Next-Lab

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

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Deliverable 2.10

Sustainable releases of the creation and personalization services

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Executive Summary

As part of the empowering facilities tackled in WP2, this deliverable gives an overview of the sustainable services and solutions released in the Graasp authoring and learning platform during the last year of the project.

This deliverable focuses on the solutions provided to support ILS creation and personalization (Task 2.1). **As a "release" document, this report is a description of the software actually implemented as part of the Graasp.eu platform, with its current online version representing the actual deliverable**.

The **sustainable** releases described in this document have two somehow contradicting objectives. The first objective is to consider further **priority** requirements gathered during the end of Next-Lab and the beginning of GO-GA (the sister H2020 project) to strengthen adoption and improve usability. The second objective is to consider **posteriority** requirements, i.e. removing some complex or little used features, to ensure that the ecosystem will be maintainable without the significant funding received so far from the European Commission for its creation.

D4.6 provides details regarding the sustainability plan of the full Go-Lab ecosystem. This deliverable provides insight on additional sustainability paths for development and implementation of Graasp.eu beyond inquiry learning for STEM education at schools. Broader deployment is considered and has been prototyped in higher education, executive training, and corporate training, for computational thinking, blended learning, and design thinking, respectively.

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1. Introduction

As part of the empowering facilities tackled in WP2, this deliverable gives an overview of the sustainable services and solutions released in the Graasp authoring and learning platform during the last year of the project.

This deliverable focuses on the solutions provided to support ILS creation and personalization (Task 2.1). It does not focus on awareness, assessment, and reflection solutions, as Task 2.2 was completed at the end of the second year. As a "release" document, this report is a description of the software actually implemented as part of the **Graasp.eu platform**, with its current online version representing the actual deliverable.

This deliverable follows D2.3, the *Initial releases of the creation and personalization services, as well as the awareness, assessment, and reflection solutions*, delivered at M12, and D2.7, the *Final releases of the creation and personalization services, as well as the awareness, assessment, and reflection solutions*, delivered at M24.

The **initial** releases were delivered to support the core implementation and dissemination activities of Next-Lab and to enforce **GDPR** (November 2017), while the **final** releases were delivered to consider lessons learned and feedback received during the second year of the project. The **sustainable** releases described in this document support secure browsing through **HTTPS** (April 2019), and offer alternatives to **open social** apps (November 2019). They have also two additional and somehow contradicting objectives. The first objective is to consider further **priority** requirements gathered during the end of Next-Lab and the beginning of GO-GA (the sister H2020 project) to strengthen the adoption and improve the usability of the ecosystem. The second objective is to consider **posteriority** requirements, i.e. removing some complex or little used features, to ensure that the ecosystem will be maintainable without the significant funding received so far from the European Commission for its creation and for the associated investigations related to promoting and adopting inquiry learning for STEM education at schools.

D4.6 provides details regarding the sustainability plan for the full ecosystem. This deliverable provides insight on additional sustainability paths for development and implementation beyond inquiry learning for STEM education at schools. Broader deployment is considered and has been prototyped in higher education, executive training, and corporate training, for computational thinking, blended learning, and design thinking, respectively.

Section 2 introduces the new Graasp landing page and its motivation. Section 3 presents the new standalone and page views offered to provide a better learning experience for learners and presentation features for teachers. Section 4 shows how alternative learning scenarios can be implemented to reach other and broader user communities. Section 5 highlights the way discussion features have been concentrated and enhanced. Section 6 reports on the back-end extension of the Graasp API to enable new shindig-free apps to be deployed and to communicate in a better way with Graasp. Section 7 summarizes the improvements in the app development framework enabling developers to create or adapt apps better integrated in the ecosystem for both online and off-line use. Finally, Section 8 provides conclusions and outlook.

2. New Graasp Landing Page

To provide information to the general public regarding the authoring and learning platform, as well as to ease onboarding of new users of the Go-Lab ecosystem, we designed a landing page visible when following the graasp.eu URL directly or when logging out of the platform. The preliminary design of this landing page was initially presented and discussed with the Next-Lab beneficiaries during the General Assembly held in Lyon in November 2018 and then detailed in D2.7.

The landing page was released on February 2019 and supports internationalization. When a language is set using the corresponding menu also available on the home page (top right), the descriptions and the dialogs are displayed in the chosen language. Only the English version is detailed below for brevity.

The top part of the landing page is shown in Fig. 1. Next to the platform name we display the short motto, i.e. “A space for everything” and at the center, next to the Graasp logo (white hand), the longer motto “Communicate, Collaborate, Build Engaging Learning Experiences”. We also highlight the fact that the platform is **free** and **open-access**, as this happened to be a key adoption factor in educational institutions and teacher communities.

The project related jargon like “ILS” is avoided in the landing page to reach a broad and open community of new or potential users.

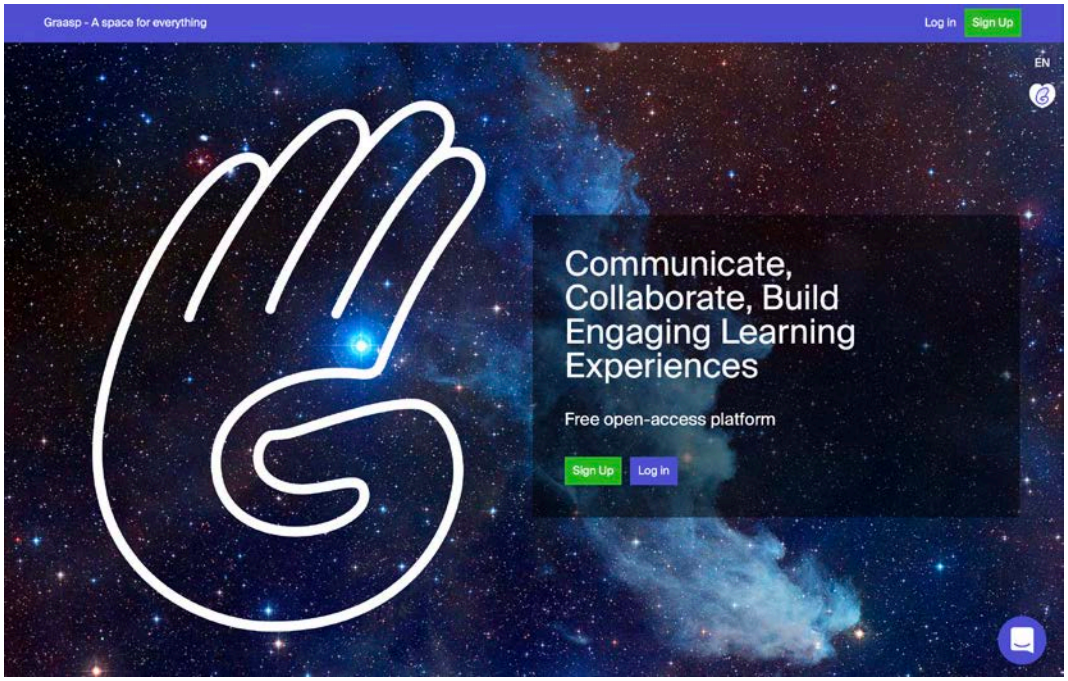

Figure 1. Top part of the Graasp landing page.

Fig. 1 also shows at the top right the donation (heart) and the language switch (EN) buttons, as well as the “Sign up” and “Log in” buttons. The donation feature was added in May 2019 as an experiment to help with the sustainability of the platform. Up to now, only one donation has been made.

When scrolling down the landing page, the second part appears (Fig. 2). This part highlights the capability of the platform to author (create or personalize) open educational resources (OERs), with Inquiry Learning Spaces (ILSs) being special cases of OERs.

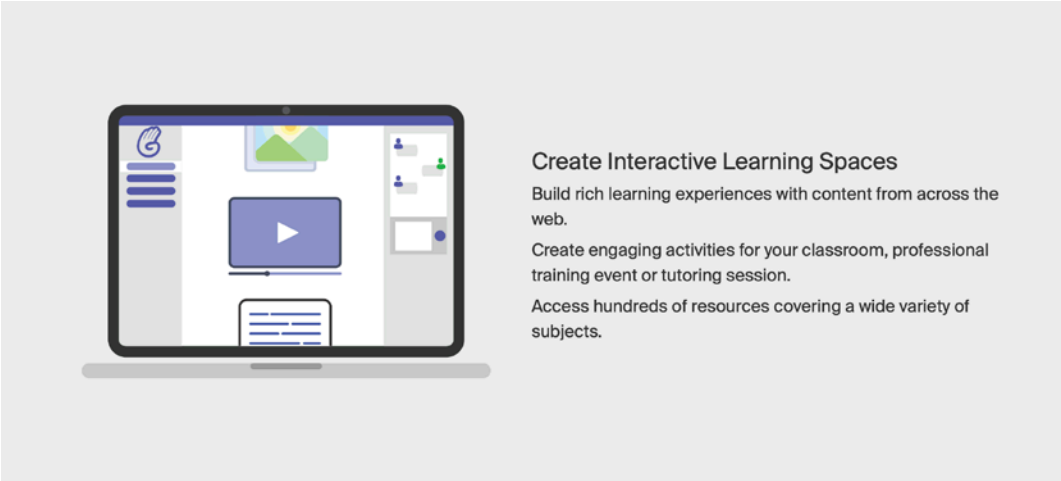

Figure 2. Second part of the Graasp landing page.

Scrolling further down highlights the more general knowledge sharing features of the platform (Fig. 3) such as using Graasp.eu to manage projects. As a matter of fact, Graasp is used as a private shared point for all project partners to organize and carry out activities using dedicated subspaces, such as spaces related to work packages, “Deliverables”, or “Meetings” (Fig. 4). Documents, multimedia resources, links, discussions, software, or even data related to tasks and events are shared between the people in charge in this framework.

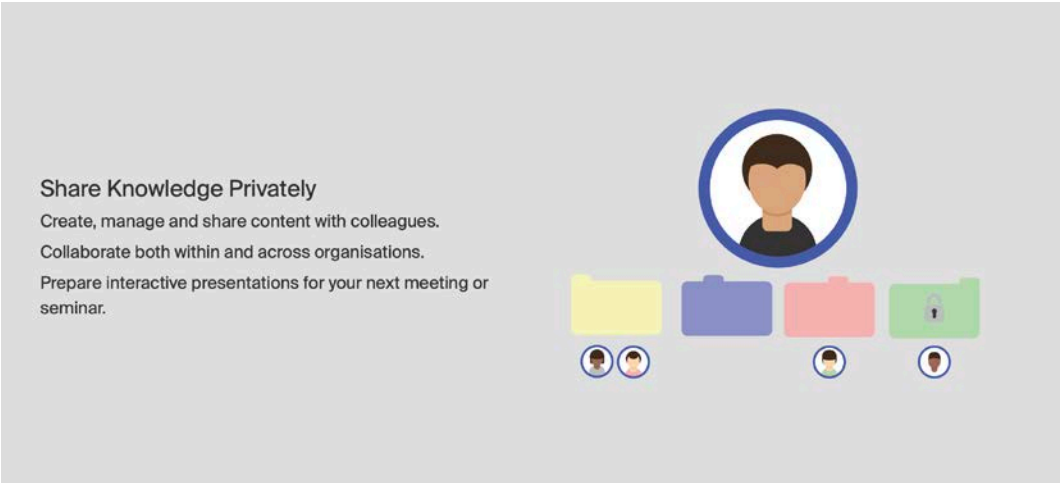

Figure 3. Third part of the Graasp landing page.

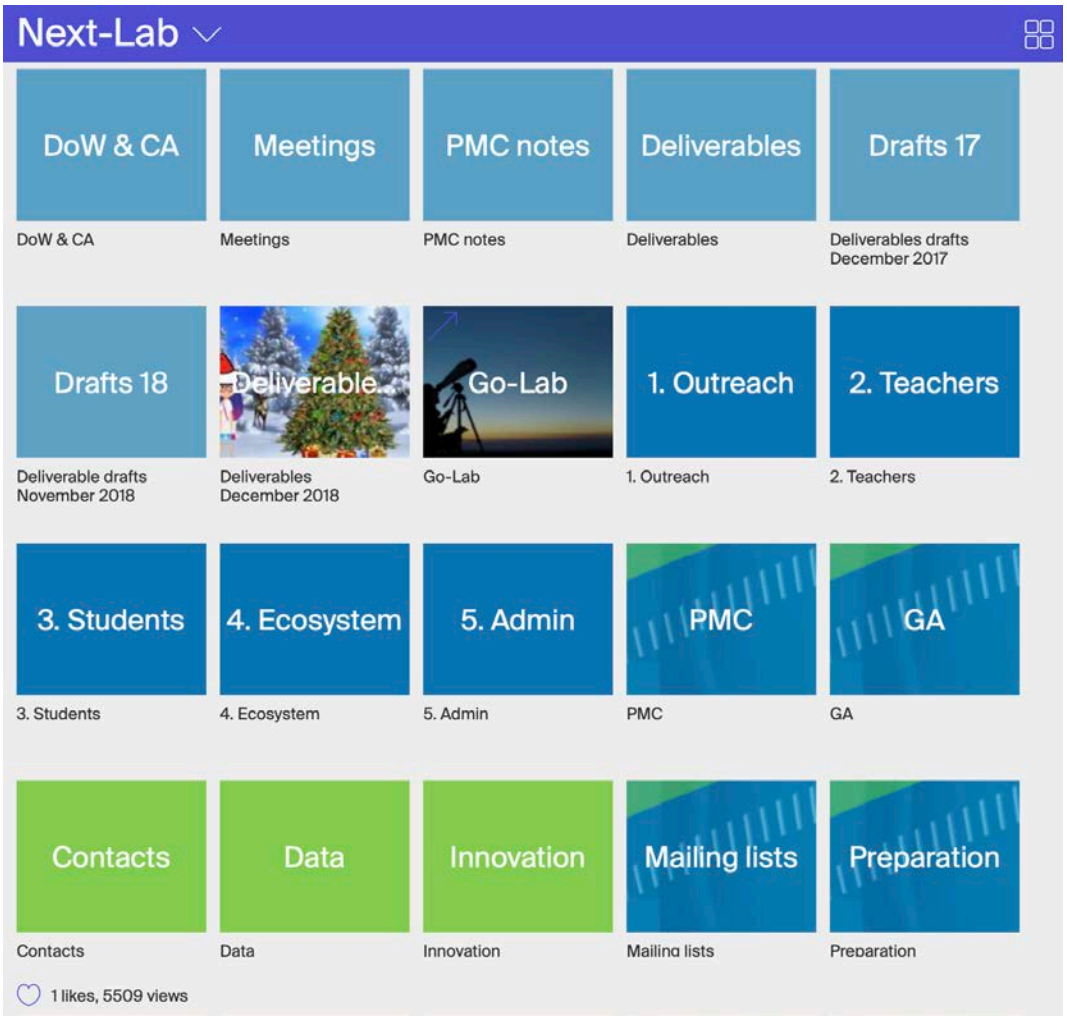

Figure 4. The private Graasp space used to manage the Next-Lab project.

The fourth part of the landing page (Fig. 5) highlights the community support feature of the platform that includes registration and consent forms for dedicated groups of users, like all users of the Go-Lab ecosystem in Europe and the users in Africa (in relation with the GO-GA project). Fig. 6 shows the Go-Lab community space in Graasp (golab.graasp.eu).

Figure 5. Fourth part of the Graasp landing page.

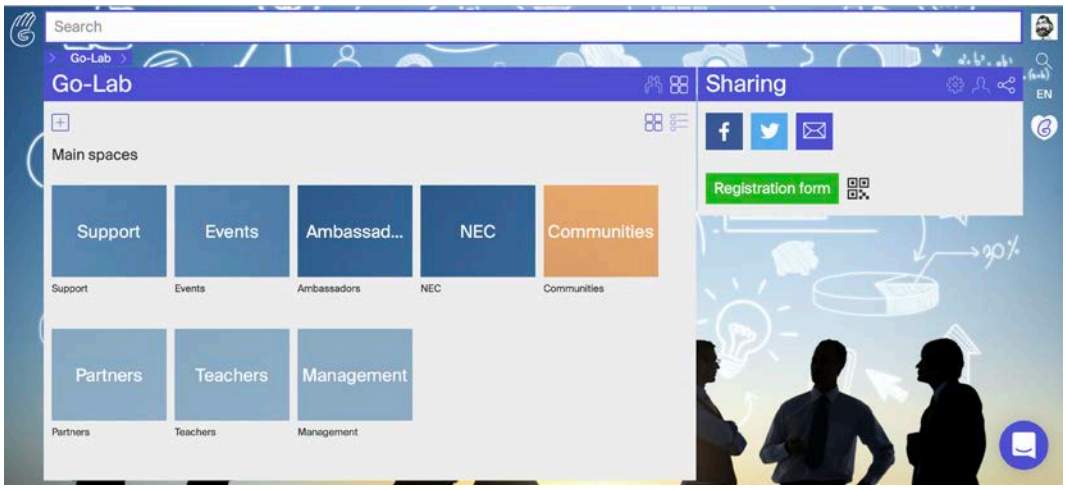

Figure 6. The community space shared by the Go-Lab community with the green link to the registration form for new members.

The footer of the landing page is presented in Fig. 7. It includes links to the desktop off-line ILS viewers, referred to as **Graasp app**, developed in the framework of the GO-GA project (see GO-GA deliverables for more details), to the simplified Graasp tutorial implemented using the new Graasp page view (see Section 3), to the platform for Graasp app and lab **developers** (see Section 7), as well as to **social media** channels and to the websites of co-financing **partners**.

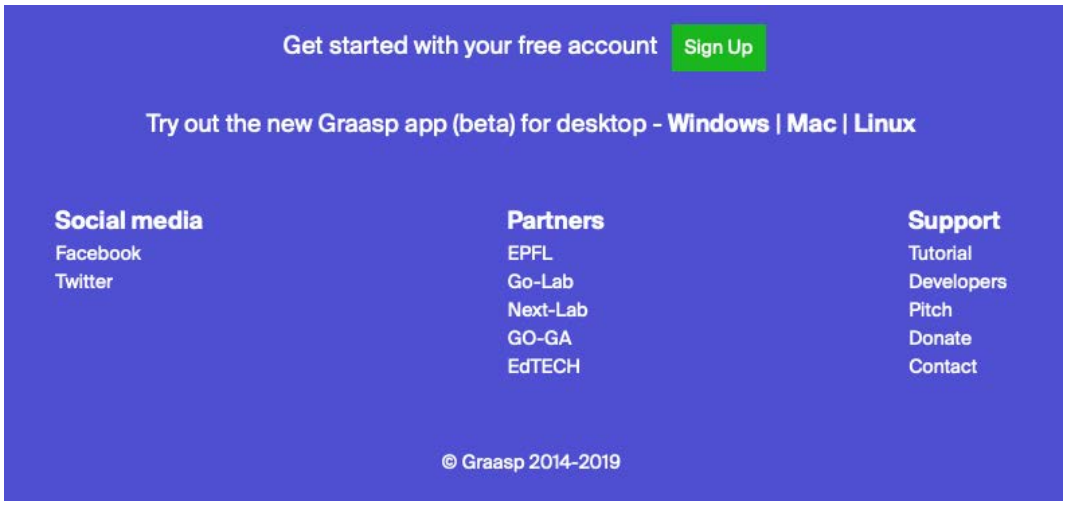

Figure 7. Footer of the Graasp landing page.

3. New Standalone and Page Views

In order to free the Graasp platform from the obsolete legacy open social[1] components relying on the shindig server—on top of which all the apps and the original standalone view were built—the first step was to provide a new standalone view. The standalone view is the view of an inquiry learning space (ILS) provided by teachers to their students, which can be used by providing only a nickname (without requiring an account on the platform). In addition of not being open social dependent, the new standalone view also relies on the new Graasp API, which better enforces rights management and better handles user load.

The preliminary design of this new standalone view was initially presented and discussed with the Next-Lab beneficiaries during the General Assembly held in Lyon in November 2018 and then detailed in D2.7 (Section 5). This view has been finalized and made available on the production server of Graasp.eu on June 20, 2019, using the same button and naming as the previous version to avoid confusion. The older view is still available by clicking on the "Show legacy view" link for old inquiry learning spaces that might have compatibility issues (Fig. 8).

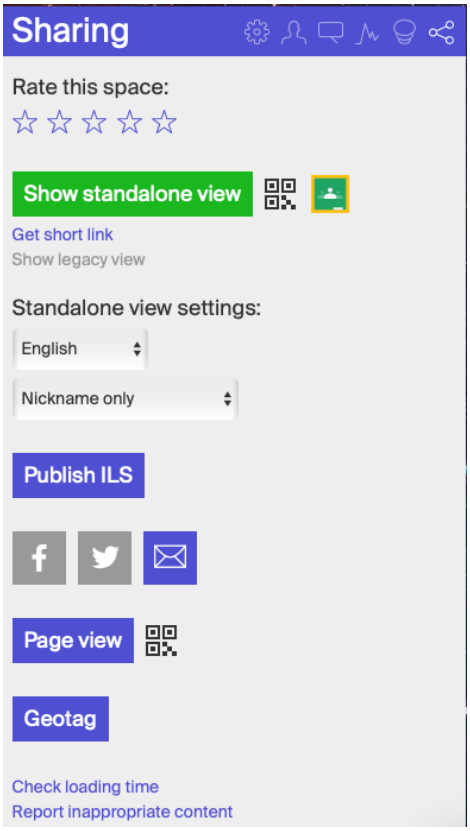

Figure 8. Graasp sharing tab with the "Show standalone view" button giving access to the new standalone view and the "Show legacy view" link providing access to the old view.

[1] OpenSocial is a public specification that defines a component hosting environment and a set of common application programming interfaces for Web-based applications [Wikipedia] that was used in Go-Lab and Next-Lab to run apps and labs not hosted in the authoring and learning platform.

The new standalone view supports new apps relying on the new Graasp API rather than open social, while still supporting legacy open social apps. The new standalone view better handles the resizing of the browser windows and propagates the resizing actions to the embedded apps and labs supporting it. It also better handles the tool area that is now on the right-hand side rather than on the bottom to better support vertical scrolling in long ILSs. One should notice that the link to the "Aquarium" view that was part of an investigation on gamification has been hidden (this feature is still available using the Ctrl-Shift-A keyboard shortcut). The new "Geotag" button is a feature required by the off-line ILS viewers for the GO-GA project, enabling teachers to find public ILSs existing in their vicinity.

The links to the standalone views include the **cloud** prefix (https://cloud.graasp.eu/...). Short links and QR codes are also provided to cover the various modalities for hassle-free sharing with students.

An example of the new standalone view is provided in Fig. 9 with the Calculator as a selected tool on the right-hand side. The left-hand side navigation area displaying the inquiry learning phases can be (un)collapsed using the "menu" icon on the top left side of the interface. The tool area can also be (un)collapsed using the blue arrow on the top right corner of the white area.

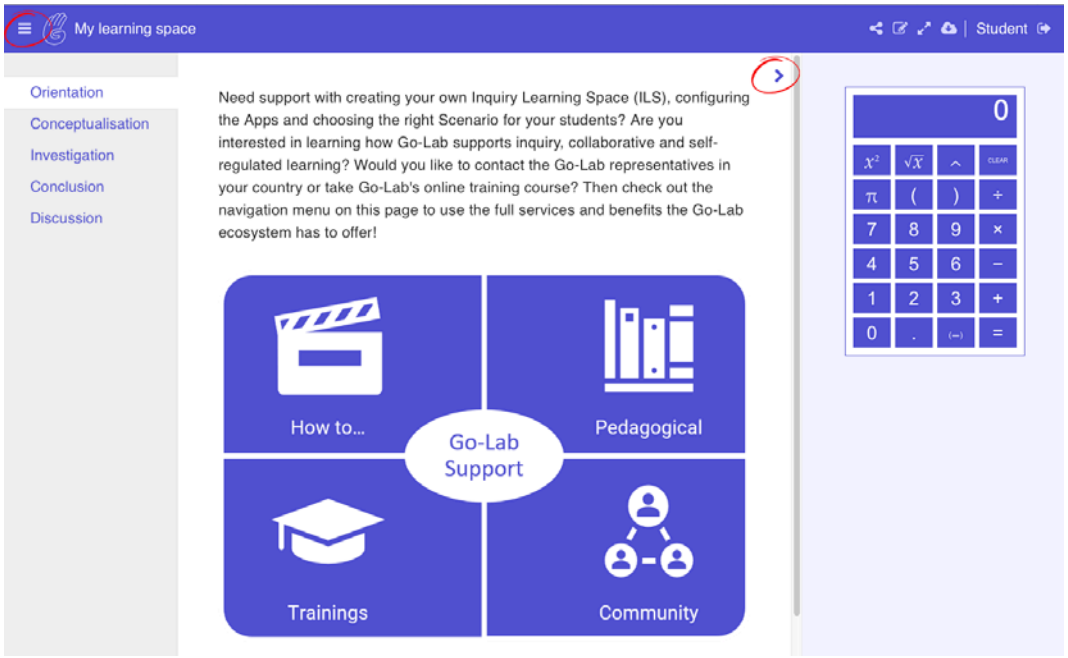

Figure 9. New standalone view including a tool on the right-hand side.

Up to now, teachers had to use the standalone view and create one or more nicknames for preview during the authoring process. These artificial standalone users had to be removed before using the ILS in a classroom to ease the supervision of the activities by the teachers and not to corrupt the learning analytics. To avoid this extra overhead in the authoring process, a new view not requiring login with a nickname has been implemented and is accessible using the "Page view" blue button or the associated QR code (Fig. 8). In this case, the name of the author (the teacher) is displayed in the top right corner instead of the student's nickname (Fig. 10) and no standalone users are created.

The links to the page views include the **viewer** prefix (https://viewer.graasp.eu/...). Access to a page view requires to provide login credentials.

Figure 10. Top bar of the standalone and page views.

Both the standalone and the page views have four icons (buttons) next to the user name (Fig. 10). The first one (3 connected dots) is to share the link of the standalone or page view on Facebook or Twitter, or to copy it to the clipboard. The second one (square with a pen), which was requested by teachers[2], provides a shortcut to go back to the authoring view. The third one (diagonal arrows) serves to expand the view to full screen and is used either by teachers when demonstrating an ILS on screen or with a beamer, or by the students when using it on their computers or tablets. The last one (cloud) is the export button that was already available before (Fig. 11). It has however been simplified and offers now only one eBook format compatible with the EPUB3 standard (see D3.7 for this ePortfolio feature). All the content, apps and labs provided by the teachers, as well as the learning outputs created by the students can be exported as a single PNG image, a PDF document or an eBook. Some apps still need to be adapted by their developers to properly export their content. When spaces include large PDF files, each page is now rendered individually in the exported document.

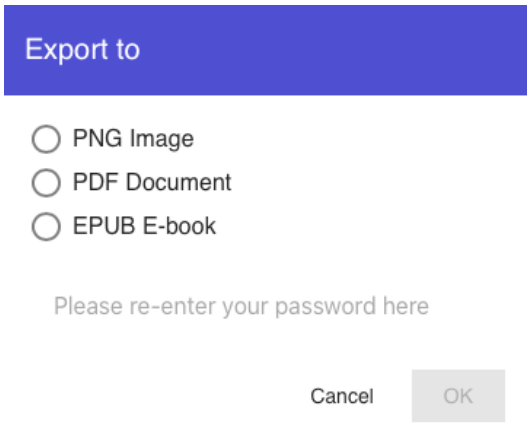

Figure 11. Export option for the standalone and page views.

The page view is not only available for ILSs, but for any Graasp spaces. This feature is turning Graasp into a combined authoring and presentation platform in which content can easily be aggregated and then displayed with easy navigation between the phases or the subspaces (that can be seen as slides). As a matter of fact, the keyboard arrows are available to navigate from one tab to another (i.e. from one phase or subspace to another, even if the navigation area is hidden). Hence, the page view can be seen as a “preview

[2] Report on Usability and User Experience Evaluation of the Go-Lab Ecosystem with Novice and Advanced Users, Internal Next-Lab Report, Matthias Heintz, Effie Law, September 2019.

mode" when authoring an ILS or as a "presentation mode" when demonstrating an ILS in the classroom or highlighting the content of a regular space during a talk.

Fig. 12a shows the example of the page view of a regular Graasp space used to give a presentation (slide show) to researchers in digital education about the usage of the Graasp platform for active learning. This new feature is a **strong added value element** to promote Graasp instead of Moodle in academic institutions as a digital education platform. It can be used as example in teamwork or design thinking activities carried out by registered university students. Fig. 12b shows the Graasp tutorial implemented the same way.

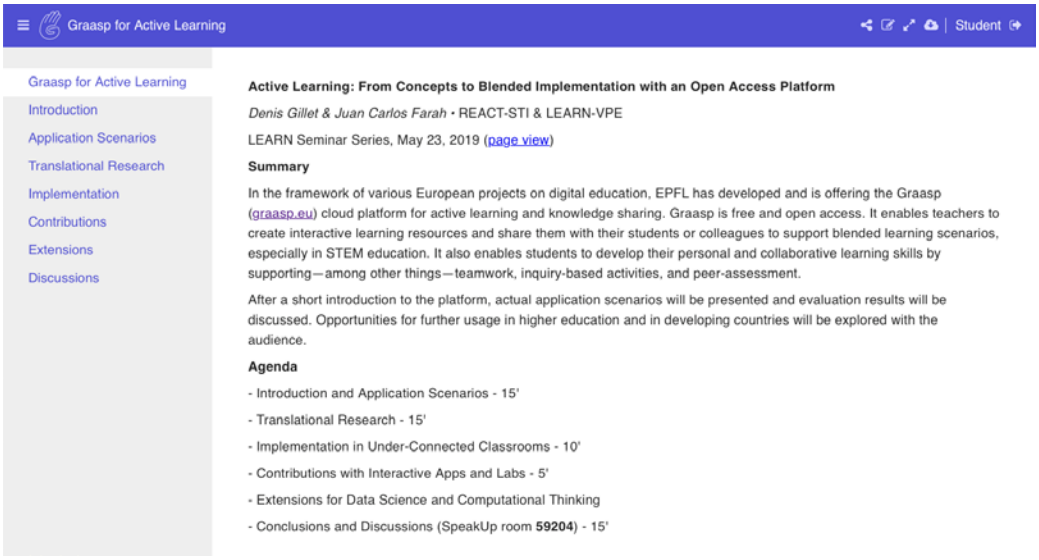

Figure 12a. Example of the page view used to give a presentation in Graasp.

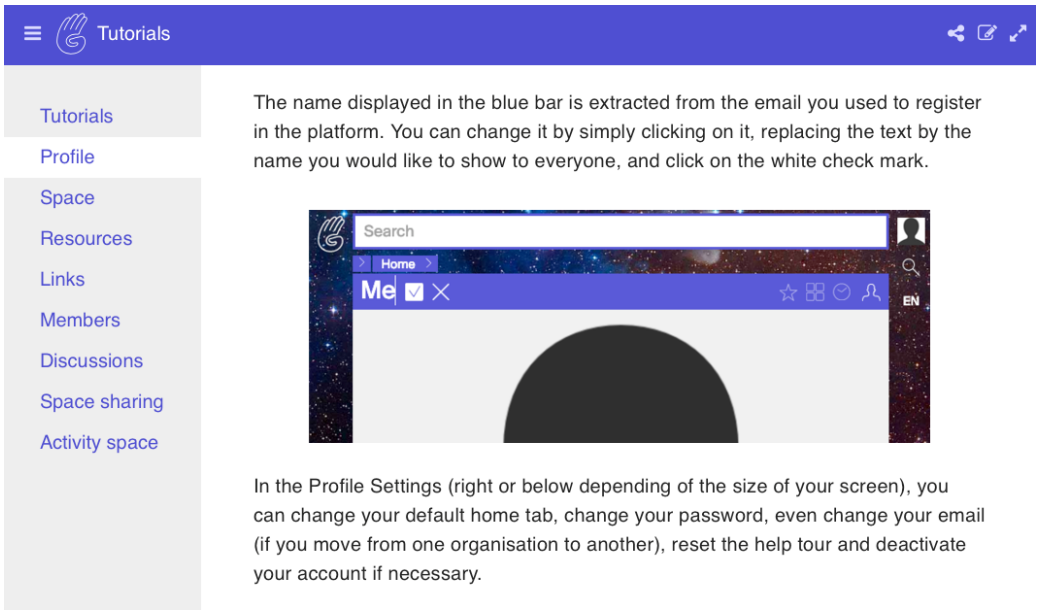

Figure 12b. Graasp tutorial implemented using the Page view.

In ILSs, the standalone and the page views enable navigation from the top space level (even if the button is clicked from within a phase). In basic Graasp spaces, clicking the “page view” button enables navigation at the current level and at one level of subspace below.

In terms of **authoring**, a few additional improvements were also made. The equation editor available in the space wiki (description) has been updated (inline equations can be added between the “\(” and “\)” symbol and centered equations between the “\[” and “\]” symbols.

Spaces can now be duplicated using the space contextual menu (Fig. 13).

Figure 13. Duplicate option for spaces in their contextual menu.

More formatting options (Fig. 14) are proposed in rich Graasp documents (created using the “Create Document” button).

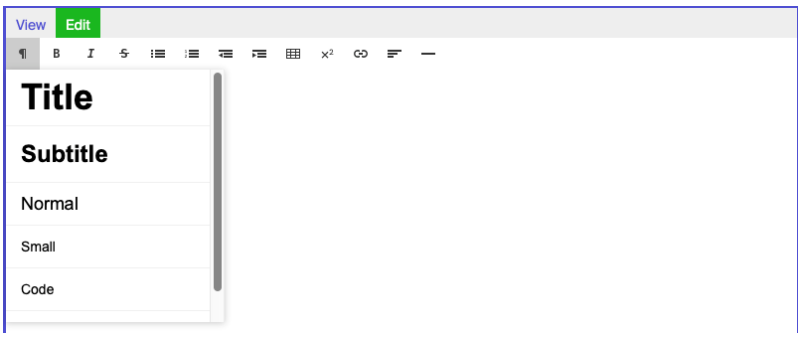

Figure 14. Formatting options in the Graasp rich-text document editor.

The size and the resolution of images in the new standalone view have been increased and the location of their description can be personalized from the expended authoring view as shown in Fig. 15 (above, below, left, right).

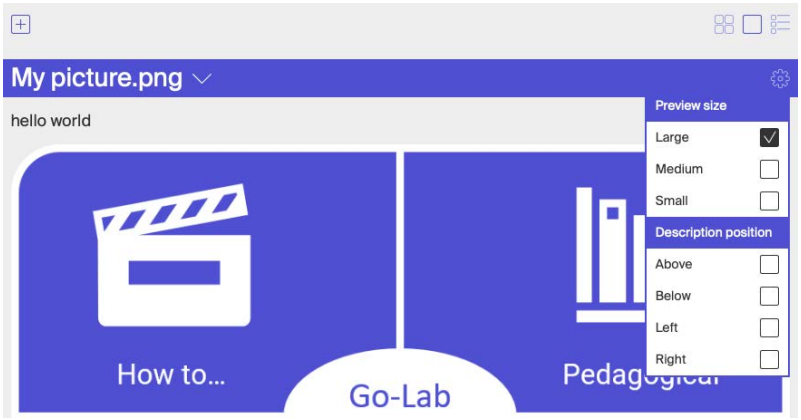

Figure 15. Settings for the resolution and position of images available in the expanded authoring view.

When an ILS is saved as a zip file (for backup purposes) and dragged-and-dropped again later in Graasp (for restoring), it can now be converted as an activity (Fig. 16a), i.e. it can be recognized again as an ILS (previously it was restored as a regular space). An activity space is a structured space with the same properties than an ILS, but that can support any learning scenarios (Section 4). As the original activity type or ILS template cannot be inferred, it is restored as a "blank" activity (see next Section) not to bias the analysis of the ILS creation patterns. Once turned into an activity, the space settings enable the user to activate activity tracking to support learning analytics (Fig. 16b).

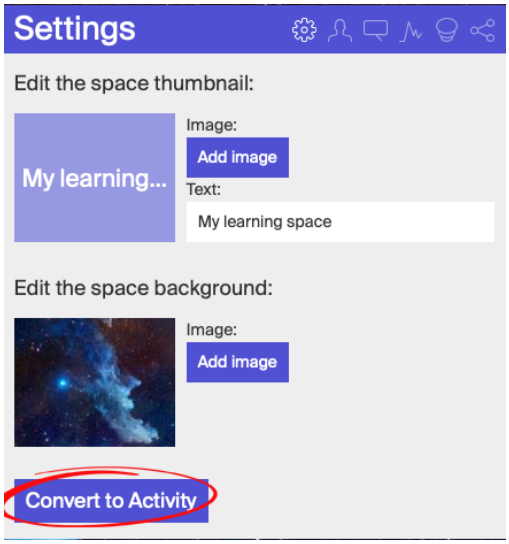

Figure 16a. Dialog to change a regular Graasp space into a structured pedagogical activity.

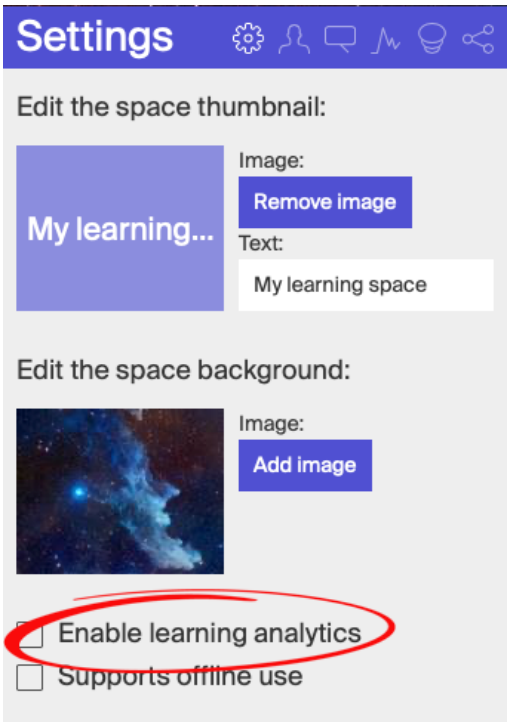

Figure 16b. Dialog to enable activity tracking in Activities and ILSs.

4. Alternative Learning Scenarios

Thanks to successful dissemination activities in educational institutions and in the digital education research community, users have developed interest for Graasp to create or personalize open educational resources beyond the scope of Next-Lab. For such users, involved neither in STEM education nor in inquiry learning, it is important to provide them with features to let them create alternative learning scenarios through additional templates and apps. This broader scope is part of the Graasp sustainability plan.

4.1 New Learning Activity Templates

New learning activities templates released in May 2019 are now offered through an additional "**Create Activity**" popup (Fig. 17), complementing the existing "**Create ILS**" popup that people outside the Go-Lab community are not familiar with.

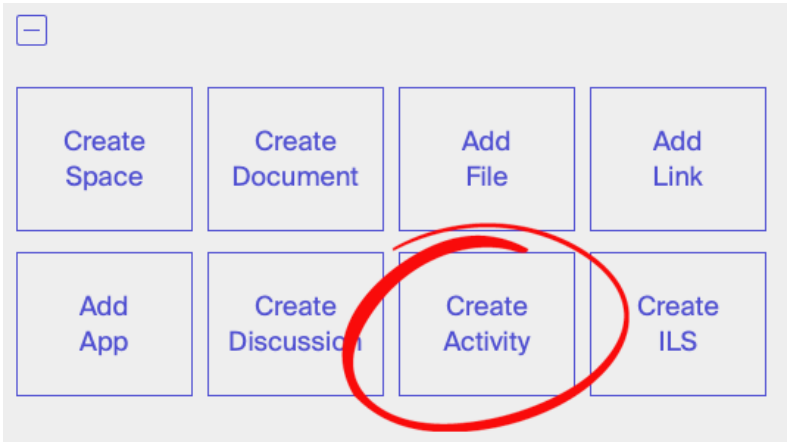

Figure 17. New button to create activity relying on alternative pedagogical scenarios.

The new learning scenarios currently proposed (Fig. 18) include a **Blank** one without any phases to let teachers create an activity from scratch, a **Training** activity corresponding to a typical course (like in Moodle) with successive modules, a **Design Thinking** activity as promoted in higher education and in executive training to support the development of transversal skills like teamwork and creativity, a **Computational Thinking** activity that is becoming mainstream in compulsory education and beyond to support the digitalization of the society, a **Self-Regulated Learning** activity for personal learning as promoted by the former FP7 ROLE project in which Graasp was originally developed, a **MOOC** activity supporting flipped classroom scenarios and showing how Graasp can easily be used to aggregate—in a few clicks—videos, summaries, and multiple choice questions structured in weekly modules as proposed by edX or Coursera, and finally an **eBook** activity using the phases as chapters (and benefiting directly of the *export as eBook* feature).

These activities have the same structure than ILSs, i.e. they integrate a series of phases that can be populated with content, including documents and links, discussions, labs, and apps. They also support standalone users, learning analytics, review mode, and rely on the "Vault" to save learning outputs generated by legacy labs and apps. They however cannot be published on Golabz.eu, which focuses on ILSs for STEM education (the "Publish ILS" button is not visible in the sharing tab of activity spaces).

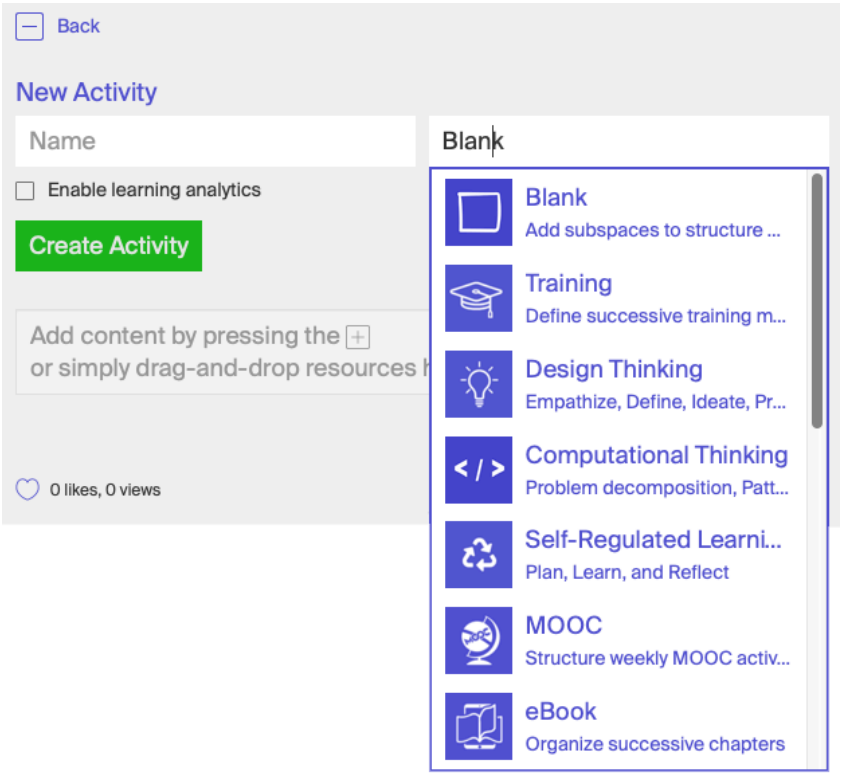

Figure 18. Alternative pedagogical scenarios currently offered.

4.2 New Graasp Labs and Apps

To support the alternative learning scenarios described in Section 4.1 and to enable the creation of open educational resources with Graasp in other disciplines beyond STEM, new labs and apps have been created using the framework described in Section 7. As these labs and apps are not published on Golabz.eu, they are offered directly in Graasp through an additional popup menu (available both when choosing “Add App” or “Add Lab”) as shown in Fig. 19. This feature has been released in July 2019 for Next-Lab and also for GO-GA as a quick way to provide access to prototype apps for off-line use.

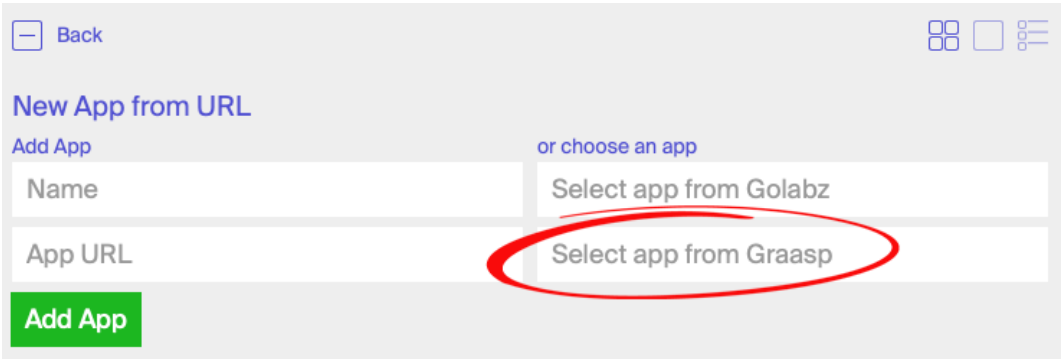

Figure 19. App selection dropdown menu offering the alternative to use apps hosted in Golabz.eu or apps hosted in Graasp.

As a sustainability measure, it is envisioned to offer public Graasp spaces as repositories for dedicated collections of apps and labs. As a matter of fact, the Graasp apps and labs shown when using the “Select app from Graasp” and “Select lab from Graasp” popup, respectively, are already available in dedicated public spaces. Adding an item in one of these two collections just requires to add them as normal Graasp resources (“Add App” button).

As part of the apps offered, one can mention the **Sketchfab app,** which enables teachers to add augmented or virtual reality resources in their activities (Fig. 20). Sketchfab.com is a repository with open access augmented or virtual reality resources for education. Extra features have been added to this Graasp app, including the direct selection of a resource from the Sketchfab repository and the generation of a QR code to explore these resources on mobile devices with the Sketchfab app.

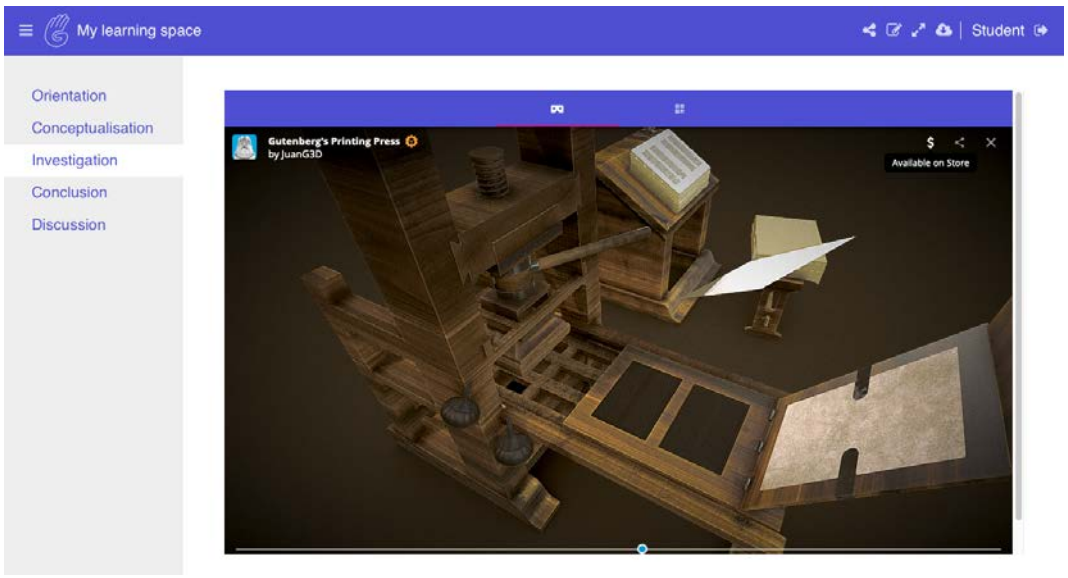

Figure 20. The Gutenberg’s Printing Press selected for exploration in the Sketchfab app (it is animated to see all operations and can be explored and rotated in 3D).

Another important app released in November 2019 is the **Code app** supporting Computational Thinking. The Code app enables teachers to offer code snippets in either JavaScript or Python and students to practice these programming languages to develop skills related to algorithms or data science. This app is detailed in D3.7. The JavaScript version was developed in collaboration with the Kyoto Institute of Technology, which is introducing the Go-Lab ecosystem for its students.

In learning scenarios different from the inquiry learning one, the distinction between labs and apps is not so straightforward. For example, the GeoGebra app can be seen just as an app providing access to resources of GeoGebra.org, or as a lab once a resource has been selected. So, we are considering to regroup both Graasp labs and apps under the “App” name and collection to simplify the user interface.

Last but not least, in the authoring view, the URLs of the apps and labs added in an ILS are now visible to help with versioning and compatibility assessment.

5. Discussion Feature

The built-in discussion items that teachers could previously add in ILS phases were not compatible with the technology used for the implementation of the new standalone and page views. They were also duplicating the features available through the SpeakUp app. As a consequence, when the new views were released in June 2019, the discussion items were decommissioned (as part of the posteriority actions).

The button to “Create Discussion” is still the same (Fig. 21), but now it is the SpeakUp app that is automatically added. One should note that SpeakUp can and is extensively used to support flipped classroom activities as a standalone application (speakup.graasp.eu). It has also native iOS and Android versions linking the Go-Lab ecosystem to mobile learning modalities.

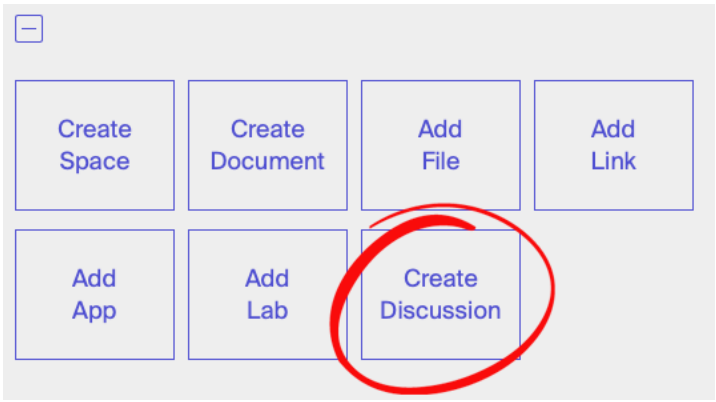

Figure 21. The option to add discussion in inquiry learning phases.

After adding the SpeakUp app in a phase, the teacher has to select in the app settings (authoring view) an existing discussion room by providing its ID or create a new one by providing a name as shown in Fig. 22.

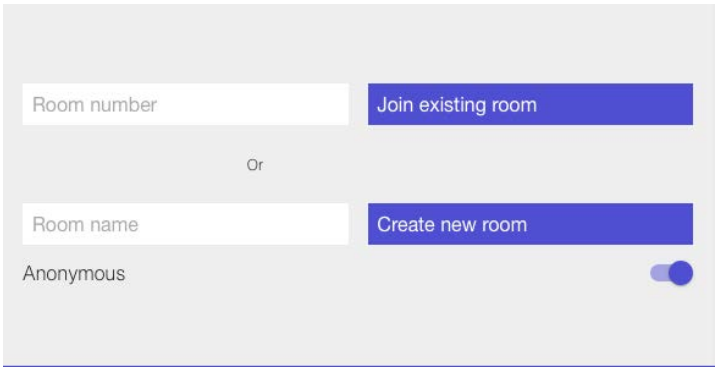

Figure 22. The current SpeakUp settings.

If the anonymous switch is turned off, the nicknames of the students will be associated to each discussion post. New features, including tags, will be soon released in SpeakUp.

6. Shindig-free App Deployment and Support

The deployment of and support for apps and labs not relying on the legacy open social standard and the associated shindig server was a complex task requiring coordination between all the components of the ecosystem. In summary, (i) the **Golabz** repository had to offer the updated versions of the apps and labs, (ii) the **Graasp** authoring and learning platform had to update its API to cover all the needs of the app and lab developers, handle vault-free configurations, action storage and retrieval, and support multiple languages, (iii) **apps** had to be updated to exploit the new API, and (iv) the **composer** (https://composer.golabz.eu) had to be adapted to support new internationalization strategies and remove open social wrapping of all external labs and apps. The final coordinated deployment action was conditioned by the availability of the new versions of the core scaffolding apps and was carried out in November 2019.

The initial Graasp API is detailed in D4.4 delivered in December 2018, Section 2. Since then, new features were added, including:

- analytics flag indicating if users' traces should be, or not, recorded;
- more contextual information can be retrieved by developers to improve their apps (e.g., nicknames/alias of other users using the ILS);
- developers can choose to flag users' actions and inputs (resources) as 'public', which allows other apps/users to see them;
- since there is an enormous amount of actions produced, fetching actions is now paginated, meaning one cannot get "all my actions", but 1 page at a time with a limited number of actions per page;
- allow an action to have a verb to better classify what the action represents.

Some other features were also added to support the GO-GA project, including:

- offline-ready ILSs are flagged;
- endpoint to get an "offline snapshot" of the ILS for the desktop app to download and use later while in limited connection conditions.

The apps in all the ILSs published on Golabz have been replaced by the new shindig-free versions in the dedicated Graasp repository hosting their copies. So, when ILSs are duplicated by teachers from these sources owned by Golabz, they are seeded with the proper updated apps.

The existing personal or shared ILSs of registered users have not been updated automatically. The new versions of the apps are integrated only when a teacher creates a copy or duplicate and existing ILS. By default, a copy is a clean instance of an ILS without standalone users and activity traces, but with the personalized settings of the apps. Making copy of an ILS for using it during a new school year of with a new class of students is recommended as part of the teacher training. So, the usage of the new apps will expand quickly thanks to this transition scheme.

Last but not least, the apps relying on the new API can store and retrieve interaction artifacts directly from the database and hence do not require anymore the “Vault”. The use of this dedicated subspace was affecting significantly the ILS responsiveness when heavily used by apps for file-based read and write operations related to students’ actions.

7. App Development Framework

As detailed in D4.4, Section 4, the new Graasp API enables the emergence of a new ecosystem of apps and labs that do not depend on the deprecated Shindig server and that bolster the Graasp and Golabz ecosystem by providing easy app and lab development following best implementation models and practices. Apps and labs mentioned in Section 4.2 of this document rely on this development framework.

The app development framework is also the foundation for new initiatives (submitted or in preparation) to develop more open educational resources for the Go-Lab ecosystem in particular and for digital education in general.

Information and access to both the app development framework and the Graasp API is available at developers.graasp.eu. To start with, the **Input app** is provided as an example that uses all of the functionalities of the API, as well as the different modes and views recommended for Go-Lab apps.

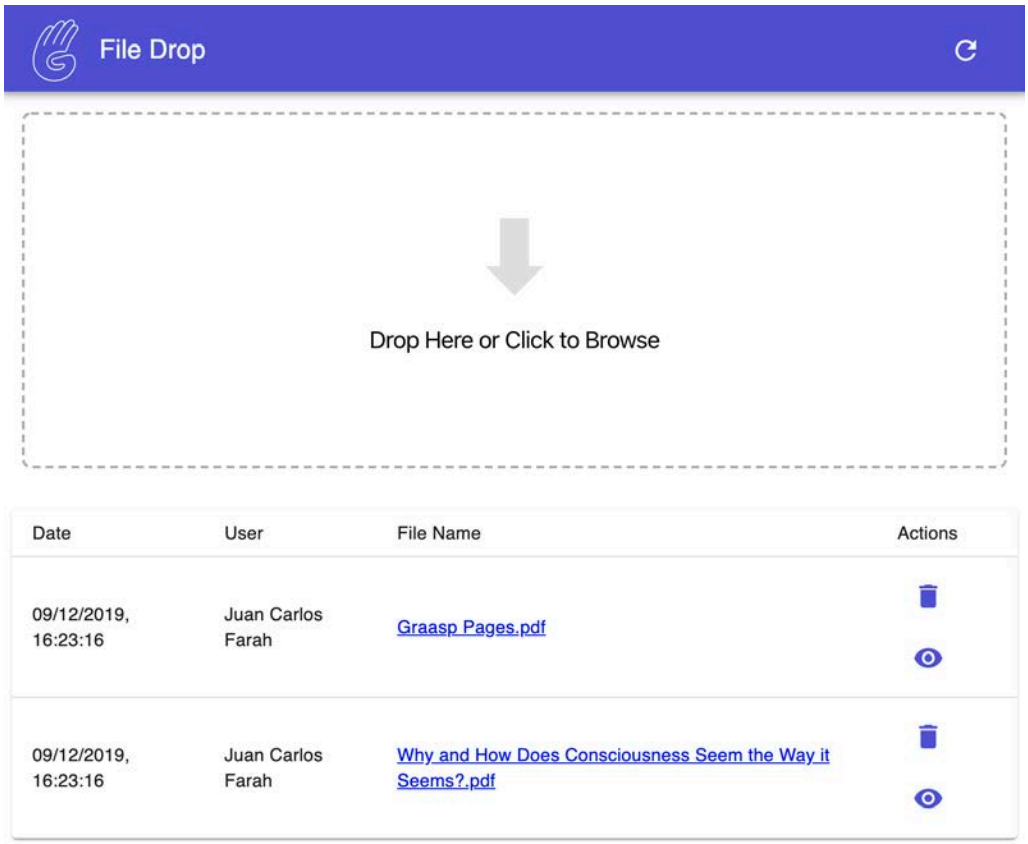

Figure 23. The File Drop app is an example of how developers can incorporate an interface for teachers and students to share files within an ILS.

Since the framework was officially released in D4.5, it has been updated to promote a more coherent experience for developers. Developers can choose to run their apps fully decoupled from the Graasp ecosystem. This means that apps are not forced to use the Graasp API. This is particularly useful to develop labs, which are often agnostic of any user information that might be provided by the API. It also allows developers to quickly develop prototypes, before having to worry about the nuances of communicating with a backend.

We have also focused on providing production-ready examples of apps and labs created with the framework. These examples showcase various key components that developers can use within their apps. The **File Drop app** (Fig. 23), for instance, shows how a developer can integrate an interface for teachers and students to upload files within an ILS. The **Light Pollution Simulator lab** (Fig 24), on the other hand, highlights the use of the HTML canvas to create rich, interactive graphical interfaces. Finally, the **Piano lab** (Fig. 25), is an example of how developers can exploit sound fonts to incorporate sounds into their apps.

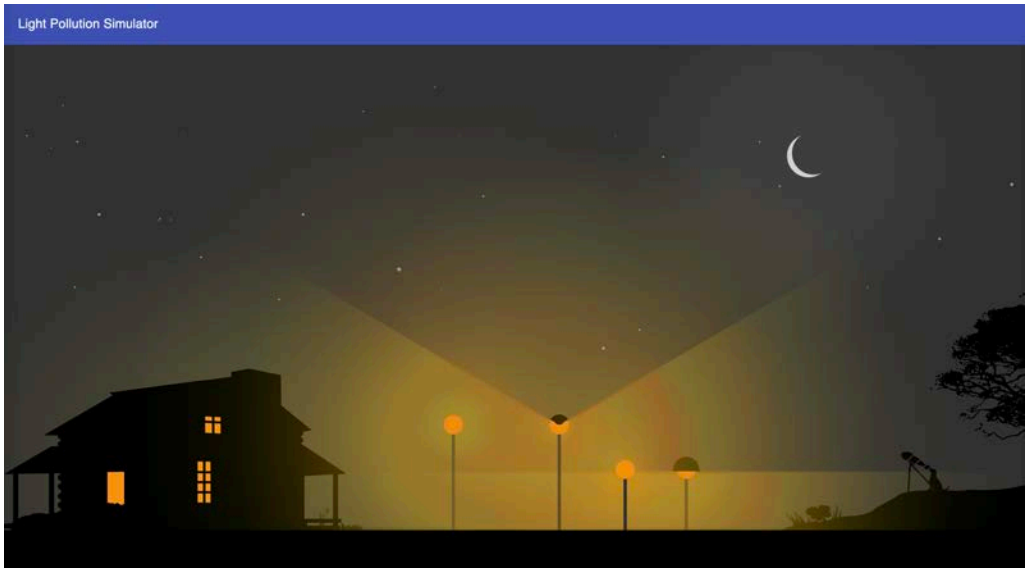

Figure 24. The Light Simulator lab provides a comprehensive example of how to use HTML canvas in order to create rich graphical interfaces.

By seeding the ecosystem with custom, open source, high-quality, apps and labs, we hope to encourage other developers in digital education and beyond to implement educational resources. Furthermore, by making these resources portable to other learning ecosystems, we hope to strengthen the sustainability and reach of the resources created within the scope of the Next-Lab project and the Go-Lab initiative.

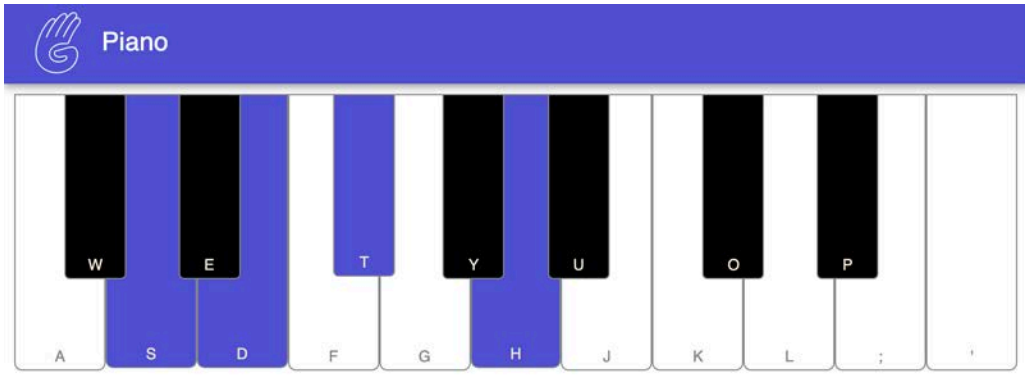

Figure 25. The Piano lab shows developers how sound fonts can be used to incorporate sound and music into their apps.

8. Conclusions and Outlook

This deliverable has detailed the sustainable releases of the creation and personalization services. All the proposed improvements, suppressions and additions have been implemented to strengthen the user experience and the sustainability of the Graasp authoring and learning platform.

Key implemented features include HTTPS support, shindig-free support, the landing page, the standalone and page views, as well as a single discussion scheme.

Many features were also added to broaden the scope of Graasp usage and to increase its user base, especially the new activity templates. As a matter of fact, the more users and more applications we have, the more opportunities we have to further sustain and develop the platform and the associated ecosystem.

The consolidated backend relying on the new open source Graasp API and the new open source app development framework also increase opportunities to further sustain and develop the platform. A nonprofit Swiss Graasp Association (Graasp.org) has been created on October 25, 2019, with this objective in mind and as a complement to the Go-Lab Association detailed in D4.6 to reach other disciplines, levels, and communities.

One of the challenges we faced was to comply with the objectives and the features defined four years ago in the Grant Agreement and be simultaneously an innovation action adapting continuously to the needs of our users and the evolution of our digital education context. Another challenge was to continuously improve the platform while simultaneously providing consistent impact data to the European Commission, including year to year comparison.

Overall the platform has been very well received and exploited by its users, both by those recruited and trained by Next-Lab, and those who discovered it by themselves. Furthermore, these users can count with a fully production-ready platform that they can rely on. Over the three years of the project, the Graasp platform was up almost 100% of the time.

For the future, the interface could be simplified even further (e.g. by hiding advanced features to new users), especially for users not discovering the platform through the Go-Lab initiative. Another expansion to consider could entail building more collections of resources matching some specific curricula like the International Baccalaureate (IB) diploma program and all the disciplines associated to it.

After 7 years of participatory design, pilots, training, dissemination, and large-scale implementation in the framework of the Go-Lab integrated project and the Next-Lab innovation action, as well as the other co-funding initiatives, the Graasp authoring and learning platform, combined with the Golabz sharing platform, apps and labs, has enabled a large community of about 20,000 teachers to create and personalize inquiry learning spaces as open educational resources and has offered to their students unique opportunities to explore science and practice scientific methodologies in an active and engaging way, and this is just the beginning.