



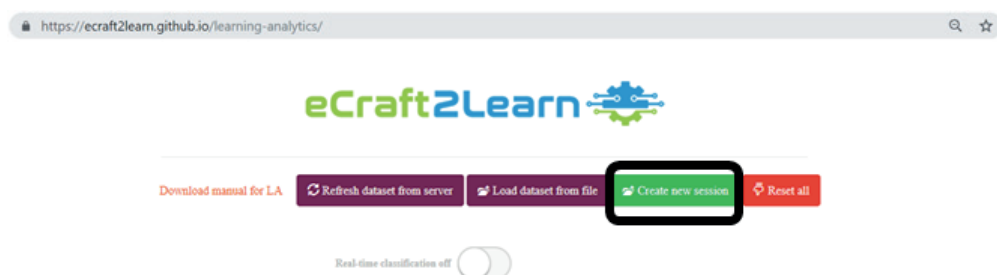
Workshop 22.11.2018 - Technical Framework

The digital platform is accessible using Google Chrome browser for full functionalit.

The digital platform can be accessed using any type of mobile device (tablet/smartphone), laptops (Linux, Windows, Mac IOs) and Raspberry Pi microcomputers. The digital platform has two interfaces: the unified user interface (UII) for students and the learning analytics interface (LA) for teachers. The login procedure to the interfaces is as described below.

Login Procedure

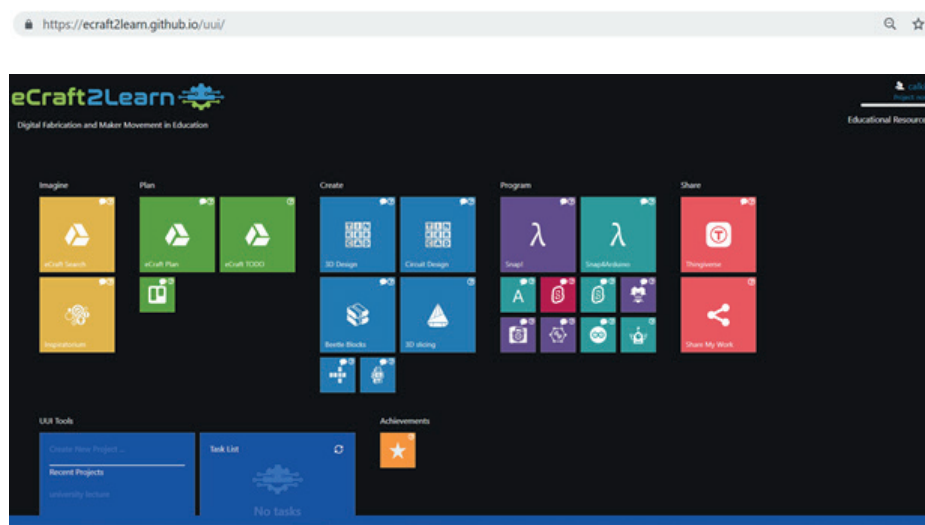
1. The teacher goes to the Teacher Interface URL and creates a new session ID



2. The system will provide a session ID that the students then can use when logging into the UII (students' interface)

Creating a new session ID is needed whenever the teacher wants to start a new project with their class.

3. Once a session ID has been generated, the students' groups can use it to login into the students' interface through the following URL



Important! The groups need to use the session ID provided by the teacher when login into the UII to develop their projects. The students need to make sure to always use the same username for their group when logging in. This helps the learning analytics to give a better feedback to the groups and the teacher/coach.

The tiles in the UII are presented in five different groups based on the five stages of eCraft2Learn pedagogical framework: ideation, planning, creation, programming and sharing. The UII allows the user to launch several tools within the UII window without the need to move between different operating system windows or browser tabs.

The eCraft2Learn project developed Open Educational Resources (OERs) linked to the personalised and contextualized use of the eCraft2Learn ecosystem. The OERs support learners' skills, needs and knowledge in educational activities that happen at individual and/or collective project work levels, in both virtual and physical environments. For that purpose, documents, videos, tools, worksheets, tutorials, manuals among other resources were created and gathered from the

broad amount of resources available on the Internet to scaffold users' work and educational progress.

The OERs are accessible in the UII, through the Educational Resources tab located on the upper right side of the homepage of the UII. The OERs in the eCraft2Learn digital platform correspond to the following types:

Documents, Descriptions and Instructions, Videos, Other Online Resources and Teacher Uploads.

From these types, the OERs are grouped in categories such as Electronic Devices, 3D Printing, A.I. (Artificial Intelligence), Worksheets, Communities, Troubleshooting, and Teacher Uploads.

- Electronic Devices gather a broad number of descriptions, applications and videos on electronic devices (e.g., sensors, resistors, motors, etc.) used for learning within the eCraft2Learn ecosystem.
- 3D Printing provides information about 3D design and printing process, with video tutorials and detail step-by-step guides.
- A.I. shows the use and application of A.I. services for programming with Snap! and Snap4Arduino environments. Detailed manuals are provided with clear examples of applications for image recognition, speech recognition and machine learning to make the built artefact interactive.
- Worksheet provides guidance examples for developing specific projects through the eCraft2Learn ecosystem. The worksheets also offer a scaffold to the five stages pedagogical methodology of the eCraft2Learn action when the learners are immersing in their hands-on project development.
- Communities are given as links to the open community of practice of Arduino and Ultimaker, which have thousands of professionals worldwide who can give feedback and assist with issues or questions.

OERs developed for teachers are also accessible through the Learning Analytics teachers' interface. The learning analytics system communicates with the UI so that it collect data from the students' actions within the interface. The data is then analysed through several data mining algorithms that are implemented in the learning analytics interface.

The learning analytics system can be used for instance to predict the performance of a group or to group similar kind of behaviours within the UI through cluster analysis. The aim is to deepen the understanding of the coach in the project settings and thus, enhance the learning and the coaching. The learning analytics system follows an open-ended philosophy and the teacher as a coach has an active role interacting with the system during prediction and cluster analysis.

The approach will help the teachers to discover things that could not be discovered from the projects otherwise. The analysis of the students or groups can be achieved through:

- Prediction where the performance of the students will be predicted and the teacher will be notified

- Cluster analysis where the activities of the groups are compared to other groups' activities and the system will inform the teacher which student groups are similar to each others
- Anomaly detection where outliers among the group activities will be found
- Association rule mining where the associations between the actives will be found. That is, the teacher will be informed which activities within the project usually occur simultaneously.