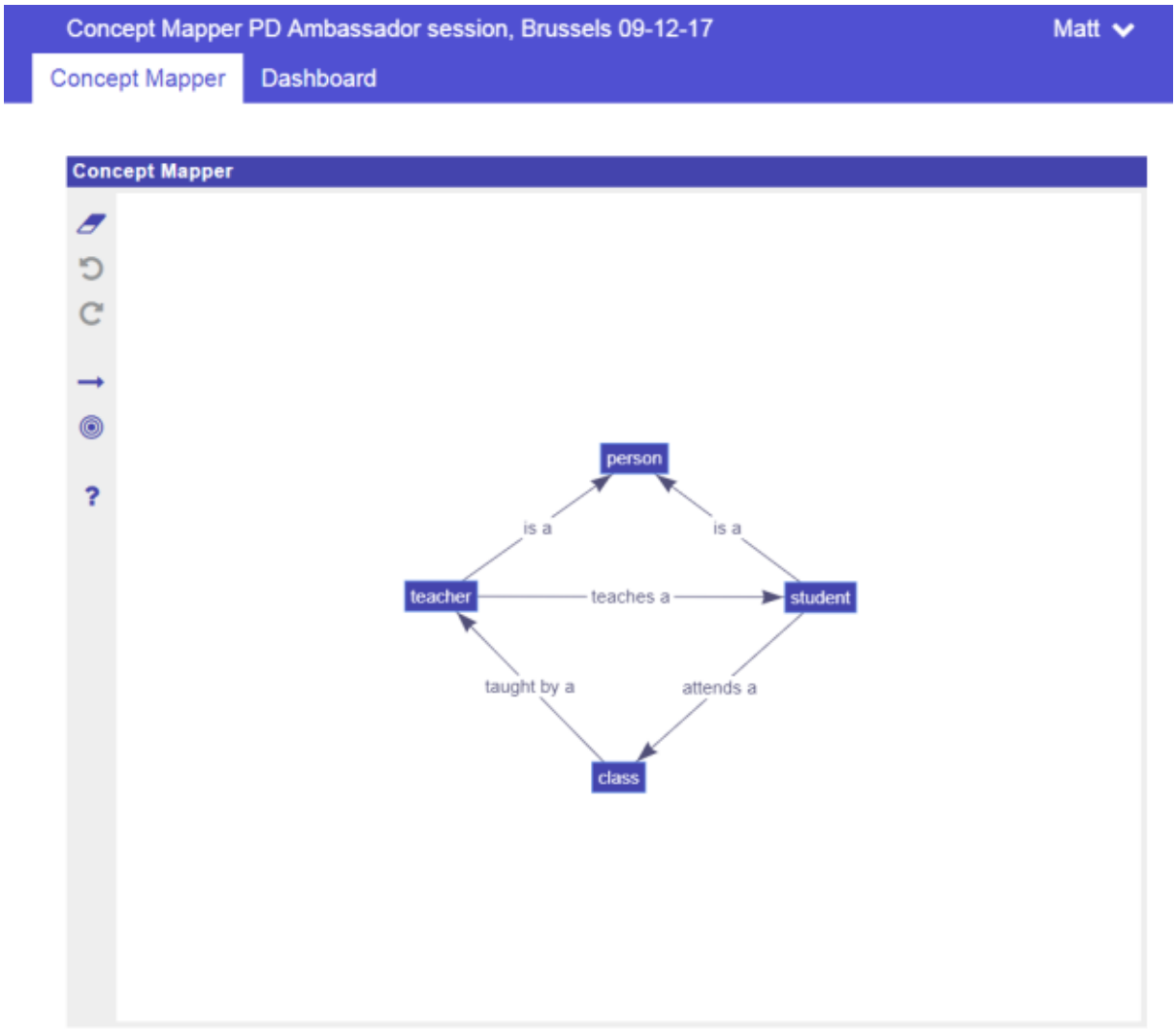


Figure 1. Screenshot of Concept Mapper.

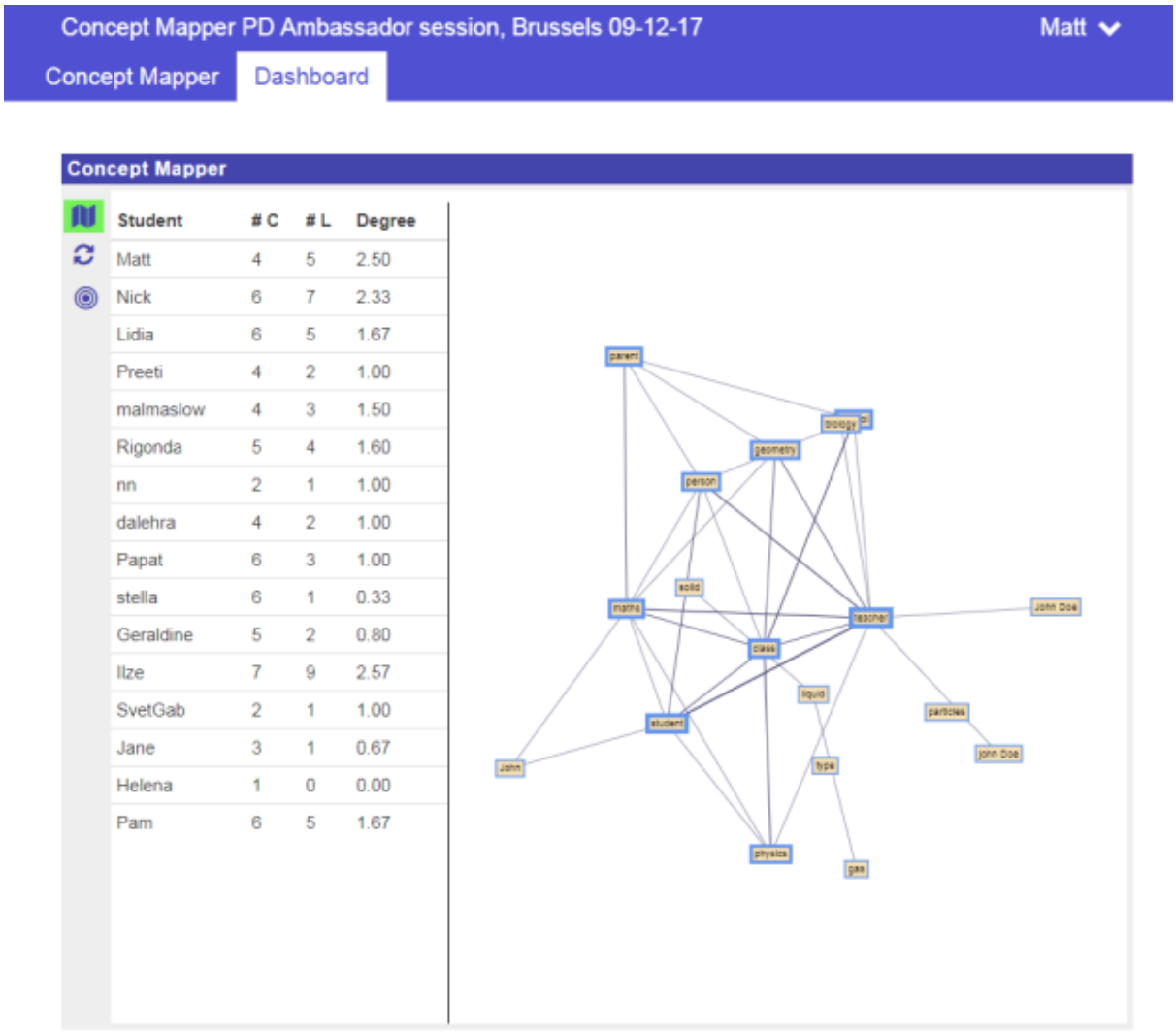


Figure 2. Screenshot of Concept Mapper Dashboard.

To collect the teachers' feedback booklets with screenshots of all states of both apps were prepared and handed out to the teachers.

The teachers then interacted with the apps for about 20 minutes and noted down their observations and improvement suggestions in the booklets. The results of this activity are reported in Section 7.1.1, the data can be found in Appendix D.

In the next section of the workshop, PD was performed on the student work viewer. The current way of accessing the students' work (inside Graasp, e.g. for the Input Box app; opening the vault in Graasp; Review Mode of the ILS, which can be accessed by selecting the nickname of a student from the members list (Figure 3) was presented as a reminder. The teachers were then asked the following questions:

- What do you as ambassadors think about the current solution?
- Are there any shortcomings?
- Ways to improve it?

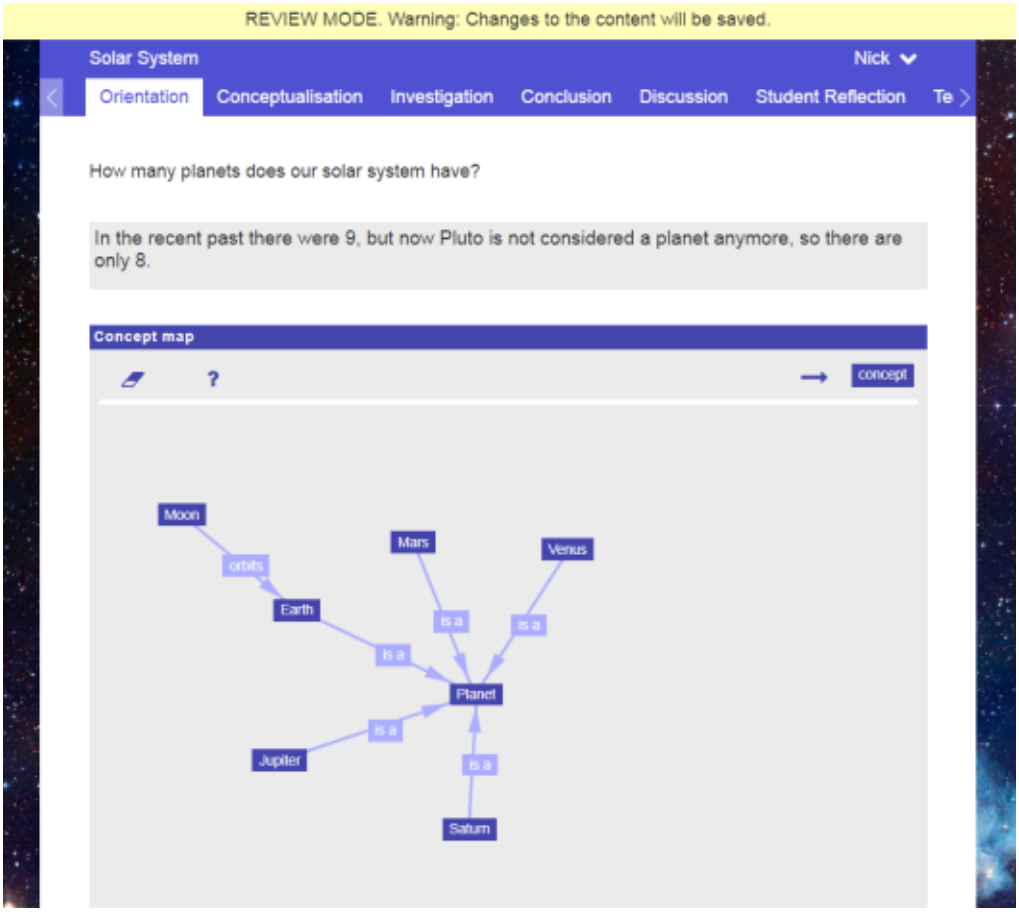


Figure 3. Review Mode of an ILS.

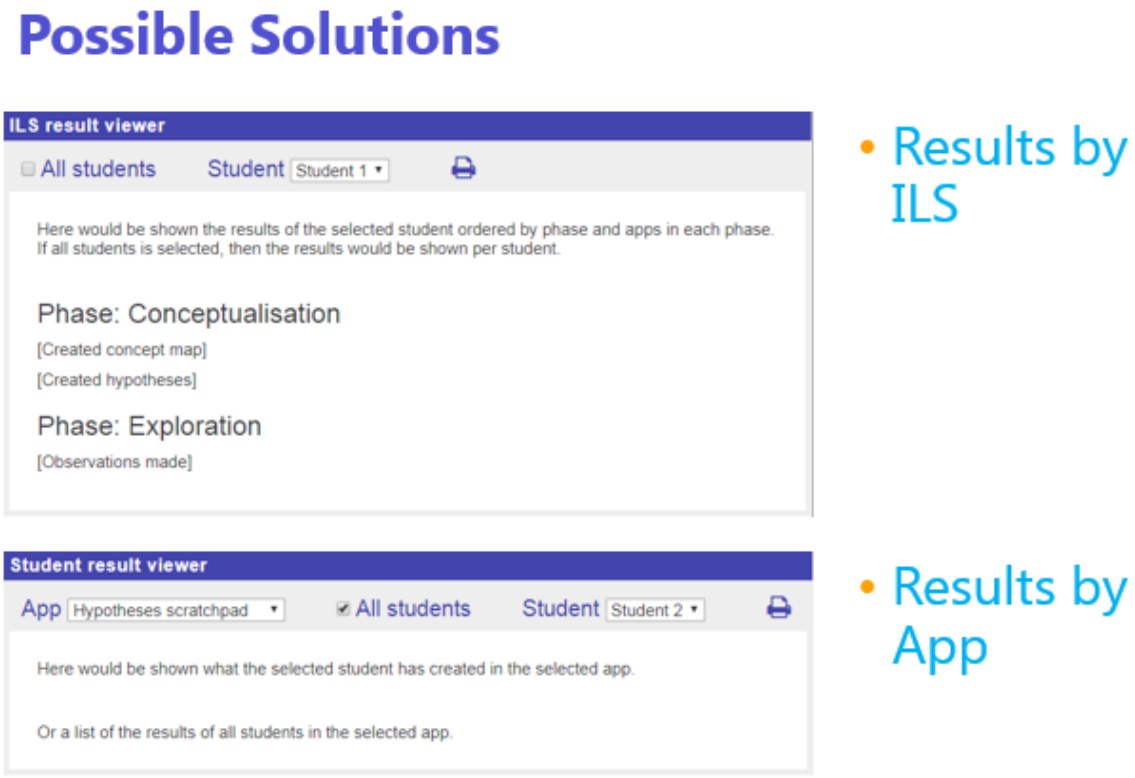


Figure 4. Mockups of possible StudentWork Viewer apps.

Possible solutions for the StudentWork Viewer were presented (Figure 4) and discussed. The results of this activity are reported in Section 7.1.2, the data can be found in Appendix E.

In the last section of the workshop the participants were asked to compare new versions of the Table Tool and Questioning and Hypothesis Scratchpads with their respective previous versions. To do so the new versions of these tools were included in an ILS[4], together with questions regarding the functionality of the new tools and comparison with the older versions. The results of this activity are reported in Section 7.1.3, Section 7.1.4, and Section 7.1.5, the data can be found in Appendix F.

The results of these activities are reported in Section 7.1.1, Section 7.1.2, Section 7.1.3, Section 7.1.4, and Section 7.1.5, details can be found in Appendix D, Appendix E, and Appendix F.

4.4 Next-Lab workshop as part of a Teachmeet event (LEIC-08022018)

PD activities have been planned and prepared for this event, but unfortunately it had to be cancelled, because not enough teachers have signed up.

4.5 Learning Analytics apps workshop as part of the Next-Lab Spring School in Bilbao (LEIC-25042017a)

The aim of the workshop run by UCY was to inform the participants about the new Learning Analytics (LA) apps in the Go-Lab sharing platform. Apart from that, the pedagogical perspective of the LA was explained and some recommendations on their use were provided. The participants had also the opportunity to try some new LA apps from both the student and teacher perspective. At the end of the workshop participants completed an online questionnaire which aimed to collect information and feedback regarding the LA apps. In total 28 responses were received.

The workshop was carried out during the Go-Lab Spring School 2018, which was held in Bilbao, Spain, from 22/04 to 25/04/2018. Specifically, this session was on 25th of April and lasted one hour and a half, from 9:00 – 10:30 a.m. Participants were 27 teachers (primary and secondary education) and approximately 10 tutors from the Next-Lab Consortium. The main purpose was to present to the participants the new developments of the LA apps, which were made in order to be in line with the European General Data Protection Regulation (EU GDPR 2016/679). The agenda of the workshop was as follows:

- Learning Analytics
  - Definition / Ethical and privacy issues / Go-Lab LA apps
- Group Activities
  - Implementation of an ILS / LA apps for teacher / real time data
  - Tool testing / LA apps for students
- Online questionnaire

At the beginning of the workshop two popular definitions of LA were presented. Specifically, according to the NMC Horizon 2016 report LA is "*an educational application of web analytics aimed at learner profiling, a process of gathering and analyzing details of individual student interactions in online learning activities*" (Johnson el al., 2016). Moreover, LA is defined as "*the measurement, collection, analysis and reporting of data about learners and their*

[4] http://www.tinyurl.com/pdreworkedapps

contexts, for purposes of understanding and optimizing learning and the environments in which it occurs" (Siemens, 2011). Then, the pedagogical dimension of the LA was explained with emphasis on the benefits for teacher and students. More specifically, the information form LA can foster the processes of monitoring, awareness and reflection, for both students and teacher. Students can monitor themselves or be monitored by teacher in terms of their activity and learning products. Awareness can be seen a subsequent step from monitoring. For students it refers to the process of being aware of their understanding and progress and for teacher it refers to knowing the state of understanding of students. Then, reflection builds on awareness, enabling students to gain insights from their experiences and to make decisions that influence their learning, and enabling teachers to reflect on design activities that meet learners' needs. Besides, based on the LA teachers can provide immediate or indirect feedback to students in the context of formative assessment.

The next topic of the presentation was data privacy and ethical issues that teachers must be aware of when they use LA in their teaching practice. Regarding this, some basic recommendations for using LA were presented (Rodriquez-Triana et al., 2017). Specifically, the aspects of consent, transparency, access, responsibility, privacy, validity, stewardship and impact were discussed. In general, in a small-scale classroom context, teacher should take the responsibility of most of the ethical and data privacy issues, and ensure that the data should be stored, secured and shared in the same way as any other student data, according to the national data protection laws.

The last topic of the presentation was the Go-Lab LA apps and the difference between the teacher and student dashboard. For that reason, the new LA apps on the Go-Lab Sharing Platform were presented. The information displayed in each app was explained, as well as how this information can be useful for teacher and/or students. Specifically, the Online users visualization, the Concept mapper (aggregation), the Timeline, the Action statistics and the Reflection tool were presented. The Online users' visualization app allows teachers to see in which phase and/or app each student is working. In the Concept mapper students create their concept map and in parallel they can see an aggregated map, as the result of the maps that have been created by all students at the exact moment. In the Teacher dashboard, teacher can also see the aggregated map and the contribution of everyone. Thus, the Concept mapper is an app suited for both students and teachers. The Timeline app depicts a consecutive sequence of phase visits over time for each student. The Action statistics indicates both the global participation and the participation in apps for students. It displays the relative number of actions normalized by the maximum that occurs in the ILS. The Reflection tool is an app for students that provides an overview of the time spent in each phase against a norm set by the teacher.

After the presentation of the above information, participants performed two group activities. In the first activity they had been asked to complete an ILS as learners and during this activity they observed the data that were created in the teacher dashboard. For this activity the new Online users visualization (Figure 5), the Student time spent, the Submitted files in ILS, the new Timeline and the Progress bar were included in the teacher dashboard. At this point it should be noted that the Student time spent, the Submitted files in ILS and the Progress bar are the four LA apps that are available on the Go-Lab platform. Later, participants tried the new LA apps specifically designed for students, i.e. the Reflection planning tool, Concept mapper (Figure 6) and the Reflection tool with reflection questions.

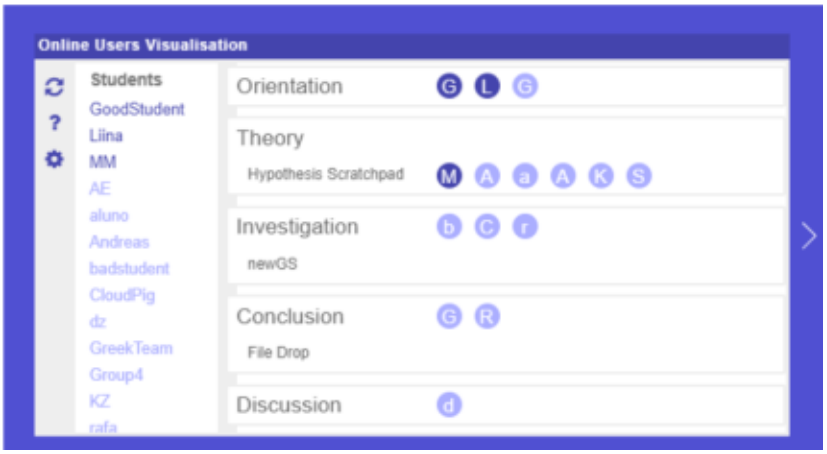


Figure 5. Online Users Visualization (upcoming version).

At the end of the workshop, participants were asked to complete the online questionnaire. It was explained to them that the questionnaire was developed to collect their feedback regarding the LA apps, based on their current or previous experience (if there was any). Each participant completed the questionnaire on his/her own device.

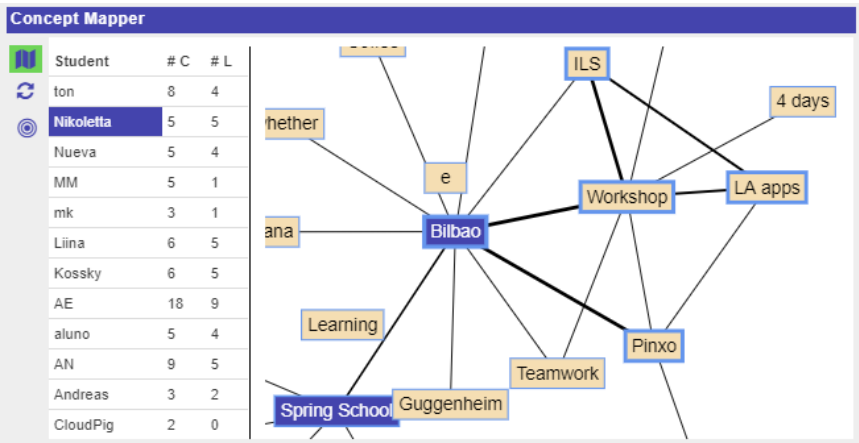


Figure 6. Concept Mapper (upcoming version).

The results of these activities are reported in Section 7.1.6, details can be found in Appendix C.

4.6 PD workshop as part of the Next-Lab Spring School in Bilbao (LEIC-25042017b & c)

On 25/04/2018 from 11:00 to 12:30 the ULEIC team performed a PD session for the participants of the Go-Lab Spring School in Bilbao. Twenty-seven teachers participated in the workshop, which was structured as follows:

- Presentation with a brief introduction of PD and the organizers of the workshop
- Collecting PD ideas on DataViewer and Conclusion Tool, using paper booklets and discussion
- Brief presentation on badges
- Collecting input on the planned badges, using a questionnaire and short discussion

The teachers worked through the ILS “Build a garden house for Stephen and Marie”[5] with a focus on the DataViewer and Conclusion Tool.

A booklet with the printouts of the tools was produced to collect the input of teachers on the whole ILS, but especially on those two tools. Thirteen booklets with teacher comments where returned.

After the teachers finished working through the ILS, providing feedback in the booklets, a semi-structured discussion based on the following questions was conducted:

- Is the Data Viewer / Conclusion Tool appropriate for Primary School children?
- What would need to be changed?
- What did you like best?
- What could be improved, and how?

After a brief presentation on what badges are and for what they could be used in the Go-Lab context, the participants gave feedback by filling in the Badges questionnaire[6].

This was again followed by a short discussion of badges with the teachers.

The results of these activities are reported in Section 7.1.7, Section 7.1.8, and Section 7.2.6, details can be found in Appendix G.

4.7 Follow-up workshop with teachers at Brookvale Groby Learning Campus (LEIC-18062018)

Based on the information and support the teachers got during the first Groby event, they are planning to apply Go-Lab into their classrooms. In the planned follow-up PD workshop in June the ULEIC PD team is going to evaluate their experience together with them, to identify issues they encounter and possible improvement suggestions to prevent them in the future. As this is the last deliverable on PD we are presenting this event here as an outlook for the upcoming PD activities in the remainder of the second year of the Next-Lab project.

[5] http://graasp.eu/ils/5ad861e0bbb2a7100d57ad17/?lang=en
[6] http://tiny.cc/nlssbq

5. Remote Studies: Next-Lab Core Group and PD Teachers Tasks

5.1 LA apps for teachers (LEIC-01092017)

To collect additional information on Learning Analytics apps for teachers, the questionnaire already used for PD activities at the Go-Lab Summer School (see LEIC-11072017a D4.1 for details) has been sent to the seven Next-Lab Core Group teachers on 01/09/2017 (the email can be found in Appendix H). Teachers were asked about their usage of and their input and improvement suggestions on Learning Analytic apps. The additional three responses collected through this activity are presented together with the 19 replies already gathered from the Summer School event (22 responses in total). The results of this activity are reported in Section 7.1.6, details can be found in Appendix I.

5.2 LA apps for students (LEIC-15092017)

To collect additional information on Learning Analytics apps for students, the questionnaire already used for PD activities at the Go-Lab Summer School (see LEIC-11072017a in D4.1 for details) has been sent to the seven Next-Lab Core Group teachers on 15/09/2017 (the email can be found in Appendix J). Teachers were asked about their usage of and their input and improvement suggestions on Learning Analytic apps for students. Only one of the seven teachers contacted replied to the questionnaire. The results of this activity are reported in Section 7.1.6, details can be found in Appendix K.

5.3 Updated Hypothesis Scratchpad (LEIC-29092017-1)

To make sure the project's reworking activities for some of the apps met the teacher's needs and expectations a task to compare previous and reworked version of the Hypothesis Scratchpad was created and has been sent to the seven Next-Lab Core Group teachers on 29/09/2017 (the email can be found in Appendix L). Teachers were asked to report the changes they noticed, indicate if they think those changes are improvements, and let us know of any issues they encounter with the reworked tools. The results of this activity are reported in Section 7.1.5, details can be found in Appendix M.

5.4 Updated Table Tool (LEIC-13102017 & LEIC-27102017)

To make sure the project's reworking activities for some of the apps met the teacher's needs and expectations a task to compare previous and reworked version of the Table Tool was created and has been sent to the seven Next-Lab Core Group teachers on 13/10/2017 (the email can be found in Appendix N). Teachers were asked which version (old or new) of the tool they preferred, which functionality they and their students need in the Table Tool, and if they have any improvement suggestions or additional feature ideas.

Response rates to CGT tasks fluctuate based on the current workload of the teachers, determining, if they find the time to reply or not. As only 2 teachers responded to the initial task, it was repeated on 27/10/2017 (the email can be found in Appendix O), which resulted in an additional reply. The results of this activities are reported in Section 7.1.3, details can be found in Appendix P.

5.5 Support Questionnaire (LEIC-13112017)

To gather feedback about the Go-Lab medium-term personalized support services a questionnaire was created and sent to the seven Next-Lab core group teachers on 13/11/2017 (the email can be found in Appendix Q). To collect more feedback it was

additionally distributed to the 611 Next-Lab authoring environment members that gave permission to be contacted and asked to provide feedback. In total 59 responses were received.

The results of these activities are reported in Section 7.2.3, details can be found in Appendix R.

5.6 Event registration (LEIC-24112017)

To better manage the increased CGT group size, to offer the CGT teachers a space to collaborate, and to let the teachers experience and provide feedback on the event registration process a space was created for them in the Go-Lab community[7]. The teachers were then asked to please register for this space and to report any issues they encounter. This task was sent out to the 36 CGT teachers on 24/11/2017 (the email can be found in Appendix S). The results of this activity are reported in Section 7.2.4, details can be found in Appendix T.

5.7 StudentWork Viewer (LEIC-07122017)

To collect additional information on the StudentWork Viewer a questionnaire was designed and sent to the thirty-six Next-Lab Core Group teachers on 07/12/2017 (the email can be found in Appendix U).

[7] http://graasp.eu/spaces/5a17e788b84a8964e8179455

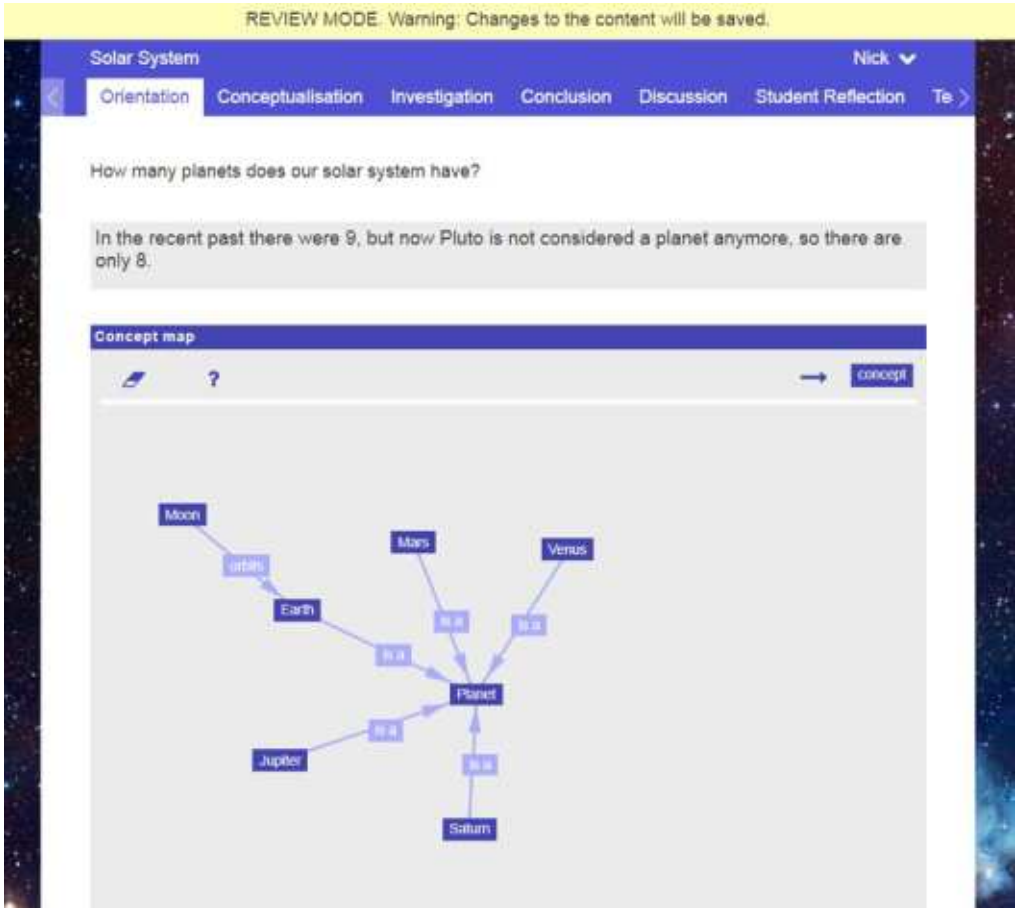


Figure 7. ILS in REVIEW MODE.

Teachers were asked about their opinion on the current solution of having a "Review Mode" of the ILS, showing the work of a student, and the idea of having a dedicated StudentWork Viewer app displaying it. Seven of the CGT teachers filled in the questionnaire and provided their input on the questions. The results of this activity are reported in Section 7.1.2, details can be found in Appendix V.

5.8 Graasp User Warnings (LEIC-02032018)

Warning messages are an important way of a system to communicate with the user, especially in potentially critical situations. To make sure the user warnings displayed within the Graasp authoring environment are easy to understand a questionnaire was created. It asked regarding the frequency of warning messages being encountered, how clear they are, and to compare them with a proposed change of the message. It was sent to the 36 Next-Lab Core Group teachers on 02/03/2018 (the email can be found in Appendix W). Fifteen responses were collected. The results of this activity are reported in Section 7.2.5, details can be found in Appendix X.

5.9 Go-Lab recognition scheme (LEIC-21032018)

To understand how beneficial teachers would find the adoption of badges to recognize teacher achievements a questionnaire was created and sent to the Next-Lab Core Group Teachers on 21/03/2018 (the email can be found in Appendix Y). To get more feedback than the initial 12 responses recorded from the CGT teachers, the questionnaire was also posted on the Next-Lab project's Facebook page on 05/04/2018 (16 responses) and used

during the Spring School on 25/04/2018 (26 responses). Teachers were asked to fill in a two-section questionnaire containing general questions about the topic as well as questions about their personal preferences. The results of this activity are reported in Section 7.2.6, details can be found in Appendix Z.

5.10 Quest / Survey app (LEIC-13042018)

To find any usability problems on the app and to verify if the renaming from 'Quest' app to 'Survey' app is confusing or conflictive for users, a CGT task was sent on 13/04/2018 (the email can be found in Appendix AA). Teachers were asked to include the app on one of their ILSs and report any problems encountered during its use. Also, teachers were asked to confirm if the new name was appropriate, if they would prefer to keep the old name or if they would like to propose a different one. The results of this activity are reported in Section 7.1.9, details can be found in Appendix BB.

5.11 Timeline app (LEIC-11052018 & LEIC-25052018)

When reworking the Timeline app the developers had the question, if the time spent by each student in each phase should be visualized based on time on the x axis or if all visualizations should start at 0, to allow for an easy comparison of different timelines. To answer this question a short questionnaire was created and sent to the thirty-five Next-Lab Core Group teachers on 11/05/2018 (the email can be found in Appendix CC).

As only 6 teachers responded to the initial task, it was repeated on 25/05/2018 (the email can be found in Appendix DD), which resulted in two additional replies as of 27/05/2018). The results of this activity are reported in Section 7.1.10, details can be found in Appendix EE.

6. Analytical studies

6.1 New Go-Lab Sharing Platform (LEIC-06092017)

On 06/09 and 07/09/2017 the ULEIC PD team did an analytical walkthrough and evaluation of the new Go-Lab sharing platform[8] in the roles of Lab editor and ILS editor (LEIC-06092017):

- To evaluate overall usability and user experience
- To identify possible obstacles when using the new GoLabz portal
- To identify errors or issues

Two HCI specialists went through the process of adding a lab (from the Lab editor perspective) and did a general check of the interface and ILS creation and publishing facilities (from ILS editor perspective). The evaluation took place over two sessions (06/09/2017 and 07/09/2017). A detailed description of the approach followed can be found in Section 2.2.3.

In addition it was considered that the portal can be the first point of contact with the project for many new teachers, issues were accordingly rated more important to fix, if they would give end-users a negative first impression (e.g. typos on the page).

In the role of Lab editor, two lab entries (uleic-test-lab[9] and second-test-lab[10]) were created.

In the role of ILS editor one ILS[11] has been published.

The results of this activity are reported in Section 7.2.7, details can be found in Appendix KK.

6.2 Hypothesis Scratchpad 2 updated (LEIC-29092017-2)

The UTE team updated several existing apps and asked for PD activities on them before they go live. The ULEIC team therefore performed an analytical walkthrough of them, starting with the Hypothesis Scratchpad 2 updated app[12] in order to:

- Identify changes compared to the existing app and evaluate them based on their influence on usability and user experience
- Evaluate its overall user experience.
- Identify possible usability problems while using the app.

Two HCI specialists went through the process of creating, editing and deleting hypotheses and configuring the new 'Hypotheses Scratchpad' app to compare its interactions to the previous version and to check for any usability issues or bugs. The main evaluation took place over one session of 4 hours. A detailed description of the approach followed can be found in Section 2.2.3.

The results of this activity are reported in Section 7.1.5, details can be found in Appendix GG.

[8] http://dev.golabz.eu/
[9] http://dev.golabz.eu/lab/uleic-test-lab
[10] http://dev.golabz.eu/lab/second-test-lab
[11] http://dev.golabz.eu/ils/uleic-gearsketch-copy-to-test-publication-process
[12] http://go-lab.gw.utwente.nl/sources/tools/hypotheses/main/webapp/hypothesis.html

6.3 Questioning Scratchpad 2 updated (LEIC-04102017)

The UTE team updated several existing apps and asked for PD activities on them before they go live. The ULEIC team therefore performed an analytical walkthrough of them. This report presents the findings on the Questioning Scratchpad 2 updated app[13] in order to:

- Identify changes compared to the existing app and evaluate them based on their influence on usability and user experience
- Evaluate its overall user experience.
- Identify possible usability problems while using the app.

Two HCI specialists went through the process of creating, editing and deleting questions and configuring the new 'Questioning Scratchpad' app to compare its interactions to the previous version and to check for any usability issues or bugs. The main evaluation took place over one session of 1 hour. A detailed description of the approach followed can be found in Section 2.2.3.

The results of this activity are reported in Section 7.1.4, details can be found in Appendix HH.

6.4 Table Tool 2 updated (LEIC-09102017)

The UTE team updated several existing apps and asked for PD activities on them before they go live. The ULEIC team therefore performed an analytical walkthrough of them. This report presents the analytical walkthrough performed for the updated Table Tool 2[14] in order to:

- Identify changes compared to the existing app and evaluate them based on their influence on usability and user experience
- Evaluate its overall user experience.
- Identify possible usability problems while using the app.

Two HCI specialists went through the process of creating, editing and deleting table entries and configuring the new 'Table Tool' app to compare its interactions to the previous version and to check for any usability issues or bugs. The main evaluation took place over one session of 1.5 hours. A detailed description of the approach followed can be found in Section 2.2.3.

The results of this activity are reported in Section 7.1.3, details can be found in Appendix II.

6.5 Concept Mapper 2 updated (LEIC-13102017-2)

The UTE team updated several existing apps and asked for PD activities on them before they go live. The ULEIC team therefore performed an analytical walkthrough of them. This report presents the findings on the Concept Mapper 2 updated app[15] and the Concept Mapper Dashboard (with aggregated map) 2 updated app[16] in order to:

- Identify changes compared to the existing app and evaluate them based on their influence on usability and user experience

[13] http://go-lab.gw.utwente.nl/sources/tools/questions/main/webapp/questioning.html
[14] http://go-lab.gw.utwente.nl/sources/tools/tableTool2/main/webapp/tableTool.html
[15] http://go-lab.gw.utwente.nl/sources/tools/cm2/cm2.html
[16] http://go-lab.gw.utwente.nl/sources/tools/cm2/cmdb.html

- Evaluate its overall user experience.
- Identify possible usability problems while using the app.

Two HCI specialists went through the process of creating, editing and deleting concept maps and configuring the new 'Concept Mapper' app to compare its interactions to the previous version and to check for any usability issues or bugs. The main evaluation took place over one session of 2.5 hours. A detailed description of the approach followed can be found in Section 2.2.3.

The results of this activity are reported in Section 7.1.1, details can be found in Appendix JJ.

6.6 Graasp User warnings (LEIC-09022018)

As some of the Graasp users had issues with some of the user warnings in Graasp (e.g. regarding the standalone view settings), the ULEIC team performed an analytical evaluation of the following user warnings:

- Switching the standalone settings to include a password
- Removing an ILS
- Removing a member from an ILS
- Self-Removing you as a member from an ILS
- Removing AngeLA from an ILS
- Removing the Vault from an ILS

in order to:

- Evaluate the overall user experience.
- Identify possible usability problems with the Graasp user warnings.

As preventing warnings is always better than improving them, where possible ideas on how to avoid these warnings in the first place are also provided.

The main evaluation took place over two sessions of 3.5 hours in total. A detailed description of the approach followed can be found in Section 2.2.3.

The results of this activity are reported in Section 7.2.5, details can be found in Appendix KK.

7. Results

The evaluation results are presented based on Apps and Infrastructure components rather than the studies they were obtained from. This makes it easier for developers and interested partners to identify relevant findings based on the artefacts they are developing or responsible for. To ensure the readability of the report only selected impactful and common results are presented here, details are provided in the signposted Appendices.

7.1 Apps

7.1.1 Concept Mapper (updated) and Dashboard

By performing an analytical walkthrough of the updated Concept Mapper 2 (LEIC-13102017-2, Section 6.5) several issues were found (details can be found in Appendix JJ):

- 6 low-importance issues were encountered while using the reworked Questioning Scratchpad. These do not represent a big impediment for the user to accomplish tasks, but it would be beneficial to address them to avoid confusion or dissatisfaction.
- 11 medium-importance problems could be obstructing the correct interactions within the tool. These issues should be fixed relatively soon as they represent a problem for the user.
- 8 highly important issues should be immediately addressed to guarantee the proper performance of the application.

Overall the Concept Mapper apps are fine, but there are several small things to be addressed.

Because the interactions possible in the Concept Mapper tool are more sophisticated than in the other apps recently tested, for example the Hypothesis Scratchpad, where the main interaction is dragging and dropping of terms, a tutorial video might be helpful for new users to understand how the tool works.

From the Booklets and Observer Notes collected during a PD workshop for Ambassadors (LEIC-09122017a, see Section 4.3 for a description of the event) the following improvement suggestions and comments on the Concept Mapper and Concept Mapper Dashboard can be derived (the detailed results can be found in Appendix D):

- Concept Mapper
    - Allow to add a link between two concepts without a label
    - Teachers should get an option to check and edit (e.g. remove concepts) the concept maps before they are added to the aggregated view
    - Several teachers (2 booklets) suggested that both concept mapper versions should be available
    - Arrows and labels of links should be shown in the aggregated concept map
    - One participant commented that the previous way of linking concepts worked better than the current one
    - For chemistry subscript and superscript need to be supported
- Concept Mapper Dashboard
    - The “Degree” information could be removed from the table as this information seems to be not useful to teachers
    - The Concept Mapper Dashboard was disliked by several teachers (2 booklets). Although they don’t have to use the app if they don’t want to, it

would be interesting to find out the reasoning in upcoming workshops (e.g. misunderstanding the purpose, usability problems, …).

- Arrows and labels of links should be shown in the aggregated concept map.

7.1.2 StudentWork Viewer

Three out of the 5 CGT teachers who answered this question (60%) thought that the current solution of having a Review Mode of the ILS was sufficient (LEIC-01122017, see Section 5.7 for a description of the activity and Appendix U for the email sent to the CGT teachers). They argued that it worked fine, was easy for teachers, and they used it with students several times. An issue that was pointed out by one of the teachers was, that old and new students could get mixed in the member list, when the ILS would be used by many students and year after year. The two CGT teachers (40%) who thought that the current solution was not sufficient unfortunately did not provide the reasoning for their opinion. Two of the answers were not considered for the analysis as they regarded the content of the example screenshot (showing a concept map for the solar system) rather than the current Review Mode solution.

Two shortcomings were identified by the participants. The first one was that accessing the work of students this way could be uncomfortable. The second one was that the user list could get too long, if the ILS would be used by many classes. One improvement suggestion provided was to address the latter: An option should be provided to delete old users from the member list.

When comparing the current solution with the proposed StudentWork Viewer, half of the participants preferred the current solution and the other half the StudentWork Viewer. The arguments for the Review Mode were that it was more structured, enabled one to look at each student individually, and provided the context. The main argument supporting the new tool was that it allowed one to look at all students and to compare the work of students.

Regarding additional functionality needed for the StudentWork Viewer the teachers asked for an option to leave teacher comments in a different colour. Additionally, they would like the option to join all contributions in one view to share it with all students in the class.

Five of the six participants who answered this question (83.34%) thought that only having the data of the University of Twente tools (Hypothesis Scratchpad, Questioning Scratchpad, Table Tool, Concept Mapper, Data Viewer, Observation Tool, Conclusion Tool, Report Tool, Experiment Design Tool, Quest, Quiz tool) being displayed in the StudentWork Viewer would be sufficient. The sixth one would like to have the Concept Map Aggregation data as well (details can be found in Appendix V).

To summarize the discussion of the StudentWork Viewer at the PD workshop for Ambassadors (LEIC-09122017b, see Section 4.3 for a description of the event), needs are not the same for all teachers as they depend on specific goals and methods used in each classroom. This made the task of finding a consensus on the StudentWork Viewer difficult to achieve. Although diverse ideas (including other arising topics given by the participants during this session) were discussed, most teachers seemed to agree on three main things: a) the need of having a ‘report’ tool to aggregate and access all the work created by students, b) preferably with the open option for teachers to indicate if they want to view either one or all students’ work at the same time, c) selected by phase rather than app (details can be found in Appendix E).

7.1.3 Table Tool (updated)

By performing an analytical walkthrough of the updated Table Tool (LEIC-09102017, Section 6.4) several issues were found (details can be found in Appendix II):

- 4 low-importance issues were encountered while using the reworked Questioning Scratchpad. These do not represent a big impediment for the user to accomplish tasks, but it would be beneficial to address them to avoid confusion or dissatisfaction.
- 5 medium-importance problems could be obstructing the correct interactions within the tool. These issues should be fixed relatively soon as they represent a problem for the user.
- 3 highly important issues should be immediately addressed to guarantee the proper performance of the application.

The Table Tool app is mostly fine and easy to use. However, in the developer version some error messages appear, which should be fixed. The usability observations are mainly cosmetic with only a few interaction-related issues.

Besides usability observations regarding the existing features and functionality, we also propose some additional ideas to create a more flexible table tool.

Two of the three CGT teachers who responded to this task (LEIC-13102017-1 & LEIC-27102017, see Section 5.4 for a description of the activity and Appendix N and Appendix O for the emails sent to the CGT teachers) preferred the new version of the Table Tool over the old version, one was neutral about the changes. The reason for the teacher who was neutral on the changes is that he only saw small changes but was missing important changes (like import and export to .ods or .xls files). The reasons for preferring the new version mentioned were that it was better defined and looked more flexible.

The respondents wanted to see all the functionality asked about in the questionnaire in the Table Tool. They agreed that teachers should be able to create rows without a name (in the first column) and should be able to restrict what students can enter into cells (e.g. numbers only). Students should be able to specify row and column names and should be able to add new rows and columns (details can be found in Appendix P).

The activity on the Table Tool performed at the PD workshop for Ambassadors (LEIC-09122017c, see Section 4.3 for a description of the event) revealed that none of the teachers preferred the old version of the tool.

For the Table Tool teachers should be able to create rows without a name, restrict the content students can enter into cells, and be able to change the name of the table. Students should be able to specify row and column names and should be able to add new rows and columns. One teacher even suggested that students should not only be able to add rows or columns, but freely create their own tables. Additionally, this teacher would like to have control over the width of cells (details can be found in Appendix F).

7.1.4 Questioning Scratchpad (updated)

By performing an analytical walkthrough of the updated Questioning Scratchpad 2 (LEIC-04102017, Section 6.3) several issues were found (details can be found in Appendix HH):

- 2 low-importance issues were encountered while using the reworked Questioning Scratchpad. These do not represent a big impediment for the user to accomplish

tasks, but it would be beneficial to address them to avoid confusion or dissatisfaction.
- 3 medium-importance problems could be obstructing the correct interactions within the tool. These issues should be fixed relatively soon as they represent a problem for the user.
- 2 highly important issues should be immediately addressed to guarantee the proper performance of the application.

Like with the Hypothesis Scratchpad, the tool should be fairly straightforward to use, especially for those users experienced with the previous version of the Questioning Scratchpad, as most of the features feel and look the same. For new users the app should also be easy to understand and there are enough instructions throughout the elements of the interface (e.g. help button, tooltips) to direct users.

Besides some error messages that occurred during testing, most elements of the app are working properly and its general design is quite clean and eye-catching.

Most of the observed usability issues are moderate and call for rather “nice-to-have” than “must have” modifications.

The activity on the Questioning Scratchpad performed at the PD workshop for Ambassadors (LEIC-09122017c, see Section 4.3 for a description of the event) revealed that only one of the teachers preferred the old version of the tool (details can be found in Appendix F).

Teachers see the improvement in the new version, but would additionally like to have more different colours, for example to stress the importance of words.

7.1.5 Hypothesis Scratchpad (updated)

By performing an analytical walkthrough of the updated Hypothesis Scratchpad 2 (LEIC-06092017-2, Section 6.2) several issues were found (details can be found in Appendix GG):

- 8 low-importance issues were encountered while using the reworked Hypothesis Scratchpad. These do not represent a big impediment for the user to accomplish tasks, but it would be beneficial to address them to avoid confusion or dissatisfaction.
- 7 medium-importance problems could be obstructing the correct interactions within the tool. These issues should be fixed relatively soon as they represent a problem for the user.
- 3 highly important issues should be immediately addressed to guarantee the proper performance of the application.

Very likely the tool will be fairly straightforward to use, especially for those users experienced with the previous version of the Hypothesis Scratchpad, as most of the features feel and look the same. For new users the app is also easy to understand and there are enough instructions throughout the elements of the interface (e.g. help button, tooltips) to direct users.

Most elements of the app are working properly and its general design is quite clean and eye-catching.

Added functionalities have benefited the usability of the tool and improved the overall user experience.

Four of the seven core group teachers replied to the CGT task on the Hypothesis Scratchpad (LEIC-29092017-1, see Section 5.3 for a description of the activity and Appendix L for the email sent to the CGT teachers).

One of them discovered an issue with the new version: If all terms were deleted, no new terms could be created. This was caused by a recent change of disabling the add button if no current term was selected, after which the new term would be added. However, if there were no terms left, none could be selected to activate the add button. This issue was immediately addressed.

Two respondents identified an issue with the old app (they thought it was not possible to delete single terms but only whole hypotheses, because it was not clear for them that dragging and dropping a term from a hypothesis back to the term area would delete it). This was improved in the reworked version, because here the user only has to move a term outside the hypothesis field to delete it.

One improvement suggesting emerging from this activity, especially for students using the tool on mobiles, would be to make new empty hypotheses appear on top of the list (details can be found in Appendix M).

The activity on the Table Tool performed at the PD workshop for Ambassadors (LEIC-09122017c, see Section 4.3 for a description of the event) revealed that none of the teachers preferred the old version of the tool (details can be found in Appendix F).

7.1.6 Learning Analytics apps

The core group teachers that answered the questionnaire regarding LA apps for teachers (LEIC-01092017, see Section 5.1 for a description of the activity and Appendix H for the email sent to the CGT teachers) knew all of the Learning Analytic apps presented (details can be found in Appendix I). Only one of them found some of the applications not useful (Online users visualisation, Student time spent, Timeline), knew the others, but has not used them yet. This option was also selected by both other respondents for a single app: Semantic Group Formation App. The only two other app where both respondents gave the same answer (“I have used it a few times”) were “Student time spent” and “Timeline”. For the remaining apps the two respondents selected “I know it but haven’t used it” and “I have used it a few times” in alternating patterns (if one picked one, the other picked the other and vice versa).

From the new answers it can be derived that the core group teachers knew all of the Learning Analytic apps covered in the questionnaire and found most of them useful. However, only one teacher used them a few times (besides Student Time Spent and Timeline, where it is two), showing that there is still a lot of potential to motivate teachers to include Learning Analytics apps in their online lessons.

All three core group teachers who answered the questionnaire used Learning Analytics apps to give feedback to their students, two of them to keep track of their students’ progress, and none in a flipped classroom. However, besides these pre-defined answer options the participants came up with one “other” reasons: To collect information about the ILS use in order to improve it.

“Apps that are related with evaluation” is a teacher need not yet covered by the existing LA apps. Additionally, the respondents came up with the following app ideas:

- App to create tests to be used in an ILS that are automatically assessed and provide feedback when the students fill them in.

- Instead of seeing the time spent in phases and the current phase each student is in, there should be a tick box at the end of each page which the students can use to indicate that they worked through this section and understood its content.

The core group teacher that answered the questionnaire regarding LA apps for students (LEIC-15092017, see Section 5.2 for a description of the activity and Appendix J for the email sent to the CGT teachers) has used all but two Learning Analytics apps for students covered in the questionnaire a few times (Action Statistics, ConceptCloud, Progress Bar, Reflection Tool, Student Time Spent, and Timeline). The respondent knows about Concept Map Aggregation and Reflection Tool (transitions), but has not used them yet. The students of this teacher used the Learning Analytics apps for reflection and self-assessment.

Regarding improvement suggestions and additional app ideas, an application with the most important formulas in science and an application presenting key concepts were suggested. Although not necessarily LA apps, these app ideas could be taken up by the project and implemented as general apps (details can be found in Appendix K).

Besides the two CGT tasks regarding LA apps for teachers and students additional data was collected in a face-to-face workshop at the Go-Lab spring school in Bilbao (ULEIC-25042018a). This workshop was run and reported here by UCY. The results from the questionnaire filled in by the participants of this session are presented below. A description of this workshop is given in Section 4.5, detailed responses can be found in Appendix C.

When participants were asked to indicate which Go-Lab LA apps they would like to use in their ILS(s), it seemed they have a particular preference for Teacher Dashboard apps, such as Student Time Spent and Online Users Visualization. This may have been expected, since it is more reasonable to prefer apps that allow them to control the progress of their class, while they preferred less the apps that foster student self-monitoring, perhaps because the process of self-monitoring is something that students are not familiar with yet.

Specifically, the highest preference was on Student time spent (57.10% Definitely I will use it and 35.70% I may use it) and Online users visualization (53.60% Definitely I will use it and 32.10% I may use it), which are both apps for teacher. Regarding the apps for students, there was found to be a confrontation between Reflection tool and Reflection planning tool, with the highest preference on the first (46.40% in contrast with 21.40%). In both apps a graph showing the real time student spent in each phase in comparison with the expected time is created, with the difference that in the Reflection tool the norm is set by the teacher, while in the Reflection planning tool the norm is set by the students. Again, it seems that teachers have the impression that their students are not ready enough to take the responsibility of allocating their time to the several tasks that they must complete. The apps with the lowest percentage of preference is the Reflection planning tool and Progress bar (21.40% “Definitely I will not use it, for each app”). Finally, three apps received a relatively high percentage in the statement “I need more training before using it”. Specifically, these apps are the Action Statistics (28.60%), the Submitted files in ILS (21.40%) and the Concept map (17.90%). Actions statistics is an example of an app that displays processed data indicating the relative number of actions in an app by a student, which is normalized by the maximum number of actions that occurs. Perhaps this data processing is unknown to teachers, making it difficult to understand the information presented. Submitted files in ILS were used in the hands-on activity during the workshop, however there was not enough time for the teachers to complete the last activity of the ILS that had been implemented, in which they should had uploaded a file. Specifically, only one file was uploaded and thus the teachers did not understand the value of this app. The Concept map is an app suited for both students and teacher. During the hands-on activity participants had the opportunity to

see both perspectives. However, the activity of the creation of the concept map was made in a rather unstructured way, since the central concept was the Bilbao Spring School and the teachers had to complete a map with ideas and concepts about the school. As a result, the map that was created included many different concepts and links, something that had confused the participants and they had considered the tool rather complicated.

In Table 5, the outcomes from the participants' comments regarding the apps they liked the most and the least are presented.

Table 5. Most liked and most disliked LA apps.

	Likes	Dislikes
Progress bar	3	4
Concept map	5	3
Online users visualization	8	-
Reflection planning tool	2	3
Students time spent	4	-
Actions statistics	2	-
Reflection tool (teacher norm)	4	-
Timeline	1	-

The app that the teachers liked the most is the Online users visualization (n=8). Concerning a comment of a teacher, with this app you can "*see where they are to be able to give individual and or whole-class support*". The Progress bar app, although it was the favourite of three participants, was most disliked (n=4). A teacher commented on it as "*not really necessary*" app. Similarly, the Concept Map and the Reflection Planning tool showed a mixed result, since some of them liked them while others not (5 likes and 3 dislikes for Concept Map, 2 likes and 3 dislikes for Reflection Planning tool). Moreover, teachers indicated their preference for some other apps, specifically 4 likes for Student Time Spent, 2 for Actions Statistics, 4 for Reflection Tool and 1 like for Timeline.

Then the teachers suggested some LA that they would like to have in the teacher dashboard. In general, their suggestions were oriented towards the assessment of student work in an ILS. The following excerpts from their suggestions demonstrate this need:

> *"… a rubric which I can evaluate my students"*
>
> *"Analytics about the correct or wrong answers of students, in real time"*
>
> *"… an app where I can see the total work of the students to evaluate"*
>
> *"… a revise tool where are automatically the correct answers"*

Regarding the student dashboard, the needs mentioned by the teachers are, somehow, already offered by the Go-Lab Ecosystem. For example, a suggestion referred to an app that allows students to "*… see their time spent in each phase, so they are aware whether they are doing it correctly*". This is what Student Time Spent app does, which in the future can offer a student view to meet this need. Moreover, another suggestion describes an app for providing teacher qualitative feedback based on a rubric, in which students will be able to see their feedback. This is like the Peer assessment tool that will soon be available on the platform. Maybe, in the future, the tool can have an option for teacher assessment.

Table 6 presents the outcomes regarding the general perception of teachers for the Go-Lab LA apps.

Table 6. Teachers' overall perception of Go-Lab LA apps.

Statement	Average score
The Go-Lab LA apps meet my requirements.	5.29
The Go-Lab LA apps are well-structured.	5.36
The Go-Lab LA apps are difficult to use.	3.57
The Go-Lab LA apps are impractical.	2.79
The Go-Lab LA apps enable the diagnosis of student performance.	5.18
The Go-Lab LA apps enable the timely provision of teacher feedback to students.	5.14
The Go-Lab LA apps help me adapt instruction to student needs.	5.21
The Go-Lab LA apps are of high educational value.	5.39
The Go-Lab LA apps do not facilitate face-to-face interaction.	3.89

As it is shown in the table, teachers indicated that the Go-Lab LA apps met their requirements, were well-structured , enabled the diagnosis of student performance and the timely provision of feedback helped them to adapt their instruction based on the student needs and were considered of high educational value . Moreover, they did not believe that the Go-Lab LA apps are difficult to use, were impractical and did not facilitate the face-to-face interaction.

Lastly, participants were asked specific questions about the Online users visualization and the Timeline. From their comments it was revealed that some additional information that the Online users visualization app may provide to them are, the time spent in each phase for each student, their learning products and the percentage of the work completed at the exact moment. Almost half of the teachers (53.6%) agreed that Online users visualization should have a student view, 57.1% agreed that the timeline app should display app activity and 75% preferred Online users visualization and Timeline to be one app.

The participants who answered the questionnaire regarding the Go-Lab LA apps were teachers from several countries of Europe and they were Go-Lab expert users. Some of them might have used the LA apps, however they had been introduced to the new LA apps. In general, their overall experience with the Go-Lab LA apps was positive. It seemed that they found the LA apps useful and easy to use. Most importantly they appreciated their pedagogical value and realized that their use can facilitate the formative assessment during the use of an ILS in their class.

7.1.7 DataViewer Tool

From the Booklets and Observer Notes from the Go-Lab Spring School (ULEIC-25042018b, Section 4.6) the following improvement suggestions and comments can be derived for the DataViewer Tool (details can be found in Appendix G):

- Data Viewer is perceived as too complex.
- Instructions for the DataViewer should be clearer.
- DataViewer is a good tool for secondary school or if the user is familiar with it. But for primary schools a simpler version would be needed. Otherwise the students' energy goes into using the tool rather than focussing on drawing and reading the graph.
- It is not clear why multiple values can be put on the y axis, but only one on the x axis.

- It is odd that the data set can be edited in the DataViewer.
- It is not obvious, how to display several datasets at once or in different graphs at the same time.
- DataViewer should be able to use Table Tool as data source.
- Instead of the question mark icon another icon, which better represents chart data, should be used.
- To make it easier for students to understand how to display data in the graph, there could be greyed out icons on the axis, where the data icons are the same design but colourful. Then the students could see that they are supposed to drag a colourful icon on a grey icon, to display the data in a graph.
- The axis should display units.
- Children need explanations, what the graphs tell them.
- The functionality of the “Edit chart” button is unclear.
- Another icon than a “play” button should be used for confirmation.
- It is confusing that there are two open folder icons in the tool with different functionality. Different icons should be used.
- Primary school students cannot deal with two variables. Instead of letting them explore the datasets freely, the teacher should have the option to configure the data and graph.
- There should be a line around the legend, to avoid confusion if the element in the legend is part of the graph or not.
- The OK button in the graph selection (Graph edit) popup is hard to find and should thus be relocated.

Most of the feedback from the booklets was also reflected in the discussion. The main message gathered through the discussion was that the tool in its current form would not be appropriate for primary school students because it would be too complicated. The main reason for this was that it allowed too much freedom and at the same time required too much knowledge from the students. To solve this issue there should be an actual “Viewer” app that only displays data in a way predefined by the teacher or at least with the type of graph specified by the teacher when creating the ILS. Additionally, and in general, the number of choices should be reduced, for teachers when setting up the tool as well as for students when visualizing data using the tool. To not lose any of the existing functionality when following this approach, there could be two versions of the tool, one easy for beginners with a limited set of functions, and one difficult for advanced and expert users with the full set of functions currently available in the DataViewer. Lastly, the teachers suggested to rename the tool to Graph Tool, as this would better represent its functionality.

7.1.8 Conclusion Tool

From the Booklets and Observer Notes from the Go-Lab Spring School (ULEIC-25042018b, Section 4.6) the following improvement suggestions and comments can be derived for the Conclusion Tool (details can be found in Appendix G):

- Conclusion tool is too abstract for children. Instead a tool that gives immediately feedback to the students would be preferred.

From the discussion it can be seen that the teachers were divided, about half said the Conclusion Tool was appropriate for their students, and the other half thought it was not. As with the DataViewer Tool (Section 7.1.7) the teachers thought the Conclusion Tool could be improved for their students by making it less abstract and complex. This could be achieved by adding colours and offering less features. For example the resources access

could be simplified by showing all data from the start, without the need to select first if it was a graph or an observation. Some of the teachers would like to have automated feedback on the conclusions as part of the tool, while others thought that this was not necessary because of the teacher feedback tool.

7.1.9 Quest / Survey app

Three core group teachers who answered the Quest app task (LEIC-13042018, see Section 5.10 for a description of the activity and Appendix AA for the email sent to the CGT teachers). Two of them agreed to rename the app to 'Survey' app, and the remaining teacher considered that, although it would be preferable to keep the old name, it would be fine to change it too. Two improvement suggestions were given (details can be found in Appendix BB):

- Adding a 'Submit' button to save students' answers.
- Making it easier to upload pictures to the questions.

7.1.10 Timeline app

Six of the 8 respondents (75%) to this CGT task (LEIC-11052018 & LEIC-25052018, see Section 5.11 for a description of the activity and Appendix CC and Appendix DD for the emails sent to the CGT teachers) would like to have a flexible way of visualizing the timelines, by having a switch between "time-based" and "comparison". The remaining two (25%) wanted to keep it as it is currently done: Based on the time displayed on the x axis. Based on these results we would thus suggest to either keep the visualization of timelines in the Timeline app as it would be or to add a switch to also show a "comparison visualization". Names that were suggested by teachers for this comparison visualization were (details can be found in Appendix EE):

- "look and compare"
- Time balance
- name/time
- comparative view of activity
- Marque progress.

7.2 Infrastructure Components

7.2.1 Go-Lab sharing platform and Graasp authoring environment

The Next-Lab project and Go-Lab resources have been presented and evaluated in several workshops, the results of which are presented in this section.

In a questionnaire presented at the end of a workshop that was part of the HMC / Ogden trust head of physics event at Fulneck School (LEIC-10112017, see Section 4.1) teachers were asked regarding their impression of and improvement suggestions for the workshop as well as the Go-Lab resources and Next-Lab project (details can be found in Appendix A). The Go-Lab resources and facilities were mostly perceived positively, especially the collection of resources, apps, labs, and ILSs on the Go-Lab sharing platform and the functionality to create and adapt online lessons. Improvement suggestions gathered for the Go-Lab sharing platform are to fix the search functionality and to reduce the complexity of the website if and where possible. Additionally broken links and empty pages were reported, so the whole platform should be checked for these and fixed where necessary.

The questionnaire already used in the Fulneck event (LEIC-10112017) was also used to gather feedback from participants of a workshop at the Brookvale Groby Learning Campus

(LEIC-20112017, see Section 4.2). The Go-Lab resources and facilities were perceived positively or neutral with the simulations being identified as being most useful. The main complaint of the participants was the complexity of the system. Although this can at least partly be explained by the short duration of the workshop which did not allow for detailed descriptions and explanations, we recommend to look into this matter to see where the Go-Lab sharing platform and Graasp authoring environment can be simplified (details can be found in Appendix B).

7.2.2 ILS

Although the session was aimed at the DataViewer Tool and the Conclusion Tool, while working through the ILS during the PD session at the Go-Lab Spring School (ULEIC-25042018b, Section 4.6) teachers also gave feedback on the ILS and other apps included using the Booklets (details can be found in Appendix G):

- General
    - The “Go to next page” icon should be interactive, if the user clicks on it, the next phase should be loaded.
    - The topic and learning content of the ILS were perceived positively.
    - Customizability and amount of features of apps can cause issues with their usability, thus reducing the flexibility and feature sets of the apps could improve them.
    - More tabs should be used in the ILS to reduce the amount of scrolling necessary.
    - ILS is too complicated for 2nd and 3rd graders, long texts should be removed and replaced by videos.
    - Large amounts of text should be hidden at first, with a button to reveal it.
    - A notebook app should be added to the ILS.
    - The instructions need to be clearer so that students know when to continue exploring the ILS and when to start calculating.
    - Additional information is needed before the hypotheses as one task suddenly talks about area, where it was all about the length of the house before.
    - An example could make the information given in the ILS easier to understand for students.
    - The game in the lab could be distracting for students.
    - Scrolling in the ILS is hard.
    - The task should be split up into two, first calculating the sizes of the houses freely and only then adding the money constraint. Alternatively, the students could calculate without a roof first and then figure out, how much it would cost to add one.
    - The “next page” instruction could be confusing, stating “go to Investigation phase” for example would be clearer.
- Hypothesis Scratchpad
    - In the Hypothesis Scratchpad it is not directly visible that the three-quarter circle is a confidence meter. That could be made more prominent that just in the tooltip.
- Observation Tool
    - The observation should be listed in order or creation from top to bottom, not the newest on top.
- Experiment Design Tool
    - The experiment design tool is too complicated for students and teachers.

- Pre-filled Experiment Design Tool makes it too easy.

7.2.3 Support

Based on the questionnaire data collected (LEIC-13112017, see Section 5.5 for a description of the activities) technical issues in general are the major cause for teachers' need of support.

Forty-nine of the 58 participants who responded to this question (84.48%) think they would benefit from working collaboratively with other colleagues and peers (26 (44.83%) say it would be beneficial and 23 (39.66%) it would be very beneficial). Two teachers (3.45%) thought it would be unfavourable for them to collaborate with other colleagues and peers and the remaining 7 (12.07%) were neutral about it. Forty-six teachers (79.31%) reported that they would benefit from peer tutoring, which is directly contacting other peers for continuous support: 28 (48.28%) said it would be beneficial and 18 (31.03%) said it would be very beneficial. Two teachers (3.45%) thought it would be unfavourable for them to directly contact other peers for continuous support and the remaining 10 (17.24%) were neutral regarding peer tutoring. Reasons for teachers to find working with peers beneficial were that collaboration and sharing of ideas and experiences in general was considered beneficial, others might have encountered issues and solved them before, and having another person working on the same task was motivating.

Forty-one of the 58 teachers who answered this question (70.69%) thought support from other teachers would be very beneficial for other teachers. Three (5.17%) thought the benefits would be very little and the remaining 14 (24.14%) were neutral about it. Fifty-three (91.38%) teachers thought support from Go-Lab team members would be very much beneficial. One (1.72%) thought the benefits would be very little, the remaining 5 (8.62%) were neutral about this.

The three most common ways for teachers to get in contact with other teachers is were in person (62.71% of 59 teachers used this way to contact other teachers at least once), via email (59.32% used this communication channel at least once), and by adding them as co-authors to their ILS (38.98% used this option at least once). The least common way to contact other teachers was Intercom, which 48 of the 57 respondents (84.21%) used "never".

The three most common ways for teachers to get in contact with a Go-Lab representative were via email (66.10% of 59 teachers used this communication channel at least once), in person (62.71% of 59 respondents used this way at least once), and by adding them as co-authors to an ILS (36.20% of 58 respondents). As for contacting other teachers, Intercom was again the least common way to get in contact with Go-Lab representatives. 49 of the 57 respondents (85.96%) "never" used Intercom to do so.

The participants thought Go-Lab representatives were the most efficient way to receive feedback (55.2% of 50 teachers), followed by Colleagues (34.5%). The third available option of automatic advice was considered most efficient by the remaining 10.3% of respondents. The question regarding the helpfulness of different ways to receive feedback showed a similar picture. Go-Lab representatives were considered the best option (by 54.2% of the 59 respondents), followed by Colleagues with 39% and automatic advice with 6.8%.

Regarding the planned usage of support features in the future, 74.6% of the 59 respondents planned or would like to learn more about the Go-Lab ecosystem. 23.7% might do so and only one teacher (1.7%) did not want to. The three ways teachers were most likely to use

to learn more about Go-Lab were “Experimenting by myself” (55 of 59 (93.22%)), “Attending trainings” (51 of 59 (86.44%)), and “Looking at the support materials” (48 of 57 (84.21%)).

In regards to supporting other teachers, the participants would be most comfortable providing support:

- face to face (rather than)
- in their own country (rather than in another country)
- in their own language (rather than English)
- in their subject (rather than outside their subject)
- in their grade level (rather than any grade level
- a few hours per month (rather than per week).

Most of the 59 responding teachers were fine with being approached directly (22 (37.29%) were comfortable, 20 (33.90%) very comfortable). 7 teachers did not want to be approached directly (4 (6.78%) feel uncomfortable with that and 3 (5.08%) very uncomfortable), the remaining 10 (16.95%) were neutral about it (details can be found in Appendix R).

7.2.4 Event registration

From the three responses received for the CGT task email sent out (LEIC-24112017, see Section 5.6 for a description of the activity and Appendix S for the email) it can be derived that the registration process should be improved, making it clearer for the users if it has been completed successfully.

Of the 36 CGT teachers invited to join the space, 22 completed the registration process. It is unclear how many CGT teachers attempted to join, but that means the success rate is at least 61.11% or higher (details can be found in Appendix T).

7.2.5 Graasp User Warnings

By performing an analytical walkthrough of the Graasp user warnings (LEIC-09022018, Section 6.6) several issues were found (details can be found in Appendix KK):

A general issue with the Graasp user warnings might be the “technical” terms, which are sometimes used, but a slight rephrasing should in most cases be enough to improve the understandability.

To increase the comprehensibility further we recommend highlighting the most important parts of the messages, e.g. by making them bold.

This section presents the results of the CGT task on Graasp User Warnings (LEIC-21032018, see Section 5.8 for a description of the activity and Appendix W for the email sent to the CGT teachers).

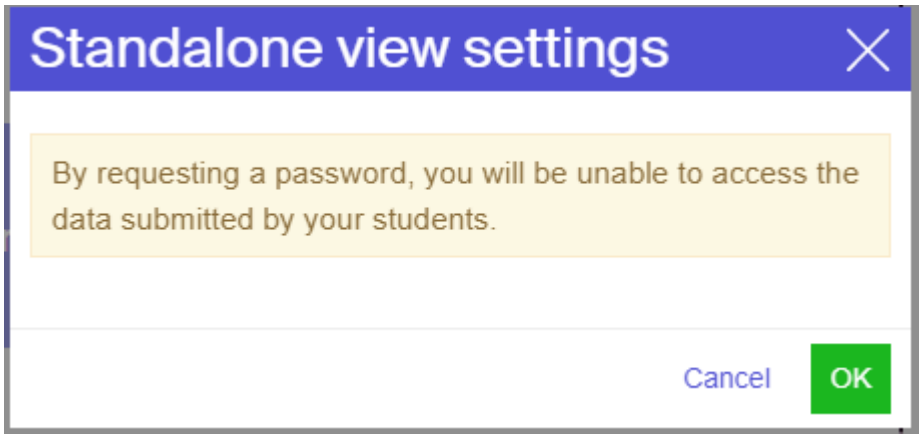


Figure 8. The 'Nickname and password' Graasp user warning.

The ‘Nickname and password’ Graasp user warning is encountered rarely. Only two of the 15 participants (13.33%) responded on the “regularly” end of the scale (one (6.67%) replied with 5 on the 0 to 5 scale from never to regularly and one with 4 (6.67%)). The majority of 13 (86.67%) responded on the “never” end of the scale (two with 2 (13.33%), four with 1 (26.67%), and seven with 0 (46.67%)). An assumed reason why nearly half of the participants never encountered this warning message might be that they kept the default settings of ‘Nickname only’ for their ILSs. The majority of 13 respondents (86.67%) understood the meaning of the message (six (40%) answered with 5 on the 0 to 5 scale from ‘I don’t understand it at all’ to ‘I understand it very well’, four with 4 (26.67%), and three with 3 (20%)). Only two (13.33%) tended towards the ‘I don’t understand it’ end of the scale (they selected 2 on the 0 to 5 scale). The answer to the question if the suggested rephrasing would be an improvement was not as clear as the answers to the earlier questions, which had a majority leaning towards one of the answer directions. Here six respondents (40%) leaned toward the new phrasing not increasing the understandability, where nine (60%) leaned toward thinking so. Given the still existing preference of the new over the old version, we recommend changing the phrasing of the ‘Nickname and password’ Graasp user warning to “By requesting a password, the Review Mode can no longer be used to access the work of students.”. The open answer question regarding other comments or improvement suggestions regarding this user warning did not result in improvement suggestions for the message, but revealed that teachers were not necessarily aware that there would be other ways to access student work than the Review Mode (e.g. teacher view in Graasp). Additionally, revealing the student passwords to the teacher was proposed as a way to get around this warning message.

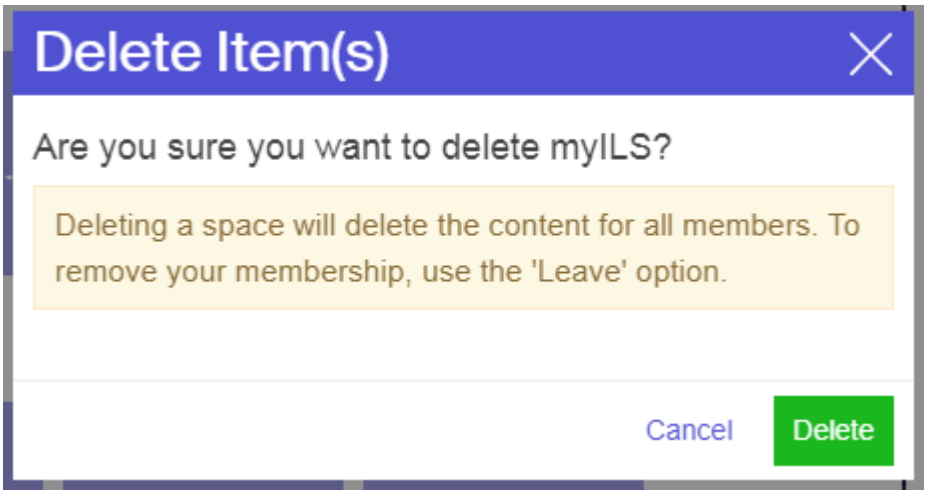


Figure 9. The 'Deleting an ILS' Graasp user warning.

The ‘Deleting an ILS’ Graasp user warning was encountered from time to time by most of the respondents. Only two of the 15 participants (13.33%) responded on the “regularly” end of the scale (one (6.67%) replied with 5 on the 0 to 5 scale from “never” to “regularly” and one with 4 (6.67%)). The majority of 13 (86.67%) responded on the “never” end of the scale with a tendency towards the centre (six with 2 (40%), four with 1 (26.67%), and three with 0 (20%)). The assumed reason for this result was that teachers did not delete their ILSs very often. The majority of 13 respondents (86.67%) understood the meaning of the message (nine (60%) answered with 5 on the 0 to 5 scale from ‘I don’t understand it at all’ to ‘I understand it very well’, two with 4 (13.33%), and two with 3 (13.33%)). Only two (13.33%) leaned towards the ‘I don’t understand it’ end of the scale (one (6.67%) selected 2 on the 0 to 5 scale, the other one (6.67%) selected 0). The answers to the question if the suggested rephrasing would be an improvement suggest that the phrasing of the ‘Deleting an ILS’ Graasp user warning should be changed to “Deleting an ILS will remove it irreversibly and its content will no longer be accessible to anyone. If instead you just want to remove it from your list of ILSs, please go to the member list and use the “Leave” option next to your name.” Eleven respondents tended to agree that this would increase the understandability (73.33%), four (26.67%) leaned towards not thinking so. However, the new message was considered too long by some teachers, they suggested to just add the ‘irreversible’ information to the initial message or show the new message through an option “Further information”.

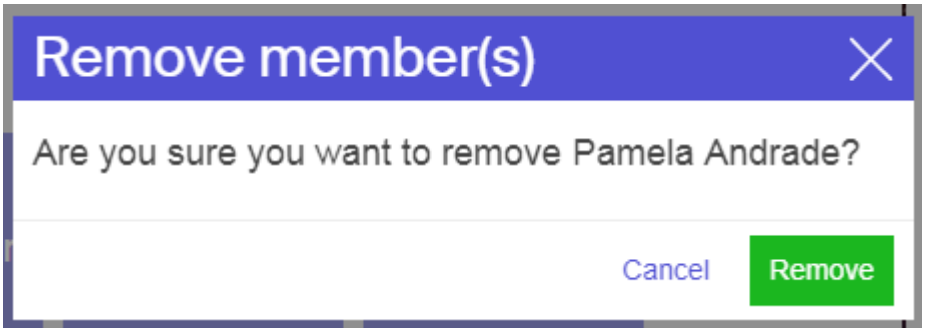


Figure 10. The 'Removing a member' Graasp user warning.

The ‘Removing a member’ Graasp user warning was rather rarely encountered by most of the respondents. Only three of the 15 participants (20%) responded on the “regularly” end of the scale (one (6.67%) replied with 5 on the 0 to 5 scale from “never” to “regularly” and

two with 3 (13.33%)). The majority of 12 (80%) responded on the never end of the scale with a strong tendency towards never (one with 2 (6.67%), five with 1 (33.33%), and six with 0 (40%)). The assumed reason for this result was that teachers did not that often remove members from their ILSs. All the respondents stated that they understood the meaning of the message (eleven (73.33%) answered with 5 on the 0 to 5 scale from 'I don't understand it at all' to 'I understand it very well', three with 4 (20%), and one with 3 (6.67%)). However, the answers to the question if the suggested rephrasing would be an improvement still suggested that the phrasing of the 'Removing a member' Graasp user warning should be changed to "Are you sure you want to remove NAME from the ILS 'NAME OF ILS'?". Eleven respondents tended to agree that this would increase the understandability (73.33%), four (26.67%) leaned towards not thinking so. One participant suggested that "the name of the ILS could be used too", which was done in the suggested rephrasing.

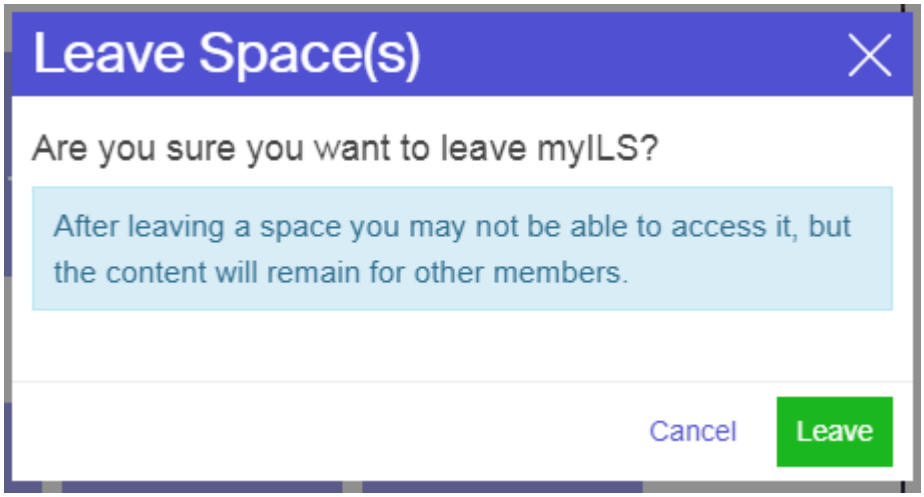


Figure 11. The 'Leaving an ILS' Graasp user warning.

The 'Leaving an ILS' Graasp user warning was rather rarely encountered by most of the respondents. Only three of the 15 participants (20%) responded on the "regularly" end of the scale (one (6.67%) replied with 5 on the 0 to 5 scale from "never" to "regularly" and two with 3 (13.33%)). The majority of 12 (80%) responded on the "never" end of the scale with a strong tendency towards never (one with 2 (6.67%), five with 1 (33.33%), and six with 0 (40%)). The assumed reason for this result was that teachers did not that often leave an ILS. All the respondents stated that they understood the meaning of the message (ten (66.67%) answered with 5 on the 0 to 5 scale from 'I don't understand it at all' to 'I understand it very well', three with 4 (20%), and two with 3 (13.33%)). However, the answers to the question if the suggested rephrasing would be an improvement still suggested that the phrasing of the 'Leaving an ILS' Graasp user warning should be changed to "After leaving an ILS it will be removed from your home page and you may be no longer be able to access it. Nevertheless, the content of the ILS will still be there for others." Twelve respondents tended to agree that this would increase the understandability (80%), three (20%) leaned towards not thinking so. One participant pointed out a typo in the new message, there was a "be" too much and it should read "may no longer be able to access it" instead, another participant suggested that the message should include "if you want to use this ILS again you should make a new copy of it from the Go-Lab site".

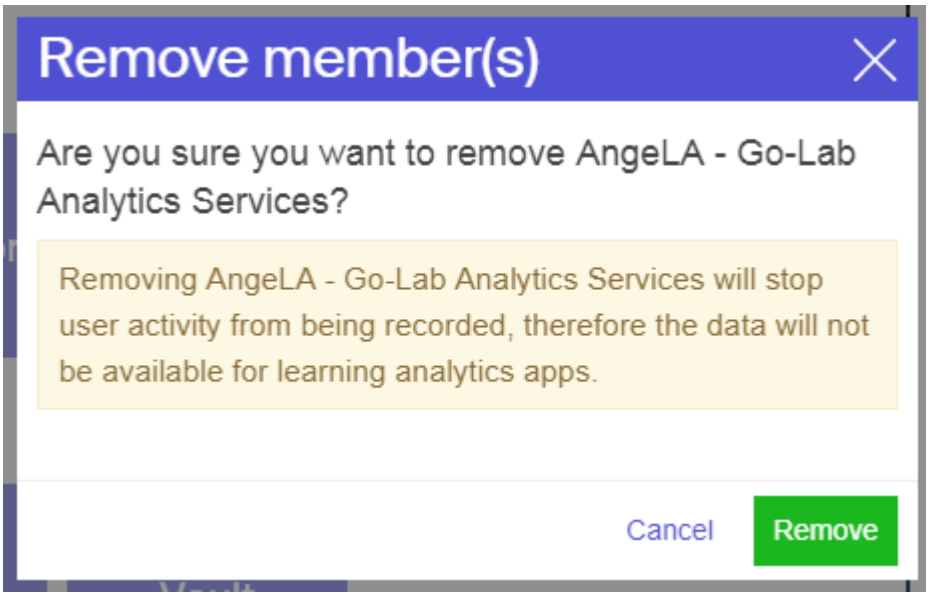


Figure 12. The 'Removing AngeLA' Graasp user warning.

The ‘Removing AngeLA’ Graasp user warning was rather rarely encountered by most of the respondents. Only three of the 15 participants (20%) responded on the regularly end of the scale (one (6.67%) replied with 5 on the 0 to 5 scale from “never” to “regularly” and two with 3 (13.33%)). The majority of 12 (80%) responded on the “never” end of the scale with a very strong tendency towards never (three with 1 (20%), and nine with 0 (60%)). The assumed reason for this result was that teachers rarely remove AngeLA from their ILSs. The majority of 13 respondents (86.67%) understood the meaning of the message (nine (60%) answered with 5 on the 0 to 5 scale from ‘I don’t understand it at all’ to ‘I understand it very well’, two with 4 (13.33%), and two with 3 (13.33%)). Only two (13.33%) leaned towards the ‘I don’t understand it’ end of the scale (one (6.67%) selected 2 on the 0 to 5 scale, the other one (6.67%) 0). However, the answers to the question if the suggested rephrasing would be an improvement still suggest that the phrasing of the ‘Removing AngeLA’ Graasp user warning should be changed to “Removing 'AngeLA - Go-Lab Analytics Services' will stop automatic activity tracking. As this data is required by some of the learning analytics apps, they will no longer work in this ILS.” Eleven respondents tended to agree that this would increase the understandability (73.33%), four (26.67%) leaned towards not thinking so. All but one participant (93.33%) thought it would be useful if the affected apps would be listed as part of the message. One participant pointed out that AngeLA was a mystery to her or him, but that the functionality to remove AngeLA was not needed, another participant suggested to add a short description of the AngeLA function besides the icon and name in the members list.

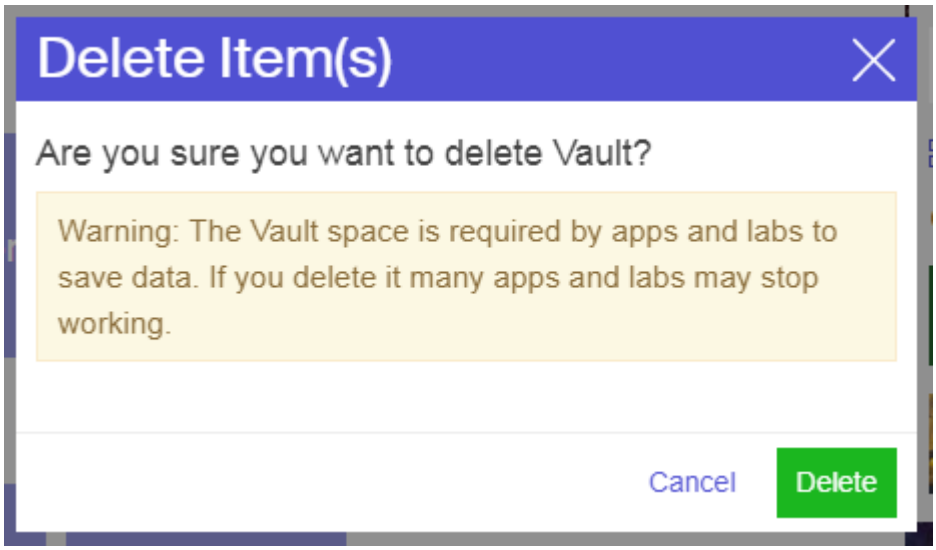


Figure 13. The 'Deleting the Vault' Graasp user warning.

The ‘Deleting the Vault’ Graasp user warning was very rarely encountered by most of the respondents. Only one of the 15 participants (6.67%) responded on the “regularly” end of the scale (with 4 on the 0 to 5 scale from never to regularly). The majority of 14 (93.33%) responded on the “never” end of the scale with a strong tendency towards never (one with 2 (6.67%), six with 1 (40%), and seven with 0 (46.67%)). The assumed reason for this result was that teachers rarely removed the Vault from their ILSs. The majority of 11 respondents (73.33%) understood the meaning of the message (seven (46.67%) answered with 5 on the 0 to 5 scale from ‘I don’t understand it at all’ to ‘I understand it very well’, three with 4 (20%), and one with 3 (6.67%)). Only four (26.67%) tended towards the ‘I don’t understand it’ end of the scale (one (6.67%) selected 2 on the 0 to 5 scale, one (6.67%) selected 1, and two (13.33%) selected 0). The answers to the question if the suggested rephrasing would be an improvement still suggested that the phrasing of the ‘Deleting the Vault’ Graasp user warning should be changed to “The Vault is required by apps and labs to save data. If you delete it, many apps and labs will stop working in this ILS.” Twelve respondents tended to agree that this would increase the understandability (80%), three (20%) leaned towards not thinking so. All but two participant (86.67%) thought it would be useful if the affected apps and labs would be listed as part of the message. One participant pointed out that this list would be too long to be interesting and would like to only include a link to this list in the message (details can be found in Appendix X).

7.2.6 Go-Lab recognition scheme

A total of 54 answers were collected from three sources during the months of March-May 2018: Core Group teachers, link on the project’s Facebook page and answers from participants of the Spring School (LEIC-21032018, see Section 5.9 for a description of the activities and Appendix Y for the email to the CGT teachers).

For the general questions, the participants responded that badges were relevant for teachers as well as schools. They also thought badges should be awarded for all the activities proposed in the questionnaire (time spent, skills obtained, ILS co-creation, ILS co-authoring, using ILS in classroom, ILS publishing, peer support, usage of Golabz, usage of Graasp) with about half of them or more "strongly agreeing" or "agreeing" with each option but one (time spent). Just one suggestion that was not included on the list was given by a teacher: giving badges for attending seminars. Regarding teacher roles to be recognized "policy maker influencer" and "peer supporter" were the only options that had less "strongly

agree" than "agree" responses. For the other options (trainer, PD teacher, focus teacher, disseminator) again about half of the respondents or more selected "strongly agree" for recognizing this role.

Regarding their personal preferences, nearly half of the teachers (45.3%) said that newly earned badges should be awarded "immediately". And there was a preference for all badges to be awarded by the system automatically (44.4% of responses were “strongly agree”), but teachers would also be willing to "apply" for badges by filling in a form (28.3%). There was no clear preference regarding how to receive or display badges with 20-23 teachers each choosing each option (via email, displaying them on the Go-Lab sharing platform, displaying them on the Go-Lab authoring platform) as their favourite one. Teachers rated email as their least preferred way to receive badges while giving displaying the badges on the Go-Lab sharing platform and on the Go-Lab authoring platform about the same rating, with a slight preference towards Golabz. Also, half of the teachers or more said they "strongly agree" or "agree" with letting others know about them on a list of contacts or based on a map as well as finding people around them working with Go-Lab and letting them see the badges they have earned (details can be found in Appendix Z).

The additional responses to the Go-Lab recognition scheme questionnaire collected at the Go-Lab Spring School (ULEIC-25042018b, Section 4.6) are reported together with the initial responses as the point was to gather more input, not distinguish between the participants from different events and sources.

In the discussion during the Go-Lab Spring School event in addition to badges for teachers and schools, also the topic of badges for students came up. The teachers had the following oppinions and ideas regarding student badges:

- very useful to motivate students
- should appear automatically throughout the ILS, ideally with graphical and sound-effects
- there could be a ‘Badge App’ which the teacher could include in the ILS, specifying conditions for which badge to show

Whereas most teachers were positive regarding the idea of badges for students (some did not like the idea as it might undermine inquiry based learning, where the will to learn should be the motivating factor), they were split regarding badges for teachers. Some found them a great idea, others were sceptical. One reason teachers did not like the idea of badges for themselves was that they did not want to feel like ‘competing’ against fellow teachers (details can be found in Appendix G).

7.2.7 New Go-Lab Sharing Platform

By performing an analytical walkthrough of the re-designed Go-Lab Sharing Platform (LEIC-06092017, Section 6.1) several issues were found (details can be found in Appendix KK):

- 16 low-importance issues were encountered while using the new Go-Lab sharing platform. These do not represent a big impediment for the user to accomplish tasks, but it would be beneficial to address them to avoid confusion or dissatisfaction.
- 18 medium-importance issues could be obstructing the correct interactions within the website. These issues should be fixed relatively soon as they represent a problem for the user.
- 31 highly important issues should be immediately addressed to guarantee the proper performance of the website.

8. General Findings and Major Themes

As the artefacts for the PD activities performed in month 9 to 17 were very diverse, not many generalizations and major themes can be derived. However, some general themes emerged.

One positive aspect that can be seen from the iterative PD activities is that several artefacts have clearly been improved over time and that these changes have also been noticed by the teachers (see Section 9.2 for details).

Another major theme, which spans over several apps, is their suitability for younger students. Teachers considered most of the evaluated apps as too complex for younger students. They argued for a reduction of features to not overwhelm primary school students and to provide them with less functionality, tailored to what they actually needed.

But not only for students the complexity of apps should be reduced, teachers could also benefit from a system that (at first) gives them apps with reduced, basic functionality. Once they get more familiar with an app, additional features can then be made available.

9. Adoption

9.1 Adoption of PD Findings by Developers

Findings and improvement suggestions were mostly sent to the developers in a report of the PD activity right after analysing the data. For some activities, like the recent workshop at the Go-Lab Spring School, this deliverable reports the process and results to the developers and other partners.

If and how to address the issues and improvement suggestions identified was left to the partners. Developers usually identified feasible changes from our reporting (e.g. for technical reasons or due to time constraints, not all identified issues could always be addressed) and then implemented them into their system or application. An example response to our PD activities on the Questioning and Hypothesis Scratchpad by one of the Next-Lab developers can be found in Appendix LL.

9.2 Adoption of Re-worked Artefacts by End-users

From our iterative PD activities on reworked apps (e.g. Section 4.3, 5.3, 5.4, 6.2, 6.3, 6.4, and 6.5) some general observations are that the target users notice the changes and mostly consider them an improvement (e.g. Section 7.1.3, 7.1.4, and 7.1.5). This not only shows that our efforts to improve the Go-Lab resources are successful, but also how they can contribute to the adoption of artefacts by teachers. With software that is better tailored to their needs and easier to use, teachers are more likely to apply it in their teaching practice.

Several Next-Lab activities in general and PD activities in particular (e.g. Section 4.6) were aimed at primary school teachers and students. This is not only in line with the goal of Next-Lab to better include these target groups. It also addresses one of the barriers identified in D4.1 for the adoption of reworked artefacts: suitability for younger students. Especially the Go-Lab Spring School, which was targeted at primary school teachers, resulted in a lot of input, feedback, and improvement suggestions on how to adapt the Go-Lab ecosystem to the needs of younger students.

10. Technology Readiness Level (TRL)

10.1 Increased TRL of the Go-Lab ecosystem

This section summarizes the work performed in Task 4.3 to increase the Technology Readiness Level (TRL) of the platforms, services, and apps part of the Go-Lab ecosystem.

As stated in the Grant Agreement, the existing Go-Lab ecosystem as available in the beginning of the project was already a complete solution fully operational and in production (i.e. online 24/7 and open to all interested European users). It was made up by three main components: the **Golabz sharing platform**[17] utilised as a repository of online labs and apps, the **Graasp authoring platform**[18] that allows teachers to create, personalize, and utilise learning spaces with the students, and the **tutoring platform**[19], an online social meeting place for teachers to share experiences and get coaching. According to the TRL definitions[20], the Go-Lab ecosystem at that time was labelled with TRL7. As a reminder, TRL7 is for System prototype already demonstrated in an operational environment, i.e. schools in the case of Next-Lab.

To increase the TRL of the **tutoring platform** while relying on the limited development resources available in the project, a new user support strategy and solutions have been devised. Interactions between teachers to share experiences and best practices are now offered through a shared Go-Lab community space in Graasp.eu[21]. It is a special type of Graasp space which can be branded with the community skin (background image and colour scheme). To get access people are requested to provide details about themselves and explicit agreements to receive notifications and being followed by their national community manager. In community spaces a special internal access scheme is available to ease the invitation of large cohorts of users in shared subspaces and subspaces that are dedicated to support training and dissemination events with registration can be created. The live help feature of the tutoring platform has been transferred to the professional Intercom[22] online service enabling requests from the users of the Go-Lab ecosystem to have their questions and requests automatically redirected to available Next-Lab Expertise Center (NEC) partners or to their local ambassadors for swift action. As a consequence, the TRL of the tutoring platform is now aligned with Graasp and the Intercom levels. As a consequence of this new support strategy, the management of infrastructure supporting the community and the help-desk has been transferred from IMC to EPFL who is developing and hosting the Graasp authoring platform. The FAQ part[23] has been strengthened and is still managed by IMC.

Both the sharing and authoring platforms have been strengthened during the first 18 months of the project to increase their TRL. The adaptations and upgrades are described below.

[17] https://www.golabz.eu
[18] https://graasp.eu
[19] http://tutoring.golabz.eu
[20] HORIZON 2020 – WORK PROGRAMME 2014-2015, General Annexes, Extract from Part 19 - Commission Decision C(2014)4995, G. Technology readiness levels (TRL)
[21] https://golab.graasp.eu
[22] http://www.intercom.com
[23] http://support.golabz.eu

10.2 TRL of the Golabz sharing and support platform

The work on the **sharing platform** has been reported in D4.2 at month 12 and is not repeated here. Some of the features reported in D4.2 as work in progress have already been released, e.g. the new project website and the new support page, display of content by user, disabling preview for not functioning labs until they are repaired, automated update of language information, etc. Improvements have been made to the lab publishing and ILS publishing processes, as well as to the content reviewing process. The updates implemented are increasing TRL of the sharing platform from 7 to 8, i.e. an actual system completed and qualified through test and demonstration. To reach TRL 9, Golabz still needs to add some social features (for example, ratings and comments) and strengthen its search engine (e.g., to allow search by subject domain or author).

Figure 14 provides the statistics on the use of the sharing platform. As one can see from the figure, from the beginning of the Next-Lab project the sharing platform counts about 130,000 visitors, with about 8,000-10,000 visitors per month (in average). The per cent of returning visitors is 11,8% (about 15,000 users), which is slightly higher than the number of ILS-creators registered in Graasp (about 12,000 teachers), so we can assume that most of the returning visitors are the active teachers utilising the ecosystem to create ILSs and teachers considering to do so (e.g., teachers who have an account in Graasp, but haven't created an ILS yet).[24]

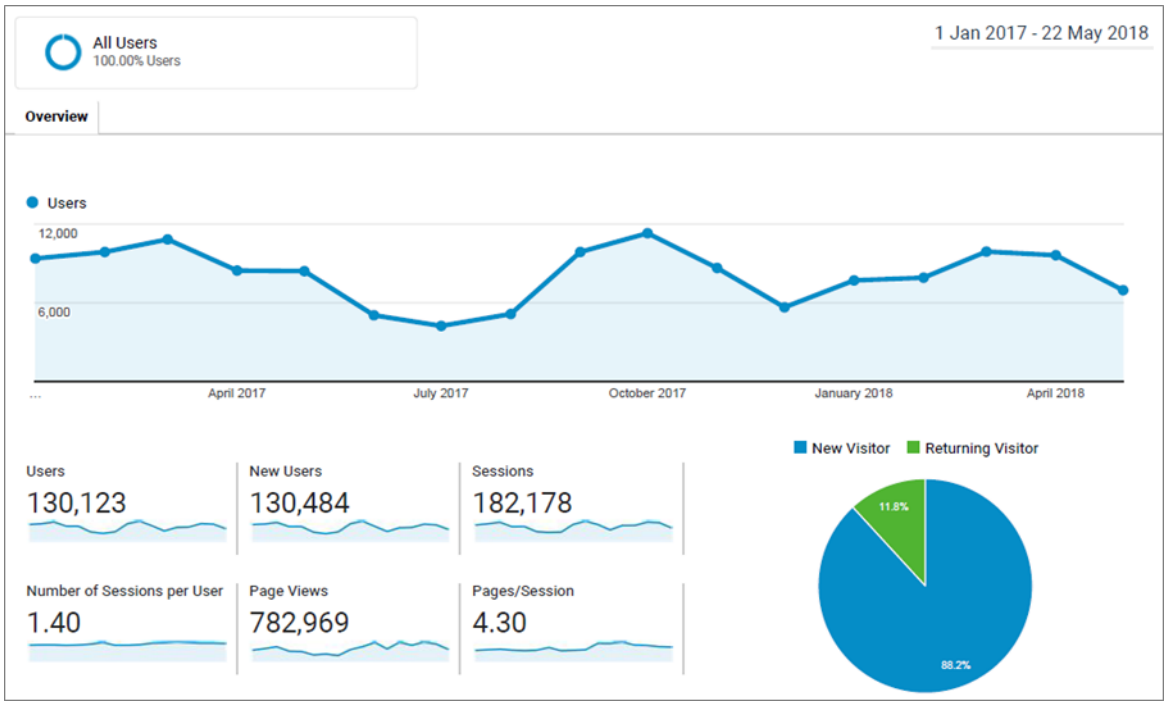


Figure 14. Go-Lab Sharing Platform visitors statistics.

The sharing platform is hosted at a HostEurope server, located in Strasbourg. HostEurope guarantees the availability of their service (hardware, network, etc.) for an average of 99.999% of monthly time. IMC has an enterprise contract for professional virtual server with enough capacity to assure scalability of the platform and high performance by an increased

[24] All numbers as of May 22nd, 2018.

number of users. The server is regularly maintained and backed up by HostEurope, so the security of data is assured.

10.3 TRL of the Graasp authoring, learning, and community support platform

Many adaptations and updates have been implemented to increase the TRL of Graasp from 7 to 8 (see Figure 15 for the old architecture and Figure 16 for the new one) and also to increase the possible load the server can handle (Figure 17):

- PowerEdge R730 with intel Xeon E5-2643 v4 3.4GHz 20M Cache 9.60GT/s QPI Turbo HT 6C/12T, 16GB RDIMM, 2 x 400GB SSD, and Dual, Hot-plug, Redundant Power Supply
- PowerEdge R630 with intel Xeon E5-2643 v4 3.4GHz 20M Cache 9.60GT/s QPI Turbo HT 6C/12T, 16GB RDIMM, 2 x 120GB SSD, and Dual, Hot-plug, Redundant Power Supply

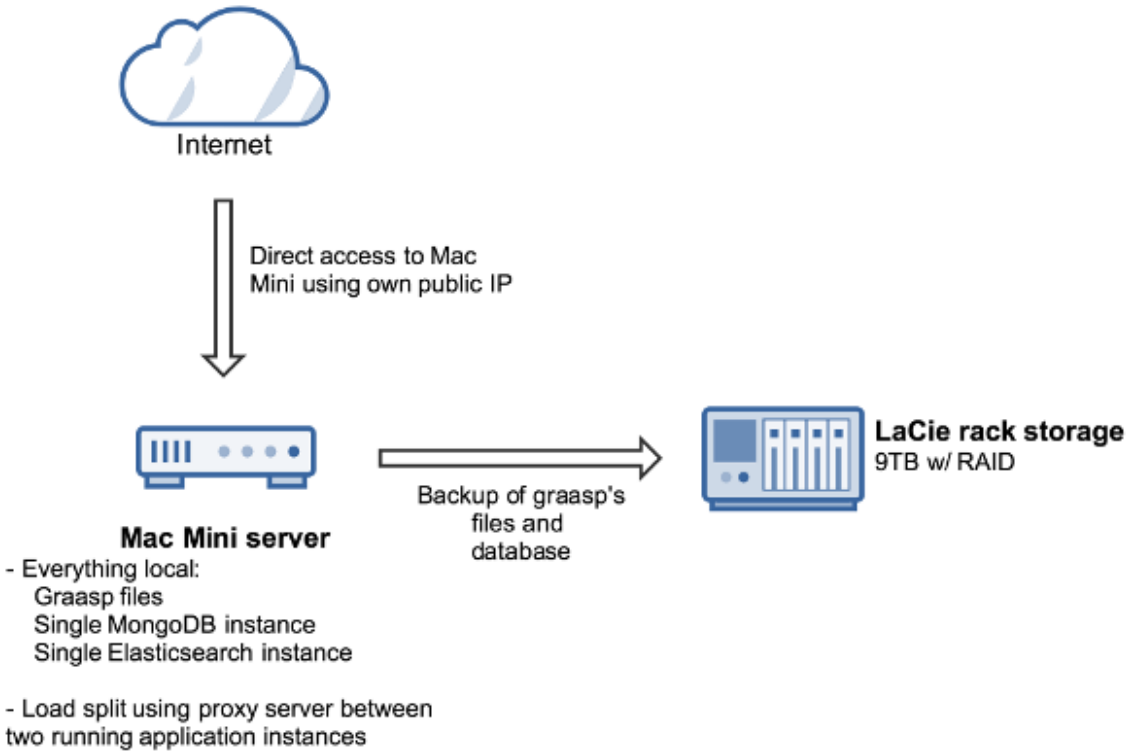


Figure 15. The old architecture of Graasp.

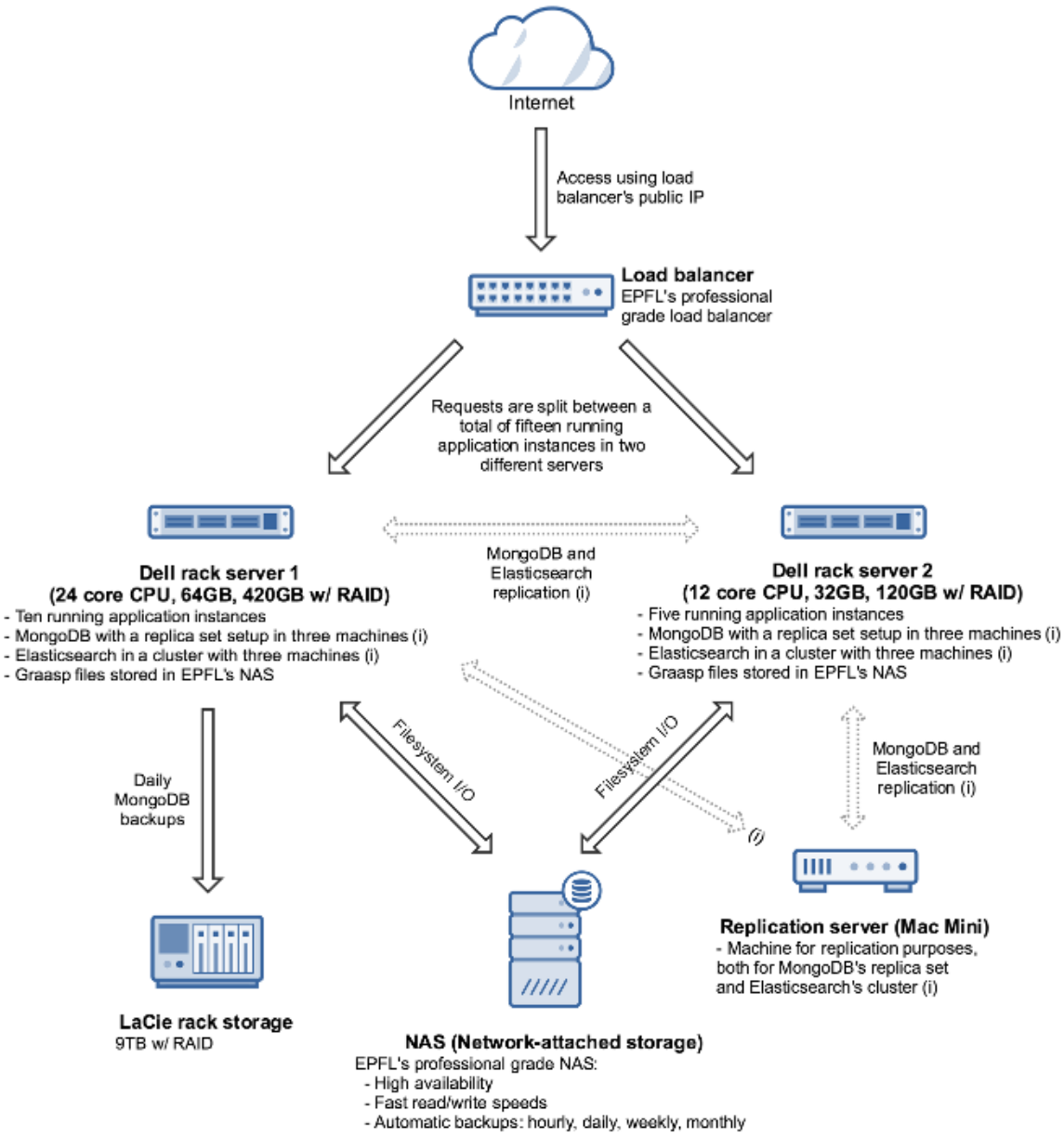


Figure 16. The current architecture of Graasp.

Figure 17. The current server rack for Graasp.

11. Conclusion

During month 9 to 17 of the Next-Lab project, various PD activities have been conducted on diverse parts of the Go-Lab ecosystem ranging from single apps to the whole reworked Go-Lab sharing platform. The studies were tailored to the information needs of the partners requesting information. They ranged from small, in-depth analytical walkthroughs (i.e. expert review) by HCI specialists, examining the artefacts of interest from the perspective of interaction design, to large scale, general questionnaires sent to several hundred teachers as end-users of the artefacts under evaluation. These activities, which were embedded in face-to-face events, involved remote participants, and performed by HCI specialists, provided valuable feedback, input, and improvement suggestions for developers and other interested partners. We are therefore planning to continue to conduct the PD activities in the established fashion. The results show that the changes are not only recognized but also appreciated by the end-users.

12. Planned activities for the remainder of the project

Besides concrete events already lined up (e.g. LEIC-18062018) we are also currently planning and preparing some additional PD activities, for example together with UT and other partners to evaluate apps with primary school students. For the latter we are working on a study designed for the students to work through an ILS and afterwards provide feedback and input on the apps in this ILS with different PD activities (like annotating screenshots, discussions, and using sticky notes to express their ideas).

In addition to these events already foreseen, we will continue to provide PD support on demand for partners whenever they would like to get input on any of their artefacts from end-users or HCI specialists. This approach has been proven successfully in the project. It allows us to flexibly address the information needs of our partners, based on their requirements (like time constraints, amount of feedback required, etc.).

13. References

Heintz, M. & Law, E. (2017). *Next-Lab Deliverable 4.1 Report on participatory design activities and adoption* (Next-Lab Project).

Johnson, L., Adams Becker, S., Cummins, M., Estrada, V., Freeman, A., and Hall, C. (2016). *NMC Horizon Report: 2016 Higher Education Edition*. Austin, Texas: The New Media Consortium.

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Rodríguez-Triana, M. J., Prieto, L. P., Vozniuk, A., Boroujeni, M. S., Schwendimann, B. A., Holzer, A., & Gillet, D. (2017). Monitoring, awareness and reflection in blended technology enhanced learning: a systematic review. *International Journal of Technology Enhanced Learning*, 9(2-3), 126-150.

14. Appendices

A. Report on Next-Lab workshop session for teachers as part of the HMC / Ogden trust head of physics event at Fulneck School (LEIC-10112017)

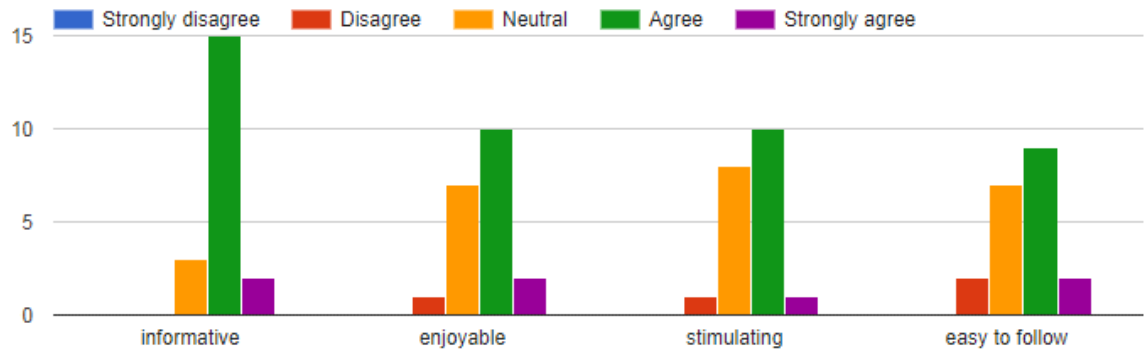
On 10/11/2017 from 10:00 to 12:00 the ULEIC team presented the Next-Lab project and Go-Lab resources in conjunction with PD via a questionnaire at a teacher workshop which was part of the HMC / Odgen trust head of physics event at Fulneck School in Leeds, UK. Twenty-one teachers were attending the event to learn about and discuss ways to improve their physics teaching.

The Next-Lab workshop contained of a presentation covering the topics

- Educational Vision of the Go-Lab and Next-Lab project
- Resource portal ("Go-Lab sharing platform"), including hands-on
- Authoring facility ("Graasp authoring environment"), including hands-on
- Benefits and opportunities of collaborating with the Next-Lab project team.

This presentation was followed by a questionnaire to gather feedback on the workshop as well as Go-Lab resources. The results of this questionnaire are presented in the following. Additionally questions regarding further interest in working with the Next-Lab project were asked, which are only reported anonymously here due to privacy concerns.

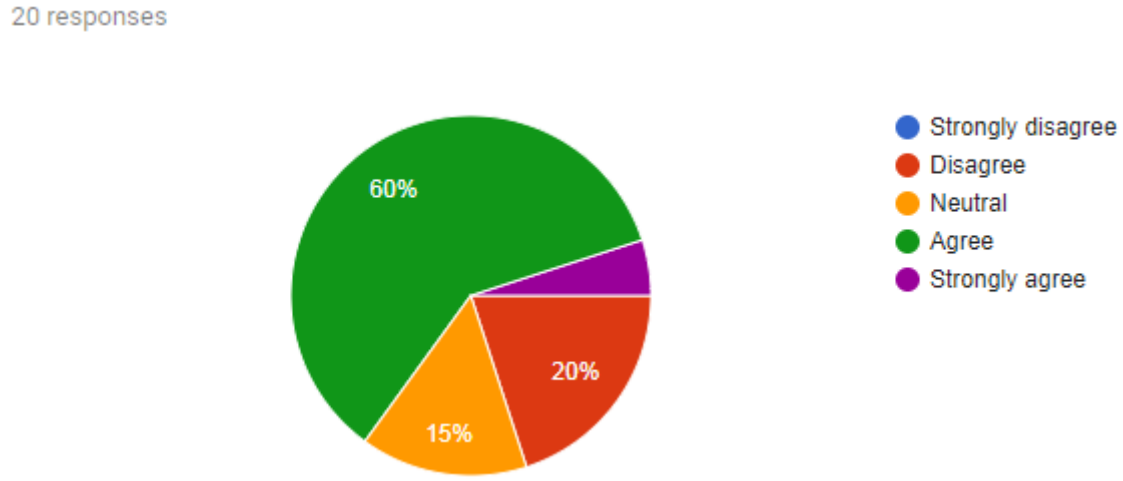
Question 1: I found this workshop informative | enjoyable | stimulating | easy to follow



Fifteen of the 20 teachers that filled in the questionnaire agreed that the workshop was informative (75%) an additional 2 (10%) strongly agreed, whereas the remaining 3 (15%) were neutral about it. Twelve teachers (60%) found the workshop to be enjoyable (10 (50%) agree and 2 (10%) strongly agree), one teacher (5%) disagreed with it being enjoyable and the remaining 7 (35%) were neutral on that matter. Eleven teachers (55%) found the workshop stimulating (10 (50%) agree and 1 (5%) strongly agree), one teacher (5%) disagreed with it being stimulating and the remaining 8 (40%) were neutral. Finally, eleven teachers (55%) found the workshop easy to follow (9 (45%) agree and 2 (10%) strongly agree), two teachers (10%) disagree with it being easy to follow and the remaining 7 (35%) are neutral.

The worst results being on the "easy to follow" question can be explained by the time constraints for the workshop, which did not allow for detailed explanations of all topics. However, overall the workshop was mostly perceived positively.

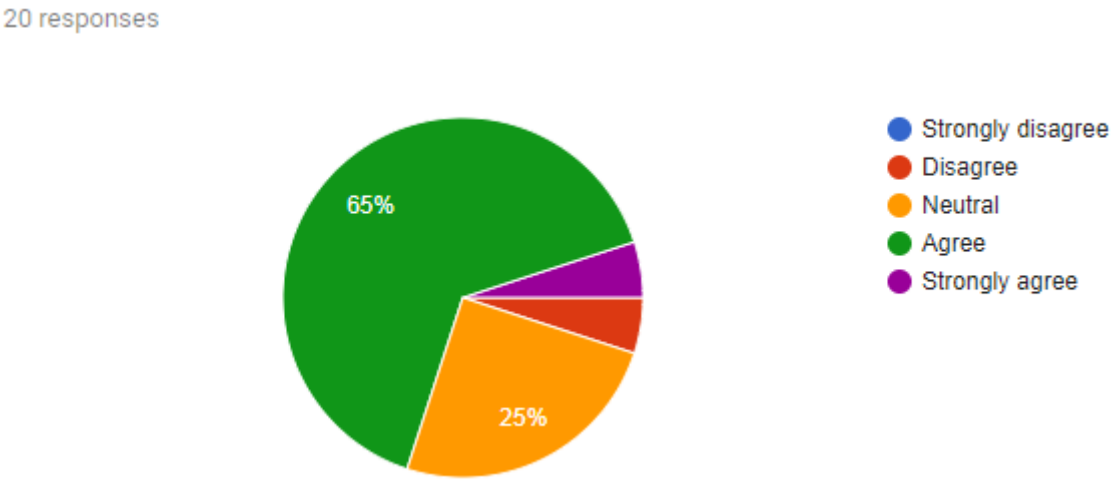
Question 2: I believe the Go-Lab facilities and resources could be an asset in my own teaching.



Thirteen teachers (65%) believe that the Go-Lab facilities could be an asset in their teaching (12 (60%) agree and 1 (5%) strongly agree), four teachers (20%) disagree with that statement and 3 (15%) responded neutral.

It is a good sign that none of the teachers strongly disagreed with the Go-Lab resources being potentially beneficial for their teaching and that 65% saw benefits, but in future workshops the advantages of the Go-Lab facilities should be highlighted even more, to convince also the remaining 35% of their benefits.

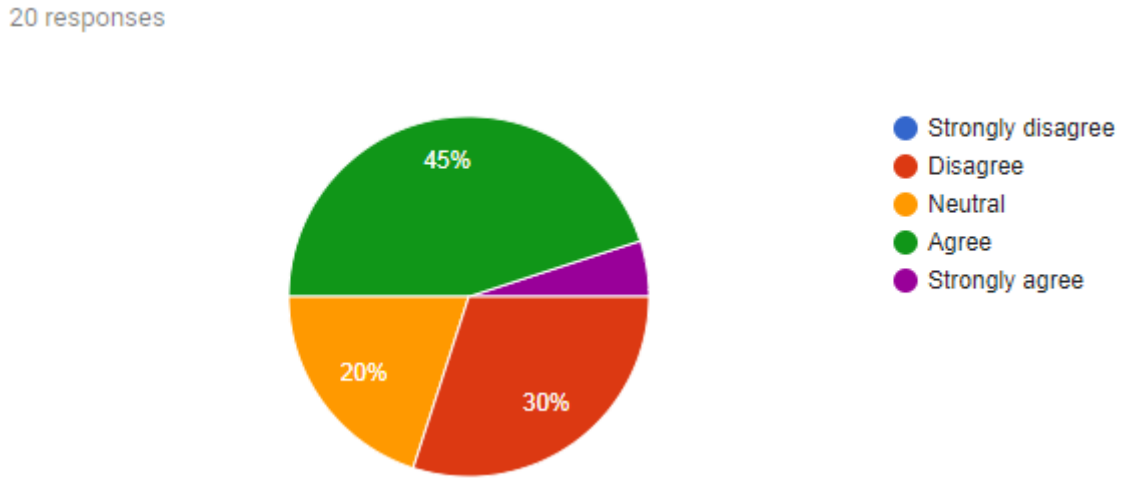
Question 3: I think that my pupils could benefit from using Go-Lab.



Fourteen teachers (70%) believe that their students could benefit from using Go-Lab (13 (65%) agree and 1 (5%) strongly agree), one teacher (5%) disagrees with that statement and 5 (25%) responded neutral.

The responses to this question are similar to Question 2, however, with slightly more agreement and less disagreement. This could indicate that teachers see benefits for their students from Go-Lab but are not sure how to integrate Go-Lab in their own teaching. For future workshops we could learn from that to even better inform teachers on how they could make use of the resources in their own teaching.

Question 4: I am interested in writing my own ILSs for use in my teaching.



Ten teachers (50%) are interested in writing their own ILS for use in their teaching (9 (45%) agree and 1 (5%) strongly agrees), six teachers (30%) disagree with this statement and four (20%) responded neutral.

We think that interesting half of the participants in writing their own ILS after a rather short introduction to the Go-Lab system is a good result. However, with a third of the teachers disagreeing, there is room for improvement in further workshops or in follow-up events.

Question 5: What parts of Go-Lab seemed to be most useful to you?

- The lab resources.
- abilty to set different challege tasks within one lesson
- Bringing together resources from different areas into a single portal
- online storage of lesson material
- Creating specific lessons
- preview of labs
- Links to apps
- Having many the resources pulled into one location
- Access to resources from other teachers
- Searchable labs, some of the apps seem interesting
- Creating or adapting an ILS
- Ability to consolidate animations and videos in one place
- online labs
- Lab search facility
- Ready made spaces for me to edit in Physics or chemistry

The aspects of the Go-Lab ecosystem that seemed most useful to the teachers are the resources (apps, labs, and ILSs from other teachers) together with search functionality supporting their discovery and the functionality to create and adapt online lessons.

Question 6: Do you have any suggestions on how to improve the system?

- no (2)
- Check tat the URLs lead to actual pages, there were many pages that didn't work, it made it feel like it was losing support and I'm not willing to invest time in something that will effectivly become defunct
- I think its far from intuitive and so if anything it could be less complex.

- general search in golab works, rather than producing blank white squares
- I had a lot of problems opening links to labs or embedding labs that didn't open. Either content had been removed or there was an error accessing Flash and I was faced with a blank screen. This seriously limited the amount of content that was useful to me and I couldn't use the labs that I wanted to.
- Not all the labs were working.
- better initial search of labs by keyword.
- banks of questions etc for each lab, e.g. self marking MCQs rthat relate to the labs equivalent to the automatically marked MCQs on GCSEpod
- Far too complicated as a first user. Too many icons, windows, hidden options. The link and similarities with GoLab is confusing. Too many links to external labs and simulations don't work.
- better search engine

The main complains about the system are that the search is not working and the complexity of the portal. To address these issues the search should be fixed and it should be checked if all the links and pages are working. Additionally the complexity of the portal should be reduced if and where possible.

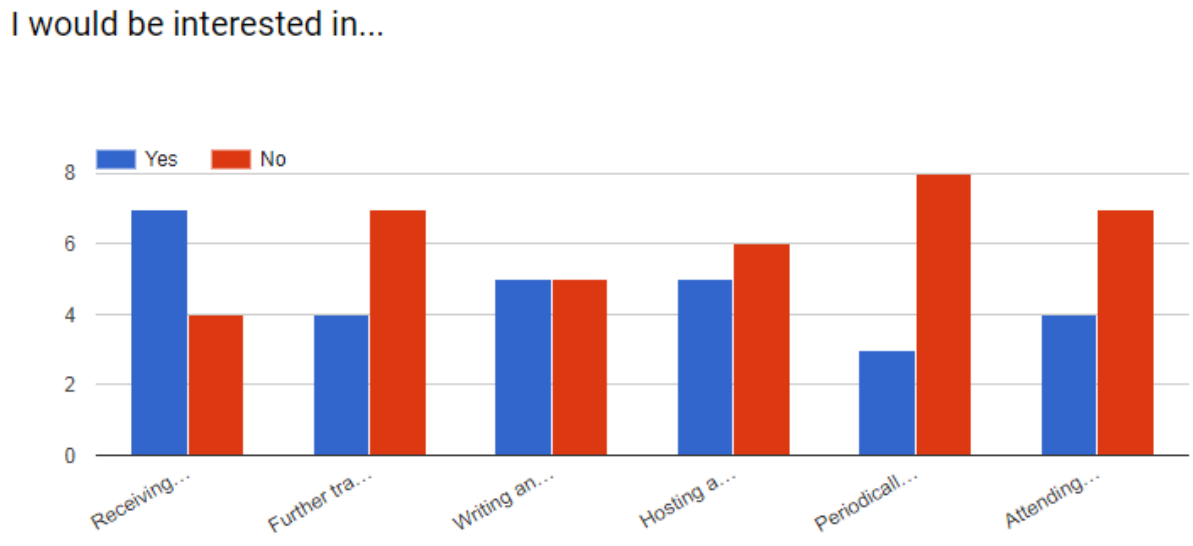
Question 7: Is there anything you would like to have in Go-Lab that you haven't seen?

- need more time to evaluate
- Getting students to work collaboratively
- no
- Difficultly in navigating the Graasp website

It is already possible in Go-Lab to have students work collaboratively, but there was no time during the workshop to present this aspect. Additionally, further collaboration support is already planned to be integrated in the course of the Next-Lab project. The difficulty in navigating the Graasp website can also at least partly be attributed to the limited time available to introduce the teachers to it.

Question 8: Further interest in Go-Lab

Ten teachers provided their email address and nine their name to indicate further interest in the Next-Lab project (details not listed here due to privacy).



- Receiving Go-Lab news via email

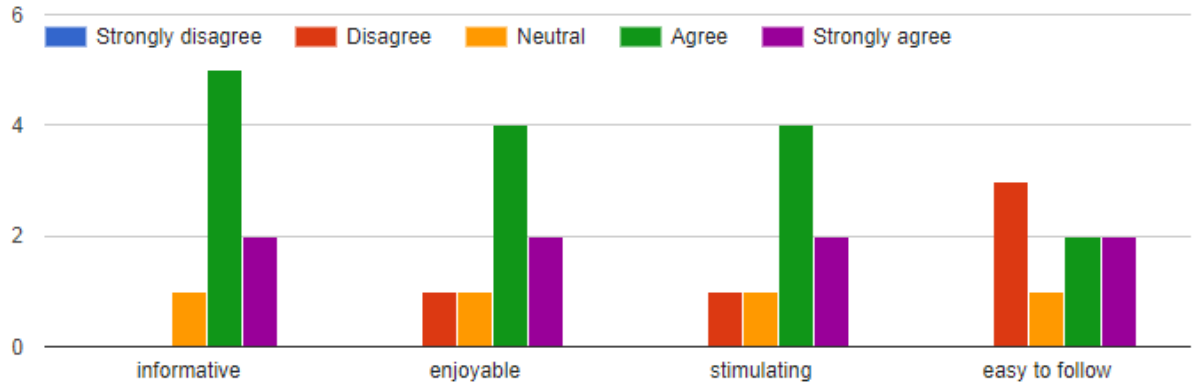
    - 7 Yes
    - 4 No
- Further training opportunities
    - 4 Yes
    - 7 No
- Writing and delivering my own online lesson (ILS) with support from the team
    - 5 Yes
    - 5 No
- Hosting a Go-Lab event for teachers at my school
    - 5 Yes
    - 6 No
- Periodically providing teacher expertise and feedback on specific Go-Lab facilities
    - 3 Yes
    - 8 No
- Attending a winter or summer school (event for teachers)
    - 4 Yes
    - 7 No

A summary of this workshop can be found in Section 4.1 and a summary of the results is presented in 7.2.1.

B. Next-Lab workshop for teachers at Brookvale Groby Learning Campus (LEIC-20112017)

The results of the questionnaire are presented in the following. Additionally questions regarding further interest in working with the Next-Lab project were asked, which are only reported anonymously here due to privacy concerns.

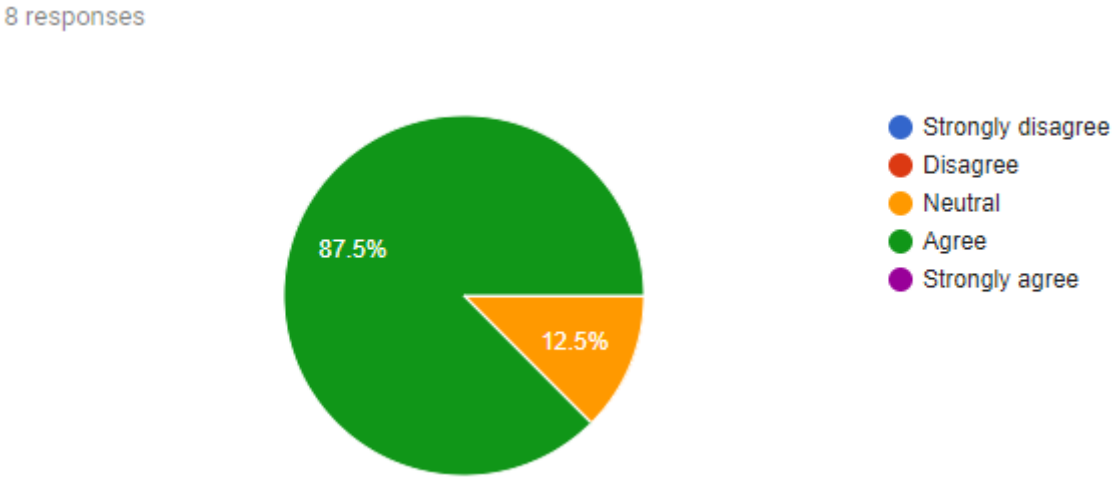
Question 1: I found this workshop informative | enjoyable | stimulating | easy to follow



Five of the 8 teachers that filled in the questionnaire agreed that the workshop was informative (62.5%) an additional 2 (25%) strongly agreed, whereas the remaining 1 (12.5%) were neutral about it. Six teachers (75%) found the workshop to be enjoyable (4 (50%) agree and 2 (25%) strongly agree), one teacher (12.5%) disagreed with it being enjoyable and the remaining 1 (12.5%) was neutral on that matter. Six teachers (50%) found the workshop stimulating (4 (50%) agree and 2 (25%) strongly agree), one teacher (12.5%) disagreed with it being stimulating and the remaining 1 (12.5%) was neutral. Finally, four teachers (50%) found the workshop easy to follow (2 (25%) agree and 2 (25%) strongly agree), three teachers (37.5%) disagree with it being easy to follow and the remaining 1 (12.5%) is neutral.

The worst results being on the “easy to follow” question can be explained by the time constraints for the workshop (only one hour), which did not allow for detailed explanations of all topics. However, overall the workshop was mostly perceived positively.

Question 2: I believe the Go-Lab facilities and resources could be an asset in my own teaching.

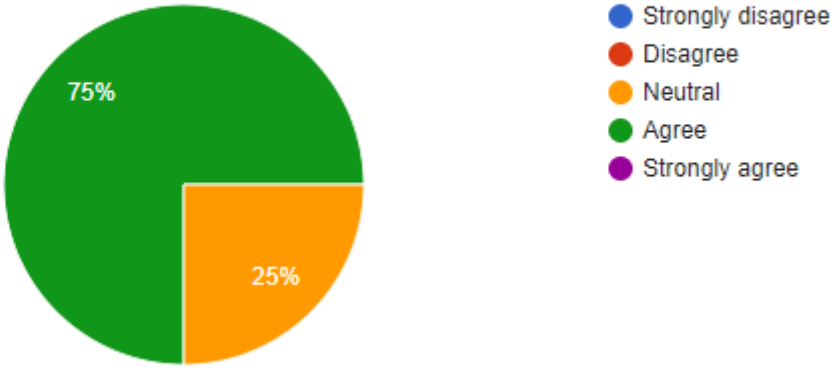


Seven teachers (87.5%) believe that the Go-Lab facilities could be an asset in their teaching (agree) and 1 (12.5%) responded neutral.

Apparently, the workshop was successful in conveying the benefits of Go-Lab for the lessons of the teachers.

Question 3: I think that my pupils could benefit from using Go-Lab.

8 responses

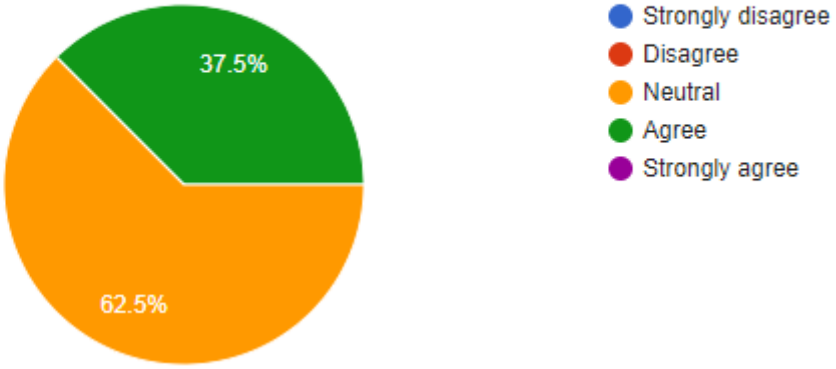


Six teachers (75%) believe that their students could benefit from using Go-Lab and 2 (25%) responded neutral.

The responses to this question are similar to Question 2, showing that teachers see the benefits of Go-Lab for students.

Question 4: I am interested in writing my own ILSs for use in my teaching.

8 responses



Three teachers (37.5%) are interested in writing their own ILS for use in their teaching (agree) and five (62.5%) responded neutral.

We think that interesting more than a third of the participants in writing their own ILS after a really short introduction to the Go-Lab system is a good result. However, with nearly two third of the teachers not being convinced to apply Go-Lab by creating their own ILS, there is room for improvement in further workshops or in follow-up events.

Question 5: What parts of Go-Lab seemed to be most useful to you?

- Animations

- Some of the simulations look reaally good - especially if you don't have the ability to perform the experiment yourself
- Simulations
- the animated investigations
- Building circuits
- The interactive parts for students
- lab simulation

The aspects of the Go-Lab ecosystem that seemed most useful to the teachers are the simulations.

Question 6: Do you have any suggestions on how to improve the system?

- Not had enough time as yet to comment
- Quite difficult to navigate around
- doesnt seem very straight forward
- It appears quite complex to build a lesson
- Is there anyway that go labz and graasp could be one system, it seem laborius to always have to log on.

The main complain about the system is its complexity. This can be explained by the short time span available for the workshop and thus explanation of the system. However, a helpful comment that could be picked up is a single sign on for Go-Labz and Graasp.

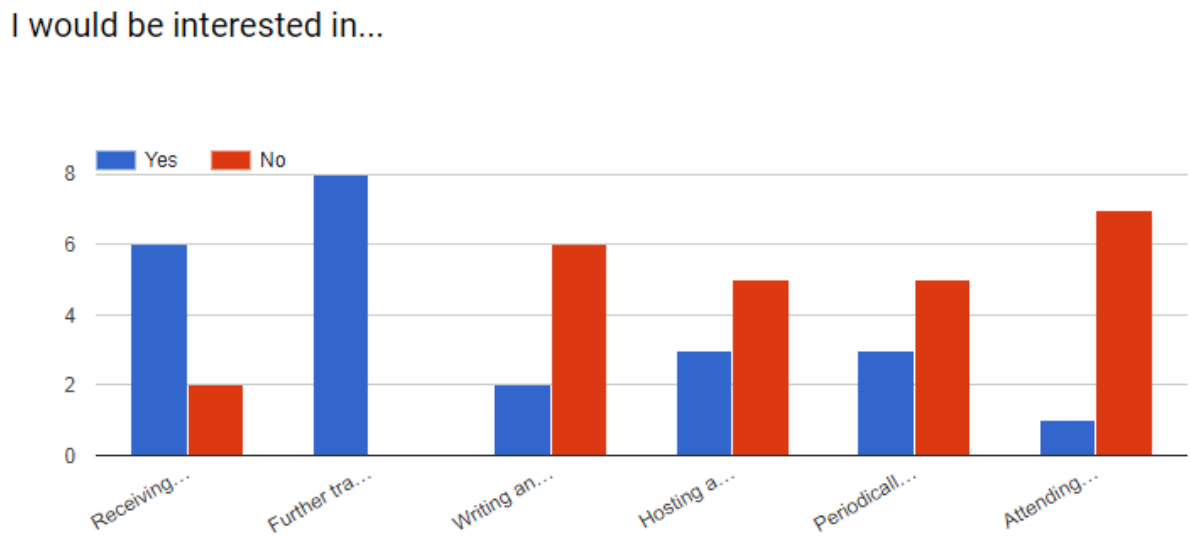
Question 7: Is there anything you would like to have in Go-Lab that you haven't seen?

- Not had enough time as yet to comment
- specifically matching to the AQA units to safe time
- haven't had a thorough look yet
- A way for students to submit their work or see how far they have reached through the task, like a progerss bar.

It is already possible in Go-Lab to include a progress bar, there was just not enough time during the workshop to show this.

Question 8: Further interest in Go-Lab

Eight teachers provided their name and email address to indicate further interest in the Next-Lab project (details not listed here due to privacy).



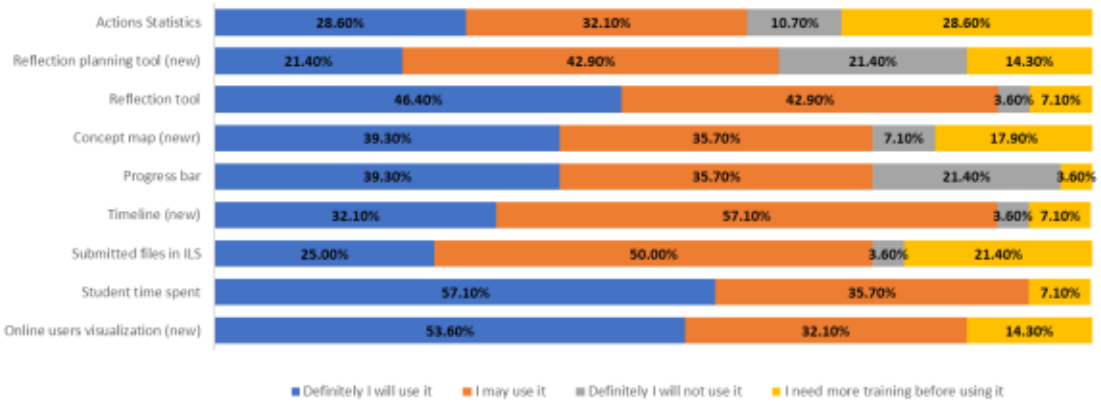
- Receiving Go-Lab news via email
    - 6 Yes
    - 2 No
- Further training opportunities
    - 8 Yes
    - 0 No
- Writing and delivering my own online lesson (ILS) with support from the team
    - 2 Yes
    - 6 No
- Hosting a Go-Lab event for teachers at my school
    - 3 Yes
    - 5 No
- Periodically providing teacher expertise and feedback on specific Go-Lab facilities
    - 3 Yes
    - 5 No
- Attending a winter or summer school (event for teachers)
    - 1 Yes
    - 7 No

A summary of this workshop can be found in Section 4.2 and a summary of the results is presented in 7.2.1.

C. Face-to-Face User Studies: Workshop - Learning Analytics Apps/Why, when and how to use them?

Go-Lab LA apps

For each of the following Go-Lab LA apps, please indicate whether you are willing or not to use it in your ILS(s).



Please comment below on your most liked and most disliked LA app.

1	Most liked LA app: progress bar Most disliked LA app: Concept map
2	online users visualization
3	aggregated concept map, I think it will be nice to have it shared online with the students, so they can see how they are working as a group. It reminds me of the answergarden web tool. Reflection planning and progress bar, I don't see their relevance (I might need more examples of their use to understand how I can use them in my ILS)
4	I like the visualization the most, because it is easy to see where the children are. I do like the concept map, but I do not like it for primary school because I don't think it is really childfriendly. I like the reflection planning tool, but not for primary school children in the age I am teaching.
5	I like most the student time spent -app. It's easy to interpret the data, it gives real-time data and data from the past. I don't understand progress bar -app. Student can't know at which point he/she is on the ILS since the phases that are still coming aren't known.
6	I like the reflection planning tool, because students have to think about their own planning and how much time they will spend on each phase. I do not know if students will use the progress bar and if this will work for them.
7	Progress bar is useful.
8	I think I will be using quest as reflective questionnaire, but I can`t see much use for the LA apps at the moment at my job. I feel like I get more important "data" by being in contact with the students while working with them in ILS.
9	Online users visualization is the one I most liked, the one I think is not really necessary is progress bar.

10	action statistics: this app enables me to monitor students' time spent on each phase of the ILS
11	Most liked: Online users visualization. To see where they are to be able to give individual or whole-class support. Most disliked: reflection planning tool: too hard yet for my 3rd grade class.
12	reflection tool / planning tool efficient for student and teacher and also "management" timeline provides a perspective of student behavior
13	Don’t have enough experience using them.
14	Liked most concept map, reflection tool, online users visualization.
15	The aggregated concept map is the one I really liked the most. It is very helpful to have your students views automatically combined to one place. On the other hand, I think the Reflection planning tool is something I would not really use in a classroom setting, because I think that it mainly concerns distance and adult learning scenarios
16	I like the Online users visualization and Progress bar. I disliked the Concept map (not operational like should be.
17	l liked most the concept map and the student time spent apps.
18	I really like the online users visualization, student spent time and the actions statistics. I think concept map should be improved, I'm not sure that will be working with the whole class.
19	I like the reflection tool, because students can immediately reflect on their progress. There is no app that I dislike.
20	Reflection Tool is good. Also, time spent. But I have to say that I have not tried them all yet.
21	I like Online users visualization most, and the aggregated concept mapper is great, too

Please describe below what other analytics you would like to add in the teacher dashboard.

1	I would like to be aware whether they have watched the whole video or skipped it
2	I don’t know another tool, but I would like it if the tools were more child friendly, more colors, bigger click buttons.
3	the average time of all the students
4	It would be good to have revise tool where are automatically the correct answers.
5	I would like to add a rubric which I can evaluate my students.

6	time line
7	No ideas yet, but to use the concept mapper in primary school I would like to let the children make a kind of mind map with colors (and may be drawings).
8	On quiz the number of tries before reaching the good answer
9	Analytics about the correct or wrong answers of students, in real time.
10	I would like to have an app where I can see the total work of the students to evaluate (quantitative results).
11	Maybe a good idea would be to show to teachers in real time the results.
12	I would like and app that could give me feedback in real time quantitative results when using a quiz with closed questions (multiple choice). I think it will be also useful if I can do the download of the whole entries of my students in a report. Maybe students can answer a similar quiz in the end of the ILS to compare the results (pre-quiz /pos-quiz).
13	I will think about that
14	I cannot say that

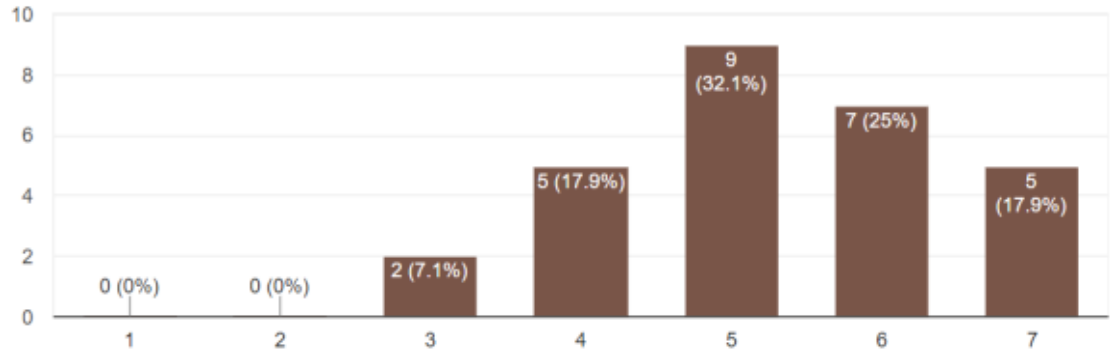
Please describe below what other analytics you would like to add in the student dashboard.

1	I would like to have them see their time spent in each phase, so they are aware whether they are doing it correctly
2	same answer as 3
3	the average time of all the students
4	The same.
5	Easy tools for students to reflect on their work and ideas. Tools to plan their work and support metacognitive skills.
6	I would like to add a rubric which I can evaluate my students and then they can see my feedback.
7	one app where students click to check that they have already finished
8	no ideas yet
9	comparative data between the student and the average (or median which would probably be better) value of the class
10	Analytics about the correct or wrong answers of students, in real time.
11	A app where the students can see his ranking (quantitative results).

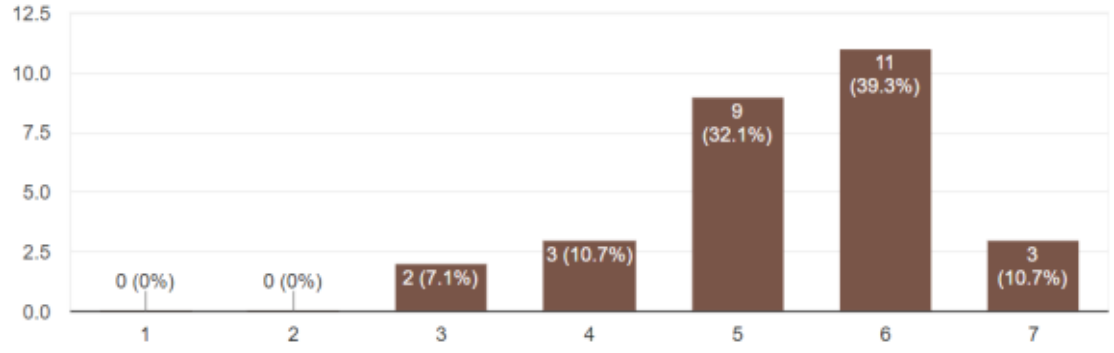
12	A more tool about angement after many times of entering into ILS by not using different usernames.
13	I think it will be useful having the same app closed questions (quantitative results) to students. These results could be given at the end of the ILS as a report.
14	I will think about it
15	When I open the link, the new thing should open in new page. Then it is easier to follow where am I when I cannot finish the previous action. It is suggestion for today's presentations too.

For each of the following statements, please indicate your extent of agreement by clicking the number of choice.

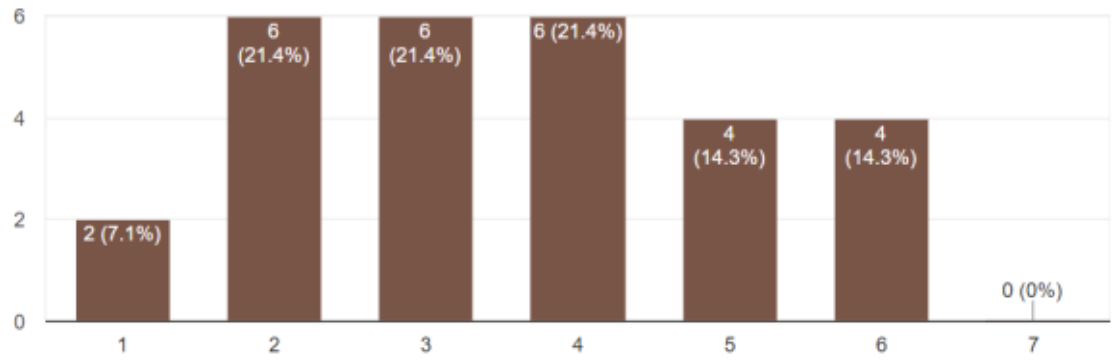
The Go-Lab LA apps meet my requirements



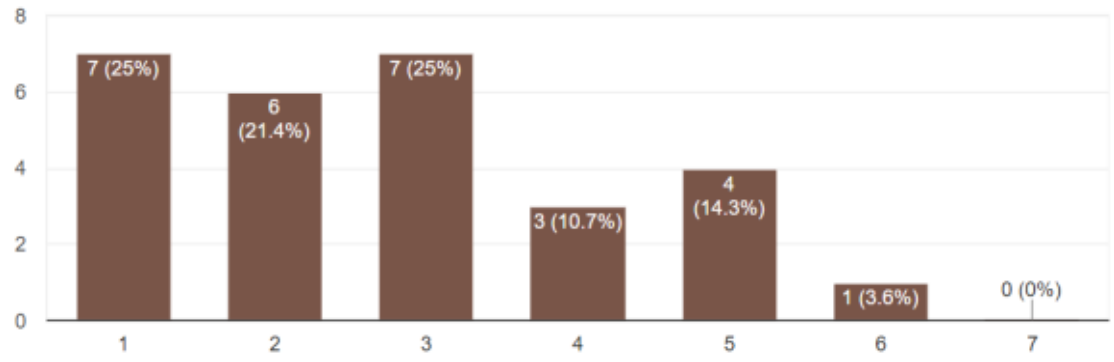
The Go-Lab LA apps are well-structured.



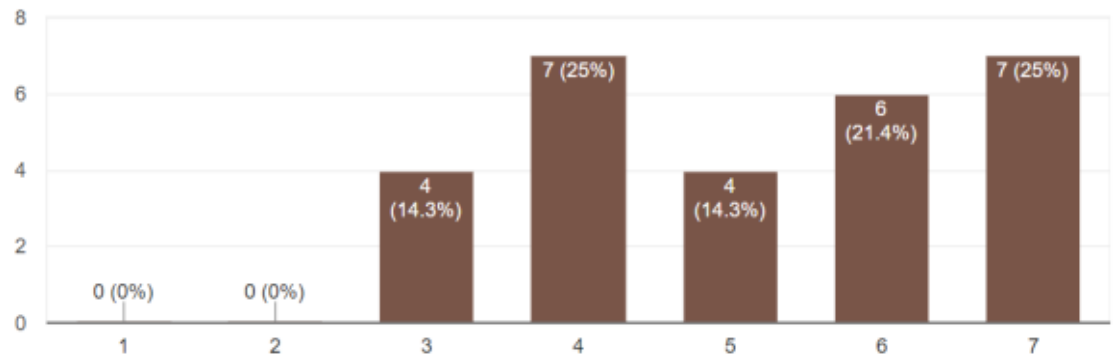
The Go-Lab apps are difficult to use.



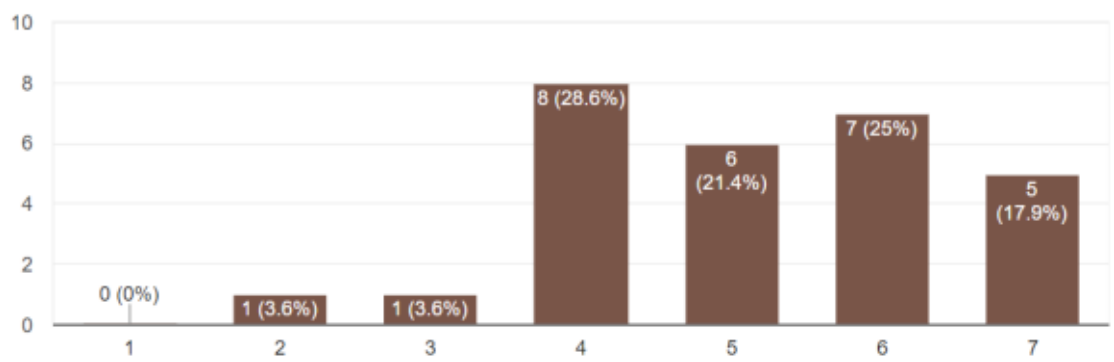
The Go-Lab LA apps are impractical.

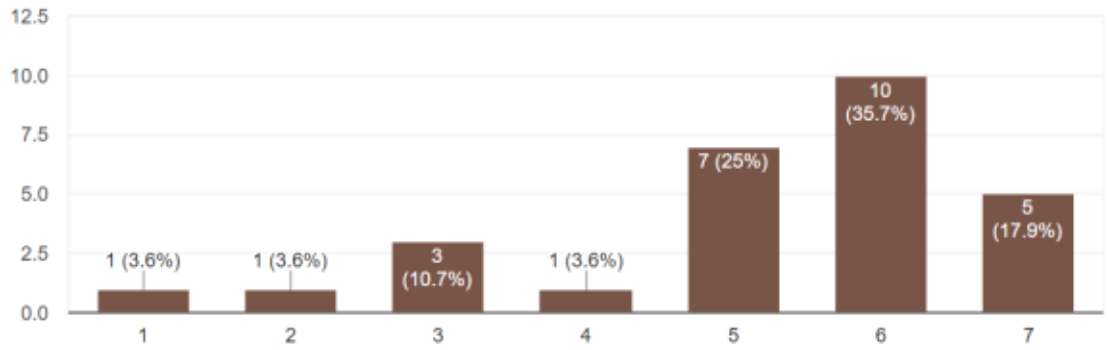
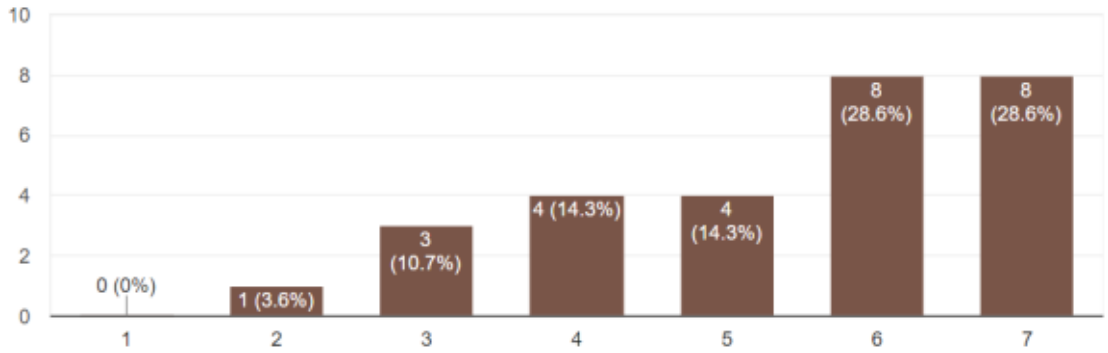
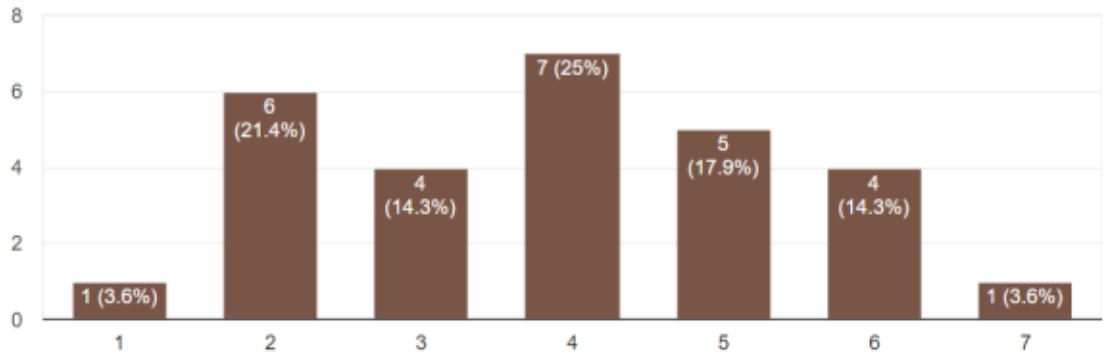


The Go-Lab LA apps enable the diagnosis of student performance.



The Go-Lab LA apps enable the timely provision of teacher feedback to students.



The Go-Lab LA apps help me adapt instruction to student needs.

The Go-Lab LA apps are of high educational value.

The Go-Lab LA apps do not facilitate face-to-face interaction.


Online Users Visualization and Timeline

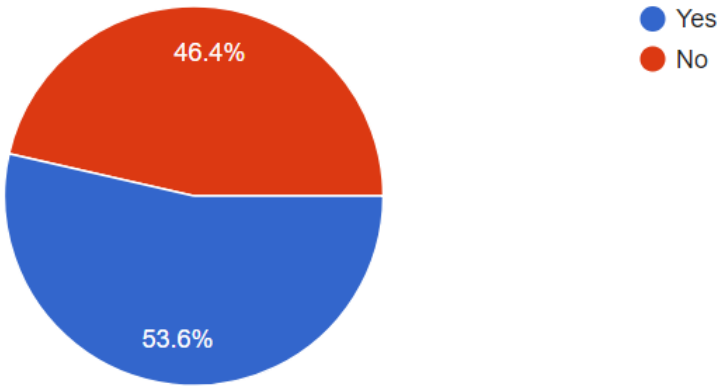
Online users visualization

If you click on one of the students (on the corresponding circle), what information would you like to see about that student?

1	time spent, phase he is at, % of completion of each phases
2	if the student needs help and if the student is working. It would be nice if i could see if the students have a question,

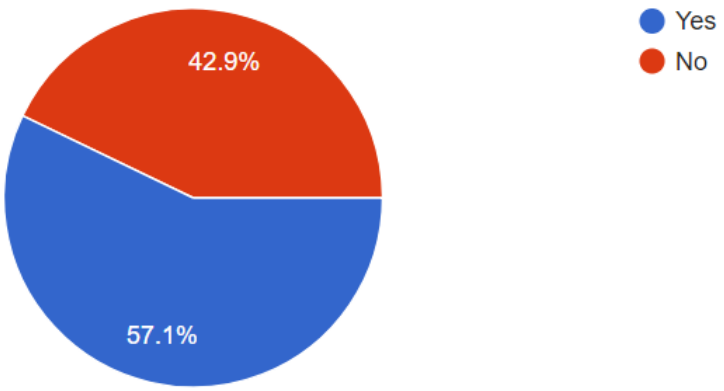
3	What the student is doing at the time.
4	The students response.
5	His answers, the word he has written.
6	theirs answers
7	Time per phase. Answers they've filled in.
8	How many things have they filled in as a percentage of all the apps that can be filled.
9	The answers of student, the time that spends in each space.
10	The timeline; his work; his scores of the quiz.
11	About time spent and engagement to each part of ILS.
12	I want to see the content of the student's entry, time spent in each part of the ILS.
13	Where the student faced difficulties or problems.
14	what is problem for him/her
15	stage, time spent, link to their view of ILS

Should there be a student view of this app?



Timeline

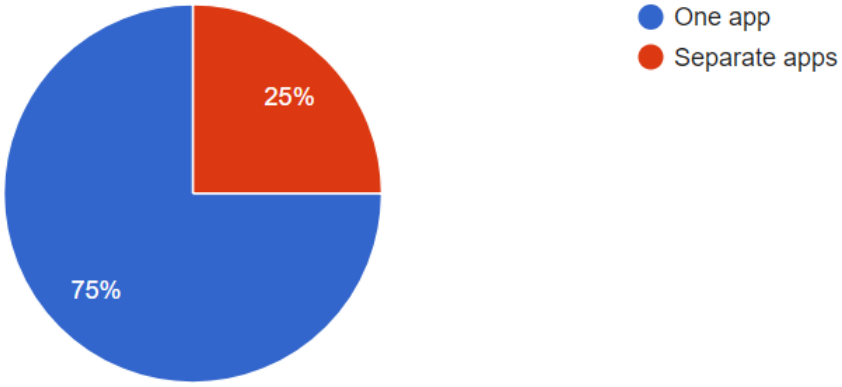
Would you like to display app activity on the timeline?



If yes, what sort of information would be valuable? (e.g. time spent on app, number of actions, etc.)

1	time spent
2	actions and if they have a question
3	I'm not sure is that valuable. Students do many things (scroll the phase, apps, labas) simultaneously. Thus, the data we get is difficult to interpret. Better tho keep it simple.
4	what they did in a phase
5	time spent on app
6	time distribution
7	time spent, number of cycle drop-off-return
8	The visualization of the time spent on app help students to manage your own time.
9	The time of spent.
10	relative progress of any student and the mean of the class
11	All the proposed
12	all the above
13	The specific time the student started the app along with the time spend. Fort example, if a student uses an app for 2 minutes, then moves to the next phase and then come back to the previous app for another 3 minutes, instead of only stating that the student used the app for 5 minutes it would be good to say for example 10:00-10:02 (2 minutes) 10:10-10:13 (3 minutes) Total time spent: 5 minutes
14	I am not sure about that. There was no button I do not know

Should the timeline and the online users visualization be one app or separate?



If you have any other comments, questions or concerns about online users visualization app and timeline app, please feel free to note them down below.

1	I need more hands-on experience and guidance to learn more about these apps.
2	Online users can be a stimulation to collaborative work It might propose to create a "labile" chat with co-workers
3	The answers to many of those questions have little value as we may expect that most teachers don't have extensive experience to draw conclusions
4	no, thanks
5	For me it is time to do homework ;)

A summary of this workshop can be found in Section 4.5 and a summary of the results is presented in 7.1.6.

D. Input on Concept Mapper and Concept Mapper Dashboard from Booklets annotated during the PD workshop with Ambassador Teachers as part of an Ambassador Teacher weekend event in Brussels (LEIC-09122017a)

Comments in square brackets were added to describe drawings or make comments easier to understand:

- Booklet 1:
  - Concept Mapper
    - [Arrow from eraser and undo icon to comment]
      Can students also choose their own concepts?
      [This seems to be a comment related to the old way of adding concepts, where the concept was dragged onto the concept map from this position in the menu instead of creating a new concept by just clicking anywhere in the empty space of the concept mapping area.]
    - [Circle around target icon  to center the concept map on the screen and arrow to the comment]
      I love this option
    - [Arrow from map icon  to comment]
      great IDEA
    - I would like to choose for a arrow without putting | choose text in between
    - [Comment next to the selected map icon ]
      great ideas
  - Concept Mapper Dashboard
    - [Circle around column label “Degree” with arrow to comment]
      I don’t think it’s useful! A lot off if a students just makes links the degree will go up? But it doesn’t have to be correct.
    - [In the view that shows the concept map of a single student, after highlighting his name in the table]
      this nice to see this view!
- Booklet 2:
  - Concept Mapper
    - [Arrow from map icon  to comment]
      Teacher needs to check what students are writing in their concept map before this being made available to other students
- Booklet 3:
  - Concept Mapper
    - I think that you have to provide the both version of concept mapper. Some users are already familiar with the previous one!
    - Please use Google Forms for this kind of feedback!
      [Comment regarding the PD method using booklets rather than a comment on the Concept Mapper]
  - Concept Mapper Dashboard

        - I don't like this at all! This kind of approach missing the main point of concept map creations!
- Booklet 4:
    - Concept Mapper
        - Next time could you please use some other forms to write feedback?
          [Comment regarding the PD method using booklets rather than a comment on the Concept Mapper]
        - Both concept mappers should be provided.
    - Concept Mapper Dashboard
        - I don't like it, because I don't see much point in using this.
- Booklet 5:
    - Concept Mapper
        - [Tick mark next to concept map]
        - [Arrow from line between the concept "class" and "geometry", where the participant added an arrow head pointing towards "geometry"]
          Arrows can be shown
        - [Three arrows from the lines between concepts]
          Name (Label) of relation
    - Concept Mapper Dashboard
        - [Arrow from line between the concept "John" and "maths", where the participant added an arrow head pointing towards "maths"]
          Arrows can be shown
          [2x]
        - [Three arrows from the lines between concepts]
          Name (Label) of relation
          [2x]
        - [Circle around "Degree" information]
        - [Tick mark next to concept map]
- Booklet 6:
    - Concept Mapper
        - I have never used digital concept map. To me it looks awesome especially to check their conceptual understanding. I wonder if the students can add their own words? And if yes, is it possible for the teacher delete those words, in case some student use a word that can take the whole class off the topic. So, I'd like to have editing 'power' to keep control.
    - Concept Mapper Dashboard
        - Degree is confusing and don't find it necessary.
        - I like how we can connect and check each individual student
- Booklet 7:
    - Concept Mapper
        - Very useful
          [2x]
    - Concept Mapper Dashboard
        - Very useful for teachers
        - Very useful
          [highlighting of single student's map in aggregated concept map]
        - Very useful
          [concept map of single student]
- Booklet 8:

    - Concept Mapper
        - [Arrow towards the target icon  to center the concept map on the screen]
          Great
        - [Arrow towards the link connecting “geometry” and “teacher” with the label “taught by a”]
          arrow without Text not possible
        - [Arrow from map icon  to comment]
          Problems with Edge and Firefox
    - Concept Mapper Dashboard
        - [Arrow towards the selected map icon ]
          perfect
        - [Tick mark under the table]
          Great
- Booklet 9:
    - Concept Mapper
        - Comfortable tool, the older option with arrow that connected between 2 characters without other words was better you could grab it and that works. Now you must be very specific.
        - Very useful and good tool.
    - Concept Mapper Dashboard
        - Good feedback for the teacher about student’s conceptual map. #C , #L > what for? Degree - maybe won’t be used by teacher.
- Observer Notes
    - Concept Mapper
        - The map icon  did not work for one teacher on Edge and Firefox (newest version of the latter, freshly installed)
        - Teachers raised the general question: What’s the point of a concept map? => We let other teachers who used it before share their experiences.
        - For chemistry subscript and superscript need to be supported
        - Question: What is the point of the “Degree” value?
        - The aggregated concept map was not shown for one teacher in Edge and Firefox
    - Concept Mapper Dashboard
    - Others
        - Check out Nearpod.com for future data collection (whiteboard functionality: draw on picture)

A summary of this workshop can be found in Section 4.3 and a summary of the results is presented in 7.1.1.

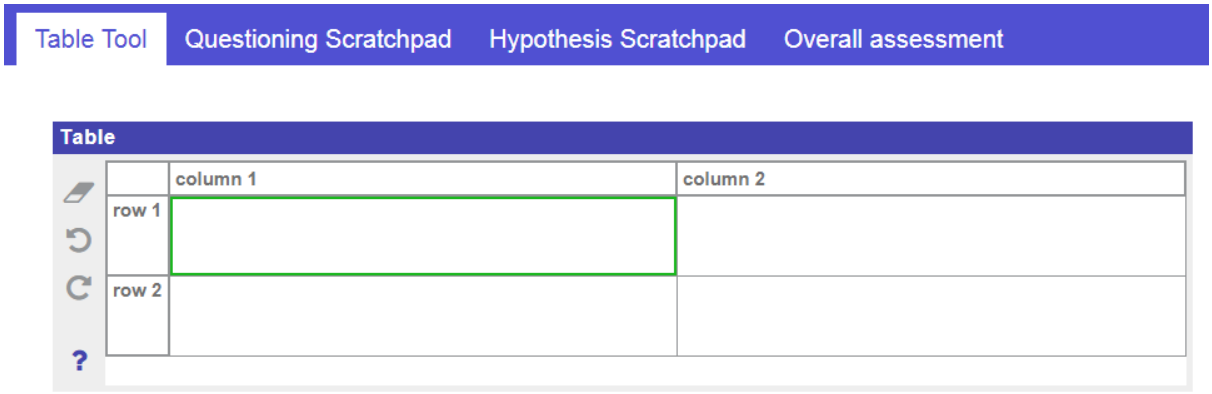
E. Discussion of StudentWork Viewer at PD workshop for Ambassadors (LEIC-09122017b)

The conversation with the group was recorded as follows:

- After showing to teachers how to visualize content created by their students (e.g. Upload -> sees all – dropfile) participants agreed that the standalone view does not need improvements for the Hypothesis and Table Tool apps.
- Most of them (8) thought that the visualization works fine as it is designed now, but maybe creating reports would be helpful for them to assess their students. (That is, having all answers in one document).
- 9 participants thought a solution would be to have answers in a printable table only with information added/filled in by the students organized by phase. For example, having in the report just the hypothesis (input) instead of including the whole app (other terms, etc.)
- Participants want to have the option to select either one or all students.
- For the filedrop to visualize the actual file as a small image instead of a link.
- Printing does not seems necessary for every teacher.
- Although there was no full agreement on this, teachers seem to think that having results by students is more useful than by apps.
- Teachers refer to the need of having automatic marking.

A summary of this workshop can be found in Section 4.3 and a summary of the results is presented in 7.1.2.

F. Input collected on Table Tool, Questioning and Hypothesis Scratchpad at the Ambassador event (LEIC-09122017c)



1. Teachers should be able to create rows without a name (in the first column).

- Strongly agree (4)
- Agree (11)
- Neutral (2)
- Disagree (1)
- Strongly disagree (0)

In the table tool...

2. Teachers should be able to restrict the content students can enter into cells (e.g. only numbers, in a certain range; only text, with a maximum length, certain words; ...)

- Strongly agree (3)
- Agree (12)
- Neutral (2)
- Disagree (1)
- Strongly disagree (0)

3. Teachers should be able to change the name of the table

- Strongly agree (5)
- Agree (8)
- Neutral (4)
- Disagree (0)
- Strongly agree (5)

4. Students should be able to specify row names.

- Strongly agree (4 students)
- Agree (7 students)
- Neutral (3 students)
- Disagree (2 students)
- Strongly disagree (0 students)

5. Students should be able to specify column names.

- Strongly agree (3 students)
- Agree (7 students)

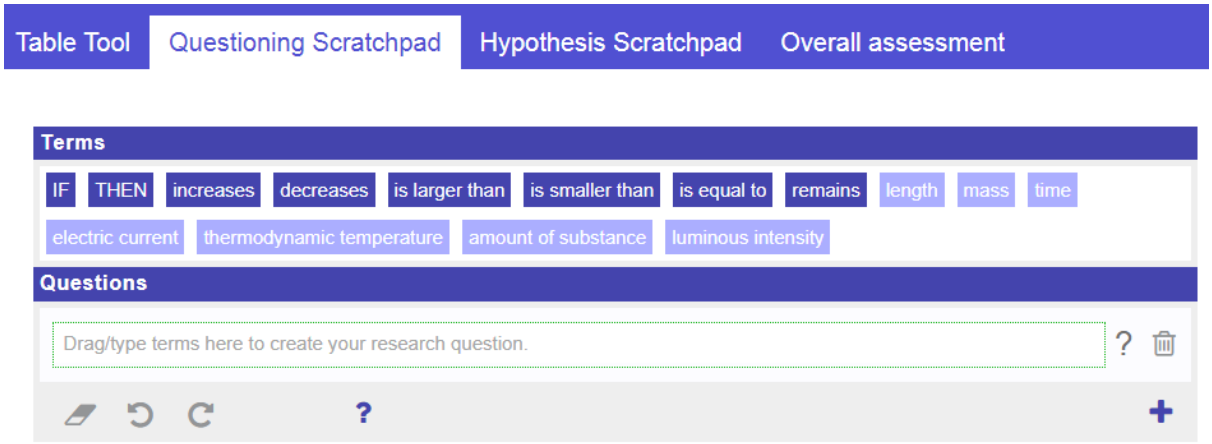
- Neutral (4 students)
- Disagree (2 students)
- Strongly disagree (0 students)

6. Students should be able to add new rows.

- Strongly agree (3 students)
- Agree (8 students)
- Neutral (6 students)
- Disagree (0 students)
- Strongly disagree (0 students)

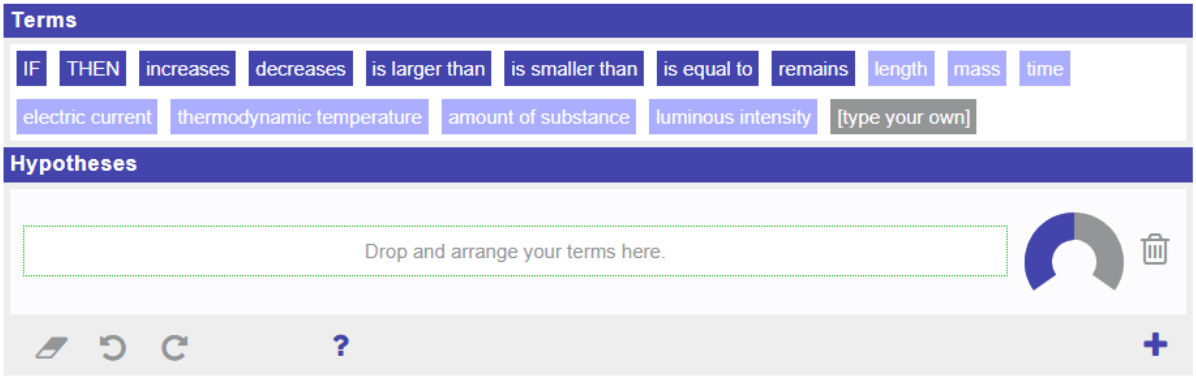
7. Students should be able to add new columns.

- Strongly agree (3 students)
- Agree (8 students)
- Neutral (5 students)
- Disagree (0 students)
- Strongly disagree (0 students)



Which changes have you noticed between the previous and current versions of the Questioning Scratchpad? Do you consider them to be improvements?

- different colours
- Colour stress for main and second important words. Yes it is improved.
- Type their own words? Drag and drop zone...
- I like but I have not big experience with it.
- I don't use this app
- No.



Which changes have you noticed between the previous and current versions of the Hypothesis Scratchpad? Do you consider them to be improvements?

- Drag and drop...
- I don't use this app much
- No
- to saw the hypothesis

Overall I prefer the…

1. Table Tool

- Previous version (0 students)
- Neutral (4 students)
- Current version (8 students)
- I have not used the previous version (1 students)

2. Questioning Scratchpad

- Previous version (1 students)
- Neutral (5 students)
- Current version (6 students)
- I have not used the previous version (1 students)

3. Hypothesis Scratchpad

- Previous version (0 students)
- Neutral (6 students)
- Current version (5 students)
- I have not used the previous version (1 students)

Please elaborate on your selection above, e.g. what do you like better in the tool you prefer or what could be improved in the tool you like less.

- ?

Do you have any improvement suggestions for the reworked versions of these 3 apps?

- I would like the students to be able to create their own table, not just add rows or columns. I would also like to control width of cell.
- No

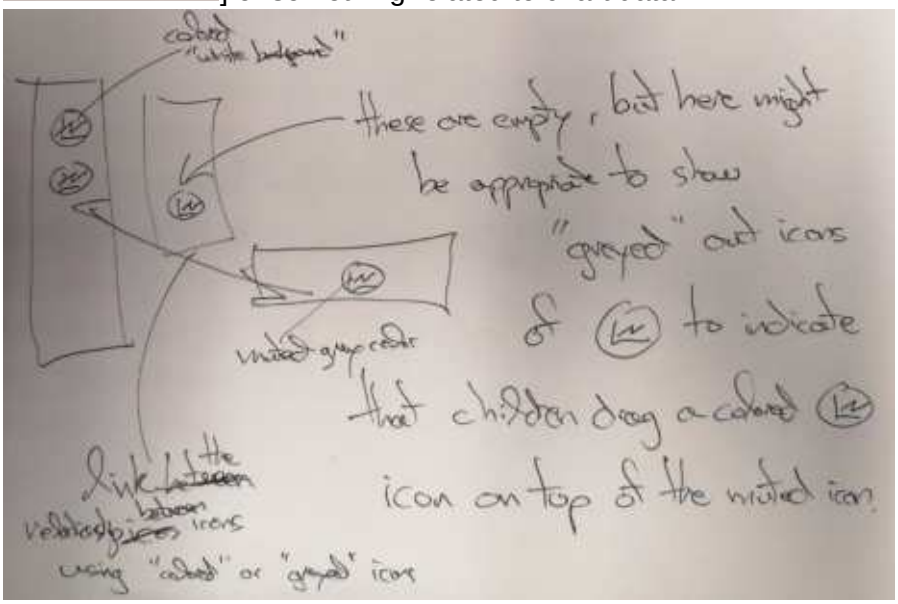
A summary of this workshop can be found in Section 4.3 and a summary of the results is presented in 7.1.3, 7.1.4, and 7.1.5.

G. Booklet data and observer notes from PD workshop at the Go-Lab Spring School (LEIC-25042017b & c)

The following is a transcription of the comments (content in square brackets are comments by the person transcribing the notes, for example to describe drawings).

- Booklet 1:
  - General
    - [Drawing of “Go to next page” icon on the bottom of the page] If you have this picture available in the ILS I think you should have a link on it.
  - DataViewer
    - [no feedback]
  - Conclusion Tool
    - [no feedback]
- Booklet 2:
  - General
    - I really like the topic of the ILS. It’s highly motivating, and the information-phase is really nice visually for the students.
    - As in overall with many apps in graasp, I think that the high level of modability causes problems with usability. I think in elementary education the apps need to be little more intutiative (I think of apple usability).
  - DataViewer
    - I find the experiment design and data viewer tools too complex on investigation 2.
- Booklet 3:
  - General
    - [no feedback]
  - DataViewer
    - DataViewer is hard to use. The instructions should be clearier. I couldn’t use it without help.
    - This is a good tool for secondary of high school.
    - There are a lot of features in this DataViewer tool. Maybe more simpel would suit to primary school. Maybe the energy goes using the DataViewer and it’s hard to concentrate on the thing what the students should learn: Drawing the graft and reading it.
    - Of course if the program is familiar this is a good tool.
  - Conclusion Tool
    - [no feedback]
- Booklet 4:
  - General
    - Pictures are ok!!
    - I would make more tabs so students don’t need to scroll down so much.
    - I would make a video with all info (POWTOON), there is much text for 2nd, 3rd graders.
    - [triangle] buttom next to big texts allowing kids to read the text. (I’m assuming this ILS is for 2nd graders)

        - I find this ILS too complicated for 2-3rd graders, I wouldn't implement it unless I cut most of the content. or separate it into different parts.
        - Drea Builder is perfect!
    - DataViewer
        - [no feedback]
    - Conclusion Tool
        - [no feedback]
- Booklet 5:
    - General
        - I'd personally like to use the table tool really often to insert data.
        - The experiment design too is far to complex and demanding for both the teacher and the student.
    - DataViewer
        - Later on it's necessary to also use this [Table Tool] as an input in the data viewer to draw a graph. Right now they are not compatible and a table cannot be imported into the data viewer.
          [Drawing: Please -> 1. Table (with drawing of a table) -> Data viewer (drawing of a graph) -> =)]
    - Conclusion Tool
        - [no feedback]
- Booklet 6:
    - General
        - i tried to click the go to next page icon
        - te confidence meter does not indicate my confidence (or even that that is the function
        - there could be a "working observation, and then under it they are in order of "observing", now they are newest first
    - DataViewer
        - when I dragged the one axis in the Graph I got immediate FB that I did not have enough columns
        - It is not clear to me, why I can have multiple on Y but only 1 on
        - It is off that I can edit my data set
        - I have 12 data points in 3 sets and somehow it is not very obvious how to show them all, or at least 3 different graphs
    - Conclusion Tool
        - [no feedback]
- Booklet 7:
    - General
        - [no feedback]
    - DataViewer

        - (?) icon is not intuitive as representing a data set
          Maybe [drawings of graphs with a circle around them
          
          ] or something related to chart data.
          

        - [Arrow from comment to left folder icon in DataViewer] Can we load data from the TableTool, not just the EDT?
    - Conclusion Tool
        - [no feedback]
- Booklet 8:
    - General
        - [Drawing that visualizes the task of the ILS (Rectangles with 9x8 = 72 cm^2]
    - DataViewer
        - better to see units
        - better to see icons instead of question mark.
    - Conclusion Tool
        - [no feedback]
- Booklet 9:
    - General
        - It would be nice to add a notebook.
        - We started calculating too soon. It was not clear that we had to explore first.
    - DataViewer
        - Very nice app! Combination of math and hypotheses.
    - Conclusion Tool
        - [no feedback]
- Booklet 10:

    - General
        - Hypothesis suddenly requires them to know they have to keep in mind both perimeter and area
          -> a notebook is needed / a tool for it
          -> there is no maximum / minimum width for Stephen, so 9x1?
          -> suddenly marie: square meters instead of length
        - information -> You have to read really good to understand. Maybe give an example first it could be easier for the children.
        - -> in the app there is a game this could be distracting
        - scrolling is hard.
        - first only perimeter / area -> after that add the money -> because we already started calculating while filling in the hypothesis -> too hard
        - nice app
        - compared to the question where they need to multiply with 100 and 150, it is too easy to fill in the experiment design – no lab needed
    - DataViewer
        - nice to get a graph.
        - I was thinking about 1 formula with all variables when I was trying to fill in the hypothesis.
          So it seems like this app does not take everything into account
        - Children need explanation about what the graphs tell them.
    - Conclusion Tool
        - [no feedback]
- Booklet 11:
    - General
        - The hypothesis is difficult because they have to think about the walls and the root at the same time.
          Maybe they only have money for the walls first to make the hypothesis and then they would figure out how much they would need for the roof.
    - DataViewer
        - [Arrow from the comment to the “Edit chart” icon ] The edit gives you a different graph than the one you had. I configured the axis, but it didn’t have effect.
        - Why the [triangle drawn: ] button for “enter”?
    - Conclusion Tool
        - [no feedback]
- Booklet 12:
    - General
        - The “next page” instruction will maybe confuse the children, so that would be more specific by mentioning “go to Investigation 1” for example.
    - DataViewer
        - According to Data graph => There are tow arcive (file) buttons, that might be confusing for kids.
        - According to Data graph (dataviewer): It’s impossible for a kid in age of eight-nine-ten years old to deal with to variables. It would be

nice to have the teacher the freedom to choose how to make the graph and the variables.
        - [Circles around folder icons with lines to another circle that contains a 1]
    - Conclusion Tool
        - According to conclusions: that's confusing and abstract to kids. A nice idea would be a "pop-up" tool of giving in conclusion a quick feedback, like "Well done", "Perfect", "So close", "try again" ….. etc.
- Booklet 13
    - General
        - [Drawing to support solving the questions in the ILS (rectangle with 8 on the left hand side and 9 on the top) +2500 root 150€/m^2 wall 100€/m]
    - DataViewer
        - Possible mistake for the graph tool: There are two icons [drawing of folder], but only the first one will import the data.
        - [Circles around the two folder icons with lines to a questionmark each]
        - [Drawing of a line of dots with the legend at the end, which also contains a dot, with the label Area and has an arrow pointing to it]
        - There could be a mistake in data interpretation because the legent is a dot like the other ones and it is not separated somehow. It would be helpful if there was a square line for example to separate the legend.
        - After pressing the "edit" button [drawing of the Graph edit button ], I could not find the OK to continue. Shoud be located elsewhere (top or bottom right).
    - Conclusion Tool
        - [no feedback]
- Observer Notes
    - General
        - For primary school students it would be food to have a Mindmap version of the Concept Mapper with
            - different colours for nodes
            - lines instead of arrows between nodes
            - icons plus text as labels for nodes
            - nodes that get smaller the further away they are from the initial centre nodes
    - DataViewer
        - [no feedback]
    - Conclusion Tool
        - [no feedback]

The following notes have been taken by Joep van der Graaf during the discussion of DataViewer Tool, Conclusion Tool, and Badges:

General discussion

- No comments

Data viewer

- Appropriate?
    - No, because:
        - Concepts: variables is difficult
        - Children must understand what relations are
        - Graphs are generally difficult
- Like best:
    - Circles with variables to drag to axes
    - Ability to load your own values and data
- Things to improve:
    - Limit the number of graphs that can be created to one
    - Starts the axes at zero (not at where data starts)
    - Bar graphs have values on the axes that do not always match the value of the bar
        - Solution is to place values underneath each bar
    - Do not present values with decimals when the input values do not have decimals
    - Only use numbers
    - Allow external data, like Excel, to be loaded
    - And allow export of data to formats like Excel
    - One variable on one axis (and not more than one variable)
    - Or predefine that graphs and their axes
    - Limit the number of choices (this is handy for all apps)
        - This helps the teacher and the students
        - Create some predefined apps that are easy to use for beginners; then the can continue with more advanced apps
            - For both students and teachers
        - For example software for music and photos: light and extensive version
            - Suggest to upgrade when certain issues pop up
    - Create two versions: easy and difficult
        - Easy has only the simple graph types
    - Some say ‘line graph’ is confusing, some say it does not harm
    - Create a tutorial for reading graphs (using the data viewer)
    - Automatically load data in the viewer (if there is data)
    - OK button (Joep: which OK button?) on bottom left should be moved and move options to the right side
    - Input of data viewer comes from EDT
        - Therefore, results should be correct. Thus let EDT provide feedback
        - EDT can be simplified
            - Fewer options so it looks more like the table tool
                - Just two columns where numbers can be entered
                - Without all options like ‘constant’
        - Make EDT and data viewer compatible
    - Folder-icon should be changed (there are two)
    - Change the name to graph tool
    - Question mark option does not show a question, but should be an answer or a word in a circle or an exclamation mark

Conclusion tool

- Appropriate? Half say yes, half say no
- Like best:
    - You can see the hypotheses
    - You can load data
    - Clicking on the hypotheses and then comment on it
- Things to improve:
    - Simply show all possible data resources when loading data and not first whether it was a graph or an observation
    - Provide feedback on whether the student did well
        - But teacher feedback does the job
        - Some want real-time feedback
        - Feedback can be “you did it: you found the correct dimensions” or “try again”
        - Make it something teachers can define: if correct, then provide feedback A. If incorrect, then provide feedback B
        - Allow a rating to be given to the conclusion (like a grade)
        - Joep: then there was more discussion about whether this is the goal of the app or not, because there is also a teacher feedback tool
        - Export the content of the conclusion tool for feedback purposes
    - Try pop-ups (with an avatar), because not all content can be seen, due to scrolling
    - Make the appearance less abstract and complex
        - Add colours
        - Offer less features
            - Or do a walk through with pop-ups
            - Where you make one thing bigger
            - Like clicking on the hypothesis, then a pop-up shows
    - Show it when a conclusion was created, like a tick box
    - No need for data and time
    - Change the name of the app
        - Like ‘what have you learned’
        - Also for the hypothesis tool (and all tools)
            - Let teacher create own title, but provide a suggestion

Badges

- Most know that there are badges, but some do not
- Create badges for students
    - If a quiz was scored well
    - If they helped others
    - If they practiced
    - If they participated in class
- Student dashboard with collection of badges belonging to their work
- Allow teachers to customize student badges
- Relate it to an account in go-lab, but it is also okay to have badges based on an ILS
- How to collect it?

    - Create a vault for badges
- See teachers badges when you search on go-lab
- Opt-in because some do not like this competition
    - For both teacher and student badges
    - Allow badges to be hidden
- Create two types for students: One for the work done in an ILS; this badge can be lost after completion. One for competence in ILS; this badge can be saved
- Students and teachers should know when badges are awarded
- How long can you keep the badges? Forever, or 3 years?
    - Add data and name on badge
    - Make the badge downloadable
- Some do not like the idea of badges, because inquiry learning is based on the will to learn and it seems to contradict with the badges. It feels like an other system

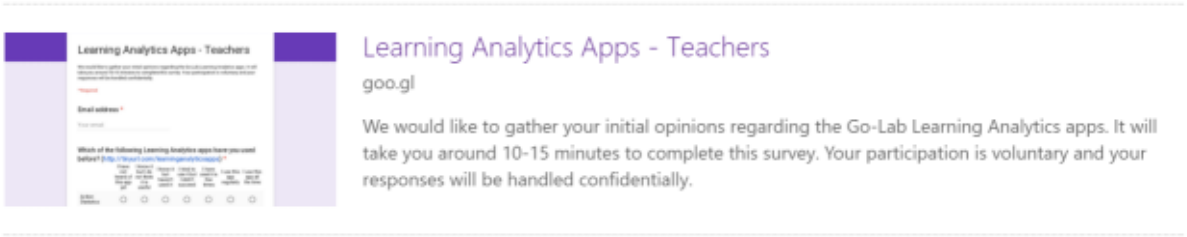
A summary of this workshop can be found in Section 4.6 and a summary of the results is presented in 7.1.7 and 7.1.8.

H. Email for CGT: LA apps for teachers (LEIC-01092017)

Dear Next-Lab core group and PD teachers,

Thank you very much to all of you who gave feedback on the scenario integration using PDotCapturer. If you have not done so yet, but would find the time, feel free to still provide your input, more feedback would be helpful and much appreciated.

This week we would like to gather your input on your use of Learning Analytics apps in your ILS, as a teacher. To do so we have created the following questionnaire: https://goo.gl/forms/TIc0AwyDChNpwqN23 .



If you have any additional comments regarding Learning Analytics apps for teachers that are not covered in the survey, please email them to us!

If you could please respond to the questionnaire by September 11th, that would be great and much appreciated!

Thanks for your support,

Matthias, for the University of Leicester team

This activity is described in Section 5.1 and a summary of the results is presented in 7.1.6. Details can be found in Appendix I.

I. Results of CGT task on LA apps for teachers

Which of the following Learning Analytics apps have you used before? (http://tinyurl.com/learninganalyticsapps)

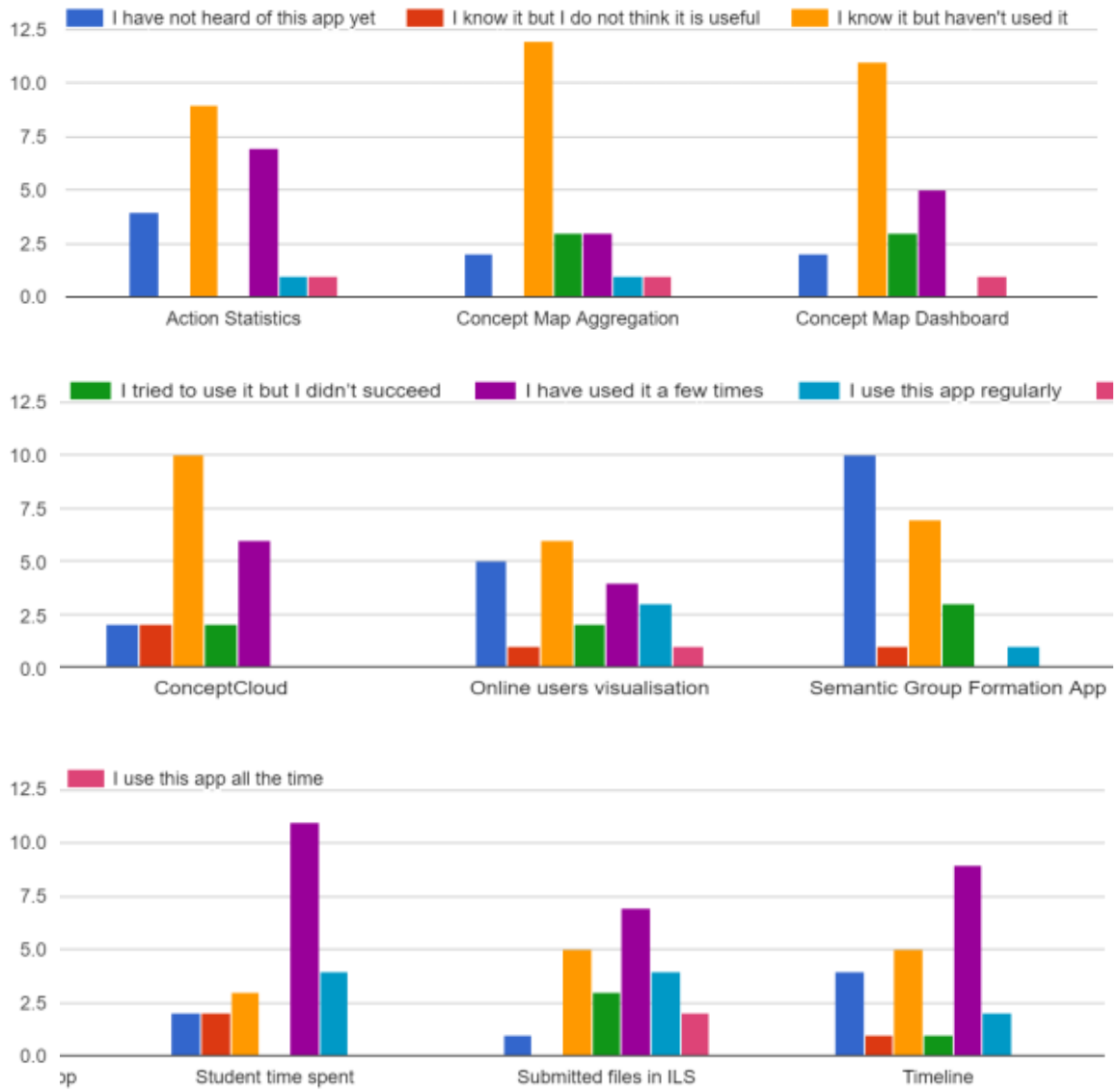


Figure 18. Responses regarding usage of LA apps for teachers (n=22).

For what purpose do you usually use learning analytics apps?

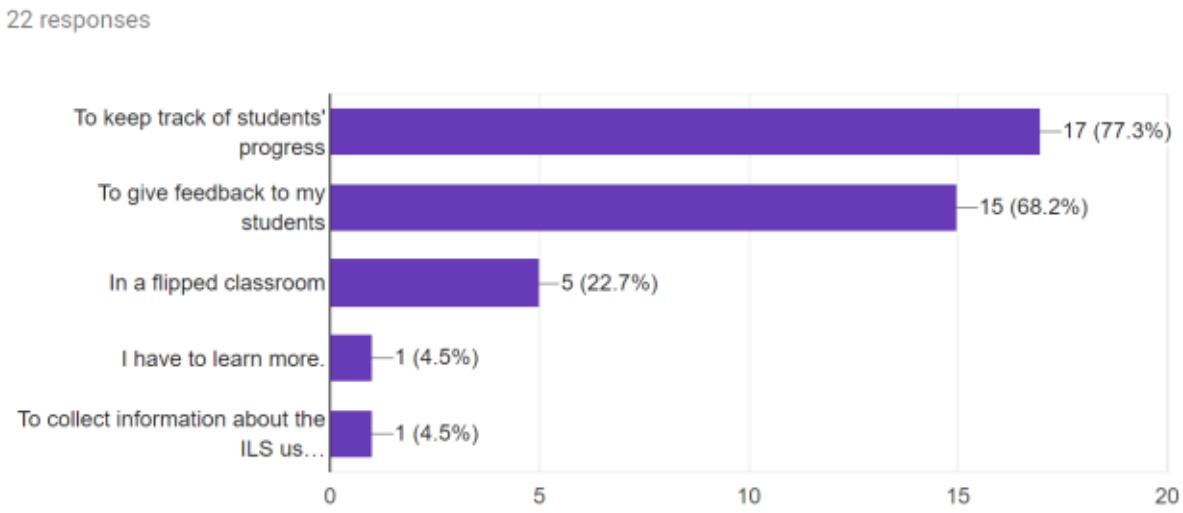


Figure 19. Purpose of LA apps for teachers (size of bar shows number of responders picking this option; n=22, but several options could be picked).

The answer option abbreviated in Figure 19 is “Other: To collect information about the ILS use in order to improve it”.

Are there any teachers' needs that are not covered by the existing LA apps?

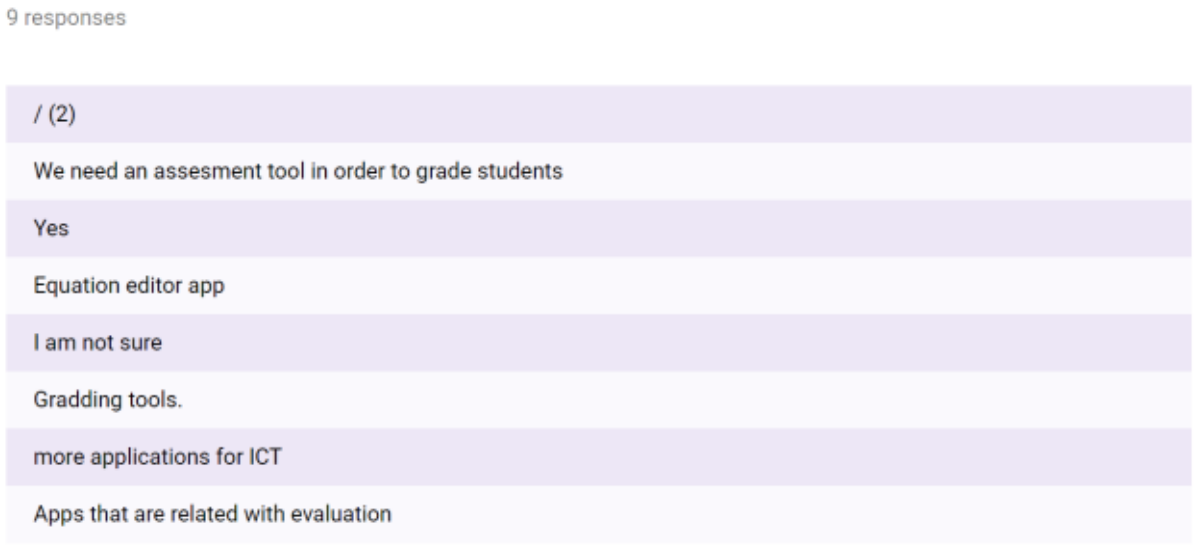


Figure 20. Responses to the question regarding teachers’ needs not covered by LA apps.

Do you have any ideas for additional LA apps for teachers?

11 responses

/ (2)
No (2)
A grading app is nessesary.
Equation editor app
apps that will common for teachers' and students' assesment
Prloblem Based Learning tools
The possibility to collaborate with others teachers for creating more applications ICT
Just one suggestion (I have no idea how complicated that may be) I'm not specially interested in the time students have inverted in every steep, but I may be interested in knowing which steps they have finished... if they had some kind of "tick box" they can mark when they consider they have understood and done one activity, I would love to know where is every user.
App to creat tests to be used in the ILS and students responde and in the end they Will no the evaluation

Figure 21. Responses to the question regarding ideas for additional LA apps for teachers.

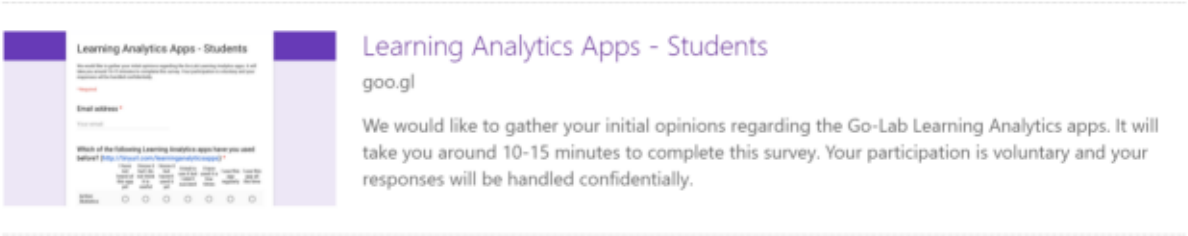
This activity is described in Section 5.1 and a summary of the results is presented in 7.1.6. The email can be found in Appendix H.

J. Email for CGT: LA apps for students (LEIC-15092017)

Dear Next-Lab core group and PD teachers,

Thank you very much for all of you responding to the last task. The results show that all but one Learning Analytics (LA) app for teachers have been used a few times by one third and are known but have not been used yet by two thirds of the respondents ("Semantic Group Formation" being one exception, which is known but has not been used by all respondents and "Online users visualisation" being the other exception with a third each for these two options and a third knowing it, but thinking it is not useful). It would be interesting for us to know why you used them or why you have not used them yet, despite knowing about them, and even more why you think that "Online User Visualisation" is not useful. If you could drop us a short email explaining that, then this would be very helpful and much appreciated.

After asking about LA apps for teachers in the last task, we would now be interested in your use of LA apps for students and have thus prepared a similar questionnaire: https://goo.gl/forms/V3QpKkG4dXukWExS2



In case you have any additional comments regarding Learning Analytics apps for students that are not covered in the survey, please email them to us!

If you could please respond to the questionnaire by September 25th, that would be great and much appreciated!

Thanks for your support,

Matthias, for the University of Leicester team

This activity is described in Section 5.2 and a summary of the results is presented in 7.1.6. Details can be found in Appendix K.

K. Results of CGT task on LA apps for students (LEIC-15092017)

Which of the following Learning Analytics apps have you used before? (http://tinyurl.com/learninganalyticsapps)

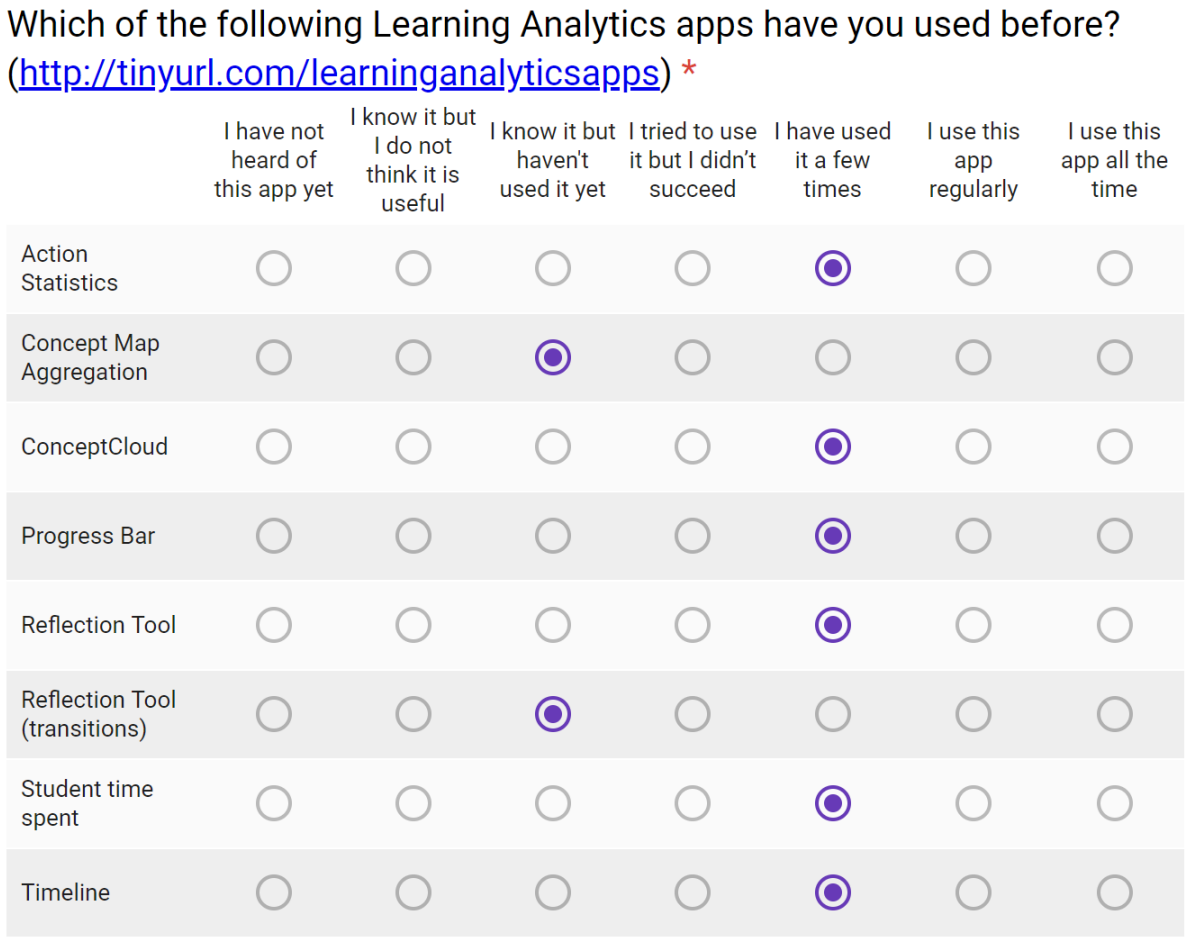


Figure 22. Responses regarding usage of LA apps for students (n=1).

For what purpose do you usually use learning analytics apps?

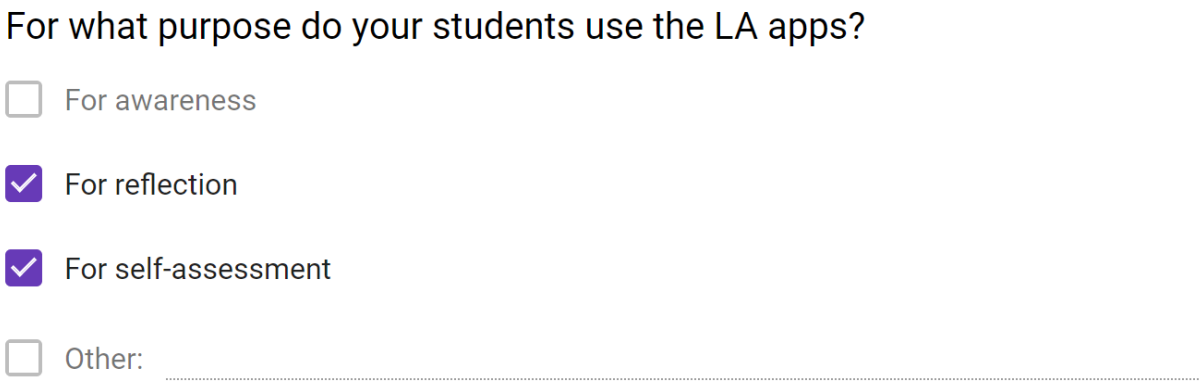


Figure 23. Purpose of LA apps for teachers (size of bar shows number of responders picking this option; n=22, but several options could be picked).

Are there any students' needs that are not covered by the existing LA apps?

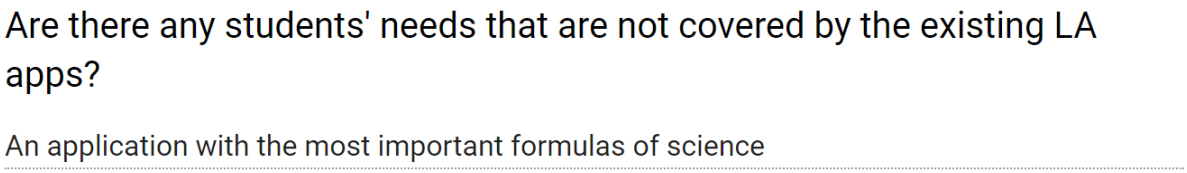


Figure 24. Responses to the question regarding teachers' needs not covered by LA apps.

Do you have any ideas for additional LA apps for teachers?

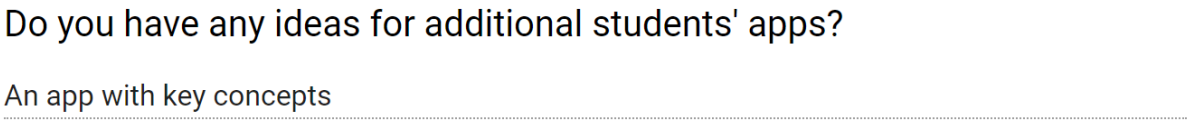


Figure 25. Responses to the question regarding ideas for additional LA apps for teachers.

This activity is described in Section 5.2 and a summary of the results is presented in 7.1.6. The email can be found in Appendix J.

L. Email for CGT: Updated Hypothesis Scratchpad (LEIC-29092017-1)

Dear Next-Lab core group and PD teachers,

Thank you very much for all of you responding to the last task. From the responses it looks like you have used all LA apps for students, besides “Concept Map Aggregation” and “Reflection Tool (transitions)”, which you also know, but have not used yet. The apps have been used for reflection as well as self-assessment.

Today’s task is of a “free exploration task”. The Next-Lab project team has re-worked some of the existing apps and the first few are ready to go live soon. To make sure that they still work fine, meet your needs, and we did not introduce any issues while reworking them, we would like you to have a look at the:

- Old version of the hypothesis scratchpad tool: http://go-lab.gw.utwente.nl/production/hypothesis/build/hypothesis.html

and the

- New version of the hypothesis scratchpad tool: http://go-lab.gw.utwente.nl/sources/tools/hypotheses/main/webapp/hypothesis.html

and write us an email stating the changes you notice and if you think those are improvements. If you notice any problems with the new version, please let us now as well!

If you could please respond to this task by October 9th, that would be great and much appreciated!

Thanks for your support,

Matthias, for the University of Leicester team

This activity is described in Section 5.3 and a summary of the results is presented in 7.1.5. Details can be found in Appendix M.

M. Results of CGT task on Updated Hypothesis Scratchpad (LEIC-29092017-1)

- Response 1
  - In the old app if we want to delet a word in the Hypotheses it erase everything, which was not good. But we could put all the terms and then rearrange the hypotheses.
    In the new app we can choose the terms and we can erase on by one but they don´t appear disorganized in a place, so the sutudent can organize and put more terms if he want.
    So the old app only had a problem, it was impossible to erase just one word. The other thinks were fine.
- Response 2
  - I opened the link for the new version of the hypothesis scratchpad tool and it can't be edited or configurated in my lap top. I'm not able to add or delete conditionals neither variables. The old version works well, though. I don't know if someone else had the same problem. Hoping it will be fixed,
- Response 3
  - Sorry for the long silence, but a lot of work.
    In the hypothesis tool I suggest that, when we press the “+”, the new hypothesis space appear on top of the others. I suggest this because students use their mobiles and if it appears on the end, they cannot scroll down.
- Response 4
  - I like the old app. The old app just have a problem, we can't erase word by word. When we need to erase something, it erases everything

This activity is described in Section 5.3 and a summary of the results is presented in 7.1.5. The email can be found in Appendix L.

N. Email for CGT: Updated Table Tool (LEIC-13102017-1)

Dear Next-Lab core group and PD teachers,

Thank you very much for all of you responding to the last task. It looks like you already liked the old version of the tool and see some improvements in the new tool.

Today we would like you to fill in a questionnaire to gather your feedback on another reworked tool: the Table Tool. The questionnaire can be found here: https://goo.gl/forms/83I4XOXXKPbTqplo2 .

If you could please respond to this task by October 23th, that would be great and much appreciated!

Thanks for your support,

Matthias, for the University of Leicester team

This activity is described in Section 5.4 and a summary of the results is presented in 7.1.3. Details can be found in Appendix P.

O. Email for repetition of CGT: Updated Table Tool (LEIC-27102017)

Dear Next-Lab core group and PD teachers,

As only a few of you found the time so far to respond to the Table Tool questionnaire (https://goo.gl/forms/83I4XOXXKPbTqplo2 , thanks a lot to those of you who already have responded!) and we would like to get more input from you as our users, for this week I would like to repeat the last task and ask you to please fill in the table tool questionnaire, if you have not had a chance to do so yet.

If you could please respond to this task by November 6th, that would be great and much appreciated!

Thanks for your support,

Matthias, for the University of Leicester team

This activity is described in Section 5.4 and a summary of the results is presented in 7.1.3. Details can be found in Appendix P.

P. Results of CGT task on Updated Table Tool (LEIC-13102017-1 & LEIC-27102017)

Overall I prefer the ...

	1	2	3	4	5	
old Table Tool		o	o	o	o	o	**new Table Tool**

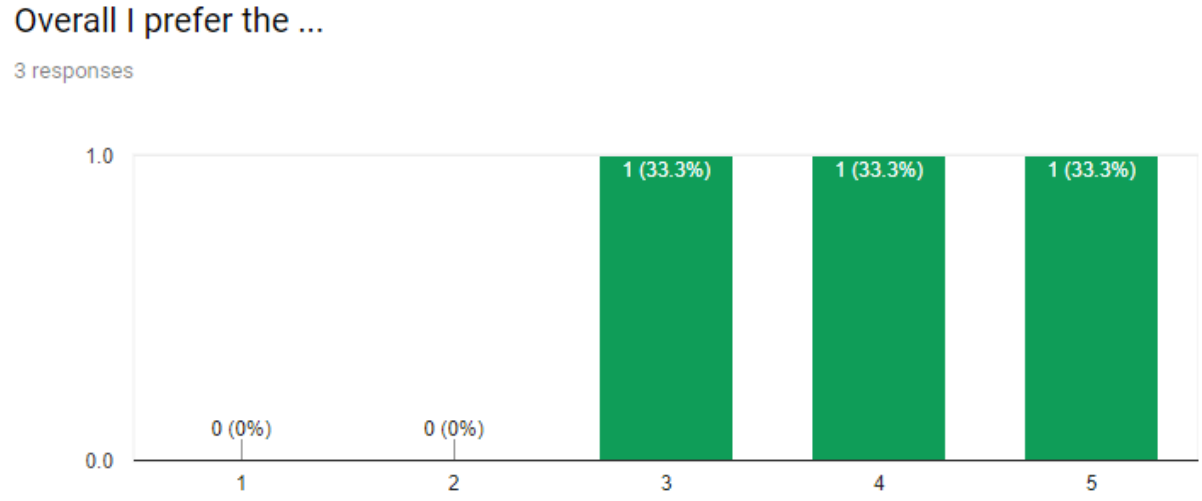


Figure 26. Responses regarding the preference of the old Table Tool (on the left, 1) or the new Table Tool (on the right, 5) (n=3).

Please elaborate on your selection above, e.g. what do you like better in the tool you prefer or what could be improved in the tool you like less.

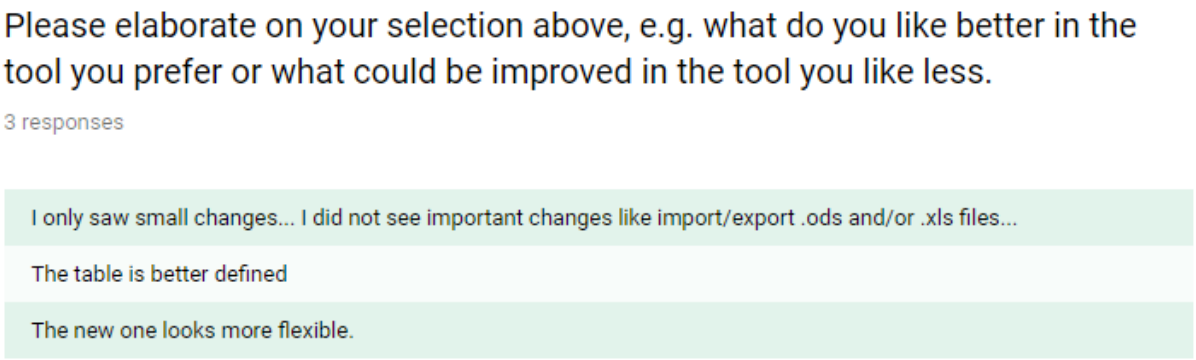


Figure 27. Reasoning of the teachers for prefering the old or new version of the Table Tool (n=3).

In the Table Tool, ...

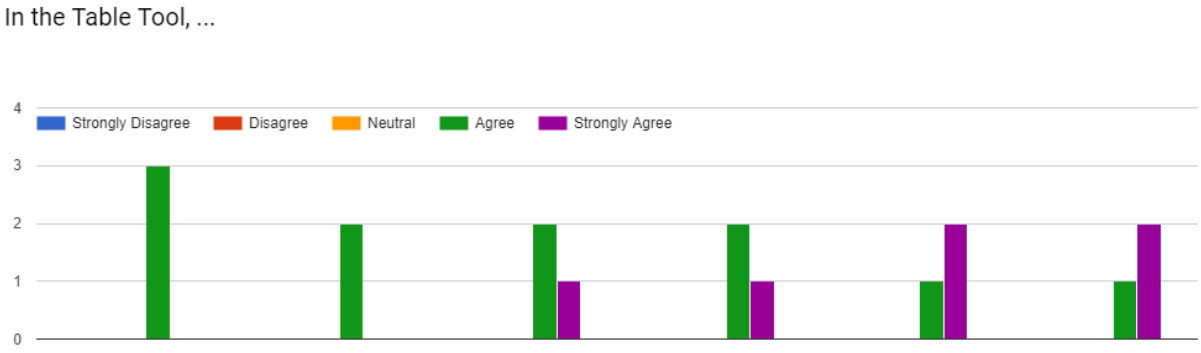


Figure 28. Responses regarding the functionality of the Table Tool (n=3). See text below for answer options.

The answer options from left to right are:

- teachers should be able to create rows without a name (in the first column).
- teachers should be able to restrict the content students can enter into cells (e.g. only numbers, in a certain range; only text, with a maximum length, certain words; ...)
- students should be able to specify row names.
- students should be able to specify column names.
- students should be able to add new rows.
- students should be able to add new columns.

This activity is described in Section 5.4 and a summary of the results is presented in 7.1.3. The emails can be found in Appendix N and Appendix O.

Q. Email for CGT: Support Questionnaire (LEIC-13112017)

Dear Next-Lab core group and PD teachers,

Thanks to all of you who replied to the Table Tool questionnaire!

As we were running a Go-Lab workshop last Friday, this week's task is a little late, sorry for that.

Today we would like to gather your feedback and input on the Go-Lab support system, how you are using it at the moment and what your plans are for the future. You can find the questionnaire at the following URL:

https://goo.gl/forms/QazdDbm2ORMmn0Mg2

If you could please reply by next Monday (20/11/2017) that would be great and much appreciated!

Thank you very much for your support,

Matthias, for the University of Leicester team

This activity is described in Section 5.5 and a summary of the results is presented in 7.2.3. Details can be found in Appendix R.

R. Results of CGT and Go-Lab members task on Support (LEIC-13112017)

When working in the Go-Lab ecosystem, how often were you in need of support regarding:

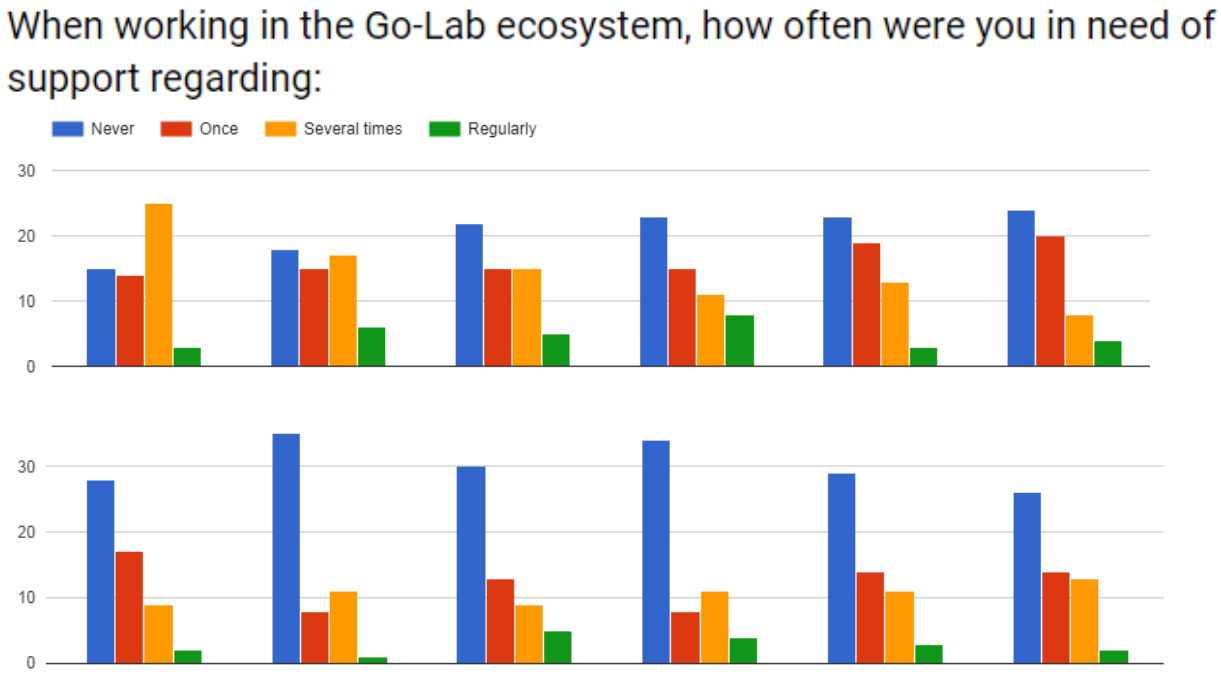


Figure 29. Respones regarding support needs (n=59). See text for answer options.

The answer options from left to right and top to bottom are:

- Technical issues in general
- Apps
- Labs
- The creation of an ILS
- The adaptation of ILS elements
- The implementation of an ILS
- Publishing an ILS
- Pegagogical issues in general
- Inquiry-based Learning
- Structuring learning content
- Scenario selection
- The adaptation of content

How beneficial would it be for you to:

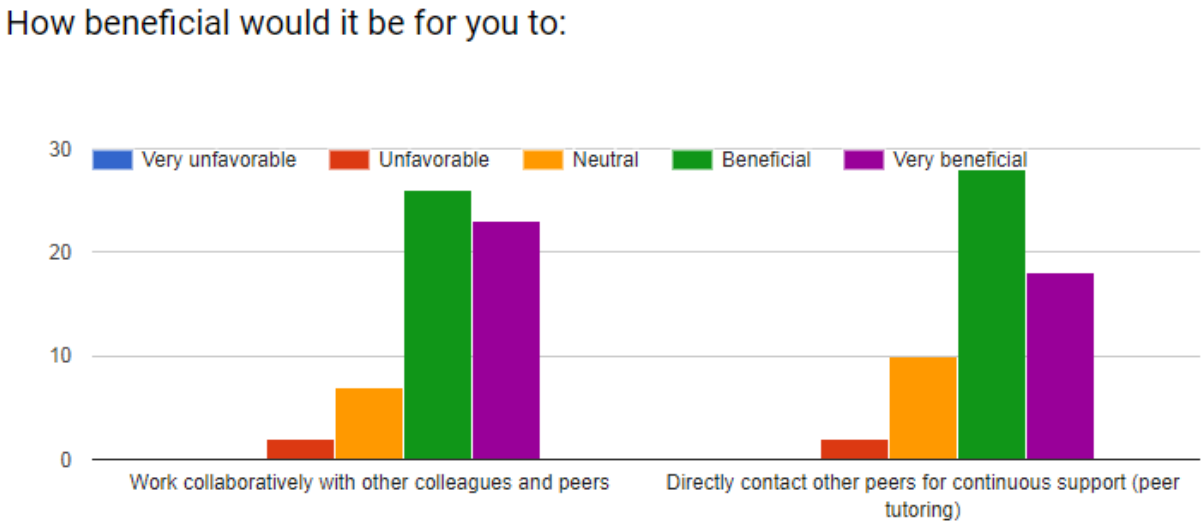


Figure 30. Responses regarding the benefits of workingcollaboratively with peers or getting support from them (n=58).

Why?

- Because it is not easy for me using this tipe of teaching
- You can easily share things that you want to do and listen to others experience , as well.
- It is very important to improve pedagogical skills.
- confronting you always has something interesting
- For exchange the experiences
- Because I think I must learn this tool to its maximum power while it is hard for me to use it in the classroom engaging students. It seems to me also very hard to set the environment and register students.
- ---
- Probably they had had the same problems before
- When you work with other you get more inspiration to make your ILS better.
- I like to work in collaboration with other collegues, I think you earn more
- Collaboration is always benefical for any work.
- Sharing experiences makes learning faster.
- I like working in team
- In order to share a common metodology and strategy with colleagues
- It collega have had the same experience or the same difficulties they can easily share ahd support each others
- In general, working with other teachers provides me with more ideas and information, and avoid duplicating tasks. And, somehow, its sets and "obligation" to work. Whem I'm overload with work, I tend to maintain those tasks that I share with other people.
- You can always learn from each other
- changing ideas
- The view and opinion of a person with about the same needs and goals, is very valuable
- co-work is effective
- *

- It will allow me to exchange the experience with my peers and to improve the lessons concept.
- Further ideas to gain inspiration on how to use the platform
- Because we can share our experience with other colleagues.
- I am only a beginner!! But a very willing Science-mad one!

How beneficial do you think it would be for other teachers to have access to tutoring/coaching/mentoring support?

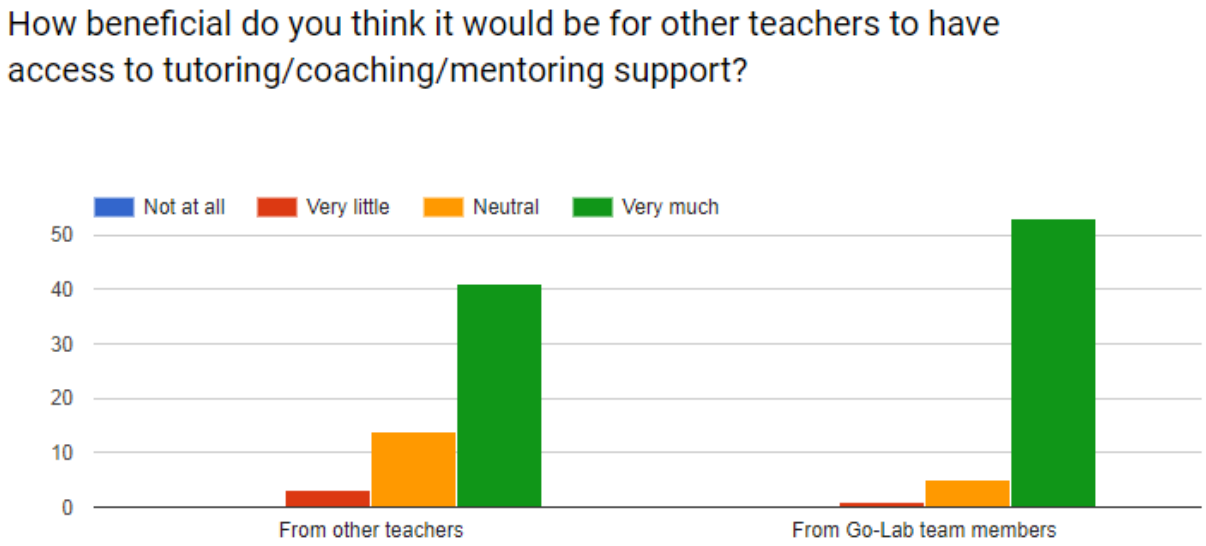


Figure 31. Responses regarding the benefits of having access to support from other teachers and Go-Lab team members.

How often did you get in contact with another teacher when using Go-Lab (e.g. to use the platforms/labs/apps, to create/adapt/publish an ILS, to apply inquiry learning, etc.)?

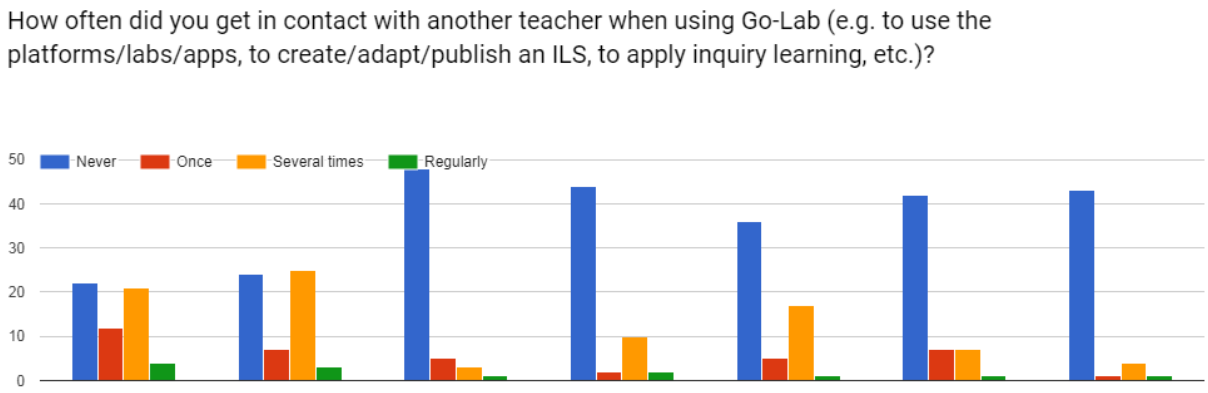


Figure 32. Responses regarding the ways of getting in contact with other teachers when using Go-Lab (n=59). See text for answer options.

The answer options from left to right are:

- Via email
- In person
- Through Intercom
- In the Graasp discussion section of your ILS
- By adding them as co-authors to your ILS using Graasp

- Via Skype (or similar)
- Other

How often did you get in contact with a Go-Lab representative (ambassadors or Go-Lab team members) when using Go-Lab (e.g. to use the platforms/labs/apps, to create/adapt/publish an ILS, to apply inquiry learning, etc.)?

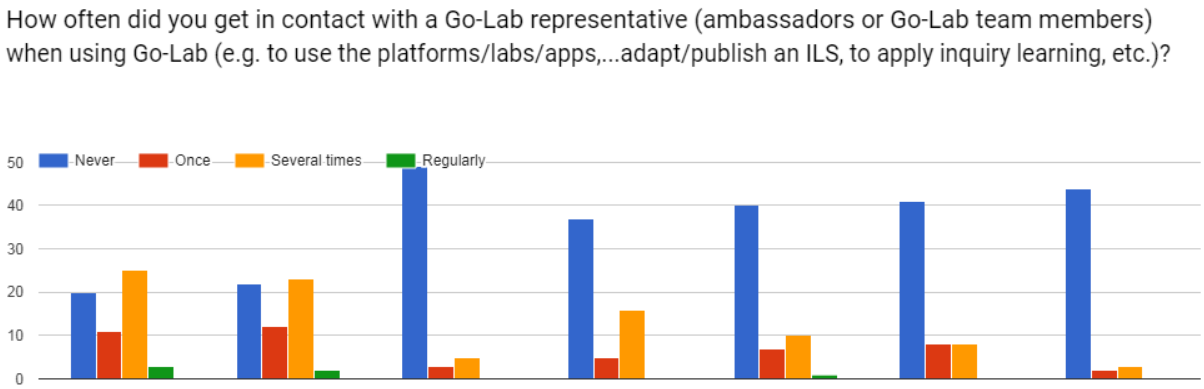


Figure 33. Responses regarding the ways of getting in contact with Go-Lab representatives when using Go-Lab (n=59). See text for answer options.

The answer options from left to right are:

- Via email
- In person
- Through Intercom
- In the Graasp discussion section of your ILS
- By adding them as co-authors to your ILS using Graasp
- Via Skype (or similar)
- Other

Do you think it is more efficient to receive feedback from:

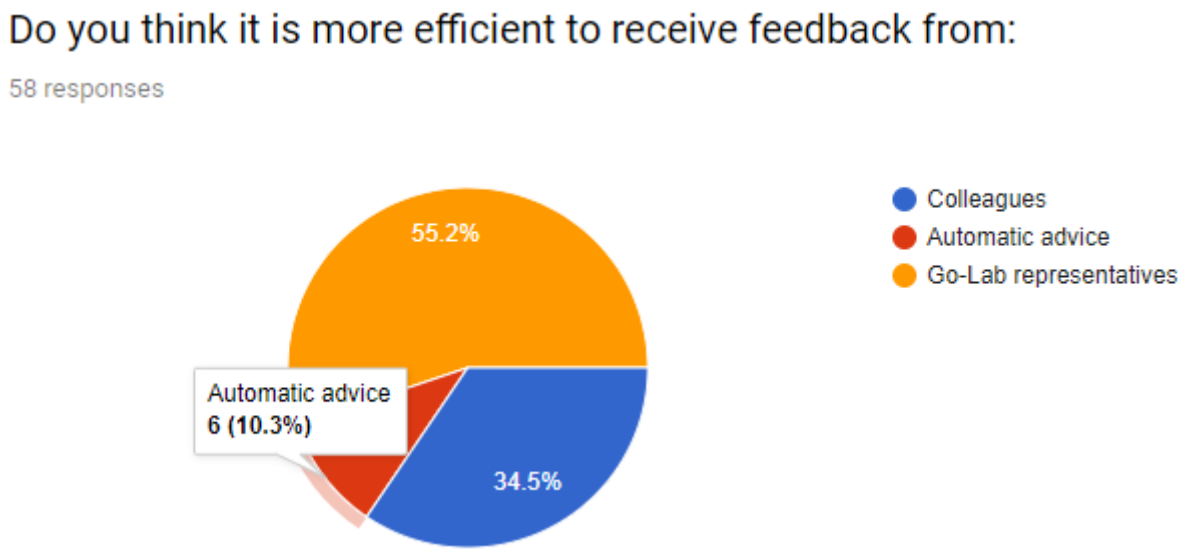


Figure 34. Responses regarding the efficiency of different sources to retrieve feedback from (n=58).

Do you think it is better or most helpful to receive feedback from:

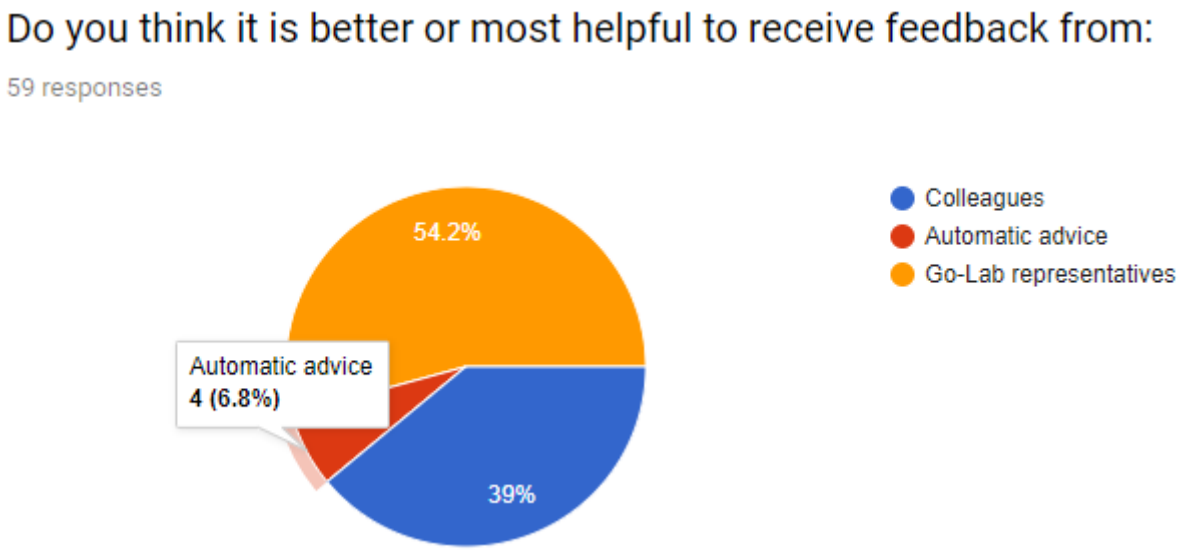


Figure 35. Responses regarding the helpfulness of different sources to retrieve feedback from (n=59).

Are you planning/would you like to learn more about the Go-Lab ecosystem (platforms/apps/labs, to create/adapt/publish an ILS, to apply inquiry learning, etc.) in the future?

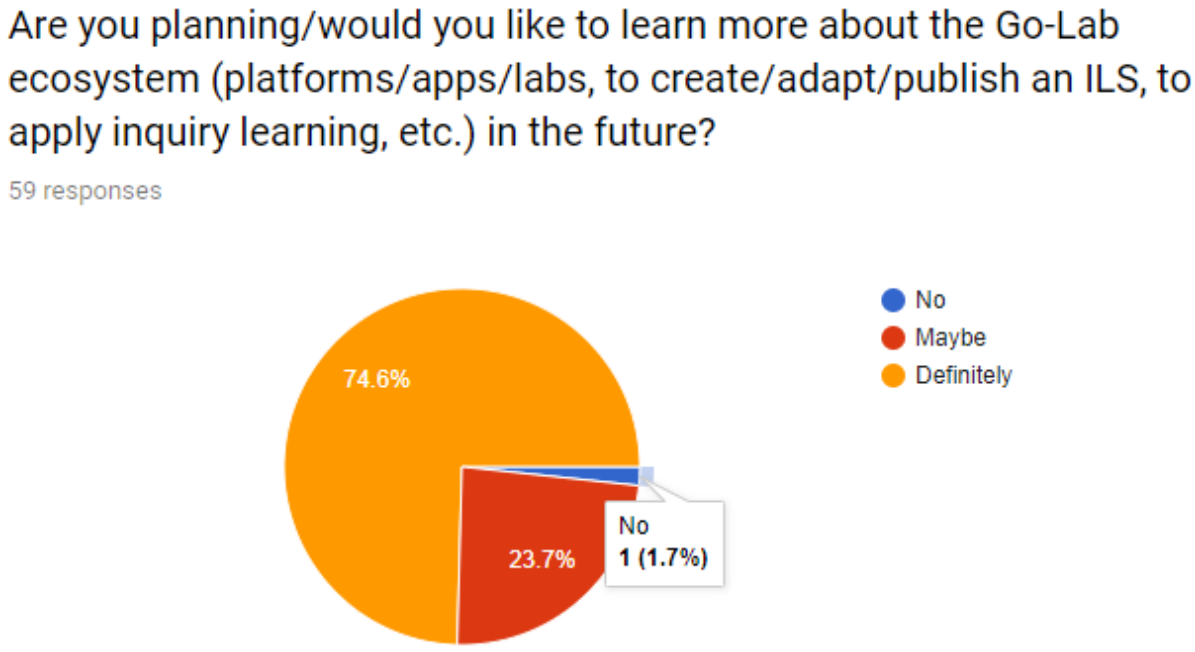


Figure 36. Responses regarding plans to learn more about the Go-Lab ecosystem (n=59).

How likely are you to use the following methods to learn more about Go-Lab?

The answer options from left to right are:

- Experimenting by myself
- Looking at the support materials
- Collaborating with other teachers
- Collaborating with experts
- Attending trainings
- Joining on-line courses
- Through Intercom

How comfortable would you feel to support other teachers

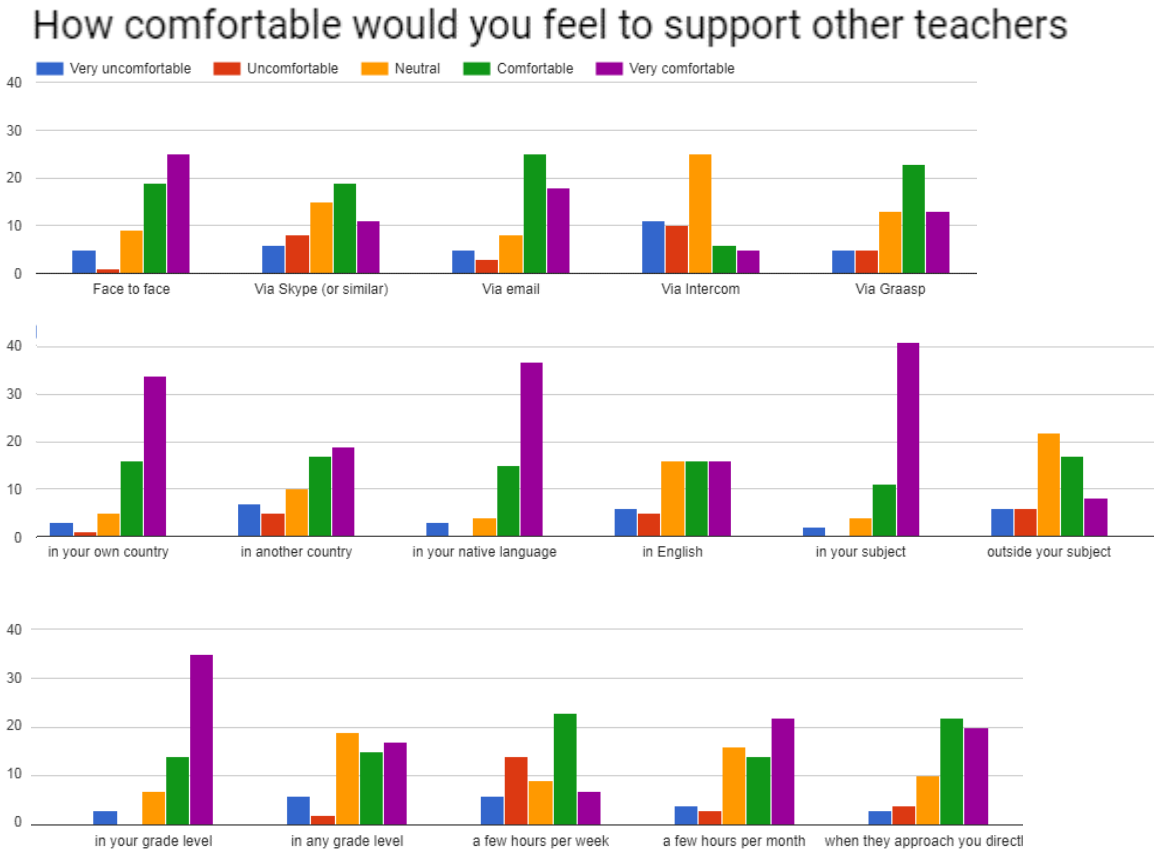


Figure 37. Responses regarding support of other teachers.

The last answer option that is slightly cut off in the end is „when they approach you directly“.

If you would be willing to further support Go-Lab by working on similar tasks like filling in this questionnaire on a fortnightly basis please provide your email address below:

The answers to this question are not reported for privacy reasons, but as said in the description of the activity, 29 new CGT teachers were recruited through it.

This activity is described in Section 5.5 and a summary of the results is presented in 7.2.3. The email can be found in Appendix Q.

S. Email for CGT: Event registration (LEIC-24112017)

Dear Next-Lab core group and PD teachers,

Thanks to all of you who replied to the Go-Lab support questionnaire. I would like to use this opportunity to welcome those of you who provided their email address to be approached with a task on a fortnightly basis as new members to the group! Thanks to all of you for your willingness to further support and improve the Next-Lab project and Go-Lab resources through your input and feedback.

To manage the increased group size and to give you the opportunity to further network with each other, we have created a space for the Next-Lab core group and PD teachers in the Go-Lab community on Graasp. This week's task is to "register" for this collaboration space. You should shortly receive an invitation email from Graasp:


[Graasp] You are now a member of the space "Next-Lab core group and PD teachers"

Graasp.eu <noreply@graasp.eu>
to me

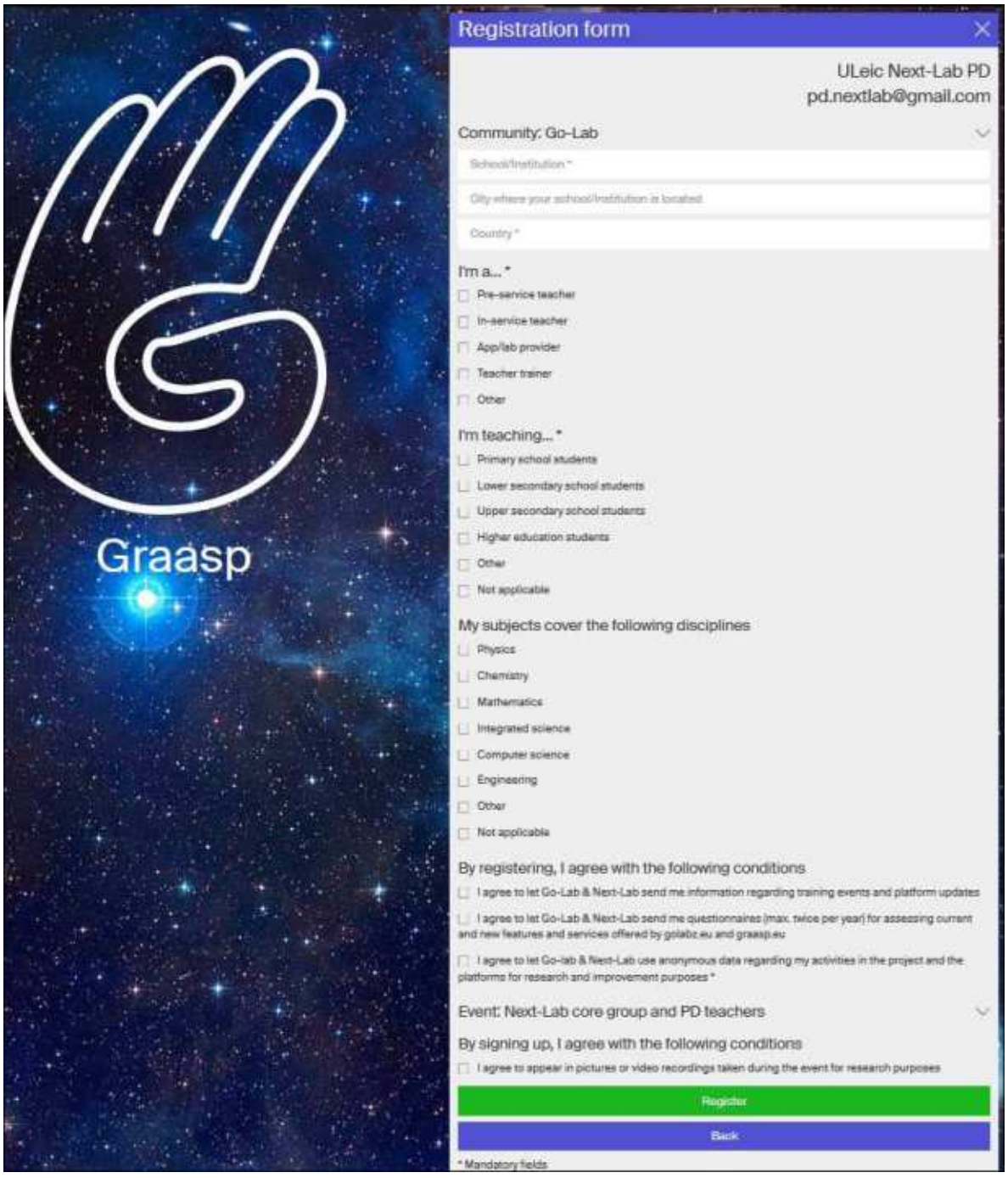
Matthias invited you to the space "Next-Lab core group and PD teachers".

Please follow the link below to access this space:

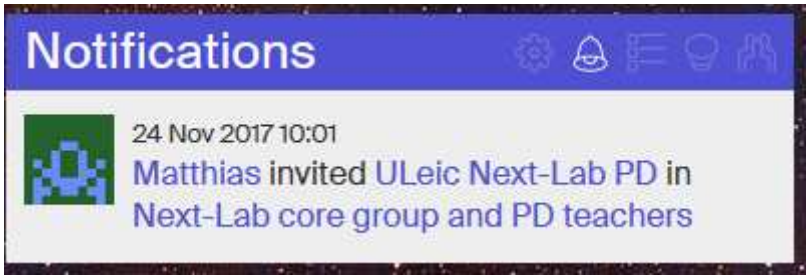
http://graasp.eu/form/5a17e788b84a8964e8179456

Graasp - Collaboration platform

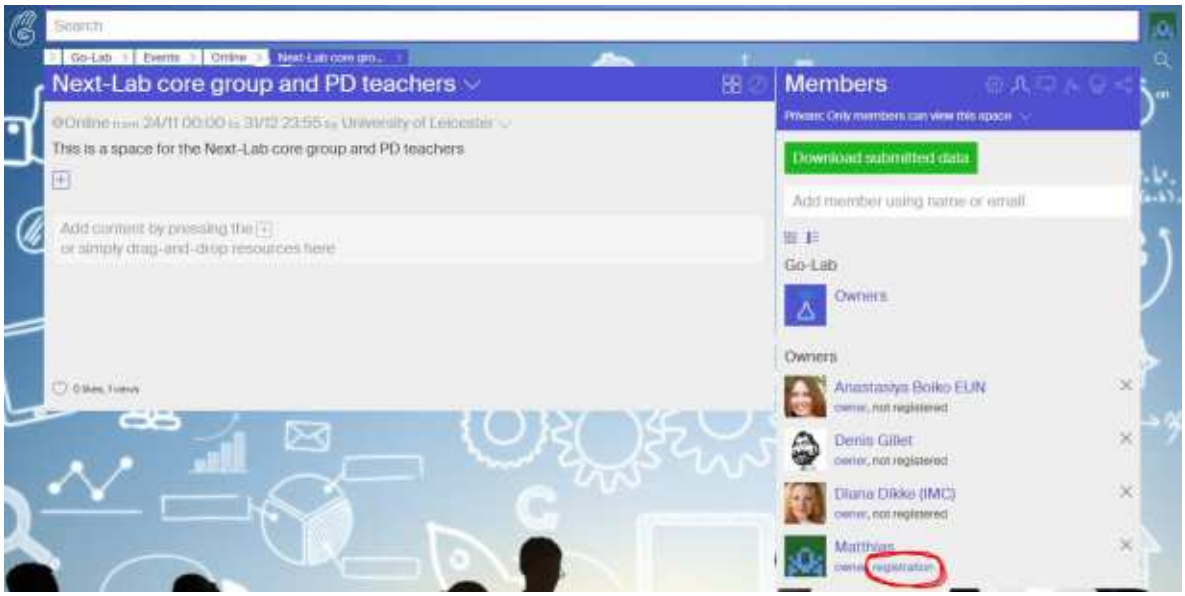
Please follow the link in the email and fill in the Registration Form (if you have attended previous events it might be already pre-filled. In this case please check and confirm the data by pressing the "Register" button):



If you don’t see the registration form, please find the notification that you have been invited by clicking on the bell icon, click on the “Next-Lab core group and PD teachers” link:



and click on the “registration” link underneath your name in the “Members” section:



If you could perform these steps by December 04th, that would be great and much appreciated!

In case you encounter any issues or have any questions, please don't hesitate to contact us.

Best regards,

Matthias, for the University of Leicester team

This activity is described in Section 5.6 and a summary of the results is presented in 7.2.4. Details can be found in Appendix T.

T. Results of CGT task on Event Registration (LEIC-24112017)

Three teachers sent an email, asking for confirmation or clarification if their registration was successful (which was the case for all three of them):

- Email 1
  - I tried to follow the steps, but the registration form will not open. May be I have already filled it up.
- Email 2
  - I think I have registered but I'm not sure it worked. Please can you confirm that this is the case?
- Email 3
  - I joined the space and the registration form looks already filled with my data.
    I'm waiting for next news.

This activity is described in Section 5.6 and a summary of the results is presented in 7.2.4. The email can be found in Appendix S.

U. Email for CGT: StudentWork Viewer (LEIC-07122017)

Dear Next-Lab core group and PD teachers,

Thanks to all of you who already joined the community, if you haven't done so, please do. In case you encounter any issues or have any questions, just let us know.

This week we would like to gather your opinions, input, and feedback on the way you access the work students have done in your ILS. To do so we created the following questionnaire: https://goo.gl/forms/XeILsfQQARRPUJsj1 . In case you have any other comments or remarks, not covered in there, please drop us an email!

Greetings from Leicester,

Matthias, for the University of Leicester team

This activity is described in Section 5.7 and a summary of the results is presented in 7.1.2. Details can be found in Appendix V.

V. Results of CGT task on StudentWork Viewer (LEIC-07122017)

What do you think about the current solution (e.g. is it sufficient)?

- No it is not: it does not reinforce the definition of planets: Object that orbits a star and has cleared its orbital path
- No
- It is sufficient, I have used it with students several times.
- It works fine
- In my opinion is not sufficient.
- it is easy for teachers. There can be issues when the ILS is used by many students year by year and the old students get mixed with the new ones in the members list.
- If it comes to the concrete example and the solar system I think is enough

Are there any shortcomings with the current solution?

- No (2)
- Moon is a natural satellite, not a planet.
- Nothing really. We teachers are always there to blend in when necessary
- It seems to me that it is a little uncomfortable to access the work of my students.
- sometimes the users list gets too long, if the ILS is used by many classes.
- I can not say that there are any disadvantages and I have no objection

Do you have any suggestions on how to improve the current solution?

- Yes
- No
- It's ok as it is.
- It may be better to have the option of deleting old users from the members list
- Often compare conceptual maps to smart maps. The difference is that conceptual maps are based on relationships between concepts, while intelligent maps are based on stable structures and radial hierarchies. So often there is no difference

Which of these two options (currently used visualization inside the ILS or dedicated tool only showing the student work without the other ILS content) would you prefer and why?

- The first option: More structured
- Student 2 (all studends look and collacollaborate)
- I prefer the first option because I look at each student individually.
- The context is always important, in my opinion the individual work is not as much.
- I would you prefer the second option because I can see and compare the work of each student for each moment of lesson. It seems to me it is more appropriate and practical.
- both could help: the first one is better to evaluate a single student or group, the second may help to compare the same item made by different students, i.e. for documentation purpose
- When I look at the two options, I would opt for the second option because I always want to watch the activity and the work of each student separately

What functionalities would you need in these tools?

- be able to leave comment in a different colour

- Yes
- The current solution is enough for me.
- I need more practice with the ILS, in general, I like sharing with the class what everyone has said or thought, so that they see and hear the same thing said or written in so many different ways: there in no "right" or "wrong" way,. So, I like joining all contributions in one major spreadout.
- In these tools I would prefer to can intervene as in the current version.
- A tool for teachers comments that may be seen by students.
- /

The dedicated tool would initially show the student work from: Hypothesis scratchpad, Questioning scratchpad, Table tool. Later will follow: Concept mapper, Data viewer, Observation tool, Conclusion tool, Report tool, and still later: Experiment design tool, Quest, Quiz tool. Would that be sufficient or would you need the student work from other apps as well (which ones)?

- Seems plenty
- The current solution is enough for me.
- The simpler the better, so this is quite enough.
- Concept Map Aggregation
- the mentioned apps are the most used, so it is enough.
- I think that all these tools are enough to show the work of a student-pupil

This activity is described in Section 5.7 and a summary of the results is presented in 7.1.2. The email can be found in Appendix U.

W. Email for CGT: Graasp User Warnings (LEIC-02032018)

Dear Next-Lab core group and PD teachers,

We hope you all had a great start into the new year. After a pause during the last two month, we are now resuming sending you bi-weekly tasks.

This week we would like to gather your input and feedback on different Graasp user warnings. For this purpose we created the following questionnaire, which we would like you to answer:

https://docs.google.com/forms/d/e/1FAIpQLSdy0Q9UW1RtvxsAE1VyfU_V1NFsd9LSSu6rGzAglwcEr180bg/viewform?usp=sf_link

If you could please respond to this task by March 12th that would be great and much appreciated.

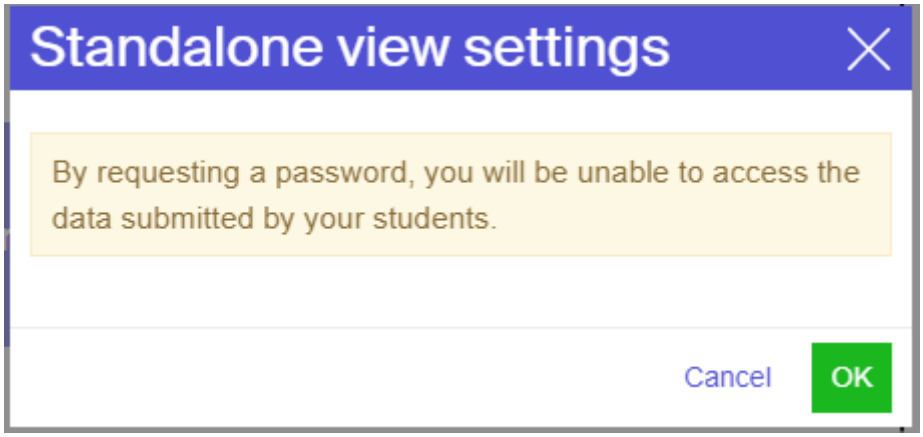
Best regards,

Matthias, for the University of Leicester team

This activity is described in Section 5.8 and a summary of the results is presented in 7.2.5. Details can be found in Appendix X.

X. Results of CGT task on Graasp User Warnings (LEIC-02032018)

When changing the standalone view settings from 'Nickname only' to 'Nickname and password' the following message is displayed:



How often do you encounter this warning message?

	0	1	2	3	4	5	
never	o	o	o	o	o	o	**regularly**

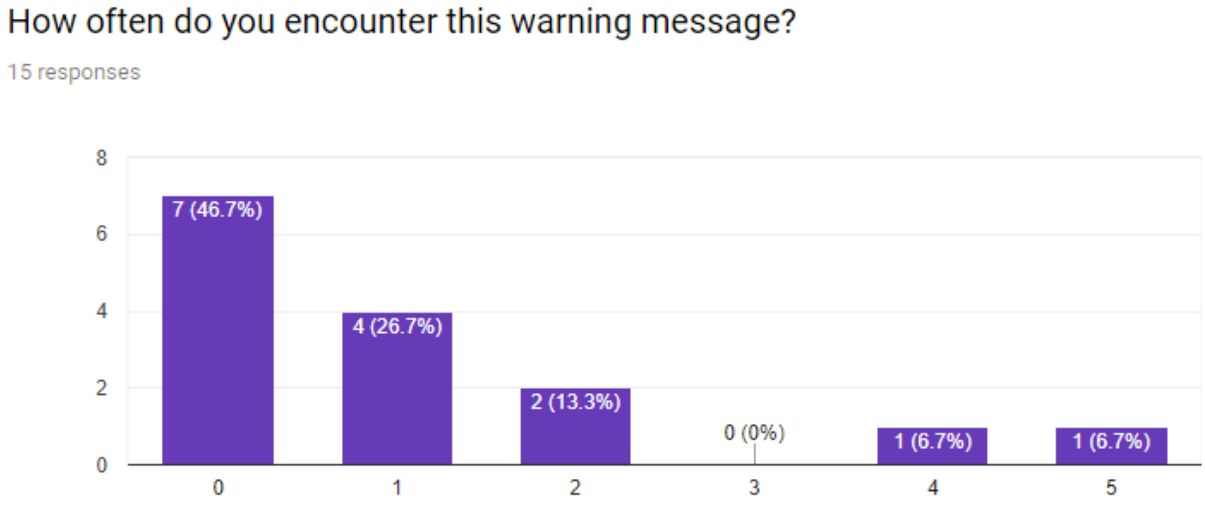


Figure 38. Responses regarding the frequency of the 'Nickname and password' Graasp user warning (n=15).

How clear is the meaning of the message to you?

	0	1	2	3	4	5	
never	o	o	o	o	o	o	**regularly**

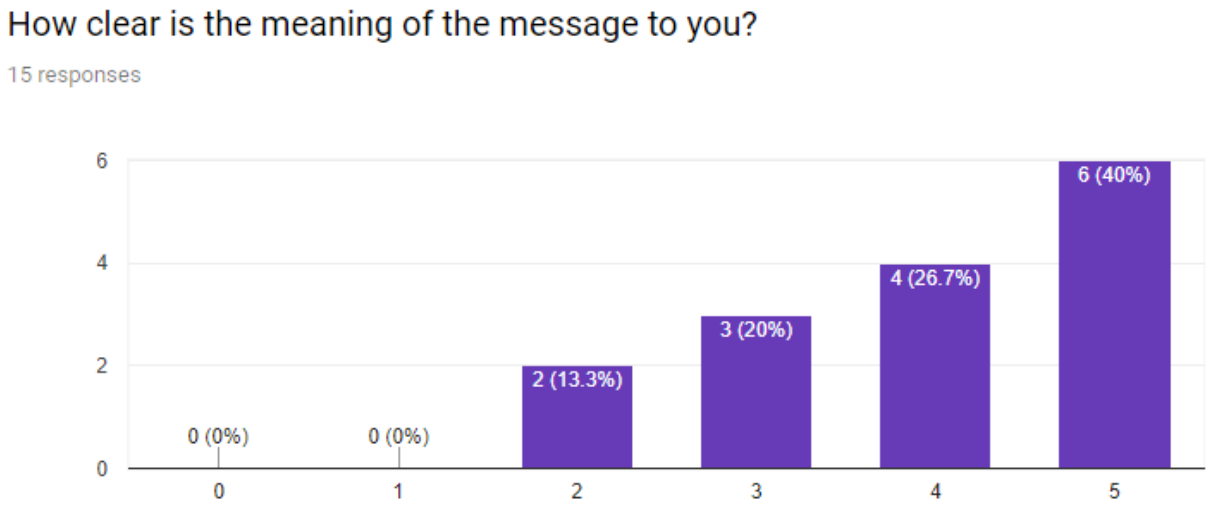


Figure 39. Responses regarding the clarity of the 'Nickname and password' Graasp user warning (n=15).

A suggested change for the message would be 'By requesting a password, the Review Mode can no longer be used to access the work of students.' Would this phrasing increase the understandability over the current one presented in the picture above?

	0	1	2	3	4	5	
not at all	o	o	o	o	o	o	**very much**

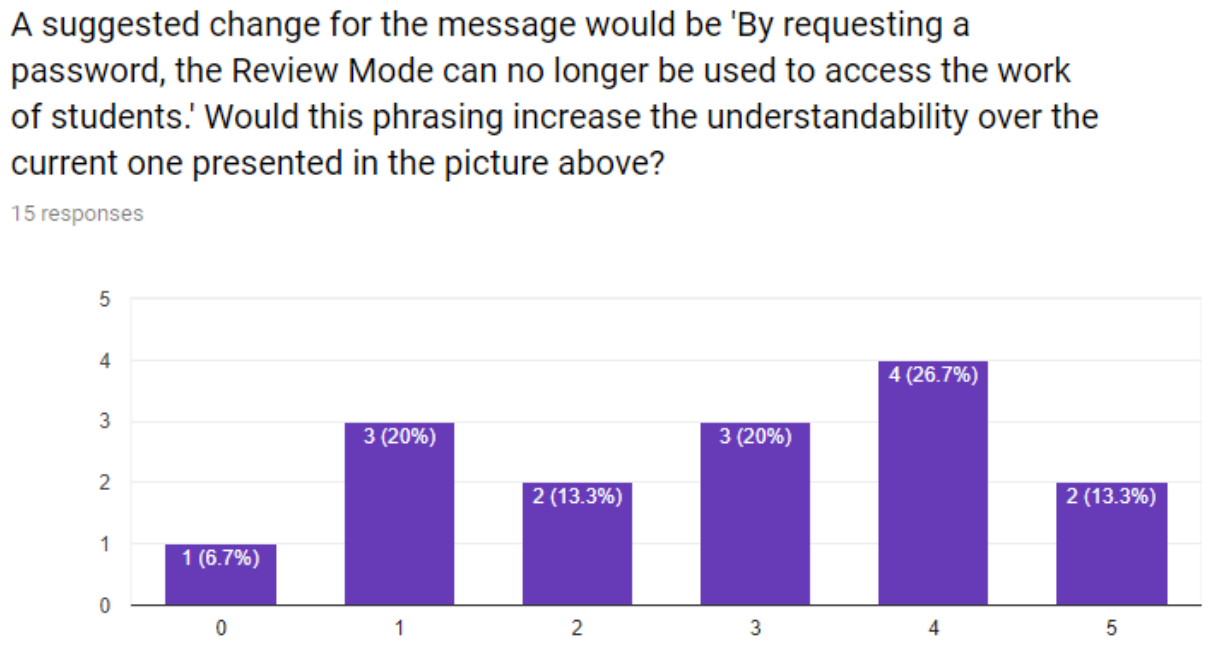
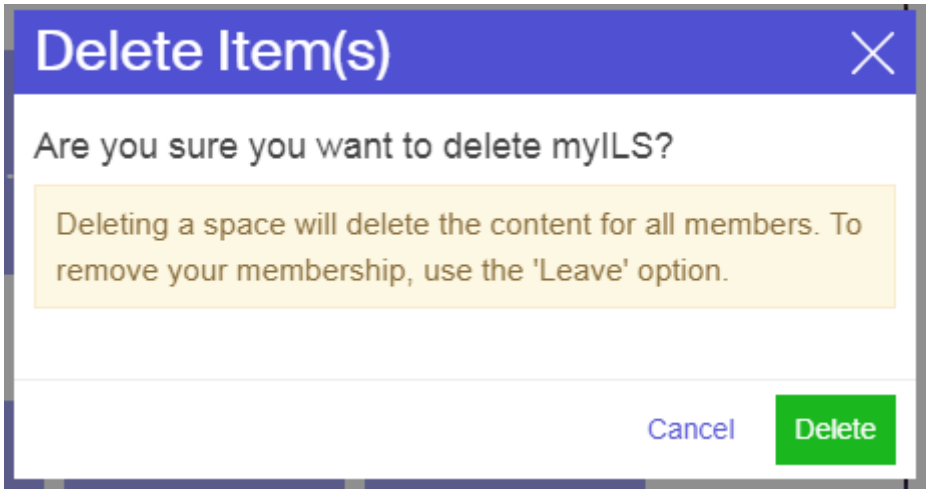


Figure 40. Responses regarding the understandability of the proposed rephrasing of the 'Nickname and password' Graasp user warning (n=15).

Do you have any other comments or improvement suggestions regarding this user warning?

- no (2)
- The first message is more clear... the teacher may not be sure about what Review mode is, and the second message seems to indicate that you may access to the students wotk by other way. Anyway, you could combine both messages "
- the warning message is ok, but the function could be improved by allowing the teacher to see students passwords.

When deleting an ILS the following message is displayed:



How often do you encounter this warning message?

	0	1	2	3	4	5	
never	o	o	o	o	o	o	**regularly**

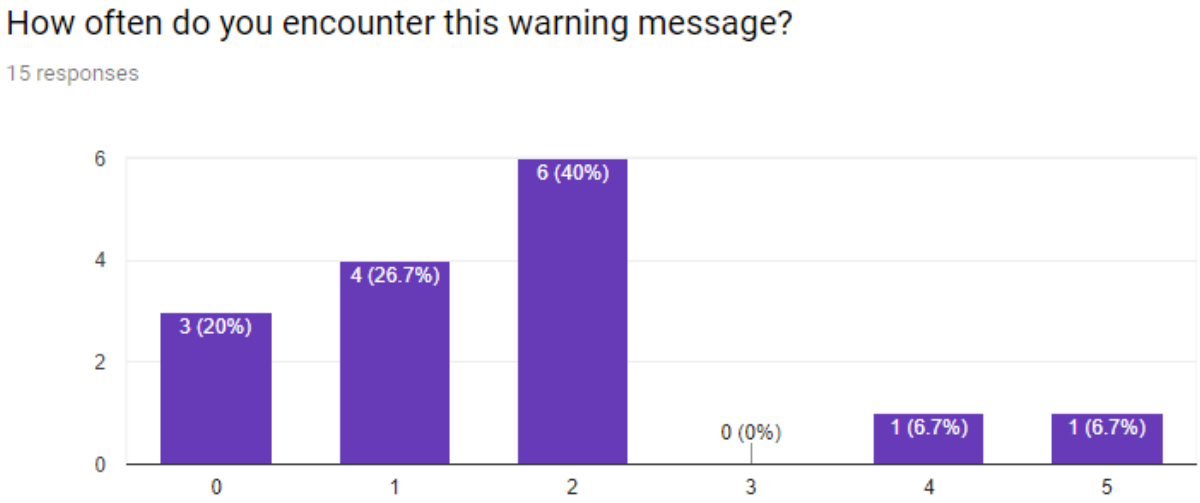


Figure 41. Responses regarding the frequency of the 'Deleting an ILS' Graasp user warning (n=15).

How clear is the meaning of the message to you?

	0	1	2	3	4	5	
never	o	o	o	o	o	o	**regularly**

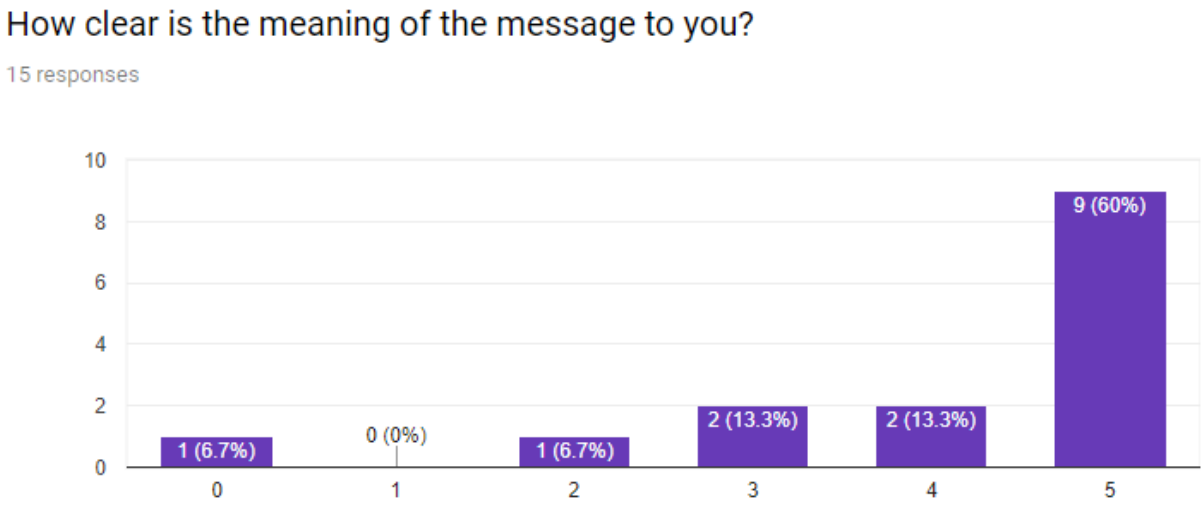


Figure 42. Responses regarding the clarity of the 'Deleting an ILS' Graasp user warning (n=15).

A suggested change for the message would be 'Deleting an ILS will remove it irreversibly and its content will no longer be accessible to anyone. If instead you just want to remove it from your list of ILSs, please go to the member list and use the "Leave" option next to your name.' Would this phrasing increase the understandability over the current one presented in the picture above?

	0	1	2	3	4	5	
not at all	o	o	o	o	o	o	**very much**

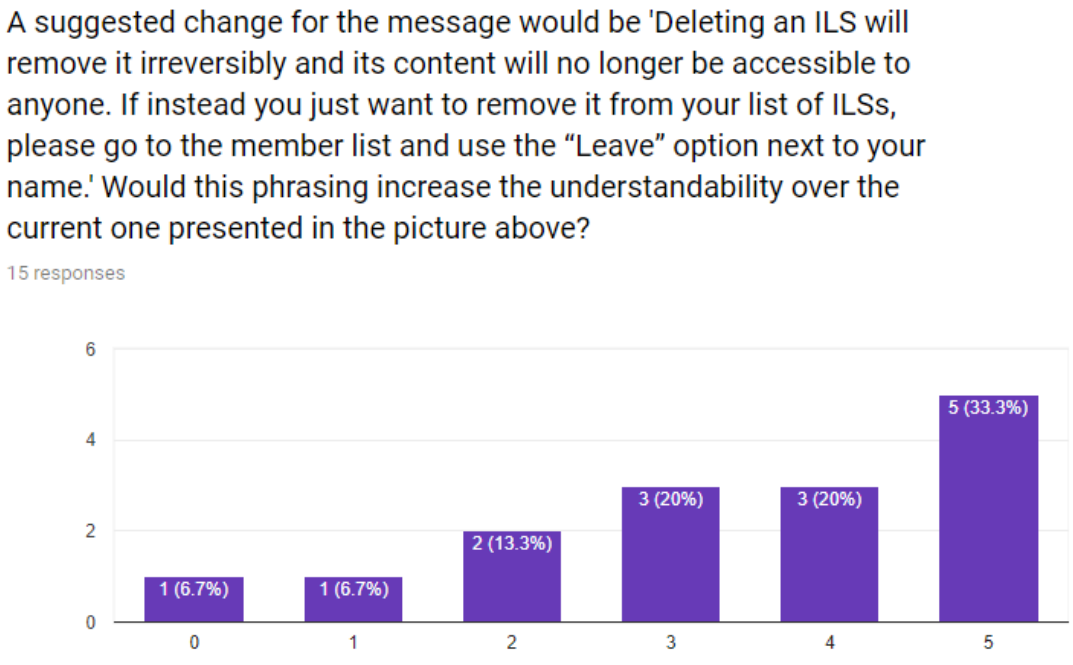


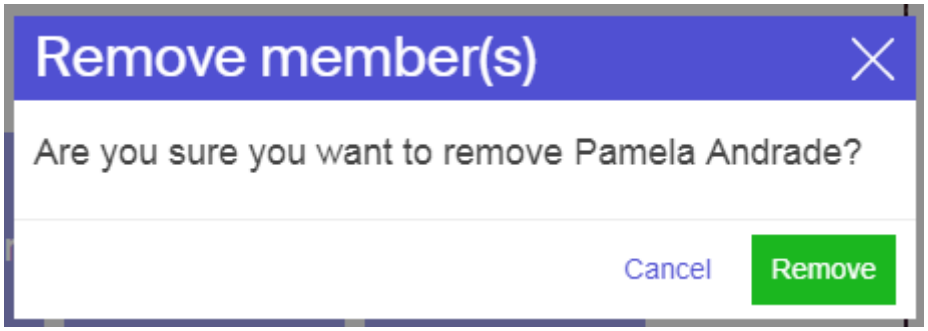
Figure 43. Responses regarding the understandability of the proposed rephrasing of the

'Deleting an ILS' Graasp user warning (n=15).

Do you have any other comments or improvement suggestions regarding this user warning?

- /
- it could be mdde shorter, just using the first message and adding the warning of irreversible operation.
- The message is very clear. the suggest change should appear if there was an option like "Further information."

When removing a member from an ILS the following message is displayed:



How often do you encounter this warning message?

	0	1	2	3	4	5	
never	o	o	o	o	o	o	**regularly**

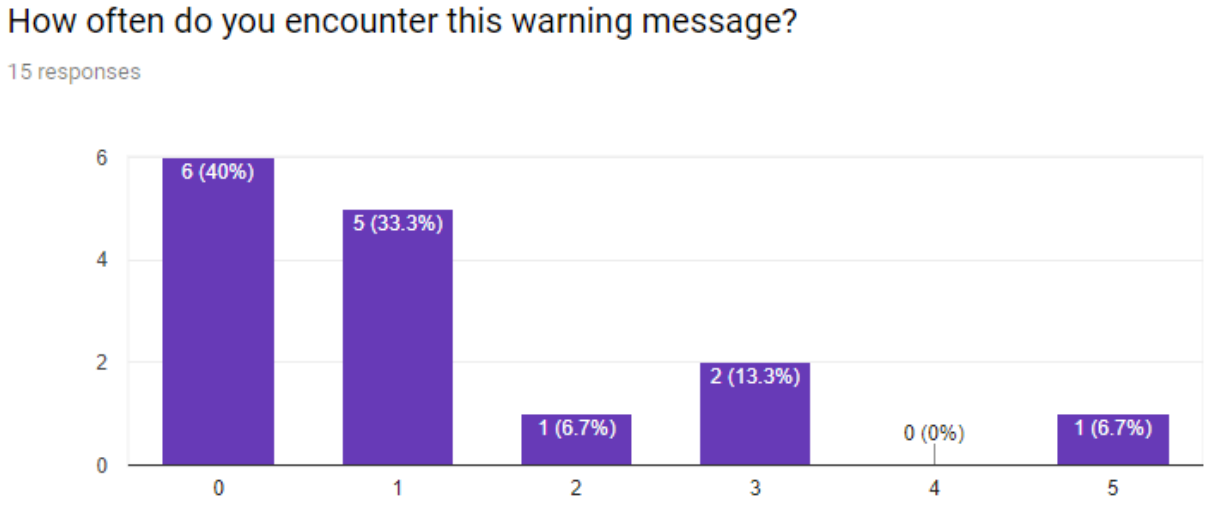


Figure 44. Responses regarding the frequency of the 'Removing a member' Graasp user warning (n=15).

How clear is the meaning of the message to you?

	0	1	2	3	4	5	
never	o	o	o	o	o	o	**regularly**

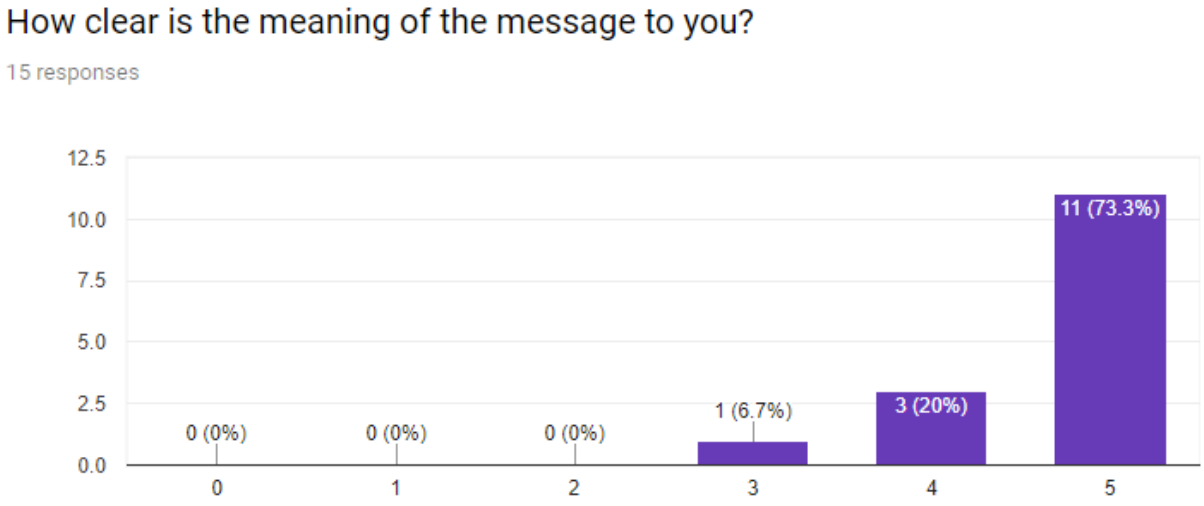


Figure 45. Responses regarding the clarity of the 'Removing a member' Graasp user warning (n=15).

A suggested change for the message would be 'Are you sure you want to remove NAME from the ILS 'NAME OF ILS'?' Would this phrasing increase the understandability over the current one presented in the picture above?

	0	1	2	3	4	5	
not at all	o	o	o	o	o	o	**very much**

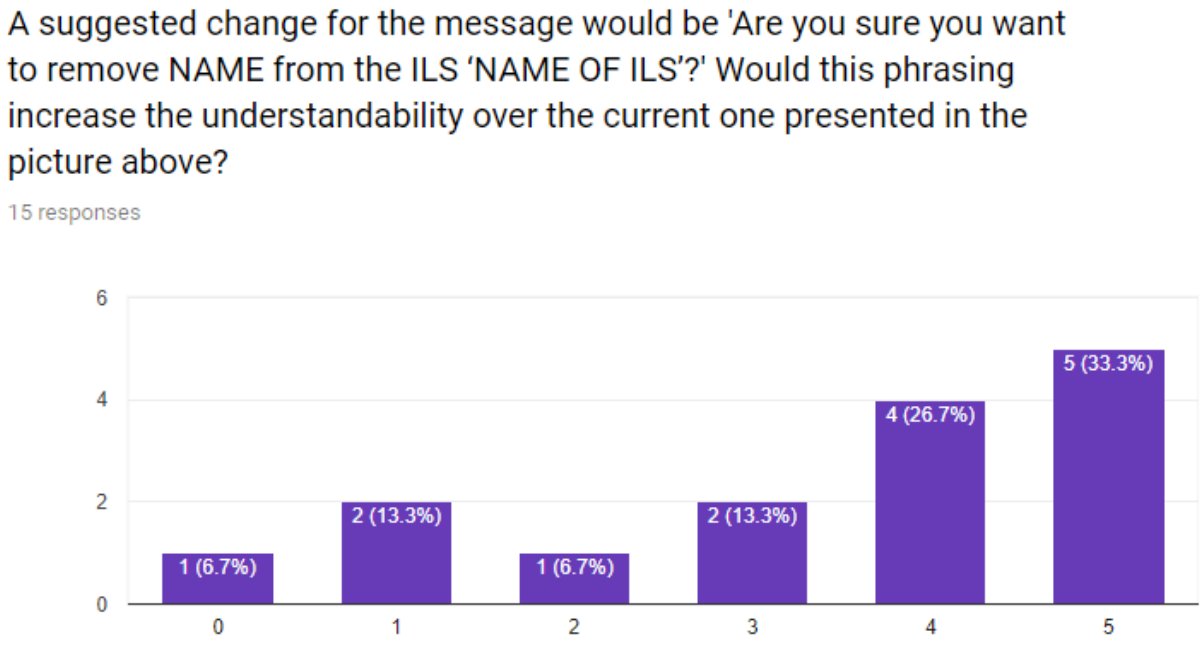


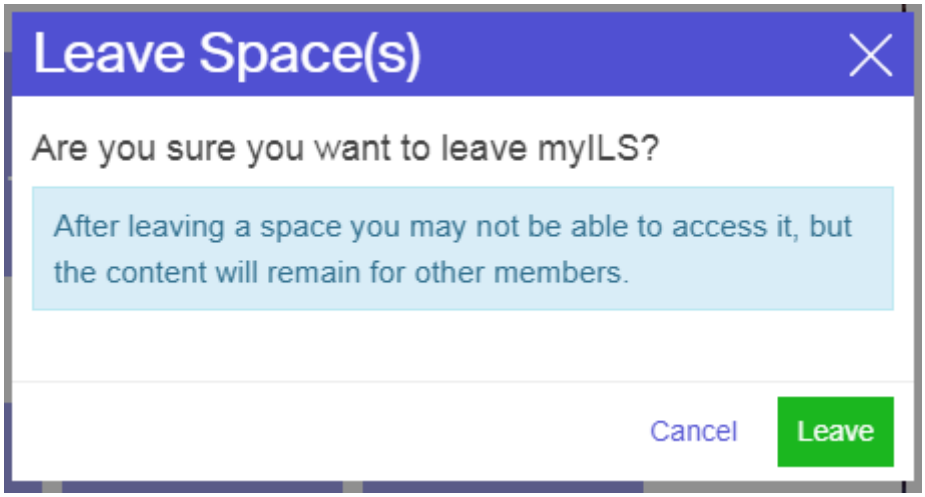
Figure 46. Responses regarding the understandability of the proposed rephrasing of the

'Removing a member' Graasp user warning (n=15).

Do you have any other comments or improvement suggestions regarding this user warning?

- \
- the name of ILS could be used too

When leaving an ILS the following message appears:



How often do you encounter this warning message?

	0	1	2	3	4	5	
never	o	o	o	o	o	o	**regularly**

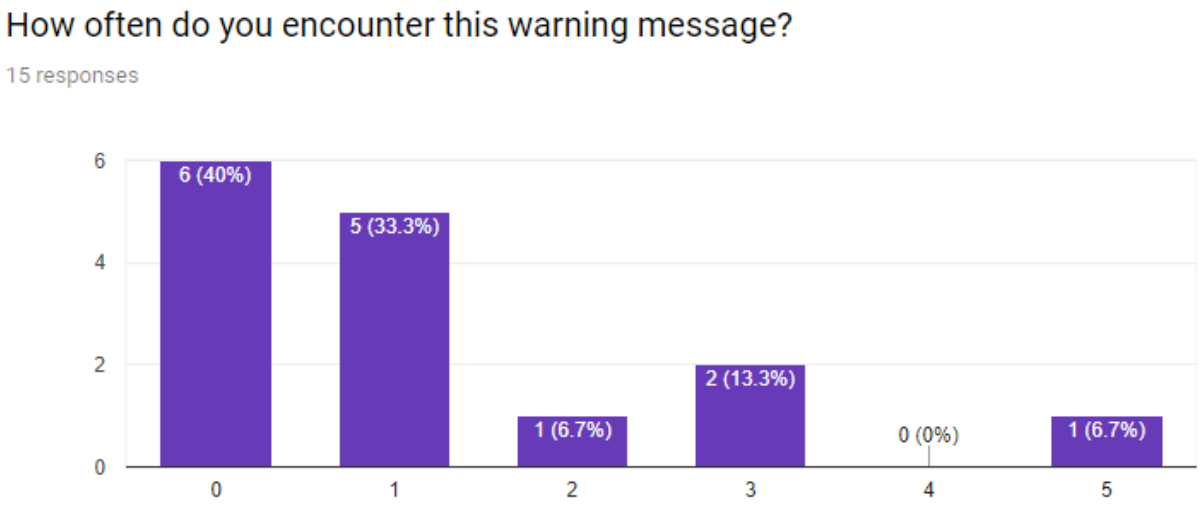


Figure 47. Responses regarding the frequency of the 'Leaving an ILS' Graasp user warning (n=15).

How clear is the meaning of the message to you?

	0	1	2	3	4	5	
never	o	o	o	o	o	o	**regularly**

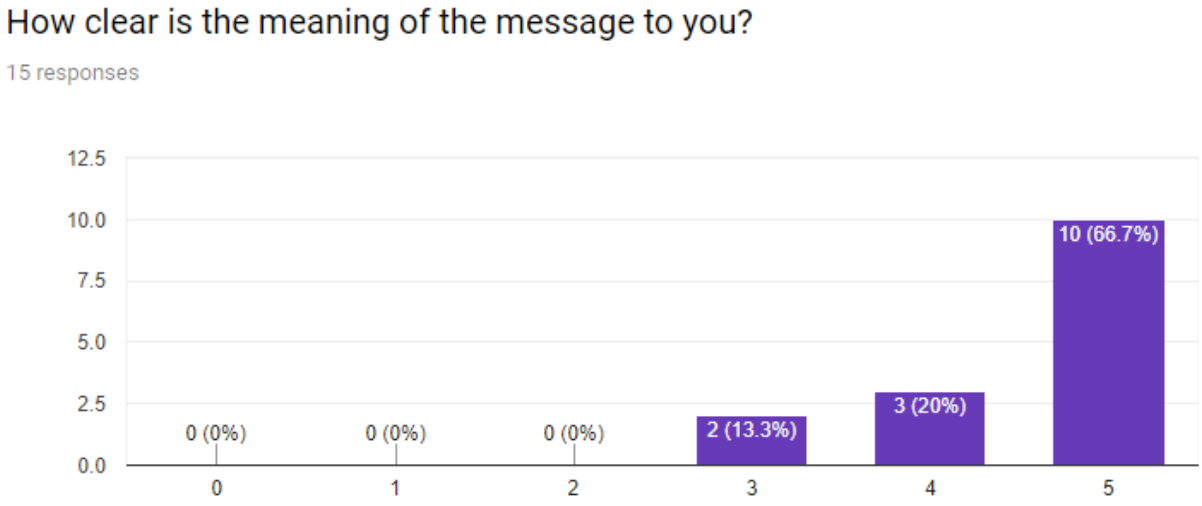


Figure 48. Responses regarding the clarity of the 'Leaving an ILS' Graasp user warning (n=15).

A suggested change for the message would be 'After leaving an ILS it will be removed from your home page and you may be no longer be able to access it. Nevertheless, the content of the ILS will still be there for others.' Would this phrasing increase the understandability over the current one presented in the picture above?

	0	1	2	3	4	5	
not at all	o	o	o	o	o	o	**very much**

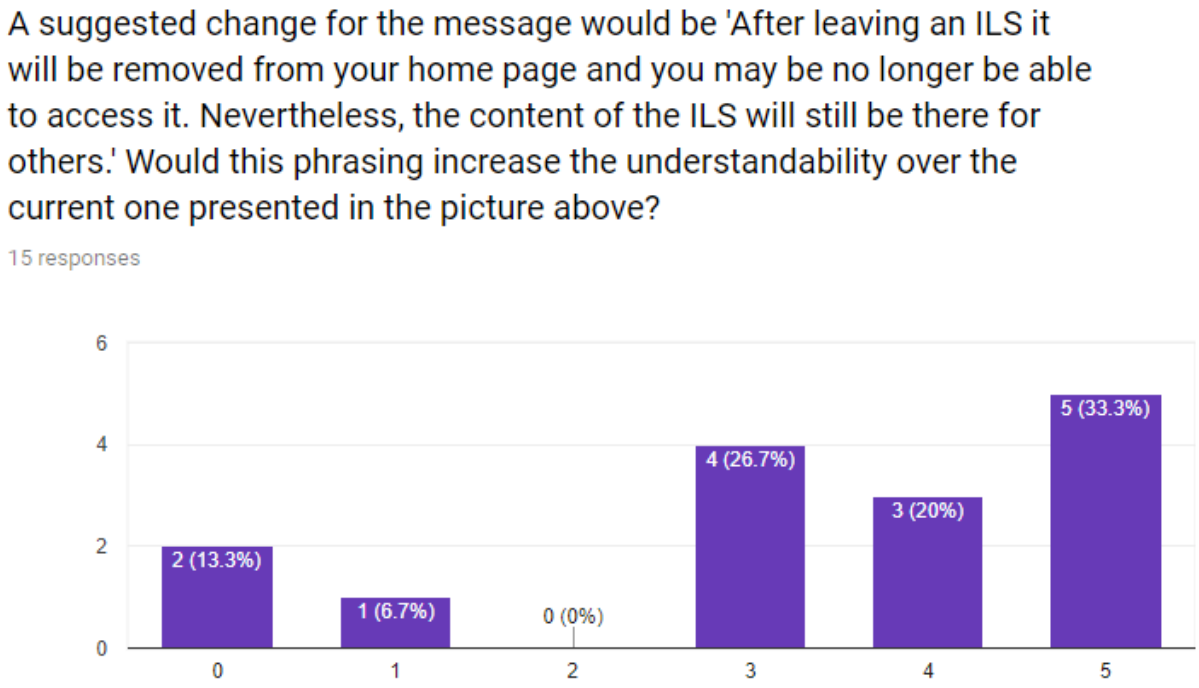
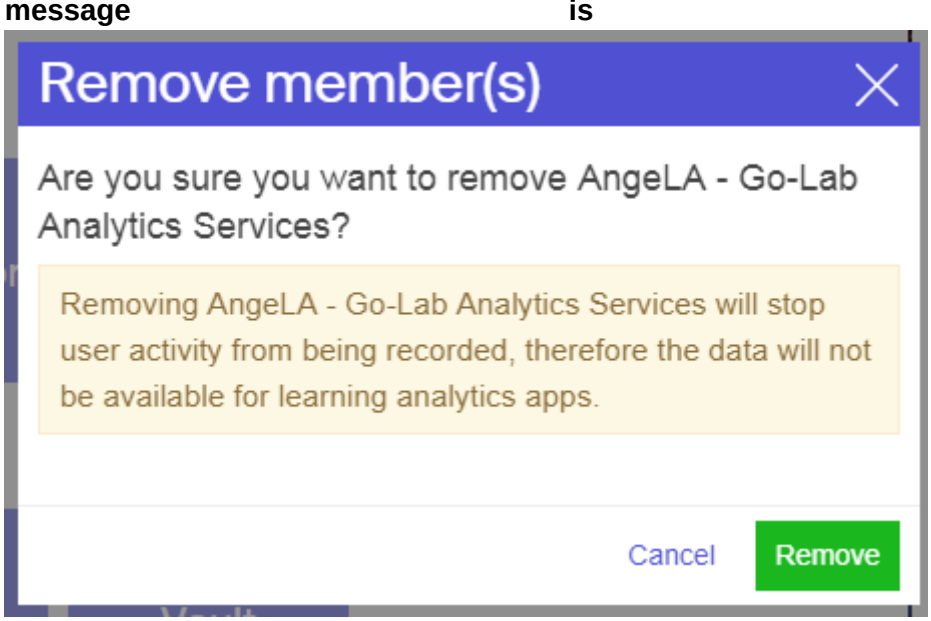


Figure 49. Responses regarding the understandability of the proposed rephrasing of the 'Leaving an ILS' Graasp user warning (n=15).

Do you have any other comments or improvement suggestions regarding this user warning?

- /
- I'm not very good at English, but the sentence " may be no longer be able to access it" sounds weird to me... too much "be". I think the original sentence was more simple and, as consequence, more clear
- it could be better to say : "if you want to use this ILS again you should make a new copy of it from the Go-Lab site"

When removing the user 'AngeLA - Go-Lab Analytics Services' the following message is displayed:



How often do you encounter this warning message?

	0	1	2	3	4	5	
never	o	o	o	o	o	o	**regularly**

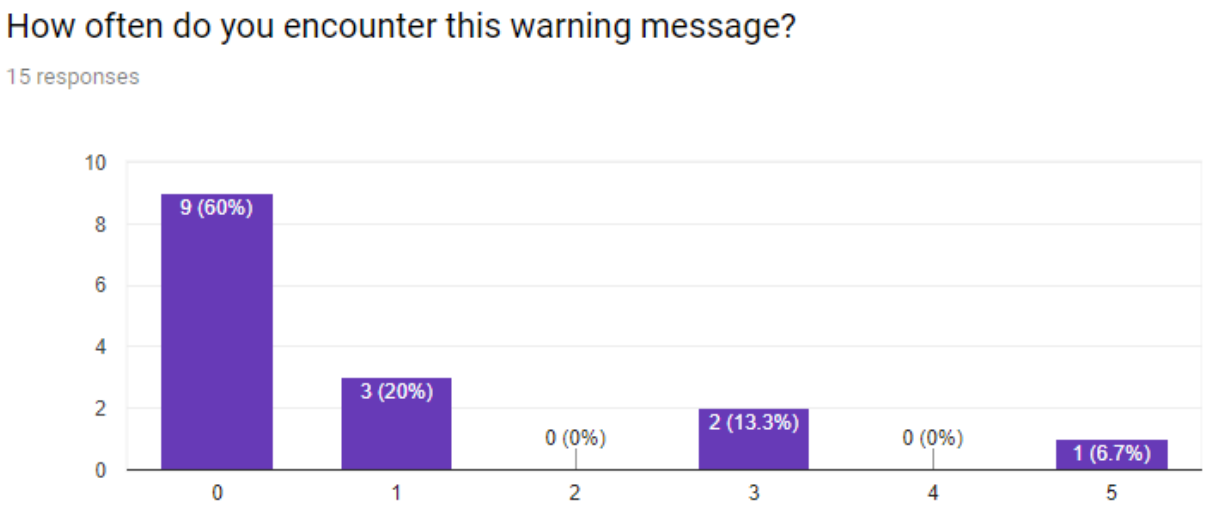


Figure 50. Responses regarding the frequency of the 'Removing AngeLA' Graasp user warning (n=15).

How clear is the meaning of the message to you?

	0	1	2	3	4	5	
never	o	o	o	o	o	o	**regularly**

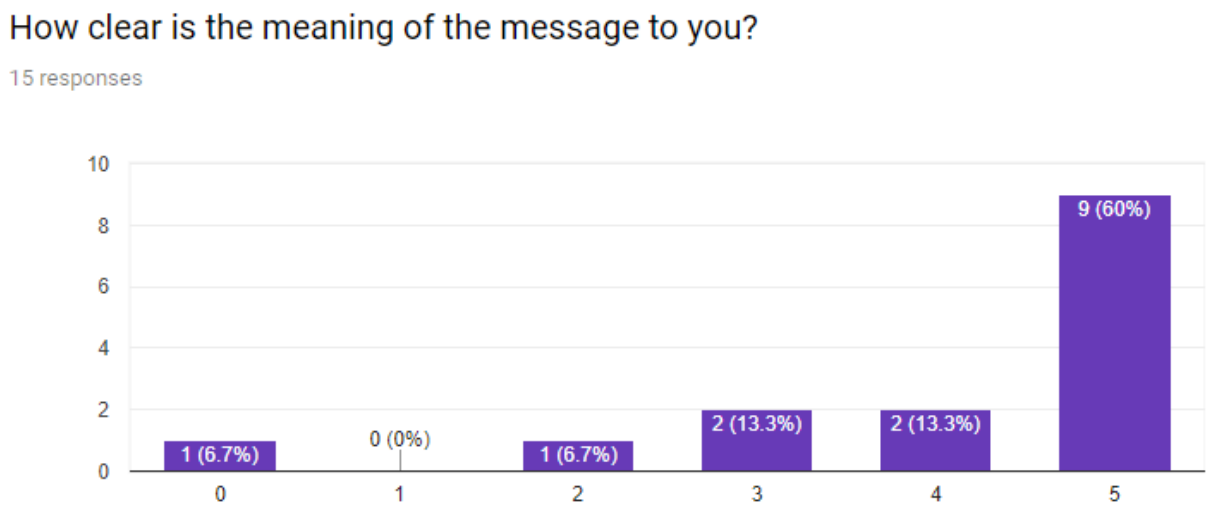


Figure 51. Responses regarding the clarity of the 'Removing AngeLA' Graasp user warning (n=15).

A suggested change for the message would be 'Removing 'AngeLA - Go-Lab Analytics Services' will stop automatic activity tracking. As this data is required by some of the learning analytics apps, they will no longer work in this ILS.' Would this phrasing increase the understandability over the current one presented in the picture above?

	0	1	2	3	4	5	
not at all	o	o	o	o	o	o	**very much**

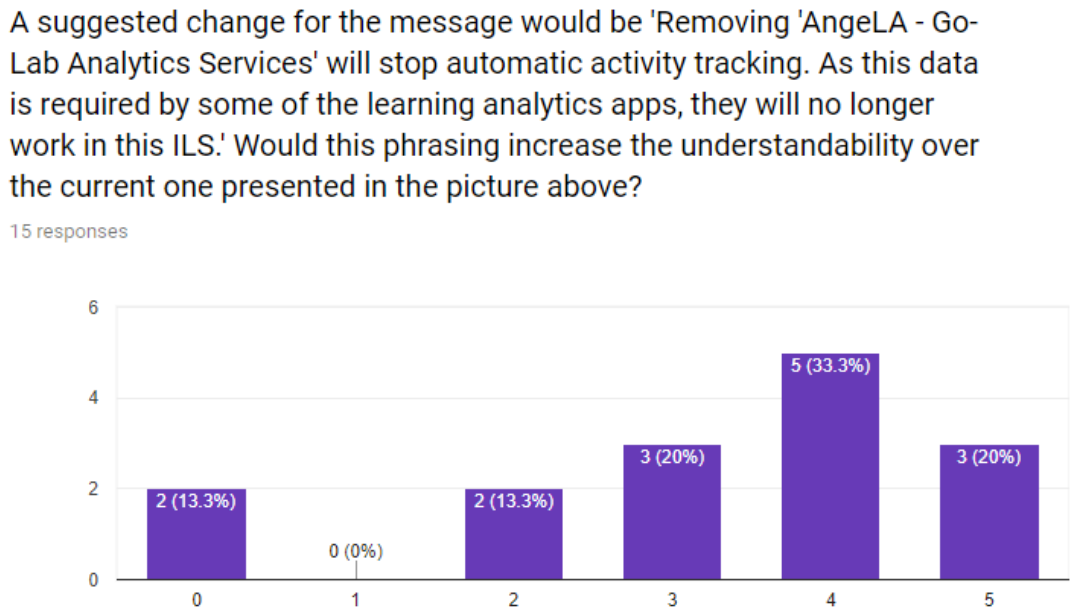


Figure 52. Responses regarding the understandability of the proposed rephrasing of the 'Removing AngeLA' Graasp user warning (n=15).

Would it be useful if the affected apps would be listed as part of the message?

	0	1	2	3	4	5	
not at all useful	o	o	o	o	o	o	**very useful**

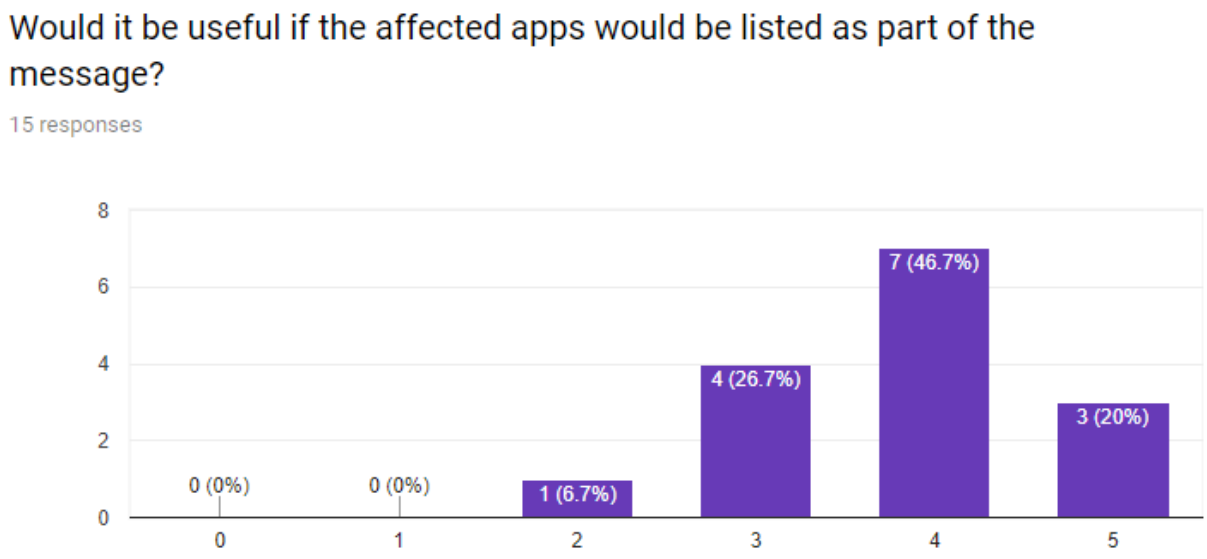
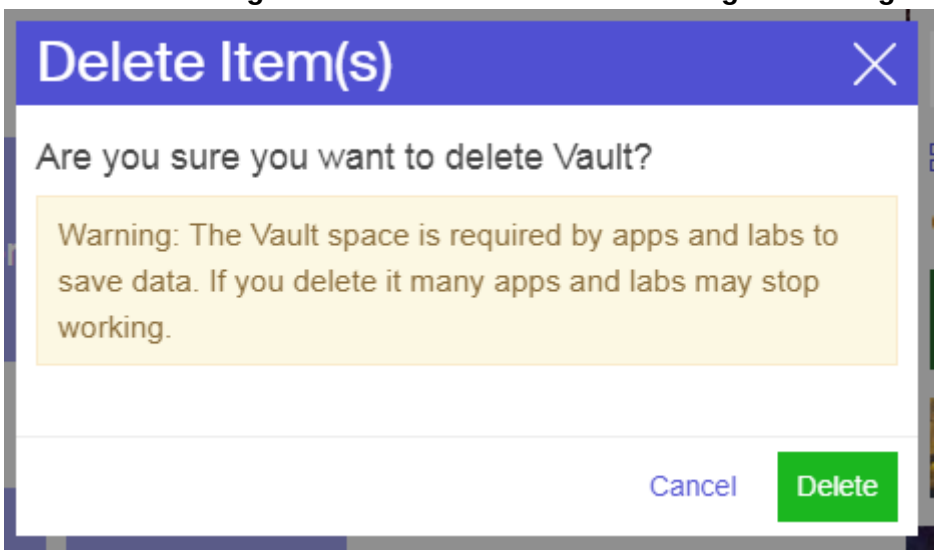


Figure 53. Responses regarding usefulness of listing the affected apps as part of the "Removing AngeLA" Graasp user warning (n=15).

Do you have any other comments or improvement suggestions regarding this user warning?

- /
- Well, the AngeLA user has been always a kind of mystery for me.
  May be hidening Angela or excluding the possibility of removing it would be more logical, but I don't know if that's too difficult. As a user, I'm not interested in the inner operation of the informatic system, and I don't need the option to eliminate Angela.
- a short description of the AngeLA function could be added besides its icon and name in the members list.

When removing the vault the following message is displayed:



How often do you encounter this warning message?

	0	1	2	3	4	5	
never	o	o	o	o	o	o	**regularly**

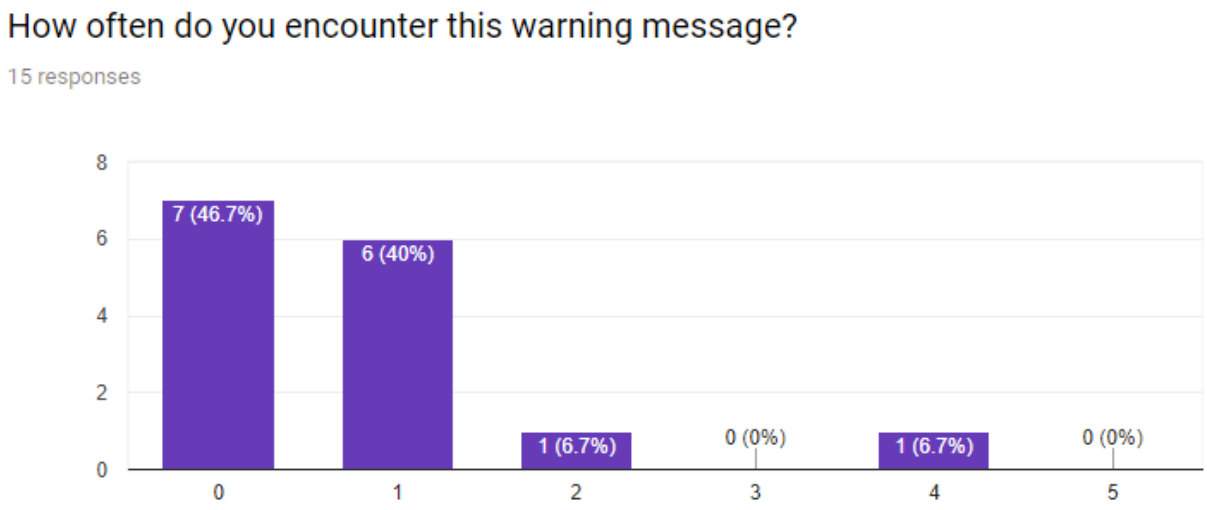


Figure 54. Responses regarding the frequency of the 'Deleting the Vault' Graasp user warning (n=15).

How clear is the meaning of the message to you?

	0	1	2	3	4	5	
never	o	o	o	o	o	o	**regularly**

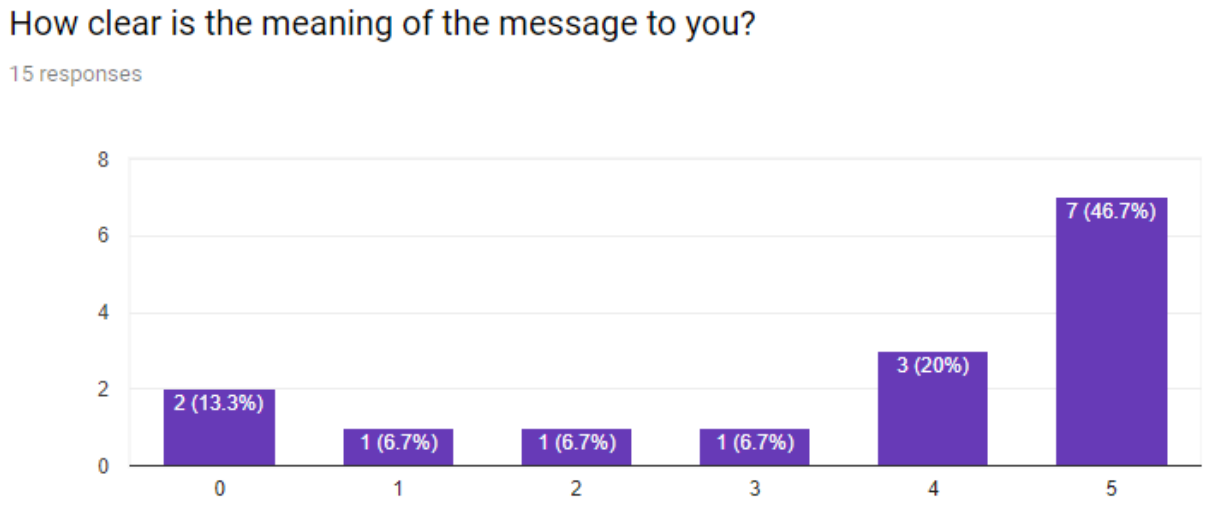


Figure 55. Responses regarding the clarity of the 'Deleting the Vault' Graasp user warning (n=15).

A suggested change for the message would be 'The Vault is required by apps and labs to save data. If you delete it, many apps and labs will stop working in this ILS.' Would this phrasing increase the understandability over the current one presented in the picture above?

0	1	2	3	4	5

not at all o o o o o o very much

A suggested change for the message would be 'The Vault is required by apps and labs to save data. If you delete it, many apps and labs will stop working in this ILS.' Would this phrasing increase the understandability over the current one presented in the picture above?

15 responses

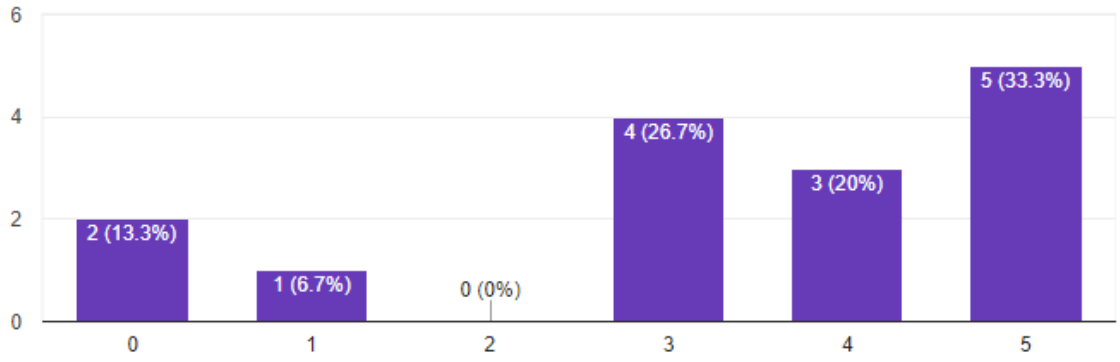


Figure 56. Responses regarding the understandability of the proposed rephrasing of the 'Deleting the Vault' Graasp user warning (n=15).

Would it be useful if the affected apps would be listed as part of the message?

0 1 2 3 4 5

never o o o o o o regularly

Would it be useful if the affected apps would be listed as part of the message?

15 responses

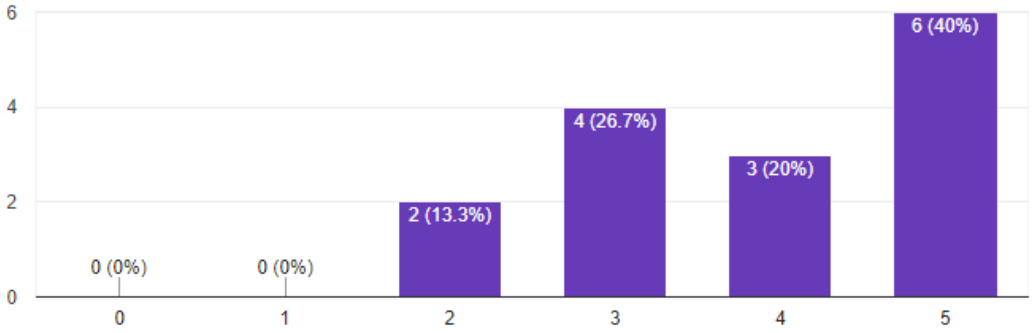


Figure 57. Responses regarding usefulness of listing the affected apps as part of the "Deleting the Vault" Graasp user warning (n=15).

Would it be useful if the affected labs would be listed as part of the message?

0 1 2 3 4 5

never o o o o o o regularly

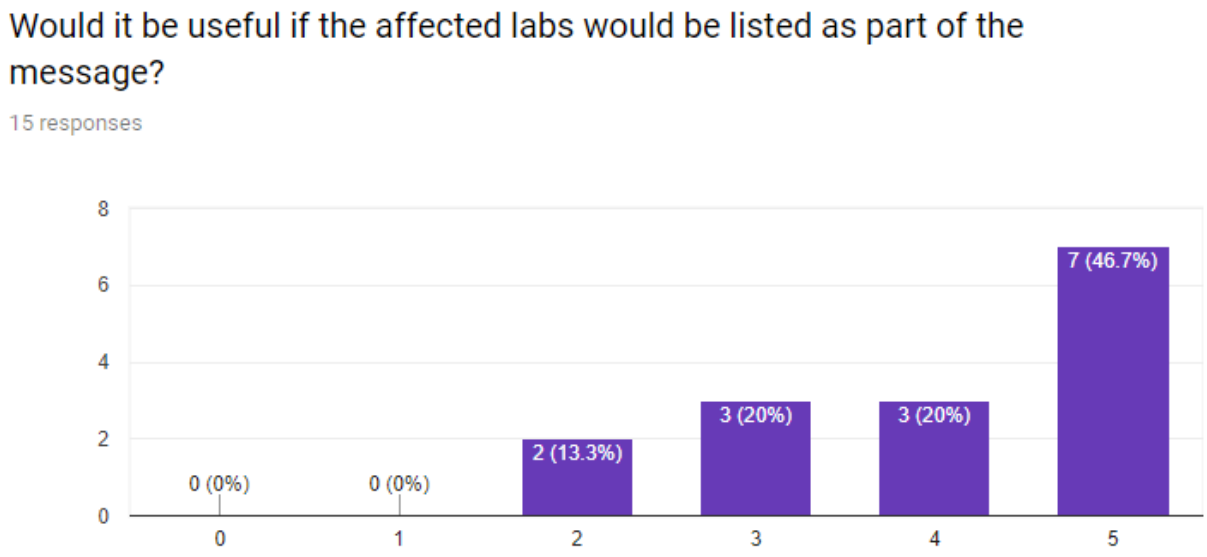


Figure 58. Responses regarding usefulness of listing the affected labs as part of the "Deleting the Vault" Graasp user warning (n=15).

Do you have any other comments or improvement suggestions regarding this user warning?

- /
- I have the impression the list of apps and labs would be too long to be interesting. May be including a link where the list can be consulted if you are interested is more logical

This activity is described in Section 5.8 and a summary of the results is presented in 7.2.5. The email can be found in Appendix W.

Y. Email for CGT: Go-Lab Recognition Scheme (LEIC21032018)

Dear Next-Lab core group and PD teachers,

thank you very much to all of you who replied to the Graasp user warnings questionnaire. From the replies it looks like the current warning messages are already quite clear, but you also identified some potential for slight improvements.

In today's questionnaire we would like to gather your input and feedback regarding our planned Go-Lab recognition scheme using badges. You can find it here: https://docs.google.com/forms/d/e/1FAIpQLSeoXqBCa8nHpLXjDhTpRCqQcb50JCi1e4Y6GsPmduPUTytQqQ/viewform?usp=sf_link

If you could please respond to this task before Easter (by March 28th) that would be great and much appreciated.

Best regards,

Matthias, for the University of Leicester team

This activity is described in Section 5.9 and a summary of the results is presented in 7.2.6. Details can be found in Appendix Z.

Z. Results of questionnaire on Go-Lab Recognition Scheme (LEIC-21032018)

Section 1. General Questions.

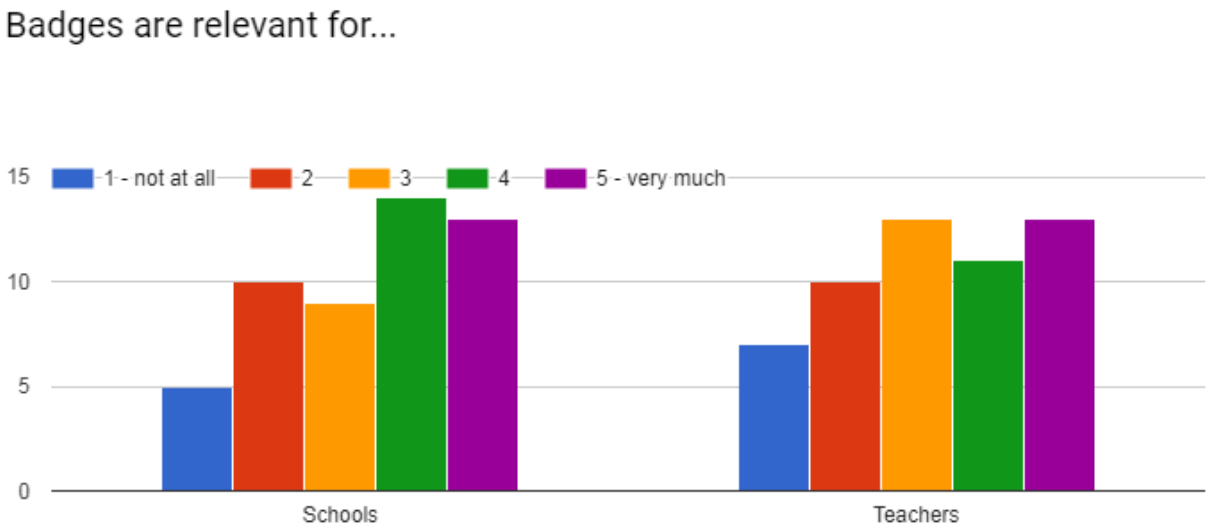


Figure 59. Responses regarding relevance of badges for schools (n=51) and teachers (n=54).

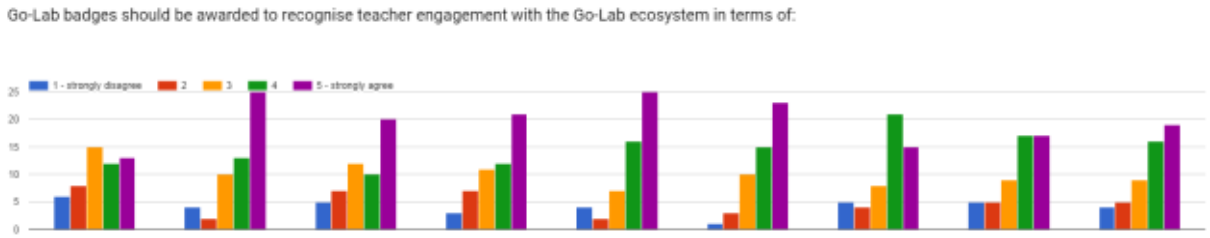


Figure 60. Responses regarding recognition of teacher engagement. See text below for answer options.

The answer options from left to right are:

- Time spent *(n=54).*
- Skills obtained *(n=54).*
- ILS co-creation (with a project team member) *(n=54).*
- ILS co-authoring (with other teachers) *(n=54).*
- Using ILSs in the classroom *(n=54).*
- ILS Publishing *(n=52).*
- Peer Suport *(n=53).*
- Usage of the Go-Lab sharing platform (www.golabz.eu) *(n=53).*
- Usage of the Go-Lab authoring platform (www.graasp.eu) *(n=53).*

Others

4 responses

-

I think that badges are compareble with grades, you dont want to give grades or badges because you add competition and it does not encourage learning.

attending training seminars

I heard about badges just today. I do not have clear opinion what is the best. but of course it is good to encourage others and say some good words to those who are better and more active

There should be badges recognising teachers for their collaboration/commitment with the project as:

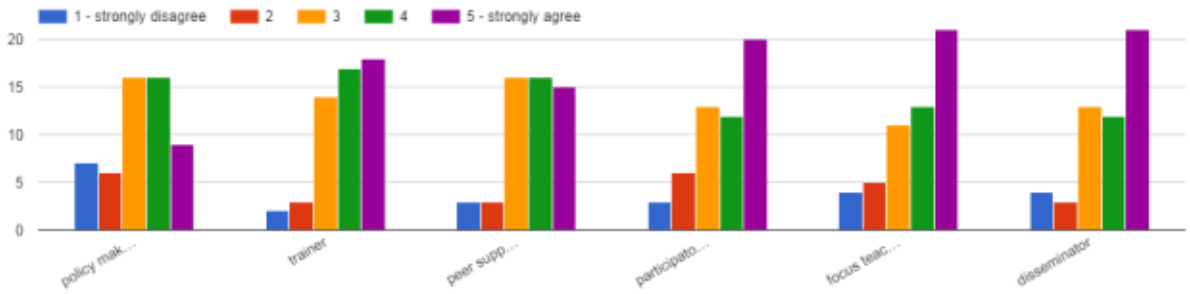


Figure 61. Responses regarding badges recognition for teachers collaborating with the project.

The answer options from left to right are:

- Policy maker influencer *(n=54).*
- Trainer *(n=54).*
- Peer supporter *(n=53).*
- Participatory design teacher (providing bi-weekly feedback on questionnaires and design tasks) *(n=54).*
- Focus teacher (providing feedback from classroom implementations) *(n=54).*
- Disseminator *(n=53).*

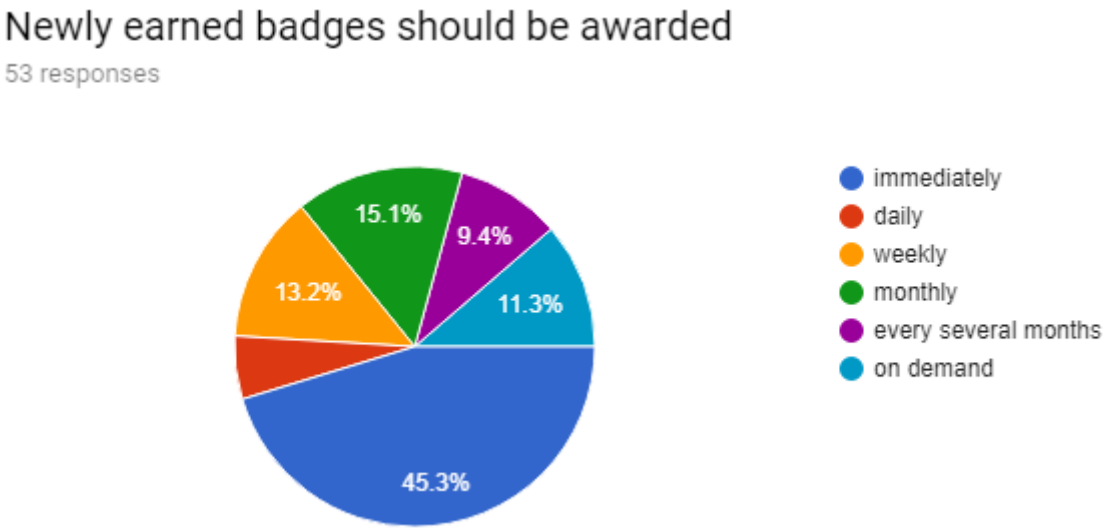


Figure 62. Responses regarding badges update (n=53).

Section 2. Personal Preferences.

I would be willing to fill in a short form and provide some evidence (referring to my engagement and commitment with the project) explaining why I should receive a badge

	1	2	3	4	5	
Strongly disagree	o	o	o	o	o	**Strongly agree**

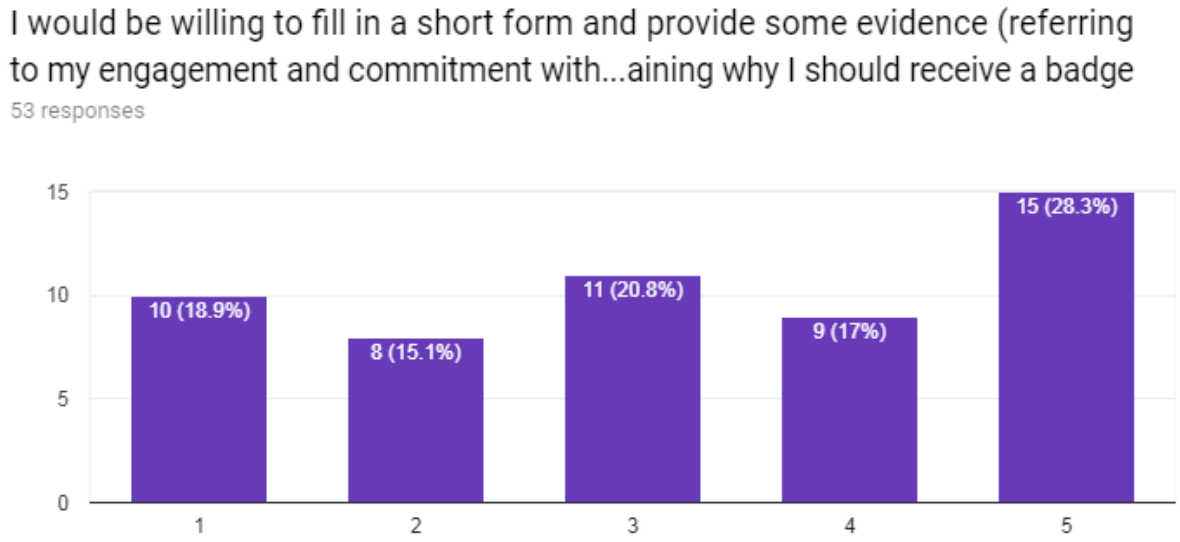


Figure 63. Responses about willigness to submitting evidence of commitment to the project to earn badges (n=53).

I think all badges should be awarded by the system automatically

	1	2	3	4	5	
Strongly disagree	o	o	o	o	o	**Strongly agree**

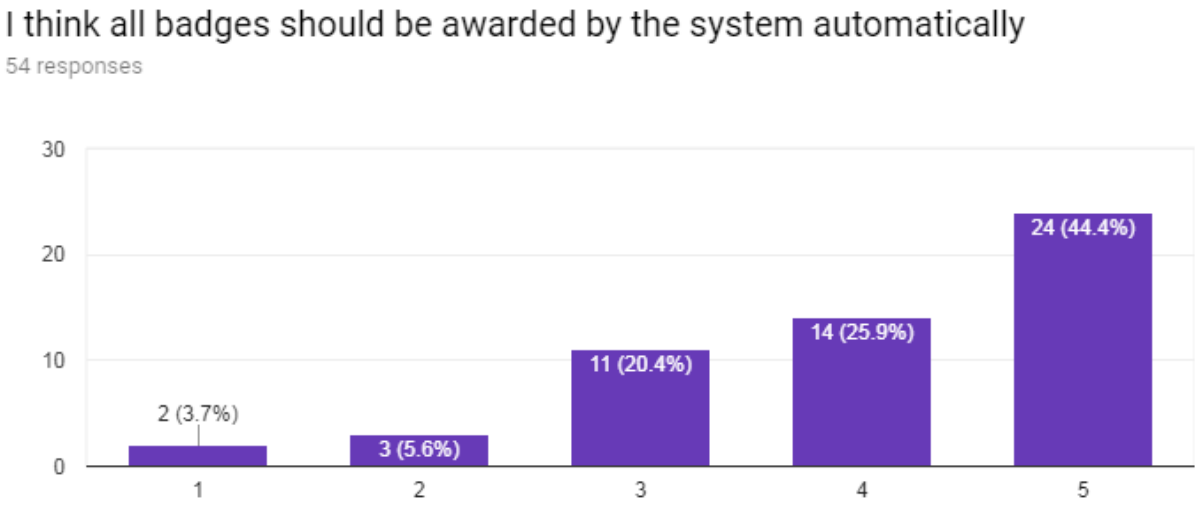


Figure 64. Responses regarding automatic assignment of badges (n=54).

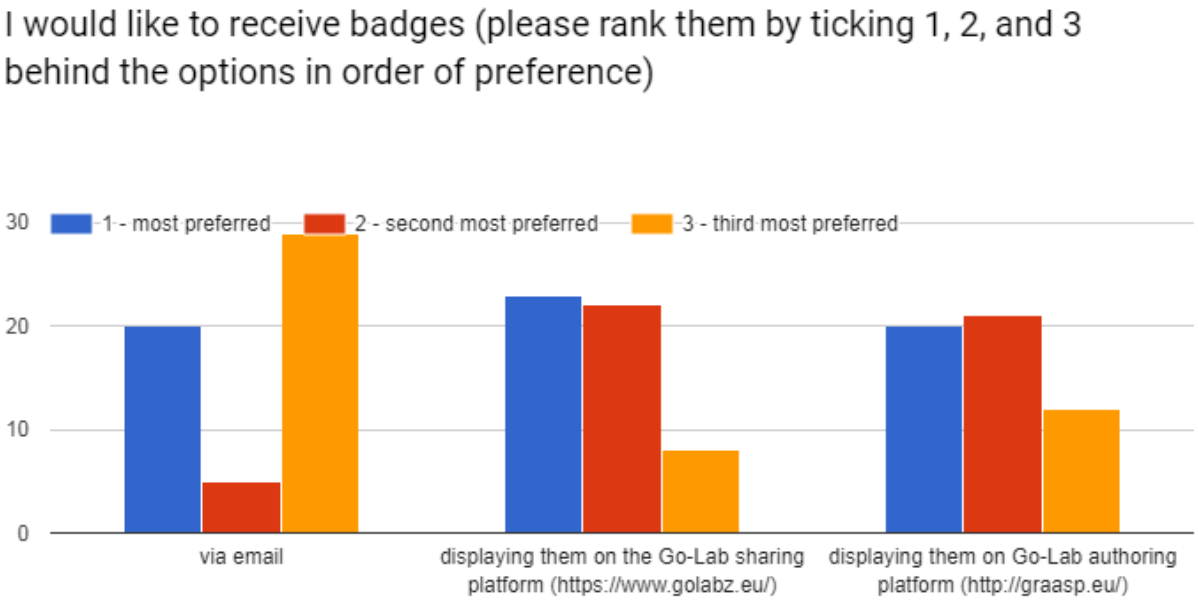


Figure 65. Preferences regarding favourite awarding method.

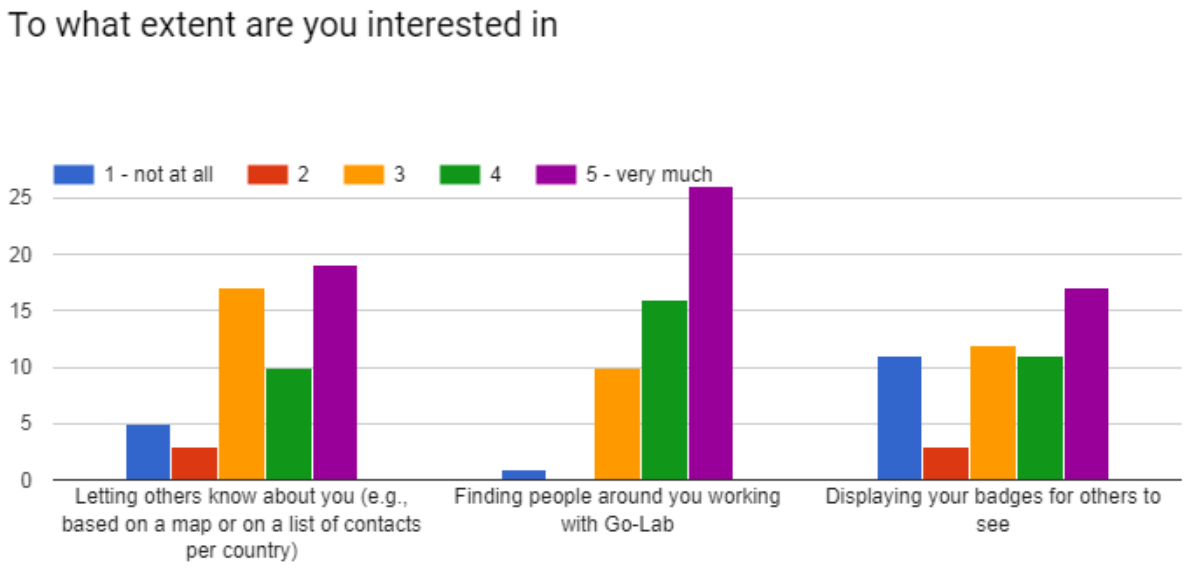
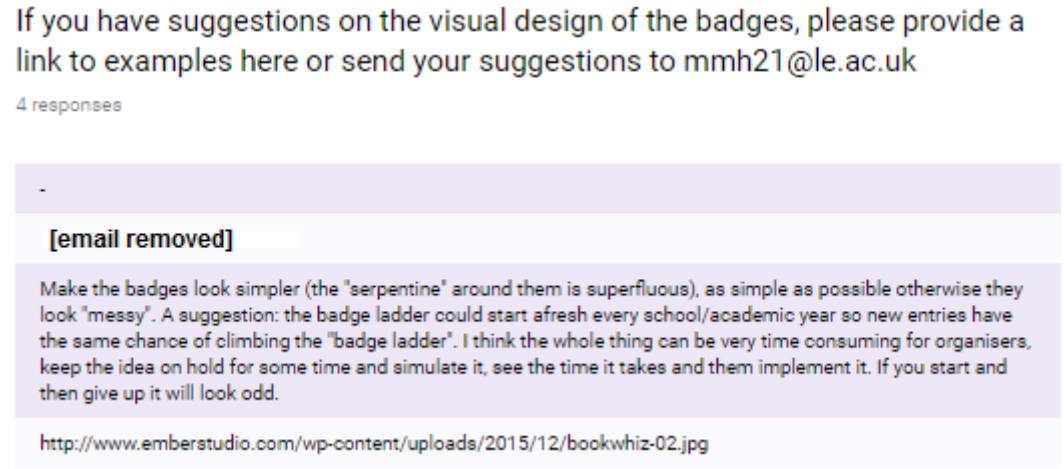


Figure 66. Responses regarding preferences on badges and personal information display.



This activity is described in Section 5.9 and a summary of the results is presented in 7.2.6. The email can be found in Appendix Y.

AA. Email for CGT: Quest / Survey app (LEIC-13042018)

Dear Next-Lab core group and PD teachers,

We hope you had a nice Easter break and want to thank all of you who took the time to fill in our recognition questionnaire.

From the responses it looks like badges are more relevant for teachers than for schools, you would like batches for all the achievements we proposed and badges should be awarded immediately after earning them. Automatic generation and providing some evidence to receive a badge are both equally well received, while receiving badges via email is most preferred. We will take this into account for our further design and implementation activities for the recognition scheme.

Today's task is more open ended than the usual filling in of a questionnaire:

We would like you to

1) create a new ILS and
2) include the Quest app (https://www.golabz.eu/app/quest-1).
3) Then create a short survey using this app and report to us via email any problems you encounter and improvement suggestions you would have for the app (preferably with screenshots).
4) Please also share with us the standalone view URL of your ILS, so that we can have a look at your survey.

Additionally we would like to get your feedback on our plan of re-naming the Quest app. The current name has historic reasons, but we think that it does not adequately the purpose of the app. We would therefore like to rename it to "Survey app". What do you think of that?

a) That's fine with me.
b) You should keep the old name, because...
c) You should rename it, but the new name should be "..." instead of "Survey app", because ...
(Please select your choice from the options above and send it to us via email, filling in the blanks if there are any)

In case you have any questions, please let us know. If you could reply to this email by 23/04/2018 that would be great and much appreciated.

Best regards,

Matthias, for the University of Leicester team

This activity is described in Section 5.10 and a summary of the results is presented in 7.1.9. Details can be found in Appendix BB.

BB. Results of CGT task on Quest / Survey app (LEIC-13042018)

- Response 1

  Sorry for not answering earlier, my answer to:

  Additionally we would like to get your feedback on our plan of re-naming the Quest app. The current name has historic reasons, but we think that it does not adequately the purpose of the app. We would therefore like to rename it to "Survey app". What do you think of that?

  a) That's fine with me.

- Response 2

  I've created an ILS "Geometric constructions for image formation by lens" ("Constructia imaginilor in lentile" - Romanian language) in which I have included the Quest app. I don't have encountered any problem.

  I have a sugestion: add a "Submit" button. After students respond to the survey, it will be useful a such button that will save all the answers and the students can no longer change them. In this form the students have the possibility to change their responses anytime.

  http://graasp.eu/ils/5968d3cbdab0e8f63c8a64e7/?lang=ro

  About re-naming the Quest app my answer is:

  a) That's fine with me.

- Response 3a

  Hello,

  Here is the ILS I used to test the Quest

  app: http://graasp.eu/ils/5a16e924dab0e8f63c7723c6/?lang=it

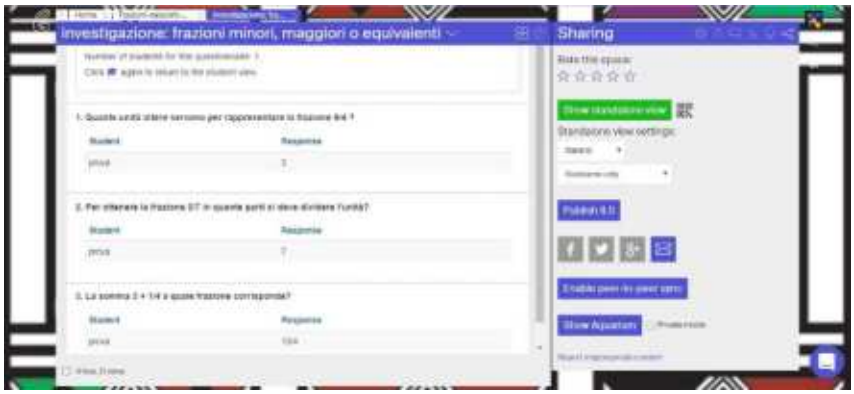
  This activity is not yet complete and it is made by me and an undergraduate student who is in training at my school.

  At the moment I just tested two types of questions: open and multiple choice, using only one test user.

  Tomorrow I'm planning to test the app with real students, who, by the way, are actively collaborating at creating GeoGebra contents for this ILS.

  As far as I've seen, the difference in the teacher view is in these screenshots:

  The open answer mode shows the nickname of the student who gave the answer, and the multiple choice mode shows the number of students for each answer.



I couldn't find the way of adding pictures in the questions, except by URL, but it would be better if teachers could also upload their own pictures. This may be my idea but I'm not sure if I understood correctly the way of adding pictures.

After the real students test I will give more details.

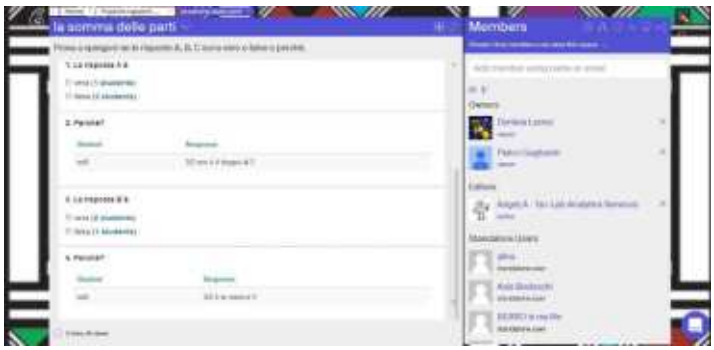
- Response 3b

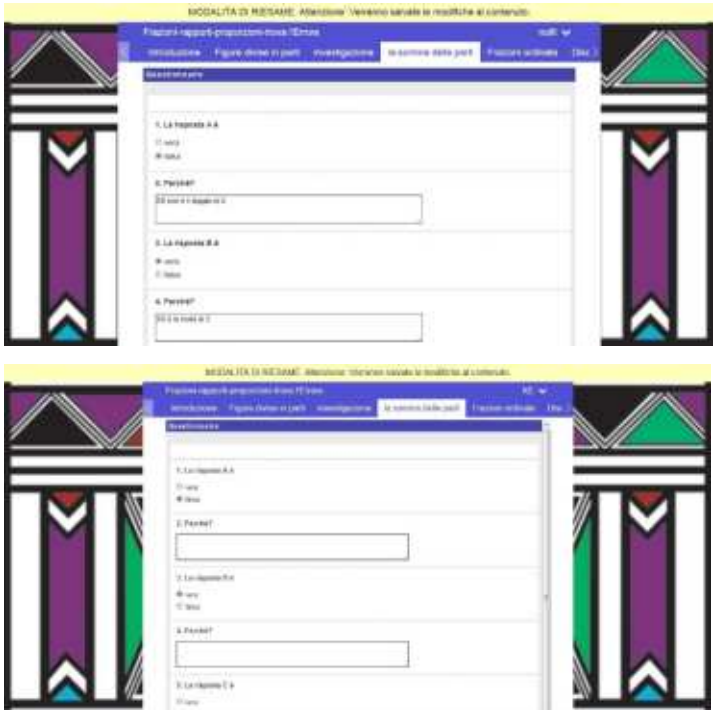
  As proposed, today my students tested the Quest App in the ILS http://graasp.eu/ils/5a16e924dab0e8f63c7723c6/?lang=it

  Both multiple choice and open answer modes worked as expected.

  In the multiple choice mode teacher can see the number of students who choose each answer, and in the open mode students'answers are listed by nickname.

  I also tried a mixed Questionnaire with choice between True and False and open explanations, but only one student explained his choices.
  I checked in the review mode after checking the teacher view from Graasp and the results are matching.





Regarding the app name, Quest is fine in my opinion, but I agree with any name.

Best regards from me and my students, who are engaged in preparing Geogebra contents.

This activity is described in Section 5.10 and a summary of the results is presented in 7.1.9. The email can be found in Appendix AA.

CC. Email for CGT: Timeline App (LEIC-11052018)

Dear Next-Lab core group an PD teachers,

thanks to all of you who gave feedback on the Quest app.

This week we would like to ask your feedback and input on the Timeline learning analytics app. You can find the questionnaire here: https://docs.google.com/forms/d/e/1FAIpQLSfVXhitvfZaTSzvDFV-6tlbknxrzDHutPJDazYkdfeuv88pAw/viewform?usp=sf_link.

CGT Timeline App Questions

docs.google.com

Currently the time spent by students in different phases of the ILS and working with different apps are displayed in the Timeline App (http://go-lab.gw.utwente.nl/sources/tools/timeline/main/webapp/timeline.html) based on the time (displayed on the x-axis). We think that this might make it harder to compare a student's timeline with those of others, as they do not start at the same point on the x-axis. If all activities would be visualized starting from the beginning of the graph (y=0), then students and the teacher could for example directly see, how one student's time spent in the Orientation phase compares to the other students, based on the alignment of the end points of the "Orientation bars". We would therefore like to ask you, what you think the best way to visualize the time spent in the graph would be:

If you could please reply to the questionnaire by 21/05/2018 that would be great and much appreciated.

Best regards,

Matthias, for the University of Leicester team

This activity is described in Section 5.11 and a summary of the results is presented in 7.1.10. Details can be found in Appendix EE.

DD. Email for repetition of CGT: Timeline App (LEIC-25052018)

Dear Next-Lab core group and PD teachers,

thanks to all of you who already filled in the short questionnaire on the Timeline app.

Unfortunately, we have only 6 responses so far. Thus, as we would like to get a more representative overview on what you think, like, and expect, to be able to better tailor the app to your needs, this week we are going to repeat the last task and would like to ask you to please fill in the Timeline app questionnaire (https://docs.google.com/forms/d/e/1FAIpQLSfVXhitvfZaTSzvDFV-6tlbknxrzDHutPJDazYkdfeuv88pAw/viewform?usp=sf_link), if you have not already done so.

CGT Timeline App Questions

docs.google.com

Currently the time spent by students in different phases of the ILS and working with different apps are displayed in the Timeline App (http://go-lab.gw.utwente.nl/sources/tools/timeline/main/webapp/timeline.html) based on the time (displayed on the x-axis). We think that this might make it harder to compare a student's timeline with those of others, as they do not start at the same point on the x-axis. If all activities would be visualized starting from the beginning of the graph (y=0), then students and the teacher could for example directly see, how one student's time spent in the Orientation phase compares to the other students, based on the alignment of the end points of the "Orientation bars". We would therefore like to ask you, what you think the best way to visualize the time spent in the graph would be:

If you could please respond by 04/06/2018 that would be great and much appreciated.

Best regards,

Matthias, for the University of Leicester team

This activity is described in Section 5.11 and a summary of the results is presented in 7.1.10. Details can be found in Appendix EE.

EE. Results of CGT task on Timeline App (LEIC-11052018 & LEIC-25052018)

How should the time spent by the students be visualized in the Timeline App?

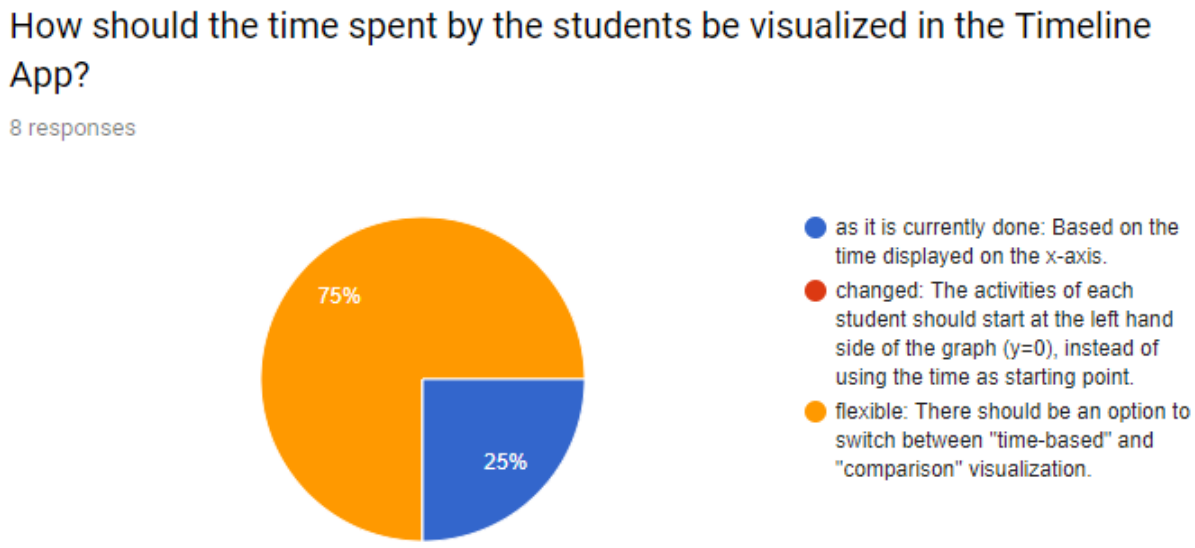


Figure 67. Responses regarding the visualization of the timelines (n=8).

What would be a good term for the "comparison visualization" that would be easy to understand for your students?

- "look and compare"
- Time balance
- Yes
- name/time
- yes
- comparative view of activity
- Marque progres

Do you have any other feedback or redesign ideas regarding the new version of the Timeline App (http://go-lab.gw.utwente.nl/sources/tools/timeline/main/webapp/timeline.html)?

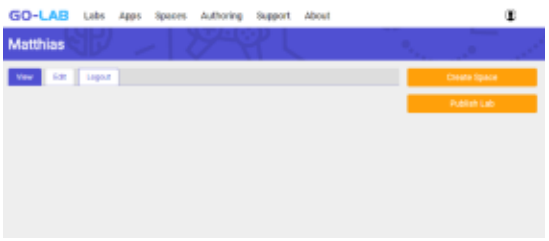
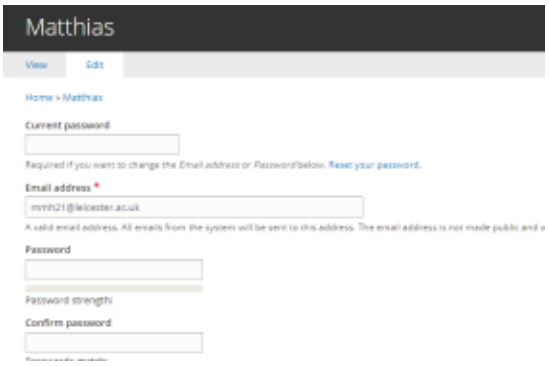
- -
- Bar chart y-axis
- Use de timelin for other uses
- no
- /
- No

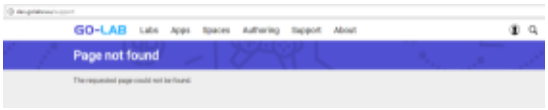
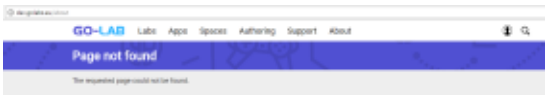
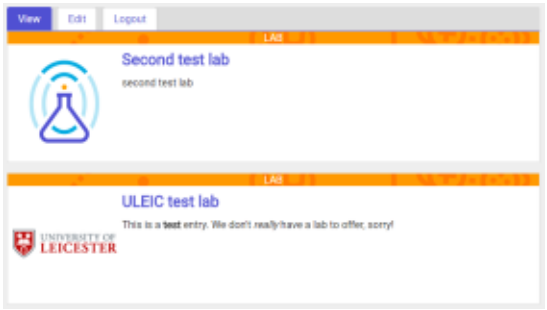
This activity is described in Section 5.11 and a summary of the results is presented in 7.1.10. The emails can be found in Appendix CC and Appendix DD.

FF. Detailed Findings from the Analytical Walkthrough Performed for the New Go-Lab Sharing Platform (LEIC-06092017)

- One laptop computer running Windows 7
- Screen resolution: 1680 x 1050 (on PC where portal was tested)
- Browser: Google Chrome

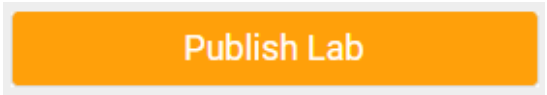
1. General

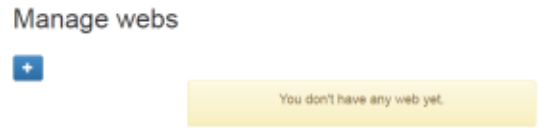
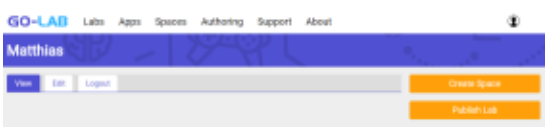
	Usability Observation	Recommended Modification	Import-ance
5	The “View” area of the user profile is empty (even after uploading a picture). 	Show user information in “View” tab or remove it. NB: The next day a list of the published labs was displayed there. Still it would be nice to also present some profile information.	**M**
6	If the end-user clicks on the “Edit” tab, the edit functionality is not displayed underneath, instead a completely different interface is presented. 	Show edit functionality in the page with the “Edit” tab. Make sure design is consistent.	**M**
7	When clicking on a screenshot it opens in the same tab. 	Screenshot should be displayed in an overlay on top of the lab information or at least in a new tab, so that the end-user does not lose the lab, when closing the screenshot tab.	**H**

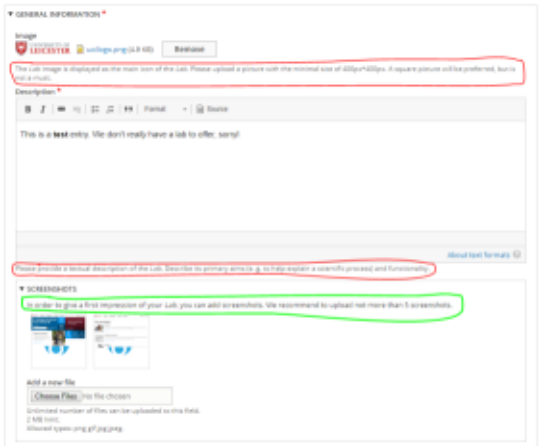
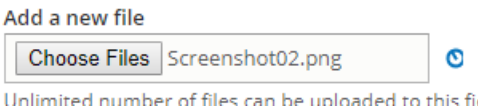
	Usability Observation	Recommended Modification	Import-ance
8	Support page cannot be found. 	Add “Support” page.	**H**
9	About page cannot be found. 	Add “About” page.	**H**
10	Based on the presented information the end-user might expect to “edit” the list of his or her LABs and might be confused to see his or her profile details instead. 	Display profile information above the list of LABs. Provide access to edit LABs information from the Edit profile page.	**M**

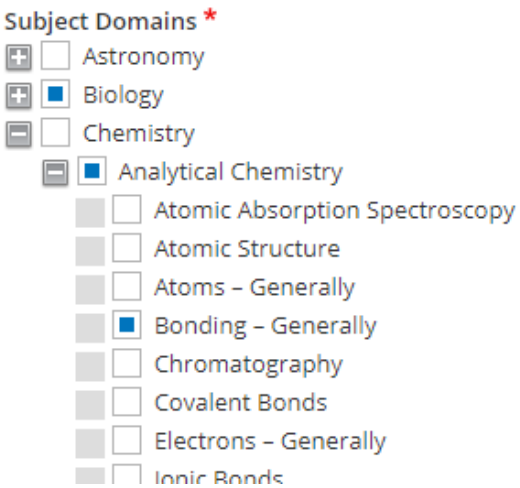
2. Lab editor experience

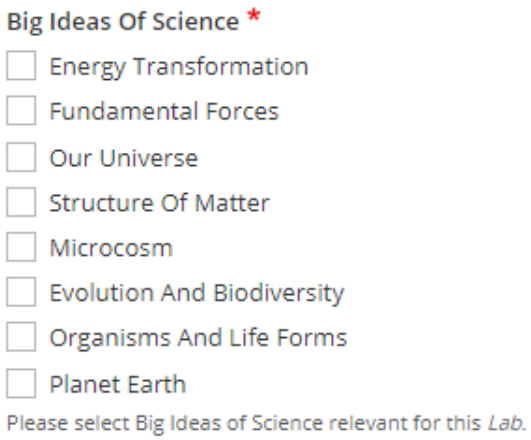
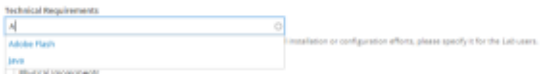
While assuming the role of a Lab editor and performing the associated task (Create lab) the following usability observations were made.

	Usability Observation	Recommended Modification	Import-ance
11	Interface element to publish lab looks like a button, but only the text is interactive.  This is inconsistent to other interface elements (e.g. “Sort” button) and thus unexpected for the end-user.	Make the interface element work like a button (whole coloured area can be clicked).	**M**
12	The button that looks like it offers the functionality to actually publish your Lab only leads to a page describing the publishing process (http://dev.golabz.eu/labs/publish).	Change the misleading label of the button, e.g. to “How to publish your lab.”	**M**

	Usability Observation	Recommended Modification	Import-ance
13	The "Publish your Lab" page (http://dev.golabz.eu/labs/publish) has a misleading heading.	Should be "How to publish your Lab" instead	**M**
14	The "Publish your Lab" page (http://dev.golabz.eu/labs/publish) has several typos and the layout could be improved (e.g. space above the second heading). 	Fix the typos on this page and check if some of the descriptions could be improved.	**H**
15	On the "Publish your Lab" page the textual description of how to get help / contact us could be improved.	Add a picture of said button to the text.	**L**
16	When following the "Go-Lab Smart Gateway Service" link, the end-user reaches a page which might be confusing for them, e.g. what is a "web". 	Improve wording, e.g. call it a "lab" maybe?	**H**
17	Not sure if every Lab editor will be an "admin" or if that is a specificity of our testing role, but not all should be admins. 	Make sure that not all Lab editors get admin permissions.	**H**
18	Profile page can not necessarily be identified as being the profile page. 	Add "(My) Profile" in front of the user name in the header. Show profile information in "View" area.	**L**

	Usability Observation	Recommended Modification	Import-ance
19	Having the description of the entry underneath the interface element to specify it, could be confusing or missed by the end-user. (Green highlighting in the screenshot = good, red highlighting = could be improved) 	Put the description between the title and interface element to provide information.	**H**
20	The loading spinner when uploading a screenshot is “cut off” on the right hand side. 	Show the complete loading spinner.	**L**
21	The buttons to “Edit” and “Remove” screenshots shown on MouseOver over the screenshot preview seem out of place and are partly cut off. 	Replace buttons with smaller interface elements.	**L**
22	The numbers added in brackets behind information retrieved from the system (e.g. user names and languages) can be confusing. 	Display these information without the numbers or explain the meaning of these numbers.	**M**
23	There seem to be some English language issues and grammar mistakes in the forms descriptions.	Address them.	**H**

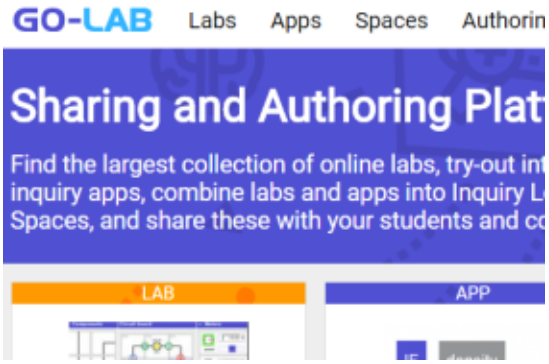
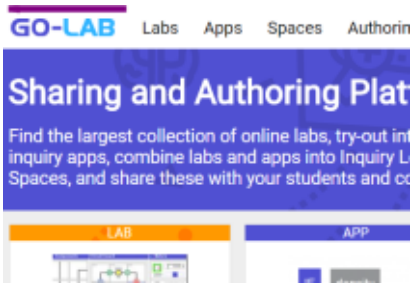
	Usability Observation	Recommended Modification	Import-ance
24	It is not clear for what the “Language information” is specified.	Give a description of the Language information.	**H**
25	The only real option in the Language information dropdown is “English”. 	Check if this is the intended behaviour for this dropdown.	**H**
26	For “Subject Domains” the end-user can select a lower-level domain without also selecting the according higher-level domains. 	Automatically select all according higher-level domains, when a lower-level domain is chosen.	**H**
27	From the description of the “Subject Domains” entry it is unclear, what is “adapted” and how. 	Describe this in more detail / in a way that is understandable for the user.	**H**

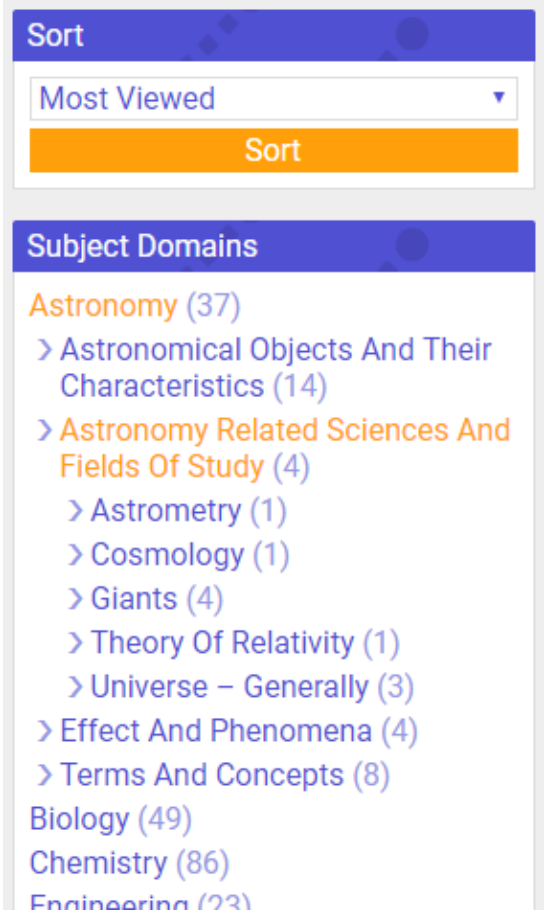
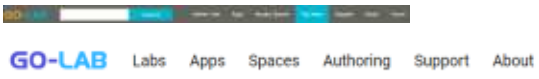
	Usability Observation	Recommended Modification	Import-ance
28	End-users not familiar with the Big Ideas Of Science might not know which ones to choose for their lab. 	Link from the names of the Big Ideas to their description in the portal.	**H**
29	Some of the description texts do not describe the entry, but give requirements instead. 	Make sure that there is a real description with more information regarding each entry.	**H**
30	If Adobe Flash and Java are the only two possible entries for “Technical Requirements”, they should not be entered in a text box. 	Provide checkboxes instead. These could be supported by icons of Adobe Flash and Java.	**M**
31	Row weight for “Embed Link” is confusing and seems to be unnecessary. 	Remove this functionality.	**L**
32	Error message on top of the Create lab page does not help to find the issue in the page. 	Area that contains the issue should be automatically expanded or at least its heading should be highlighted.	**H**

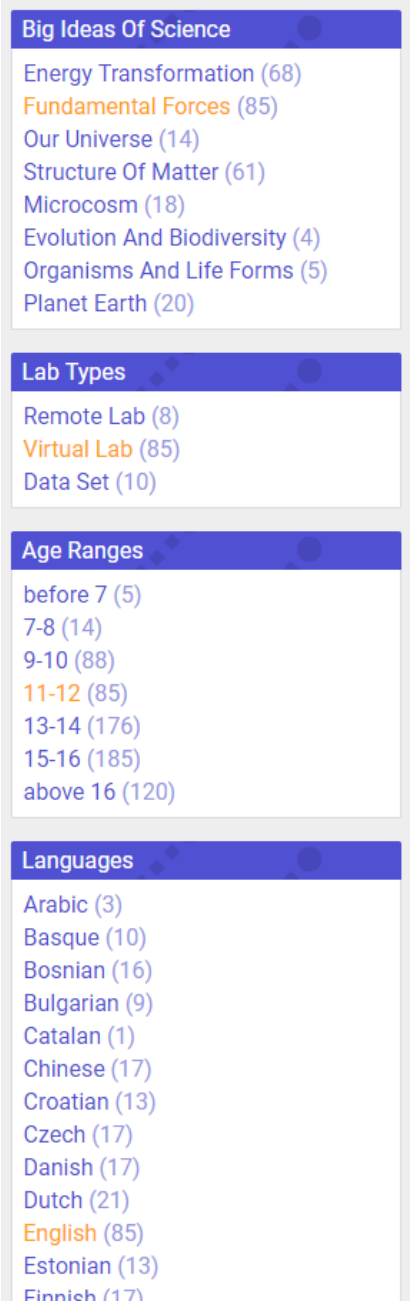
	Usability Observation	Recommended Modification	Import-ance
33	The label of the “Save” button could be misleading (e.g. save for later). 	Use “Publish” as the label instead.	**L**
34	The red bar shown when viewing the lab looks like there is an error and the red does not fit the colour scheme of the rest of the page. 	Remove the red colouring.	**L**
35	After saving a lab and going back to “Edit” it, the interface is sending mixed messages of it “has been created” and is “Not published”. 	Change “not published” to “published” once the lab has been published. Maybe change it to “unsaved changes” to indicate changes that have not been saved yet.	**H**
36	As a Lab editor I would like to see an overview of all my labs, to be able to access, edit, … them from there.	Show a list of “My Labs” in the View area of the end-user profile. NB: Such a list was shown the next day, thus it might just need some time. The portal should inform the Lab editor about the details somewhere (e.g. the instructions page).	**H**
37	Published labs do not appear in the list on the website.	Might be because it is only a testing version of the portal. In case the labs have to be “approved” by somebody, before they appear on the portal, this should be communicated to the end-user. NB: They were shown in the list the next day, thus it might just need some time. Again, inform the Lab editor about the details somewhere (e.g. the instructions page).	**H**

3. ILS editor experience

While assuming the role of a ILS editor and performing the associated task (General check of the interfaces and menus; Filtering function, search function, preview lab, preview ILS, create ILS from lab, duplicate ILS, publish ILS) the following usability observations were made.

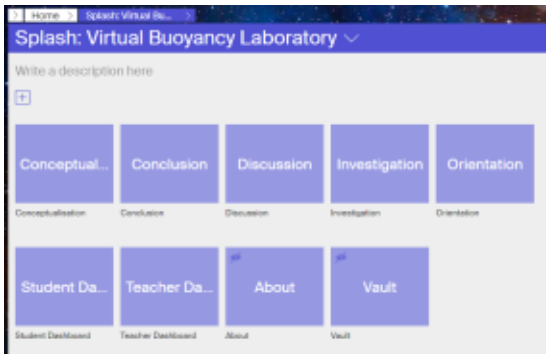
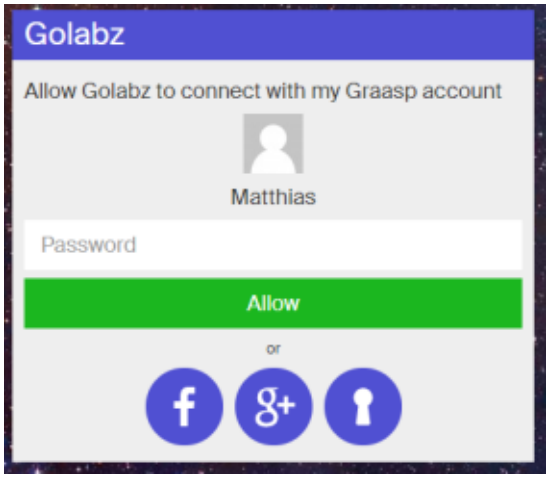
	Usability Observation	Recommended Modification	Import-ance
1	On the start page the current location is not indicated in the menu. This is inconsistent with the behaviour for Labs, Apps, and Spaces menu entries. 	Add coloured bar over the Go-Lab logo when on the start page. 	**M**
2	On the details pages for labs, apps, and ILSs the visual clue on the location in the menu is no longer shown. 	Continue indicating the current location when going from the overview to details pages. 	**M**

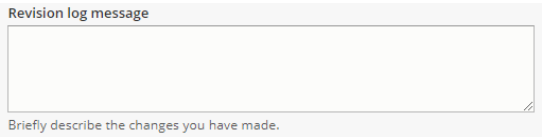
	Usability Observation	Recommended Modification	Import-ance
3	Some filters are applied automatically onClick, Sort requires a button to be pressed, this is inconsistent. 	Apply the sorting “OnSelectionChanged” of the Dropdown list and remove the button.	**L**
4	The Big Ideas are missing from the menu and their explanation seems to be no longer on the portal? 	When clicking on one of the Big Ideas in the lab/app/ILS description, not only a list of artefacts assigned to this big idea should be shown, but also an explanation, for teachers that are not familiar with the Big Ideas of Science. 	**H**

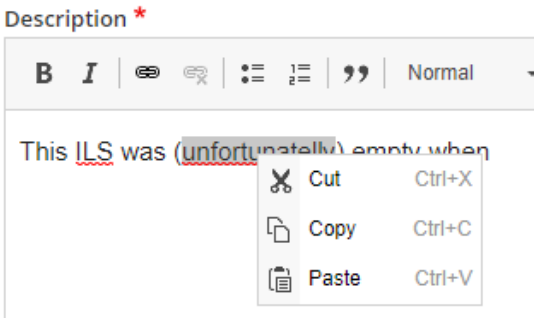
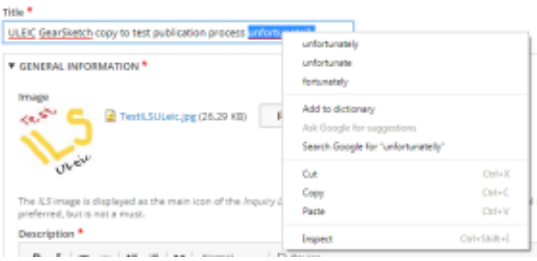
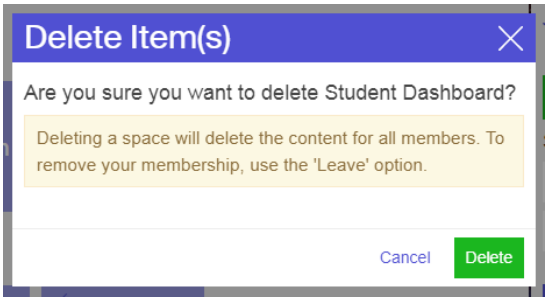
	Usability Observation	Recommended Modification	Import-ance
5	When looking at the details page of a lab and going back to the list using the “Labs” entry in the menu (instead of the back button of the browser), the selected filter options are lost.	If possible the filtering should be stored in a way that automatically applies them after looking at the details of one of the labs found. If the filtering should stay present when switching from labs to apps or ILS should be discussed.	**H**
6	The filter options on the right hand side (especially for language) take up a lot of space, although only one can ever be selected at the same time. 	To save space, a dropdown list could be used, at least for the language, as it is done for Sort. For all other options (besides Subject Domains, which have sub- and subsub-domains) this could be considered as well, although they do not require as much space and the preview of what other options and home many elements would be available could be helpful there.	**L**

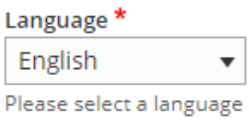
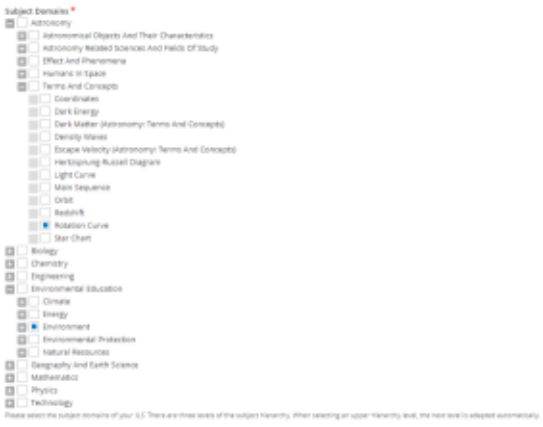
	Usability Observation	Recommended Modification	Import-ance
7	The detailed information could be presented less wordy and more appealing. 	For example Big Ideas of Science could be represented by icons, like on the old portal, and the languages could be represented by flags. The are ranges could be presented in a similar way as the Big Ideas, with the age ranges being all displayed, with some being “active” and the others “inactive”. Icons could also be used for Type, Booking required and Registration required. On one hand that would make the presentation more unified and less wordy, on the other hand it could support the users in more quickly gathering the information. 	**M**
8	The amount and type of information present on the details pages is not consistent. Compare: http://dev.golabz.eu/lab/13c-nuclear-magnetic-resonance-spectroscopy http://dev.golabz.eu/lab/gravity-force-lab and http://dev.golabz.eu/lab/balloons-and-static-electricity which show information from Type to Registration Required, Subject Domains, and Big Ideas of Science respectively.	The “less…” information should not depend on the size of the information. Instead the most important information should always presented here, no matter the size and additional information hidden behind “more …”. Suggested information and ordering: less: - Preview Link (duplicated info to “Preview” button) - Age Range - Subject Domains - Big Ideas of Science - Type - Booking required - Registration required more: - Works Offline - Languages - Embed Link - Contact Person - Lab Owner	**M**

	Usability Observation	Recommended Modification	Import-ance
9	"Preview" and "Create Space" interaction elements look like buttons, but only the words are interactive. 	Make those interaction elements behave like buttons.	**M**
10	It is not clear which fields are covered by the search? If the description should be covered it seems to not work correctly as a search for "HTML5" does not return the "Uniform Circular Motion" lab, which has HTML5 in its description text. "abridged" returns "Sexual Selection in Guppies (HTML5)" LAB, where "Java" does not.	Provide help and support and make sure that search functionality is working correctly.	**H**
11	There seems to be an issue with the rendering of lists in the Lab description (the numbering is displayed outside the content area). 	Make sure lists are rendered inside the area.	**L**
12	The phases in ILS previews seem to be ordered alphabetically instead of in inquiry order (might be related to 13), e.g.: http://dev.graasp.eu/ils/59a821c01b3c64c7f46cebee/?lang=en http://dev.graasp.eu/ils/59a820dd1b3c64c7f46cebeb/?lang=en http://dev.graasp.eu/ils/59ad73fb1b3c64c7f46cebf8/?lang=en	Show the ILS phases in the order given by the teacher creating the ILS.	**H**

	Usability Observation	Recommended Modification	Import-ance
13	When creating an ILS from a lab, the phases are in alphabetical order, not inquiry cycle order. 	Put the phases in inquiry cycle order.	**M**
14	Permission allowing Golabz to connect with Graasp account is not remembered after the first time it was granted. 	If possible, require giving this permission only once and remember it for the future (e.g. when duplicating other spaces).	**M**
15	The publishing form tab shows the drupal icon as Favicon. 	Apply Next-Lab branding instead. 	**L**
16	The original author of a duplicated ILS appears in the “Creator” not in the “Owner” text box, as indicated by the description. 	Pre-fill correct text field with original author.	**M**

	Usability Observation	Recommended Modification	Import-ance
17	Unclear who is the owner and creator of an ILS: Should the description of “Owner” and “Creator” be the other way around? Should the “Owner” be repeated as first entry in the “Creator” text field? 	From the terms I would have guessed “creator” is the original author of an ILS, who created it, and “owner” is the person who adapted it and thus “owns” the current version.	**H**
18	Name of author(s) have to be manually entered in the “Creator” text field. 	“Creator” text field should be pre-filled with the information from Graasp or at least with the name of the person publishing the ILS.	**L**
19	Wording might not be understandable for teachers, e.g. do they know what a revision log message is and why it is needed or would be useful? Where is it shown? 	Make sure this information is needed and if it is, explain it more detailed.	**L**
20	Description of what to enter should be between label and input interface element, not below interface element to specify the information. 	First provide all the information necessary or helpful for the task, then the means to perform it. 	**H**
21	The numbers added in brackets behind information retrieved from the system (e.g. user names and languages) can be confusing. 	Display these information without the numbers or explain the meaning of these numbers.	**M**

	Usability Observation	Recommended Modification	Import-ance
22	The custom context menu in the “Description” text area prevents useful functionality usually accessible through the browsers context menu (e.g. spell check).  Which is possible, for example in the “Title” input field. 	As the options in the custom context menu are also available in the browser’s default context menu, the benefit of the custom context menu is not clear and it could therefore be removed.	**H**
23	The warning message when deleting a phase from the ILS sounds odd for deleting a phase. 	Warning messages for phases and Graasp spaces should be customized and different from each other.	**M**
24	Opposite to the live system, deleting a space on the dev.Graasp does not give a confirmation message and does not automatically refresh the view, no longer showing the deleted phase. 	Not sure why this functionality is not working as expected and as on the live server, but should be the same.	**H**

	Usability Observation	Recommended Modification	Import-ance
25	Pre-filled “Language” seems to be English as default, even when submitting an ILS that was specified as being German in Graasp. 	This information should be automatically taken from Graasp, to speed up the process.	**L**
26	Teachers might not know what the different “License” options available mean. 	Add a link to a page describing the different options (either on the portal or external).	**H**
27	The hint “… use the license, which is selected in the list by default.” does not help if the user has changed it (accidentally). 	Either specify the license to select in the description or add “(default)” to the entry in the dropdown list.	**H**
28	For “Subject Domains” the end-user can select a lower-level domain without also selecting the according higher-level domains. 	Automatically select all according higher-level domains, when a lower-level domain is chosen.	**H**
29	From the description of the “Subject Domains” entry it is unclear, what is “adapted” and how. 	Describe this in more detail / in a way that is understandable for the user.	**H**

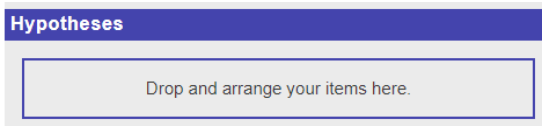
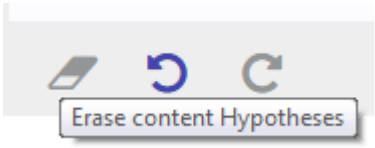
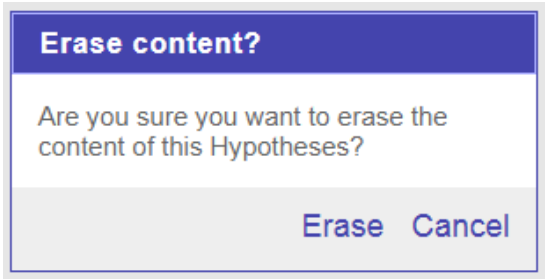
	Usability Observation	Recommended Modification	Import-ance
30	End-users not familiar with the Big Ideas Of Science might not know which ones to choose for their ILS. Big Ideas Of Science * ☐ Energy Transformation ☐ Fundamental Forces ☐ Our Universe ☐ Structure Of Matter ☐ Microcosm ☐ Evolution And Biodiversity ☐ Organisms And Life Forms ☐ Planet Earth Please select Big Ideas of Science relevant for your *ILS*.	Link from the names of the Big Ideas to their description in the portal.	**H**
31	The label of the "Save" button could be misleading (e.g. save for later). Save	Use "Publish" as the label instead.	**L**
32	The red bar shown when viewing the lab looks like there is an error and the red does not fit the colour scheme of the rest of the page. 	Remove the red colouring. If it is indicating, that this resource is not yet published / available on the portal, make that clear to the user.	**L**

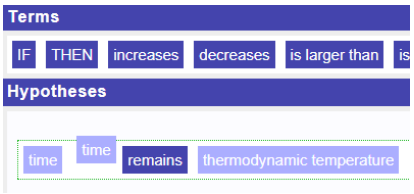
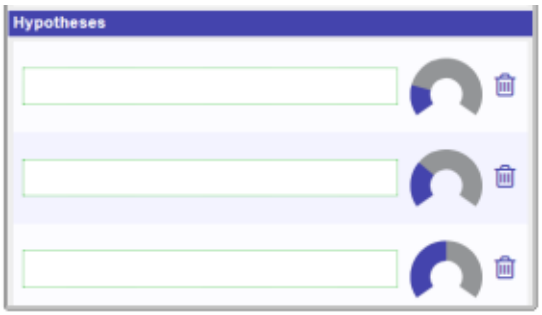
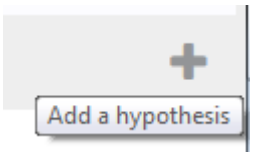
This activity is described in Section 6.1 and a summary of the results is presented in 7.2.7.

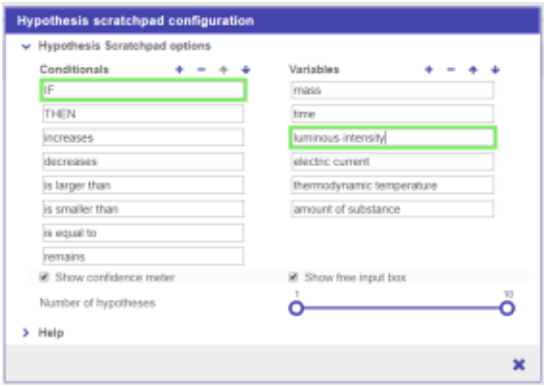
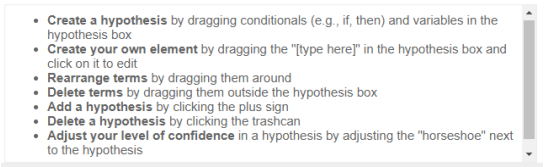
GG. Detailed Findings from the Analytical Walkthrough Performed for the Hypothesis Scratchpad 2 updated (LEIC-29092017-2)

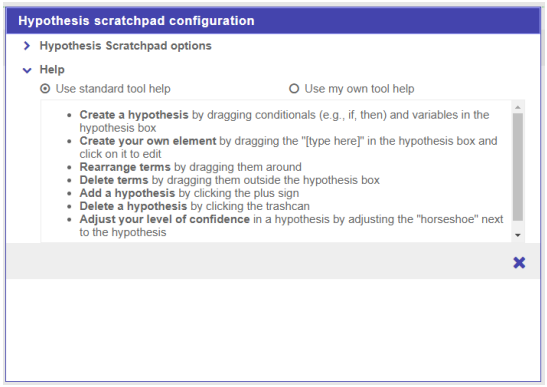
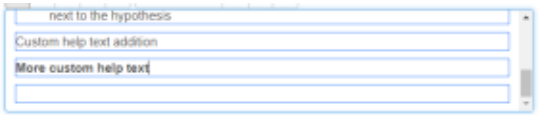
- One laptop running on Windows 7
- Screen resolution: 1366 x 768
- Browser: Google Chrome version 61

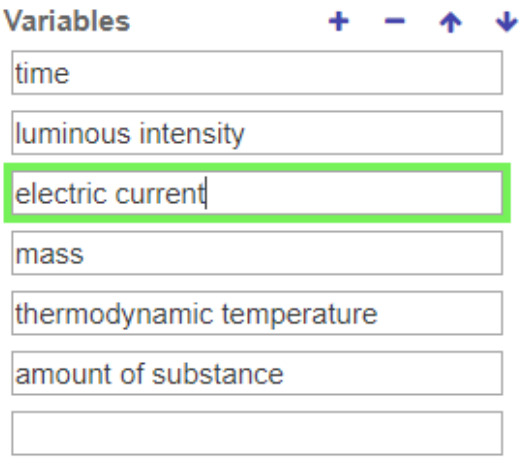
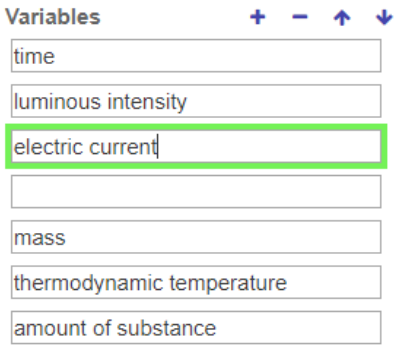
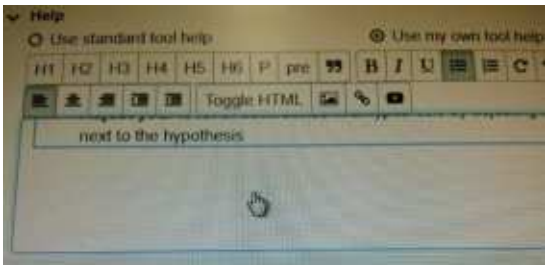
Based on our observations and discussions regarding the usability of the new version of the Hypothesis Scratchpad app, we recommend the following modifications:

	Usability Observation	Recommended Modification	Import-ance
1	The old Hypothesis Scratchpad contained a hint on how to create a hypothesis in the 'hypothesis box'. This helpful information is missing from the new Hypothesis Scratchpad: Old:  New: 	Add hint "Drop and arrange your items here" to the updated version.	**M**
2	Phrasing of tooltip for eraser icon could be improved. 	Show the tooltip "Erase the content of all hypotheses." Instead.	**L**
3	Grammatical error in the confirmation dialog when erasing the content of all hypotheses: 	Change message to "Are you sure you want to erase the content of all hypotheses?" instead.	**L**

	Usability Observation	Recommended Modification	Import-ance
4	It is not possible to directly drag&drop a term somewhere in between two existing terms in a hypothesis. Instead it has to be added at the end and then dragged to the intended position. 	Allow the user to insert terms at any position of the hypothesis, not only in the end. 	**M**
5	If there are more than 1 hypothesis and the user moves a term from one to the other, undo does not work as expected: The term stays in the new hypothesis and re-appears in the old one.	Make undo and redo work as expected in all circumstances.	**M**
6	If the number of hypotheses leads to them taking up more space then available on the screen, no scrollbar is shown to make the ones off screen accessible. 	Show a scrollbar if hypotheses are off screen.	**H**
7	When the + button is deactivated, because the maximum amount of hypotheses has been reached, the tooltip still says “Add a hypothesis”. 	Change the tooltip to “You have reached the maximum amount of hypotheses allowed”	**L**
8	If the user has several hypotheses and deletes the top one, the position of terms can no longer be moved around in the hypotheses. The terms still show the same behaviour on movement as before, but on release the term just disappears. In general it seems to be like deleting a hypothesis affects all hypotheses that were “below” it.	Deletion of hypotheses should not have any impact on other interactions.	**H**

	Usability Observation	Recommended Modification	Import-ance
9	The configuration option “Show free input box” is not easy to understand. 	Label this option “Include customizable term” instead.	**L**
10	When opening the configuration dialog the user gets the impression that the input box where the cursor is currently in is highlighted with a green frame. When clicking in a box under “Variables” the cursor and green frame appear there, but there is still another green frame around the “Conditionals” box. This is confusing. 	Have the green border only around the input box that is currently being edited.	**M**
11	When the “Help” area is extended, the user has to scroll a lot to actually see the content of the area.	When the “Help” area is extended, the “Hypothesis Scratchpad options” area could be automatically collapsed (and vice versa).	**L**
12	The default help text fits into the input field completely. However, a scrollbar appears nevertheless. 	Hide the scrollbar when it is not necessary.	**L**

	Usability Observation	Recommended Modification	Import-ance
13	The “Help” area does not fill the complete configurations dialog 	Resize the Help area so that it fills up the whole dialog.	**L**
14	The scrollbar appearing in the configuration dialog changes the layout (i.e. the size of the grey bar on the bottom and the position of the X button changes). 	Prevent layout changes caused by the scrollbar appearing.	**L**
15	For the user it is not clear and could therefore be confusing, why there are blue boxes around the text in the help input field. 	Do not show blue boxes.	**M**
16	The functionality to add a YouTube video seems not to work. 	Either make the button work or remove it.	**M**

	Usability Observation	Recommended Modification	Import-ance
17	If an input box is selected, the user would expect the new input box to appear directly underneath it and not at the end of the list. 	Insert the new input box directly below the one currently selected. 	**M**
18	If you add a link in the help text it stays there even after deleting the text. It is no longer in the HTML text that appears when switching the view with “Toggle HTML”. 	Fix link behaviour.	**H**

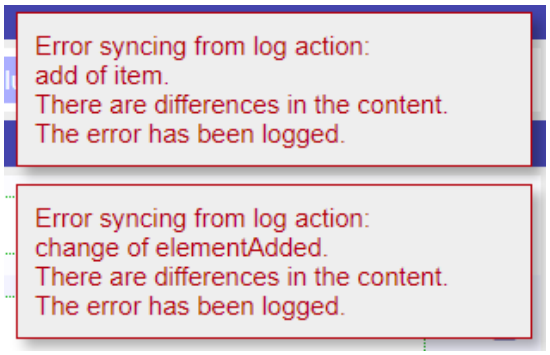
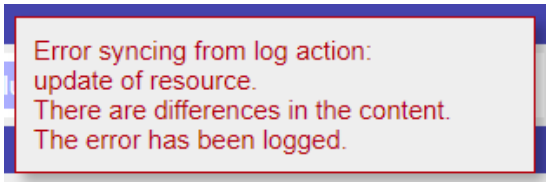
Positive observations:

- The new way of deleting terms no longer requiring to aim for the bin icon is a useful improvement because it makes it quicker and easier to remove single terms from a hypothesis.
- The new “[type here]” functionality is much more intuitive than the old one.

This activity is described in Section 6.2 and a summary of the results is presented in 7.1.5.

HH. Detailed Findings from the Analytical Walkthrough Performed for the Questioning Scratchpad 2 updated (LEIC-04102017)

Based on our observations and discussions regarding the usability of the new version of the Questioning Scratchpad app, we recommend the following modifications:

	Usability Observation	Recommended Modification	Import-ance
38	The questioning scratchpad is especially aimed at younger students, who may not fully grasp the term “research” yet.	Change the text from “Your research question…” to “Drag a term or type here to create your question.”.	**L**
39	Instruction text and actual question cannot easily be distinguished visually.	Use a lighter grey for the “Your research question…” text.	**L**
40	Currently terms dragged are always added to the end of the question.	It would be nice, if terms could be dropped anywhere within the question.	**M**
41	After deleting a question the app shows error messages when adding terms to questions: 	Check what causes these error messages and if they can be avoided. If possible, phrase error messages in a way that they provide action suggestions to the user to overcome or avoid this error, rather than just informing the user that an error occurred. If those error messages will be seen by users, phrase them less technical.	**H**
42	Having only a single line for each question can cause the beginning of a question to be no longer visible, when the screen resolution is small or the question is really long.	The question input box could have several lines to avoid partly hidden questions.	**M**
43	When dragging and dropping a term from one question to another, an error message appeared. 	Check what causes these error messages and if they can be avoided. If possible, phrase error messages in a way that they provide action suggestions to the user to overcome or avoid this error, rather than just informing the user that an error occurred. If those error messages will be seen by users, phrase them less technical.	**H**

	Usability Observation	Recommended Modification	Import-ance
44	**For the configuration dialog please see the results of the Hypothesis Scratchpad analytical evaluation as well.**	**For the configuration dialog please see the results of the Hypothesis Scratchpad analytical evaluation as well.**	**L, M, H**
45	If the teacher increases the minimum “Number of questions”, the app automatically creates them, however, if the minimum “Number of questions” is decreased, they are not automatically removed. 	The app should have a consistent behaviour of creating and deleting default question containers.	**M**

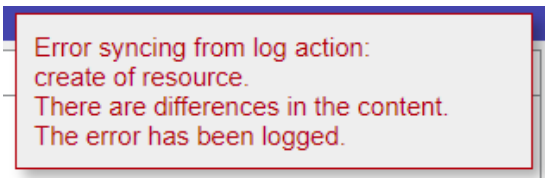
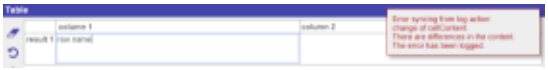
Positive observations:

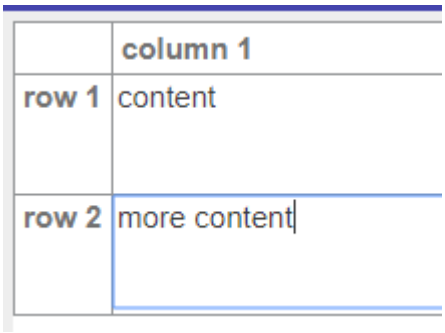
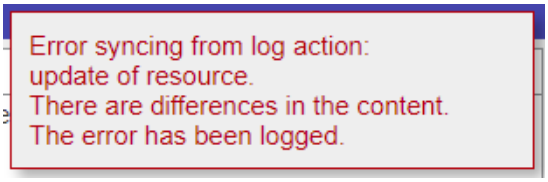
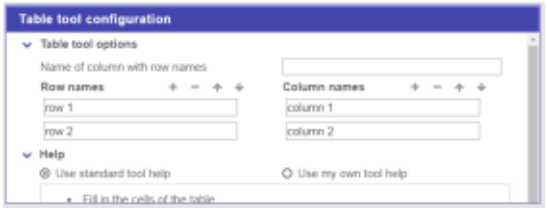
Many of the usability issues reported for the Hypothesis Scratchpad have already been addressed in the Questioning Scratchpad, before we did our analytical walkthrough.

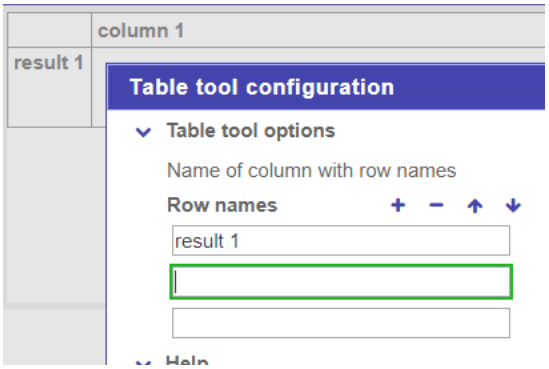
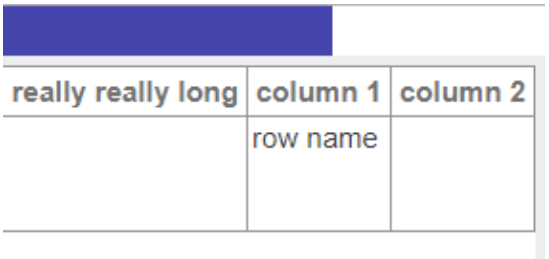
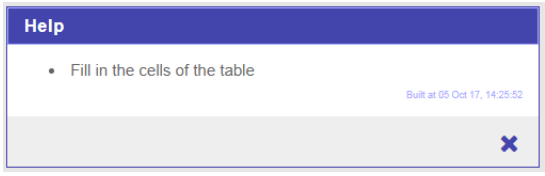
This activity is described in Section 6.3 and a summary of the results is presented in 7.1.4.

II. Detailed Findings from the Analytical Walkthrough Performed for the Table Tool 2 updated (LEIC-09102017)

Based on our observations and discussions regarding the usability of the new version of the Table Tool app, we recommend the following modifications:

	Usability Observation	Recommended Modification	Import-ance
1	After entering “test” in the first cell, the following error message occurred:  Impression: Long period of inactivity might produce this error, as it could not be reproduced. Happened again later in the session (after a period of discussion and thus inactivity/no interactions in the app:  See Appendix A for the console log.	Try to identify and fix the problem.	**H**
2	The blue box appearing when the cursor is inside a cell is smaller than the cell (i.e. white space at the bottom.  	Make the blue box as big as the cell.	**L**

	Usability Observation	Recommended Modification	Import-ance
3	In the old version of the app, the headers were easily visually distinguishable from the content cells, in the new version they look very similar:   	Change the header design in the new app to make content and headers more easily distinguishable.	**M**
4	Deleting content from a cell resulted in the following error message:  See Appendix B for the console log.	Try to identify and fix reason for error.	**H**
5	When moving the configuration window and afterwards expanding one of the options, the configuration dialog does not resize correctly, leading to parts of the interface being inaccessible:  	Keep “stretching behaviour” also after moving the configuration dialog.	**M**

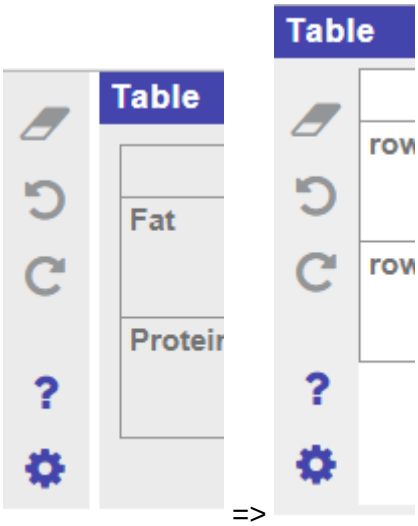
	Usability Observation	Recommended Modification	Import-ance
6	The phrasing of the first Table tool option might be confusing for the user: “Name of column with row names”.	Improve phrasing to something like “Name of column showing row names”.	**M**
7	Removing the row name (by specifying an empty one) also removes the row from the table. 	Allow for empty rows that do not have a row name.	**H**
8	We are aware that this will most likely never happen, but it could with low resolution screens at schools: If very long column names are specified, a scrollbar appears at some point to access the columns to the right of the visual part of the screen. When scrolling, the purple header stops at the fold: 	Make the design of the tool consistent, also off screen.	**L**
9	Default help is not very meaningful: 	Default help could be improved, to something like: “Click on a cell to activate it and type on your keyboard to fill it.”	**L**

Besides the usability observations presented in the table above, the analytical walkthrough also resulted in the following ideas for additional functionality which might be useful for students and teachers to be considered by the developers:

	Usability Observation	Suggested additional features	Import-ance
1	There could be use cases where the teacher does not know beforehand, how many rows will be needed by the students (e.g. recording experiment results).	Provide a configuration entry that allows teachers to enable students to add new rows to the table.	**M**
2	Tables should not necessarily require row names.	Like for the number of hypotheses in the Hypothesis Scratchpad, the teacher could also be enabled to specify a minimum and maximum number of rows.	**M**
3	Currently the flexibility of the Table Tool app for students is restricted to what the teacher configures.	An option for students to add new columns could be added to the tool, configurable by the teacher.	**L**

Positive observations:

- The menu is now underneath the header and thus looks more like part of the Table Tool app than before.



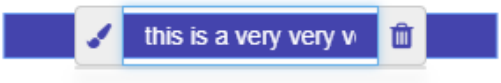
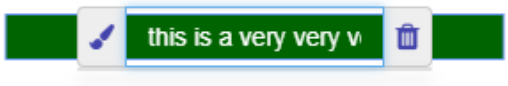
before after

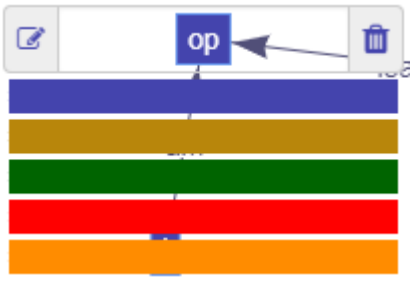
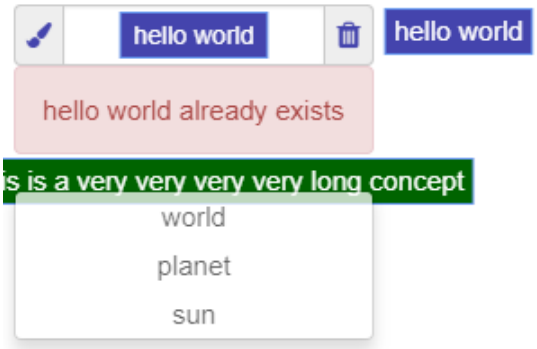
This activity is described in Section 6.4 and a summary of the results is presented in 7.1.3.

JJ. Detailed Findings from the Analytical Walkthrough Performed for the Concept Mapper 2 updated (LEIC-13102017-2)

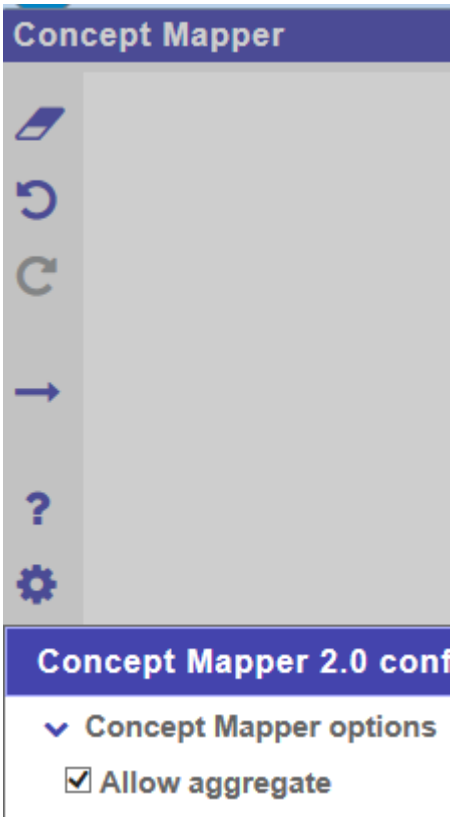
- One laptop running on Windows 7
- Screen resolution: 1366 x 768
- Browser: Google Chrome version 61, Mozilla Firefox 46.0.1, Internet Explorer 11

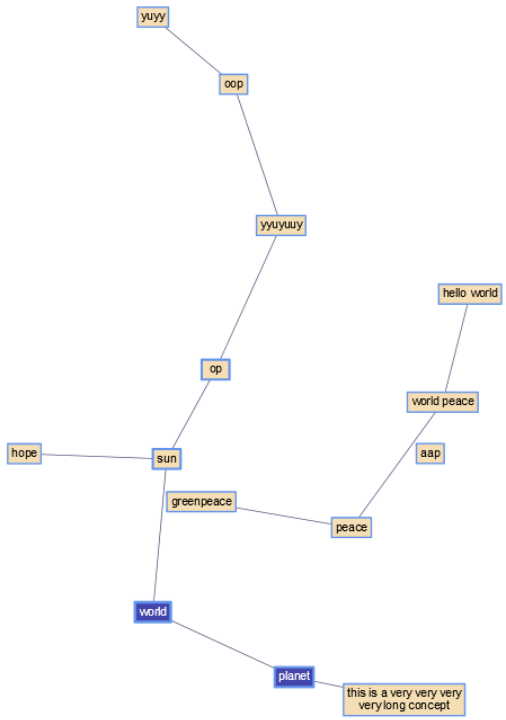
Based on our observations and discussions regarding the usability of the new version of the Concept Mapper app, we recommend the following modifications:

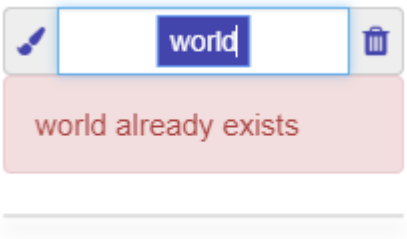
	Usability Observation	Recommended Modification	Import-ance
1	Especially for users that are accustomed to the interaction paradigm of the old version of the tool, it is not immediately clear, how to add a (first) concept.	Add a hint in form of a textual instruction like “Click anywhere to create your first concept.” to the empty concept map. Change the mouse cursor to indicate that clicking will create a concept node.	**M**
2	The concept node can be moved out of the editing box:  (To reproduce: Click on a concept and hold down the mouse button without moving the mouse until the editing interface appears. Then move the mouse.)	Prevent movement of the node while in editing mode.	**L**
3	If the user creates a very long concept node label, the node keeps expanding to the left and right of the editing box. 	Stretch the editing box accordingly.	**L**
4	The label is cut off when it gets too long for the editing box. 	Stretch the editing box accordingly.	**M**

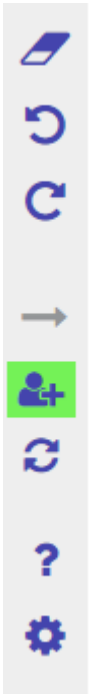
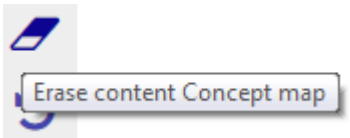
	Usability Observation	Recommended Modification	Import-ance
5	There are visual gaps between the different colours in the colour selection dropdown. 	Give the dropdown a background colour or remove the gaps.	**L**
6	The transparent background of the dropdown list makes it hard to read the entries and confusing when it overlaps with a concept node. 	Make the background of the dropdown list solid or at least more opaque.	**M**
7	The error message appearing when a concept already exists is helpful, but there should not be such a big gap to the suggested concept labels below. 	Remove the gap.	**M**

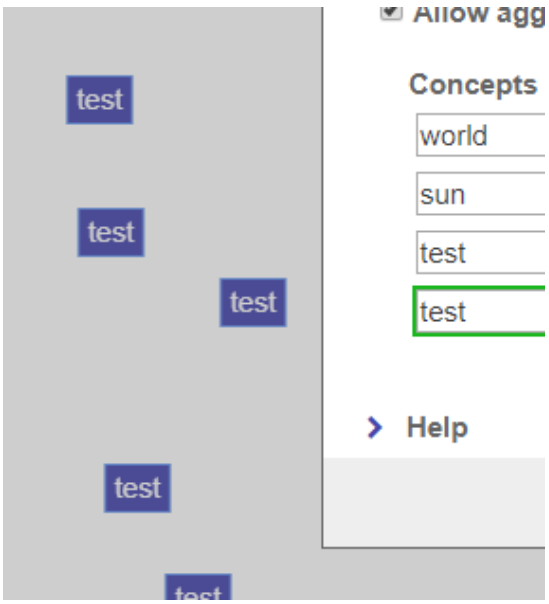
	Usability Observation	Recommended Modification	Import-ance
8	When an error message occurs, the concept map nodes as a whole can be moved around “in the background” of the editing box. 	Prevent movement of the concept map while in editing mode.	**L**
9	The overlapping of whitespaces in letters and the lines of the connecting arrows, make it sometimes hard to read the arrow label. 	Either bring back the box used in the previous version or put a box coloured like the background around and behind the label, to avoid interference of letters and arrow line.	**M**
10	If the user does not start dragging a concept quickly enough, the editing mode appears preventing movement of the concept. The user then has to click outside the editing box and start over the try to move the concept.	It would be useful, if the editing box would have a drag handler to move concepts while in editing mode, for example: 	**M**

	Usability Observation	Recommended Modification	Import-ance
11	The icon to show the aggregated concept map does not appear in Internet Explorer. 	Support Internet Explorer.	**H**

	Usability Observation	Recommended Modification	Import-ance
12	Firefox creates an aggregated concept map without overlapping concepts. This looks tidy, but might become an issue in classroom when plenty of concept maps are aggregated.  Google Chrome presents a more messy aggregated concept map:  	The aggregated concept maps should look consistent between different browsers and students. Alternatively it would be nice, if the concept map of the active student would be used as the starting point and the other aggregated maps “added” to his or her map (i.e. leave the students concept map design intact).	**M**

	Usability Observation	Recommended Modification	Import-ance
13	The icon for “aggregated concept map” is not very intuitive. The message it gives to the user is more one of “add a user (to the concept map)”. 	Use a different icon, showing a “map” icon.	**M**
14	Refresh does not seem to work, also switching between aggregated and personal map several times does not show a new concept added by another student. Only refreshing the browser updates the aggregated map.	Both refresh and switching should update the aggregated map with all concepts from all students.	**H**
15	If the user moves the concept map off screen, it might be difficult to find it again.	Either indicate visually in which direction off screen the concept map is or show a “mini map” of the entire concept mapping space, indicating where the concept map and the viewport currently are.	**H**
16	Link mode should be visualized more clearly to the user than “just” having a light green background for the link mode button. 	Change the mouse cursor (e.g. by adding the link arrow to the default mouse arrow), to indicate the switching of mode directly in the visual focus of the user.	**H**
17	The editing box looks strange if all the suggested concept terms have already been used and an error occurs. 	Do not show list UI when list is empty.	**L**
18	An empty concept appears in our aggregated concept map. 	Empty concepts should automatically be deleted and not appear in the aggregated map.	**H**

	Usability Observation	Recommended Modification	Import-ance
19	When in the aggregated mode, the top three icons in the menu (erase, undo, redo) can be clicked, but don't have a visual result in the aggregated concept map. 	Deactivate the top three icons in the menu when in aggregated mode. 	**H**
20	Erasing the whole concept map cannot be undone.	Undo button could be used to enable the user to undo an accidental deletion of his or her complete concept map.	**M**
21	There is an "of" missing in the tooltip for the erase button. 	Change tooltip text to "Erase the content of this concept map."	**L**

	Usability Observation	Recommended Modification	Import-ance
22	If the teacher specifies the same concept name twice, it breaks the security measure to restrict the usage of the same label more than once. 	Prevent the teacher from specifying the same concept name more than once in the configuration dialog.	**H**

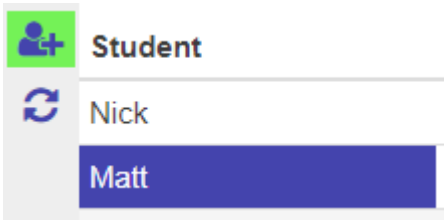
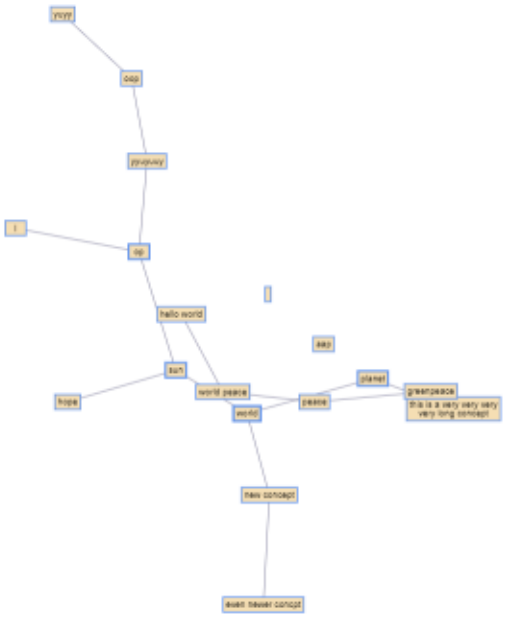
Positive observations:

- Clicking anywhere to create a new concept is an improvement over the earlier drag&drop interaction.
- The interface of the updated tool looks cleaner.
- It is nice that concepts already used in the map are automatically removed from the list of suggestions.

Detailed Findings – Concept Mapper

Based on our observations and discussions regarding the usability of the new version of the Concept Mapper app, we recommend the following modifications:

	Usability Observation	Recommended Modification	Import-ance
1	The icon for “aggregated concept map” is not very intuitive. The message it gives to the user is more one of “add a user (to the concept map)”. 	Use a different icon, showing a “map” icon.	**M**

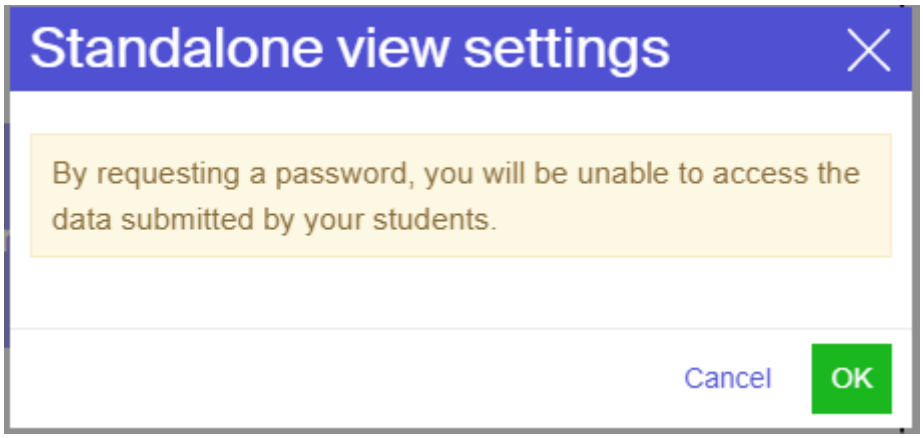
	Usability Observation	Recommended Modification	Import-ance
2	The highlighting of the selected students part of the aggregated concept map does not work if a student is selected first and then switched to the aggregated map mode. 	Make the tool behave the same in this case as when selecting the aggregated mode first and then a student in the table.	**H**
3	Firefox  and Google Chrome  show different visualisations for the same aggregated concept map.	Visualise the aggregated concept map consistently in different browsers.	**M**

This activity is described in Section 6.5 and a summary of the results is presented in 7.1.1.

KK. Detailed Findings from the Analytical Walkthrough Performed for the Graasp User warnings (LEIC-09022018)

- One laptop running Windows 7, one all-in-on PC running Windows 7
- Screen resolution: 1366 x 768, 1920 x 1080
- Browser: Google Chrome Version 64.0.3282.140

Detailed Findings – Switching the standalone settings to include a password



Rephrasing suggestion:

"By requesting a password, the **Review Mode can no longer be used** to access the work of students."

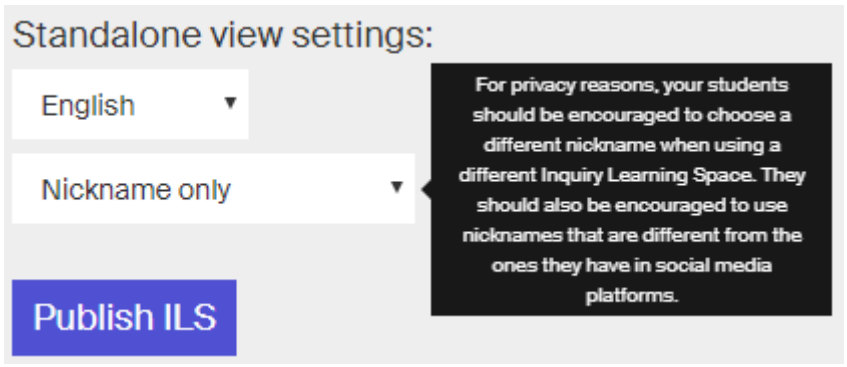
Reasons for rephrasing suggestion:

- Student work can still be accessed in the authoring view
- Not all data is actively "submitted" by the students (autosave) and it is a rather technical term
- Not only "you" is affected, but also other teachers, with whom the ILS might be shared

Prevention suggestion:

The option of making the "Review Mode" still work, even if a password is required to access the standalone view, should be considered. Alternatively, access to the data through the authoring view should be made impossible, to be consistent.

Other observations:



General suggestion:

The message could either be extended to include or changed to a description of the differences between requiring a nickname only or a nickname and password. This would help teachers to better understand what option to choose before selecting it, when changing the settings of the standalone view.

Rephrasing suggestion:

“Nickname only

The students have to provide a nickname to access the ILS, to save their work for later and for assessment by teachers using the Review Mode.

Nickname and password

The students have to specify a nickname (see above) and a password, the latter to avoid that students can access their peers work. Review Mode cannot be used if this option is selected!

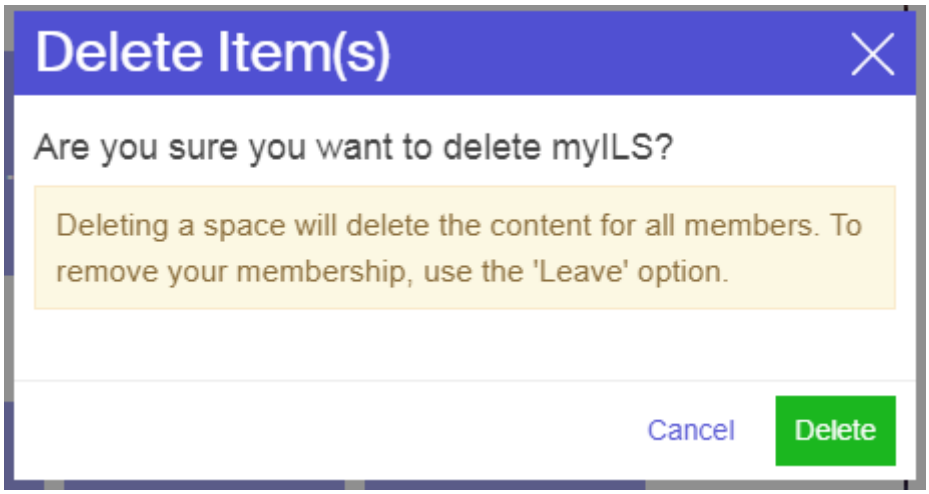
Anonymous

No credentials have to be given to access the ILS. Work of students is not saved in this case!”

Reasons for rephrasing suggestion:

- At the moment the message only includes a general recommendation regarding nicknames, which is unrelated to the interface element the speech bubble provides help for.
- The help text should also provide guidance supporting the teacher in making a decision on which option to choose.

Detailed Findings – Removing an ILS



Rephrasing suggestion:

“Deleting an ILS will **remove it irreversibly** and its content will no longer be accessible to anyone.”

The second part of the message should only appear if leaving the ILS is actually an option (i.e. it is shared with other owners):

“If instead you want to remove the ILS just from your list but keep it for other teachers, please use the “Leave” option.” (A “Leave” button should then appear as third option besides “Cancel” and “Delete”.)

Reasons for rephrasing suggestion:

- Calling it a space might be confusing, it should thus be called an ILS
- Deleting an ILS not only removes it for its members, but also the students, as the standalone view will vanish as well
- Talking about “leaving” an ILS might be confusing for teachers who never shared an ILS
- User warnings should not talk about alternative options that don’t exist (i.e. leaving, if you are the only owner)

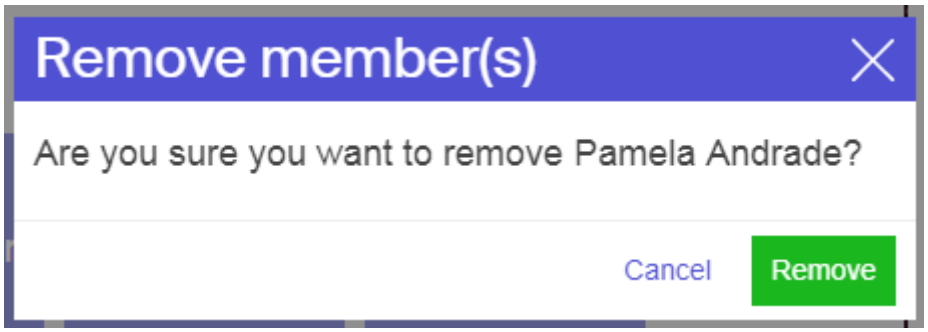
Prevention suggestion:

Regarding the second part of the user warning: The option of leaving an ILS should only be proposed if it is actually possible.

Other observations:

- Deleting a space should refresh the view so that the deleted space disappears from there to avoid users from getting confused and trying to delete it again.

Detailed Findings – Removing a member from an ILS



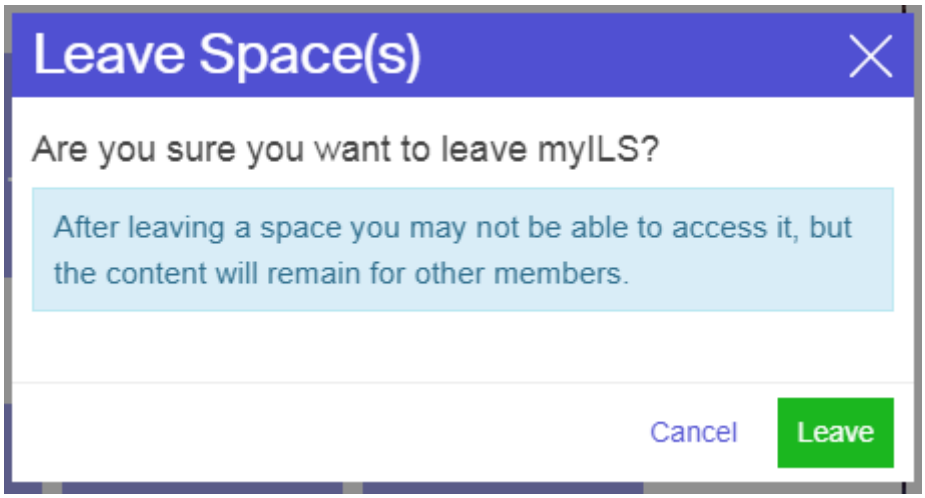
Rephrasing suggestion:

“Are you sure you want to remove <member> from the ILS ‘<ILS name>’?”

Reasons for rephrasing suggestion:

- To avoid errors, it should be specified from where the user is removed (ILS, space, …)

Detailed Findings – Self-Removing you as a member from an ILS



Rephrasing suggestion:

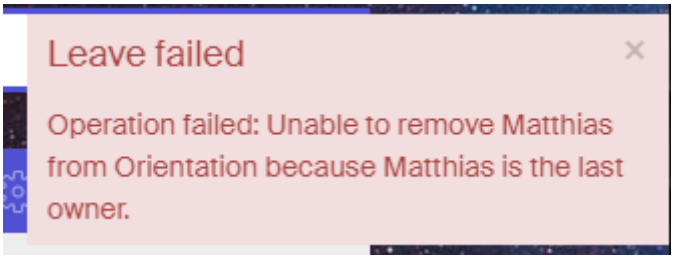
"After leaving an ILS it will be removed from your list and you will no longer be able to access it. The content of the ILS will still be there for others."

Reasons for rephrasing suggestion:

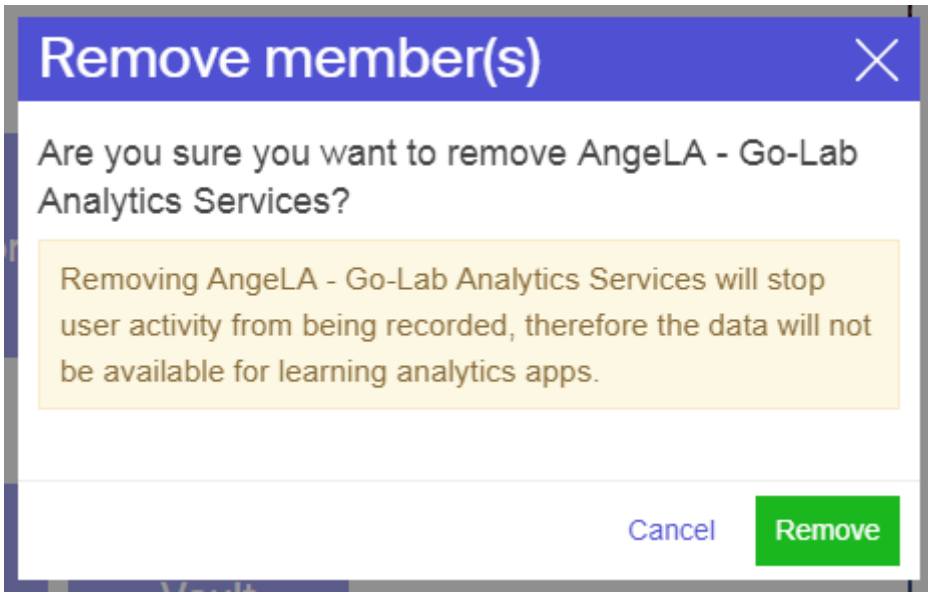
- When leaving an ILS access "may" not be lost, it "is" lost
- The content is not only available for members, but also for students in the standalone view, thus we suggest a more general expression

Other observations:

- If there is only one owner (left), the leave option should not be displayed in the menu, rather than showing an error message when it is selected:



Detailed Findings – Removing AngeLA from an ILS



Rephrasing suggestion:

"Removing 'AngeLA - Go-Lab Analytics Services' will stop student activity from being recorded. As this data is required by some of the learning analytics apps, these will stop working in this ILS."

The user warning message could also include a list of the affected LA apps, to give the teacher an impression of the impact and consequences of this action:

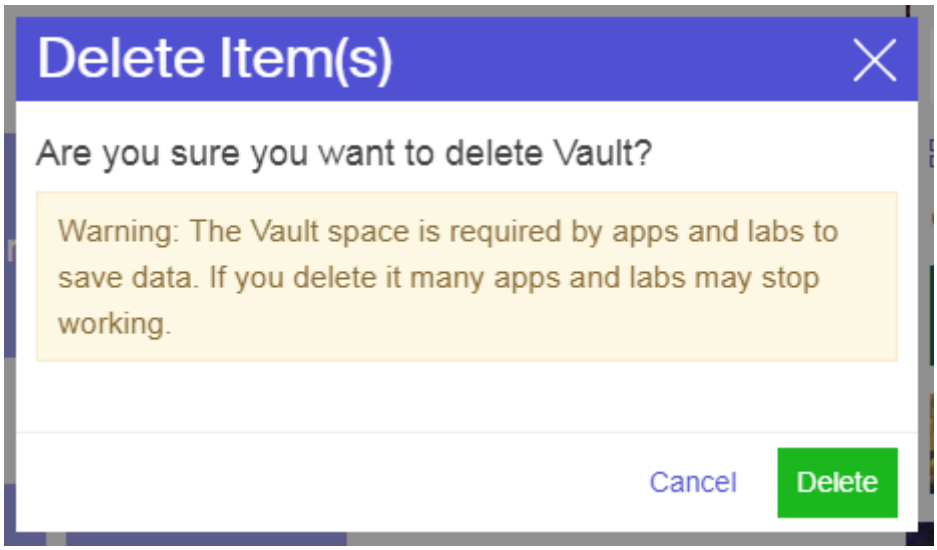
"Removing 'AngeLA - Go-Lab Analytics Services' will stop student activity from being recorded. As this data is required by the following learning analytics apps, these will stop working in this ILS:

- <AppName 1>
- <AppName 2>
- <AppName 3>
- …"

Reasons for rephrasing suggestion:

- The main issue, which the teachers will face by deactivating AngeLA, is LA apps no longer working, this should be explicitly expressed in the warning message
- Users from the teachers perspective are students
- Quotation marks around the name have been added to avoid confusion

Detailed Findings – Removing the Vault from an ILS



Rephrasing suggestion:

"The Vault is required by apps and labs to save data. If you delete it, many apps and labs will stop working in this ILS."

The user warning message could also include a list of the affected apps and labs, to give the teacher an impression of the impact and consequences of this action:

"The Vault is required by apps and labs to save data. If you delete it, the following apps and labs will stop working in this ILS:

- <AppName 1>
- <AppName 2>
- <LabName 1>
- …"

Reasons for rephrasing suggestion:

- 'Warning:' at the start should either be used everywhere or not be used in this message to be consistent
- The apps and labs "may" not stop working, they "will" stop working

Prevention suggestion:

It should not be possible to delete the vault for teachers, as it is an essential requirement for the correct functioning of ILSs (in most cases).

The vault should perhaps even be invisible for teachers, access to the student data could be provided in a more user friendly way than showing the raw 'files'.

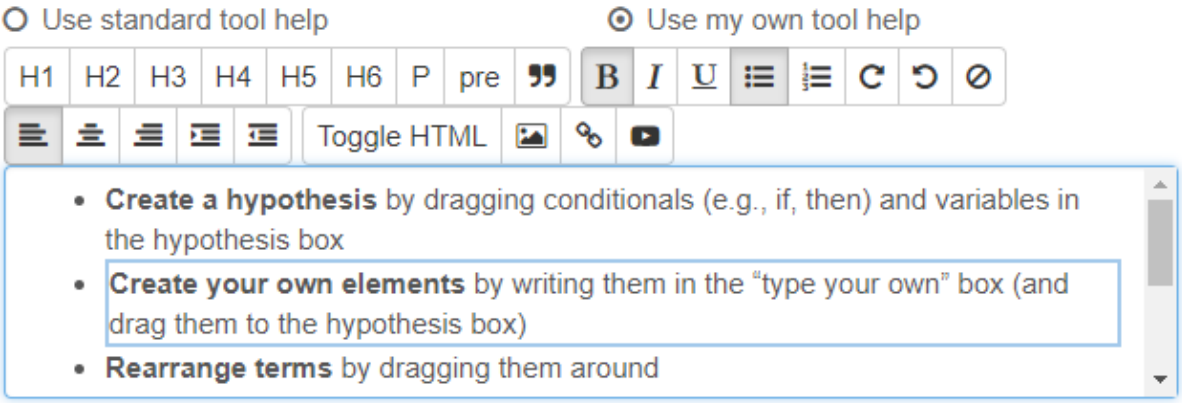
This activity is described in Section 6.6 and a summary of the results is presented in 7.2.5.

LL. Developer response regarding the PD activities on Questioning and Hypothesis Scratchpad

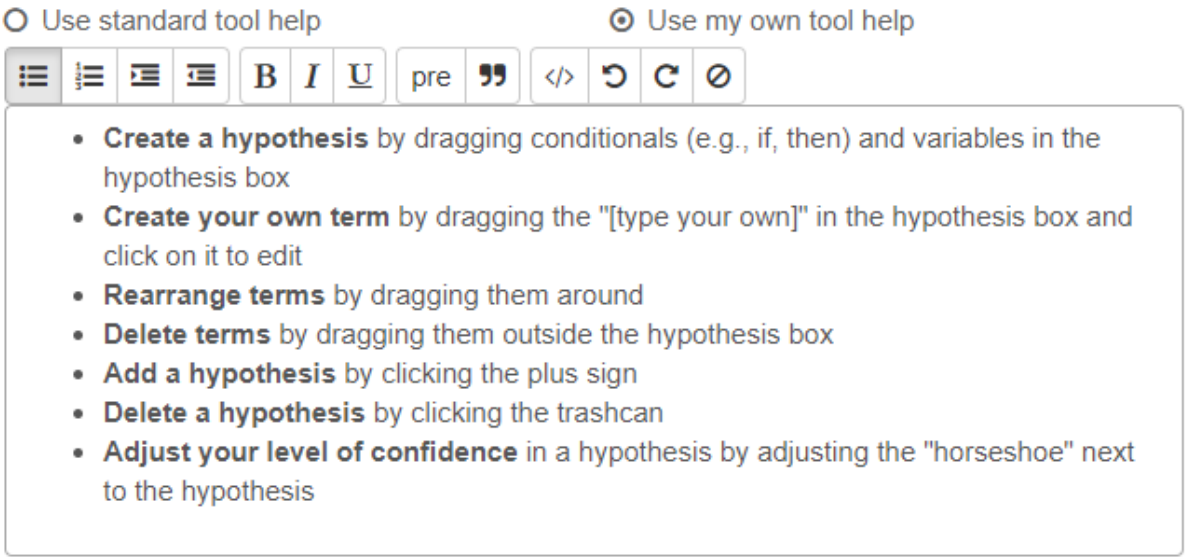
A usability assessment was done on the hypotheses and questions scratchpads. As both scratchpads use a lot of common code and thus working similar, the results of the assessment are described together. The assessment was done on pre-release versions of the scratchpads.

The assessment found some missing hints and suggested some more clear labels and hints. All these issues were solved.

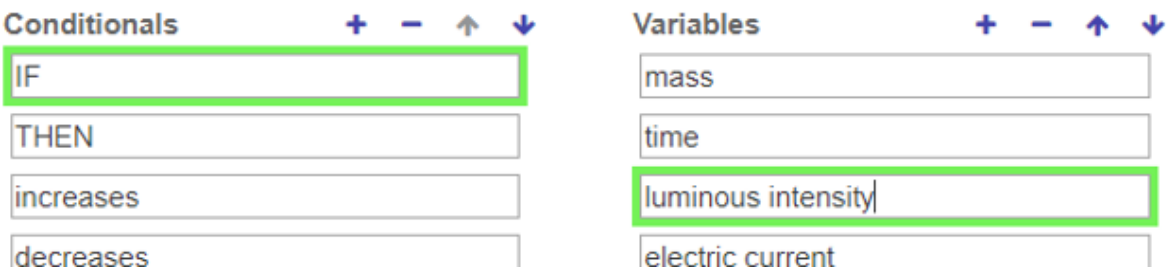
A number of layout issues with the help editor, in the configuration, were found.



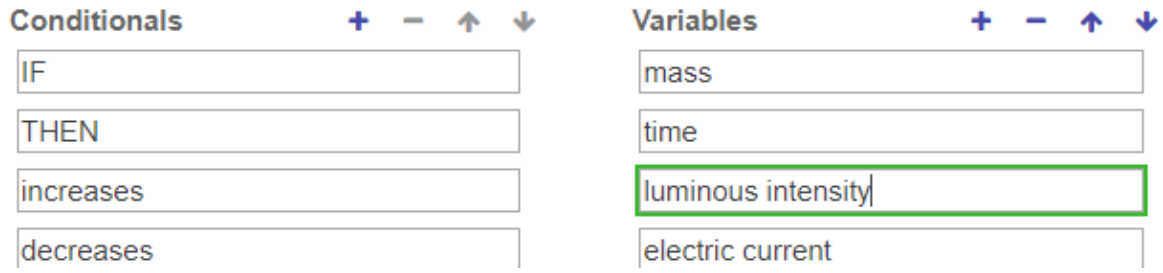
This layout issues were solved resulting the following help editor:



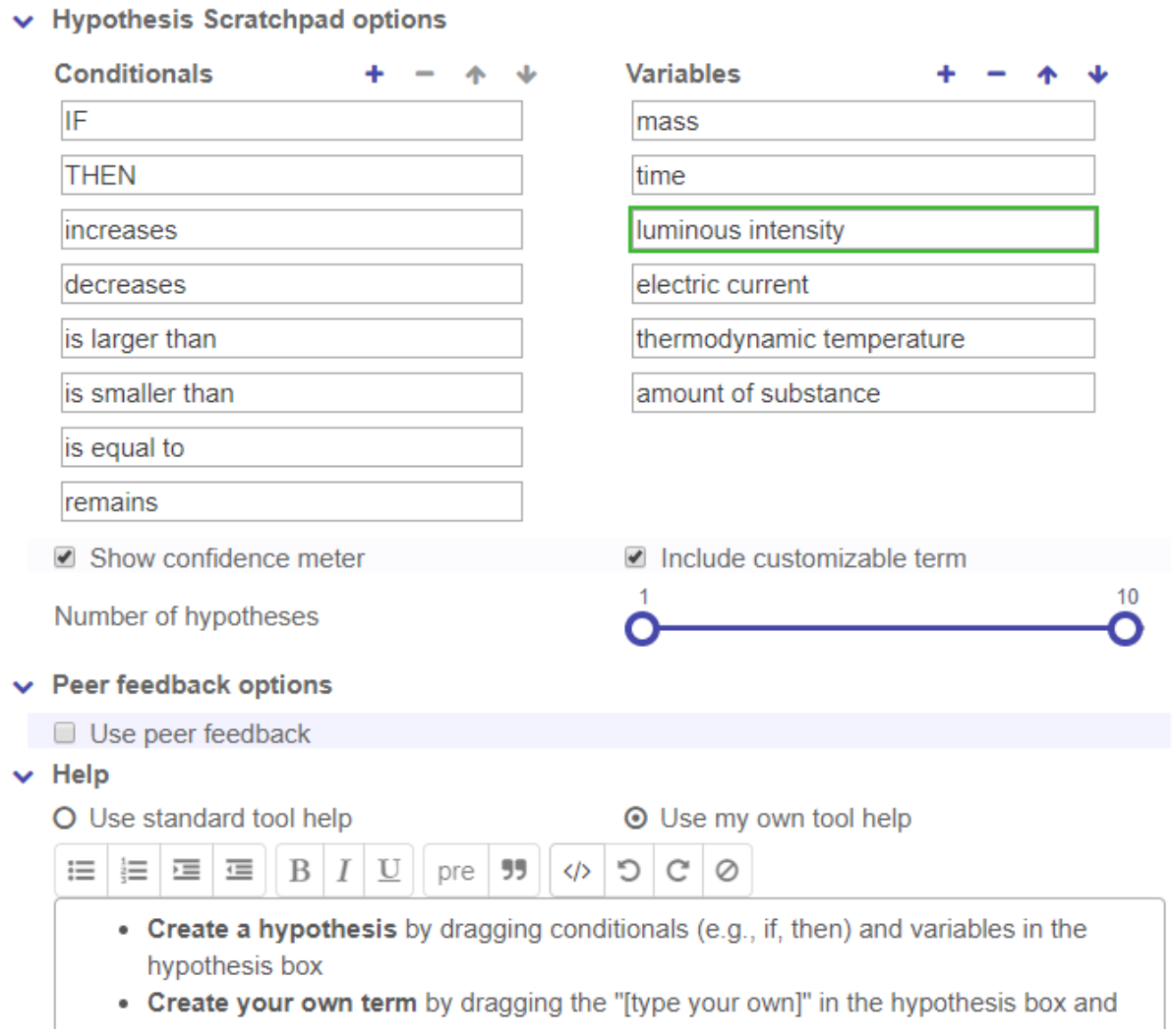
The assessment found having both a selection in the list of conditionals and variables confusing.



This has been solved, there can now be only one selection in both lists.



The application configuration consists of a number of different sections. When all the sections are opened, al lot of screen space can be used. This can result in a lot of scrolling.



The assessment suggested to only allow one section to be opened at a time. The handling of the configuration sections is done by the same code for all tools. Some tools have a lot of configurations options, making having only one section open a sensible solution. However other tools have only a few configuration options, where have only one section open at a time would be annoying. The behaviour has not been changed as it would have effect other applications in a negative way.

The assessment suggested that the user can drag a new term directly in the middle of a hypothesis/question. At the moment new terms are always placed at the end.

This is a good suggestion, but it was not clear how this could be implemented. Hopefully in a future version this will be implemented.