



Science Created by YOU

SCY TECHNICAL MANUAL DXI.3

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Executive summary

This deliverable focuses on the technical aspect of SCY (Science Created by You), its digital learning environment, SCY-Lab. It provides teachers with simple technical computer requirements, how to download and install the software (SCY-Lab) and how to get started. Information on how to navigate around and work through SCY-Lab is also available. Finally, the document introduces teachers to SCY-Lab's available tools students use during the missions.

Table of Contents

1	Before you start	5
1.1	SCY-Lab or SCYSnippets?	5
1.2	Technical requirements	5
2	Getting started	6
2.1	SCY-Lab: local installation or web-based?.....	6
2.2	Downloading and installing SCY-Lab on a local computer	6
2.3	Starting SCY-Lab from a local computer	6
2.4	Running SCY-Lab on the web	6
2.5	Authoring	6
2.6	Enrolling students.....	6
3	Working with SCY-Lab.....	7
3.1	General layout	7
4	Available ELOs, tools and snippets	8
4.1	SCYInterview tool.....	9
4.2	SCYAuthor tool.....	10
4.3	SCYMapper tool (also available as a snippet)	13
4.4	SCYED (Experimental Design) tool (Copex) (also available as a snippet).....	15
4.5	SCYData (Fitex) tool	17
4.6	SCYDynamics (Modeling) tool (also available as a snippet)	18
4.7	SCYUploader tool.....	20
4.8	SCYePortfolio tool.....	22
4.9	SCYBrowser (flying-saucer) tool.....	24
4.10	SCYLighter tool	25
4.11	SCYText tool.....	27
4.12	SCYTeacher Assessment tool	28
4.13	SCYChat (drawers) tool	31
4.14	SCYTagging tool.....	32
4.15	SCYFeedback tool.....	34

1 Before you start

1.1 SCY-Lab or SCYSnippets?

SCY-Lab is the digital learning environment in which students carry out the SCY Missions. There is a web-based version of SCY-Lab, as well as a local version. In order to work with the local version of SCY-Lab, it has to be downloaded and installed on the computers the students will work on (see 'Getting Started' below).

SCYSnippets are selected tools and components from SCY-Lab. They give an impression of the various tools available in SCY without downloading and registering in SCY-Lab. However, certain features of SCY-Lab are not available in the SCYSnippets as they depend on the integration of SCY-Lab and on server architecture, which is not available for the snippets. SCYSnippets are made to run from the internet browser, so there is no need for downloading or installing SCY software. SCYSnippets can be found on the SCYCOM website <http://scycom.collide.info>.

1.2 Technical requirements

SCY-Lab will work on computers with operating systems such as Windows XP/Vista/7 or Mac OS X and 2 GB or more RAM. A fast internet connection is needed. Wireless connections do not work well, primarily because they are slow.

In order to run SCY-Lab or SCYSnippets, you need a recent version of Java (version 1.6 or newer), a very common software program. It can be downloaded for free at <http://www.java.com>. Usually, when opening Java programs, the system may ask for confirmation. Simply, click on 'Run'.

Of course, to be able to install SCY-Lab on school computers, a user will need to have all the necessary permissions. SCYSnippets don't have to be installed.

2 Getting started

2.1 SCY-Lab: local installation or web-based?

At this moment, there are two versions of SCY-Lab: a local version and a web-based version. For the local version you will have to install applications on school computers. The web-based version works within the internet browser, without you having to install local software. However, this version depends even more on a fast internet connection.

SCYSnippets don't have to be installed; they run from within the internet browser. SCYSnippets can be found on the SCYCOM website <http://scycom.collide.info>.

2.2 Downloading and installing SCY-Lab on a local computer

At this moment, SCY-Lab can be downloaded from the SCY project site: <http://www.scy-lab.eu/scy-lab/>. Here the most recent version of the SCY-Lab application for Windows and Mac can be found in a ZIP-format: look for 'SCY-Lab application for Windows' and dito 'for Mac.'

Once downloaded, the ZIP-file has to be extracted, which results in a folder named 'scy-lab'.

2.3 Starting SCY-Lab from a local computer

At this moment, you can start SCY-Lab by opening the batch file *scy-lab-collide-review.bat*.

This runs SCY-Lab connected to the Collide review server. This server runs the latest version of SCY-Lab.

When running SCY-Lab, a window and a command screen are visible. Although a user will not work with the command screen, it should not be closed!

2.4 Running SCY-Lab on the web

The most recent web-based version of SCY-Lab can be found through the SCYCOM website <http://scycom.collide.info> at any time.

2.5 Authoring

In the Authoring part of SCY-Lab, teachers may tweak SCY Missions to fit specific needs, by setting parameters, such as the availability of specific scaffolds (yes/no) or the instructional tactics used by the system (scale from aggressive to laissez-faire).

All authoring is done online, outside SCY-Lab, through the SCY portal page on <http://scy-review.collide.info:8080/webapp>.

2.6 Enrolling students

Student accounts can be created on the SCY portal page mentioned above, when you are NOT logged in. After creating student accounts, you can log in and enroll them in a Mission.

3 Working with SCY-Lab

3.1 General layout

Mission map / navigation

You enter a SCY Mission through the Mission map. This Mission map is the first thing you see when you login. At the top left of the screen, you see the ‘Mission map’ icon. You will also find this icon on other screens, where it will be located in the bottom right corner. You can always return to the Mission map by clicking it.

In the Mission map, there are a number of icons. These icons represent coherent sets of activities, so-called **learning activity spaces**. When you roll over them with your cursor, you will see some information about the activities within. When clicked, you exit the Mission map and enter the learning activity space.

Inside a learning activity space

Inside a learning activity space, you will find

1. A small triangle in the top middle of your screen – this draws down your curtain. The curtain shows information about the learning activity space.
2. Big icons, representing ELOs. These can be opened by double clicking. When opened, an ELO typically has a number of little ‘drawers’ on the side. These can be opened, to reveal information and resources associated with the ELO.
3. A set of icons in the bottom left corner of the screen.
4. A set of icons in the top right corner of the screen.
5. The ‘Mission map’ icon in the bottom right corner of the screen.

Bottom left corner icons

There are three icons here. The top one represents an archive; the SCY version of a trash can. ELOs (except anchor ELOs) may be dragged to this archive and will disappear from the screen. They will not be deleted, though: hence the archive instead of a trash can.

The middle icon, a four-pointed star, can be clicked to create a new ELO of any type. When created, the ELO can be opened and edited.

The bottom icon is a magnifying glass, that leads to the ELO search functionality.

Top right corner icons

There are also three icons here. The two arrow-icons respectively lead to the ‘give feedback’ and the ‘ask for feedback’ functionalities, outside SCY-Lab, in the student’s SCY portal page.

The rightmost icon, a folder, also leads out of SCY-Lab. This one takes the student to his portfolio page in the SCY portal.

4 Available ELOs, tools and snippets

The SCY-Lab includes a number of tools (see Table 1), which at the moment can be use as stand alone tools (snippets) as well. All these tools are used by students in order to create the ELOs needed to complete a SCY Mission.

Table 1. SCY-Lab tools

	Tool	Description
1	SCYInterview	The SCYInterview tool helps learners to design a good interview.
2	SCYFeedback	SCYFeedback is a peer assessment tool with which students can easily ask for and provide feedback on ELOs as they are being developed in a Mission
3	SCYData	The data processing tool enables students to process and visualize numerical data sets.
4	SCYBrowser	The SCYBrowser is a limited web browser. It can only show static web pages (text with images)
5	SCYED (Experimental Design)	This tool is an editor of experimental procedures that allows learners to write down experimental procedure as task trees.
6	SCYLighter	The SCYLighter is a Mozilla Firefox extension for collecting relevant information on the web and saving it into the SCY-Lab.
7	SCYMapper	SCYMapper makes diagrams representing ideas as <i>nodes</i> and the relationship between these ideas as <i>links</i> .
8	SCYePortfolio	The SCYePortfolio tool is used to save ELOs and build a Mission Portfolio (i.e., a collection of obligatory ELOs) to be assessed by the teacher.
9	SCYText	This is a simple text editor integrated into SCY-Lab that students can use for writing and editing text.
10	SCYTool drawers	The SCY chat tool allows learners to communicate with each other in SCY-Lab and thereby collaborate on ELOs.
11	SCYUploader	SCYUploader enables students to import external files into SCY-Lab as ELOS.
12	SCYDynamics	SCYDynamics is a modeling tool that helps create and simulate graph-based models of complex problems and phenomena.
13	SCYTagging	SCYTagging is a co-operative tagging tool used by students to organise, store, manage and search for ELOs in SCY-Lab
14	SCYAuthoring	SCYAuthor is a tool that offers the teacher the ability to fine-tune a pedagogical plan and obtain a real-time overview of activity in SCY-Lab.
15	SCYTeacher Assessment	SCYTeacher Assessment is a tool with which teachers assess submitted Portfolios.

Right below, for each one of the tools presented in Table 2 you can find: the description of the tool, the purpose of the tool, what ELOs are required for the tool to work, what ELOs the tool creates, which activities the tool scaffolds/takes over, and an example of use of the tool.

4.1 SCYInterview tool

Description of the tool

The SCY-Interview tool helps learners to design a good interview. There are two stages in this process. During the first stage, the tool helps learners to prepare the interview where as the second helps them conduct the interview.

Purpose of the tool

The SCY-Interview tool guides students through the process of designing and conducting an interview. The tool takes over the process of structuring the interview by offering learners a step-by-step approach on how to form the interview questions. When working with the Interview tool, students get an idea of what data collection through interviews entails. The Interview tool is not specific to any of the SCY Missions, so it can be used across Missions.

What (Input) ELOs are required for the tool to work?

No input ELOs are required when using the Interview tool. However, it is strongly recommended that students have a basic idea of the topics they need information about. This information can come in the form of an issue list or concept map. Though, these types of ELO's are not a prerequisite, students can start working with the Interview tool without having produced these ELO's.

What (Output) ELOs does the tool create?

The output ELO is an interview schema students can print and use when conducting the interviews. The interview schema is a text document (.rtf-file) that can be opened and further elaborated with a text editor (MS Word, OpenOffice), if needed.

Which activities is the tool scaffolding/taking over?

The SCYInterview tool facilitates several learning activities, such as:

- ask a question (Debate LAS);
- identify relevant concepts, variables, principles and criteria (Conceptualisation LAS);
- identifying key issues (Analysis LAS);
- identifying limitations and constraints (Analysis LAS).

Example of use

If students decide to use interviews during data collection, they can use the Interview tool to design an interview schema. The Interview tool offers students a step-by-step approach how to form the interview questions (see figure 1).

By clicking on a step, students get a brief description of the activity, some guidelines on how the activity should be performed and a template that helps them perform the activity efficiently. The students use the template to specify the topics they want to include in their interview and the tool ensures that each issue is addressed systematically and in full. When preparing an interview, the tool guides students through four steps, namely: (1) formulate research questions, (2) specify variables, (3) formulate research questions and (4) formulate possible answer options.

The tool stores all students' input in an .rtf-file, therefore, if necessary, students can open that file and complete the interview schema with their own text editor. At the end of the interview designing process, learners can print the interview schema and take it to the interview site.

Guidelines for conducting the interview are presented via the tool as well. Students can study these recommendations in SCY-Lab or print them out. As interviews can be conducted anywhere (at home, on the street, etc.), it was decided not to provide tool support during the interview session, for this would limit the possibilities of conducting the interview.

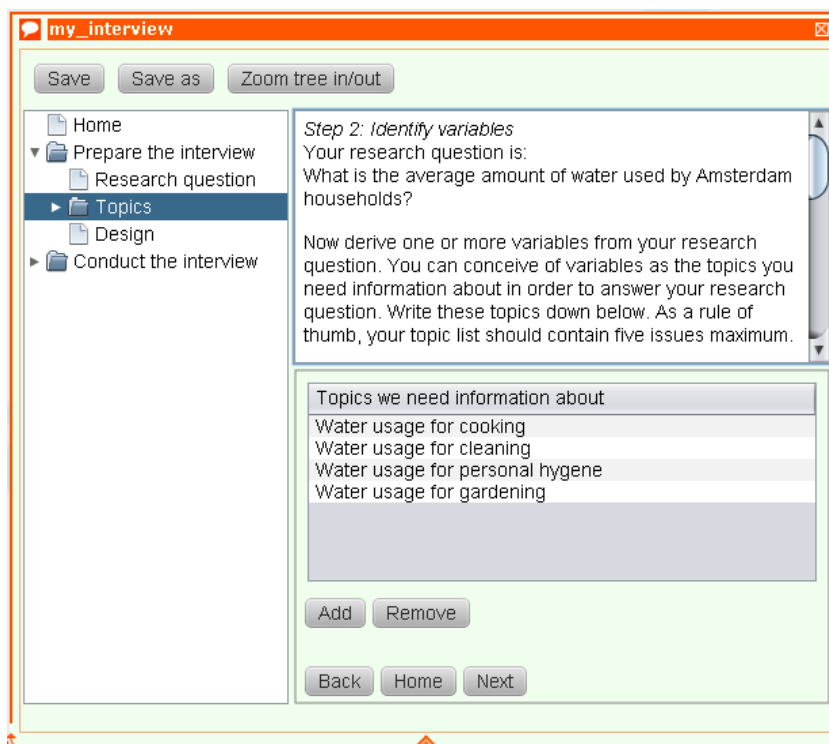


Figure 1: Screenshot of the Interview format tool.

4.2 SCYAuthor tool

Description of the tool

SCYAuthor is a tool that offers the teacher the ability to fine-tune a pedagogical plan and obtain a real-time overview of activities in SCY-Lab as students carry out a Mission. SCYAuthor has two views: SCYAuthor Fine-tune and SCYAuthor Runtime.

SCYAuthor Fine-tune gives the teacher the ability to:

- Fine-tune the scaffolding of learning goals and reflecting questions
- Upload simple additional content (e.g., URLs, pictures, specify locations, etc.).

SCYAuthor Runtime provides the teacher with:

- Awareness of the progress of the students.
- Support in making informed decisions for fine-tuning the pedagogical plan while a Mission is running.

Purpose of the tool

The teacher uses the SCYAuthor tool to:

- Select/specify the default learning goals and reflecting questions for a Mission
- Assign students to the Mission
- Add pictures and URLs to Mission material
- Specify which ELOs are required in the students' ePortfolios
- Adjust scaffolding levels (level of help)
- Specify general agent parameters, such as idle time, before intervention
- Specify the involvement of agents, being hints and help in computer learning environments facilitating learning by interacting with the students. (e.g., number of concepts in concept map before agent offer help to students)
- Define groups or automatic grouping of students

During the Mission teachers can:

- Define a group of students
- Adjust parameters of the agents
- Adjust tool specific parameters of agents
- Adjust scaffolding level
- View runtime status information
- Author reflection questions for ELOs

What (Input) ELOs are required for the tool to work?

SCYAuthor is a tool for the teacher and requires no input ELOs.

What (Output) ELOs does the tool create?

SCYAuthor is a tool for the teacher and creates no output ELO.

Which activities is the tool scaffolding/taking over?

With SCYAuthor the teacher can fine-tune, i.e., *adjust*, the scaffolding level of SCY-LAB.

Example of use

Teachers start SCYAuthor from the SCY web-portal (See the “Before you start”, and “Getting started” section in this document for information on the SCY web-portal and computer requirements) and enter the main navigation screen (see Figure 2). From this screen the teacher fine-tune the learning goals and reflecting questions *properties*, the *ePortfolio* and *Scaffolding*.

Fine-tuning the pedagogical plan involves fine-tuning a Mission and its pedagogical plan parameters, adding students to a Mission and pre-setting the global scaffolding level. Scaffold fine-tuning sets a global level of scaffolding for the Mission. Portfolio fine-tuning involves specifying which ELOs to be included in the ePortfolio and which reflection questions should be asked for each ELO and for the Mission as a whole.

The screenshot shows the SCY Author interface for fine-tuning a pedagogical plan. The header includes the SCY logo and the text 'Science Created by YOU'. Below the header is a navigation bar with links for 'User list', 'SCYAuthor', 'SCYAuthor Runtime', and 'Profile'. The main content area is titled 'Pedagogical Plan: CO2 House' and contains several sections:

- Pedagogical plan properties:** A table with columns 'Pedagogical plan properties' and 'Values'. It lists 'Name' (CO2 House), 'Description', 'Published' (checked), and 'Make all students buddies' (checked). A 'More details...' link is provided.
- Main components pedagogical plan:** A table with columns 'Main components pedagogical plan' and 'Component'. It lists 'Scenario' (Exploration - M1), 'Mission' (CO2 friendly house), and 'Portfolio' (Edit).
- Overall scaffold level:** A table with columns 'Overall scaffold level', 'Values', and 'Zoom in'. It shows sliders for 'SCYLab use' and 'Mission content', both set to 'Medium'. 'Specify' links are provided for each.
- Assessment:** A section with a 'Limit number of ELOs to be peer assessed' checkbox, links for 'Inventory of expert solutions' and 'House choices', a 'Select Anchor ELO' link, and an 'Assessment score icon' field with a 'Bla gjennom ...' button and a 'Send inn' button.
- Pedagogical plan users and groups:** A table with columns 'Pedagogical plan users and groups' and 'Object'. It lists 'Students' (52 assigned students) and 'Grouping' (0 groups).

Figure 2: SCY Author Fine-tune: main navigation page

SCYAuthor Runtime is launched by clicking the link (Figure 2) on the main navigation screen. SCYAuthor Runtime provides teachers with both a real-time overview of student progress, either through their activity in the Learning Activity Spaces (LASs) view (see Figure 3 left) or through the Emerging Learning Products (ELOs) produced view (see Figure 3 right).

The teacher can see all students as they embark on their Mission. Icons representing each individual user are attached to the LAS View in which they are at the present (Figure 3 left). In the ELO view teachers can see which ELOs each student has added to their ePortfolio and when the ePortfolio has been submitted for assessment.

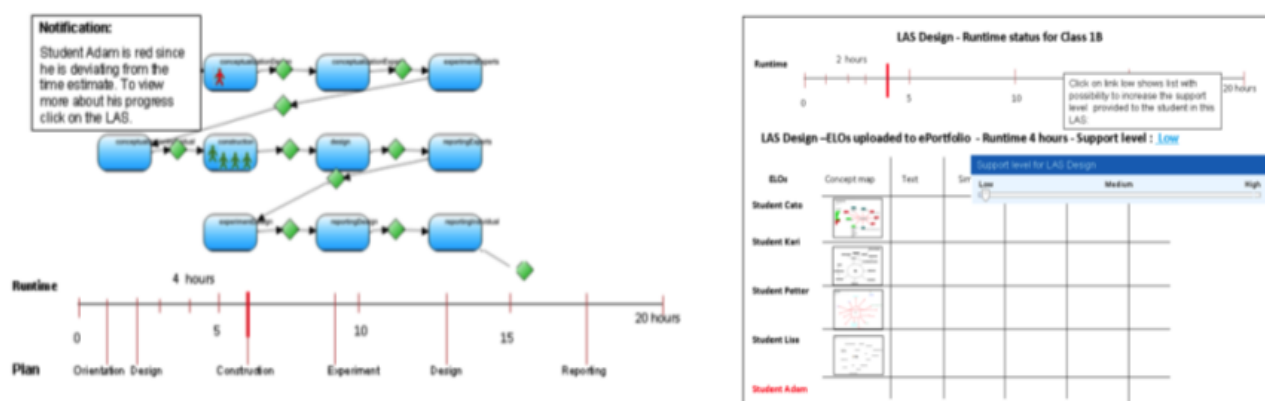


Figure 3: SCYAuthor Runtime: LAS view (left) and ELO view (right)

4.3 SCYMapper tool (also available as a snippet)

Description of the tool

SCYMapper makes diagrams representing ideas as *nodes* and the relationship between these ideas as *links* (see Figure 4). SCYMapper is useful for note taking, new knowledge creation, for idea generation, working out complex concepts and arguments, creating shared understandings (when used collaboratively) and linking new knowledge to prior knowledge.

Purpose of the tool

When using SCYMapper the learners engage in critical thinking and reflection on ideas, concepts, words, and the relationships between them, giving the learners a visual view representing their knowledge. The concept maps created by SCYMapper can show that students:

- Reflect on prior knowledge
- Reflect on relationship of new knowledge to prior knowledge
- Organise thoughts on a particular concept or subject
- Visualise knowledge
- Collaborate with peers (if collaboratively creating a concept map)
- Demonstrate understanding of specific subject matter or concepts

What (input) ELOs are required for the tool to work?

No input ELOs are required for using SCYMapper.

What (output) ELOs does the tool create?

The output ELO is a concept map that can either stand as it is or can be further developed.

Which activities is the tool scaffolding/taking over?

The SCYMapper tool can be used in several LASs.

Example of use

The learner starts SCYMapper from SCY-Lab by opening an existing map or a template for a new one. Alternatively, learners can join a collaborative session.

Creating a concept map

Different shaped nodes and links are provided to represent an overview of the learner's concepts of a specific theme. When you start the SCYMapper tool you will have to fill it with concepts by clicking on the nodes available in different forms. (There is no functional difference except the shape). You may then drag the node where you want to put it. Then fill in the name of the concept by clicking on it. By clicking on the arrow you may drag this to link two different nodes (see Figure 4).

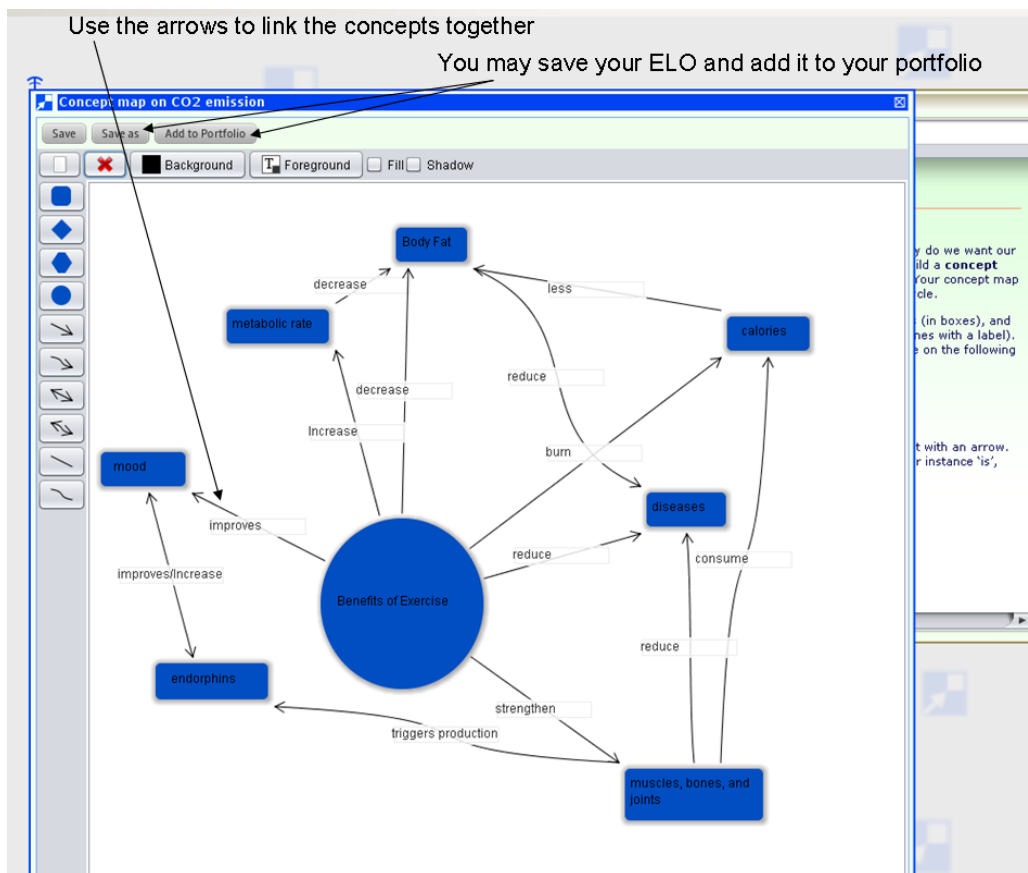


Figure 4: Screenshot of SCYMapper tool.

Collaborative concept map building

Students may delete concepts when collaborating with others on one map. A voting mechanism will be triggered for facilitating an agreement whether or not to delete the concept. When nodes are moved, all viewers will see the changes in real time. SCYMapper supports collaboration scripts from which certain actions are controlled. If one user wants to modify a concept another user is working on, a queue will be defined. When the first user has finished, the control is passed to the person next in line. Moderators may be chosen controlling the locking and unlocking of nodes.

Open sessions

Ongoing sessions are not closed when users leave them. Users can leave a session and return later but will not be able to see how the other collaborators made the new map. The new manipulated map will be presented, as is, to the user who logs back on. Teachers and learners will, by using SCY collaboration services, be able to add templates that define the meaning of concepts and relations through different colours, size and relations.

Viewing Concept Maps

A concept map can be displayed on each learner's individual screen, or projected in a classroom.

4.4 SCYED (Experimental Design) tool (Copex) (also available as a snippet)

Description of the tool

This tool is an editor that allows learners to write down experimental procedures as task trees. The experiments described with this tool are related to a question that the experiment aims to answer.

Purpose of the tool

The tool is aimed at designing experiments to be conducted in labs, virtual labs or in the field. In this context, the experimental procedure is a set of experimental tasks to be executed in accordance with a temporal and/or logical organization. Each task is characterized by a goal, a procedure, and a set of parameters linked to the material used in the task, or to the task itself.

What (Input) ELOs are required for the tool to work?

There is no input ELO required for the experimental design tool to work. But, learners, in order to engage in a good experimental design, have to rely on clearly stated hypotheses (ELOs created in the text editing tool).

What (Output) ELOs does the tool create?

The tool creates an experimental procedure ELO expressed as a task tree.

Which activities is the tool scaffolding/taking over?

The experimental design tool may be used in activities like:






- Mainly “design an experimental procedure” (Experiment LAS).
- Possibly “design a physical or virtual artefact” (Design LAS).

The experimental procedure ELO can be used in the Reporting LAS to describe experiments that have been conducted (in real or with a simulation).

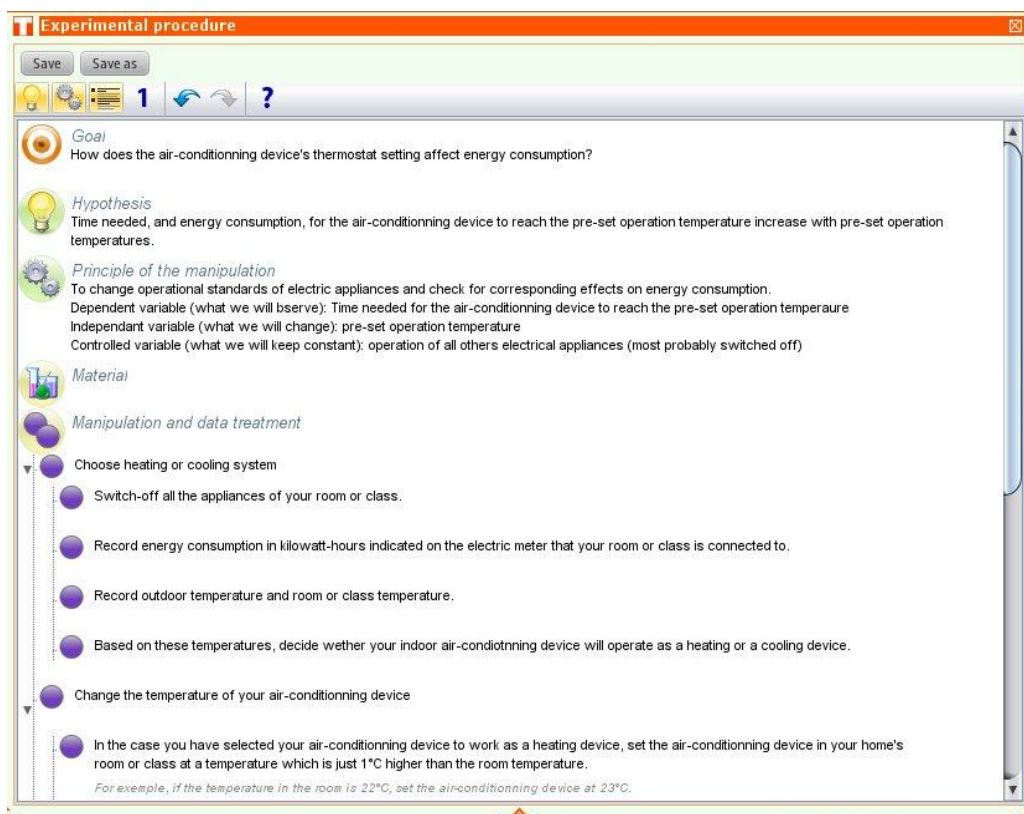
Example of use

When describing the experimental procedure, different configurations of the experimental design tool are available. Instead of tasks, the user has to choose between steps (to organize the procedure hierarchically) and actions (see Table 2). The actions can be pre-structured by the teacher. In this case the name and the description of the action can be constrained. You can also list the materials that the user has to use.

Table 2. Experimental procedure

	Goal	First, students have to describe the question or the objective of their procedure.
	Hypothesis	Then, they can write down the hypotheses related to the question or the objective: it can be the possible answer to the question and/or some properties that they believe to be true in their experiment and that won't be tested.
	Principle of the manipulation	They can describe the general principle of their experiment in the principle space. They should specify the quantities they want to measure during their experiment.
	Material	In the material space, they can add and describe the material they will use.
	Manipulation and data treatment	The procedure in itself will be described under this icon: the user will add tasks and sub-tasks that will describe each action to be carried out during the experiment.

In the tree, the learners can drag/drop or copy/paste tasks, so they can reuse parts of previous experimental procedures (see Figure 5).

**Figure 5: Screenshot of SCYExperimental Design**

4.5 SCYData (Fitex) tool

Description of the tool

The data processing tool enables students to process and visualize numerical data sets.

Purpose of the tool

The tool has three main functions: data organization, data visualization and manual curve fitting. The data organizer part enables the user to collect datasets from different sources (field work, data-loggers, simulations, etc.). The tool can also be used for treating data with mathematical functions (sums, products, simple statistical functions, etc.) and so produce new processed data. The data visualization part enables the user to visualize numerical data with different kind of graphs (2D plots, bars, pies, etc.). Finally, the curve fitting part enables the user to define manually the mathematical function that has the best fit to a series of data points.

What (Input) ELOs are required for the tool to work?

There is no required input ELO for the data processing tool to work. A dataset can be an input ELO (data set imported from a local file of the user, or previously created by another SCY tool, e.g., a simulation). A dataset can also be created directly inside this tool, so it is not a required ELO.

What (Output) ELOs does the tool create?

The tool creates a processed data ELO: table of data, structured sub-sets of data, new variables and cases that are calculated on the basis of the raw data, different types of visuals, data tables based on the visuals.

Which activities is the tool scaffolding/taking over?

The data processing tool may be used in activities such as:

- Organise data (Experiment LAS)
- Interpret data (Experiment LAS)
- Compare results (Experiment LAS)
- Relate data with hypothesis/theory (Analysis LAS)
- Identify multiple perspectives (Analysis LAS)

SCYData tool enables students to organize data in a meaningful way and making it easier to identify patterns and relationships. The tool also enables students to compose related explanations based on visualization (sometimes it's hard to see relationships in a table) and draw new variables that are combinations of other variables (results of experiments).

Example of use

Students receive a dataset from a model that they build in the modeling tool. In relation with this model, they collect experimental data from the field. Then they create a new dataset by manually adding the experimental data on a table in the data processing tool. From these two datasets, the students create a third dataset by merging the two tables. From this third dataset, they are able to plot the two series of data (simulated and experimental) on one graph, and determine the validity of the model (see Figure 6).

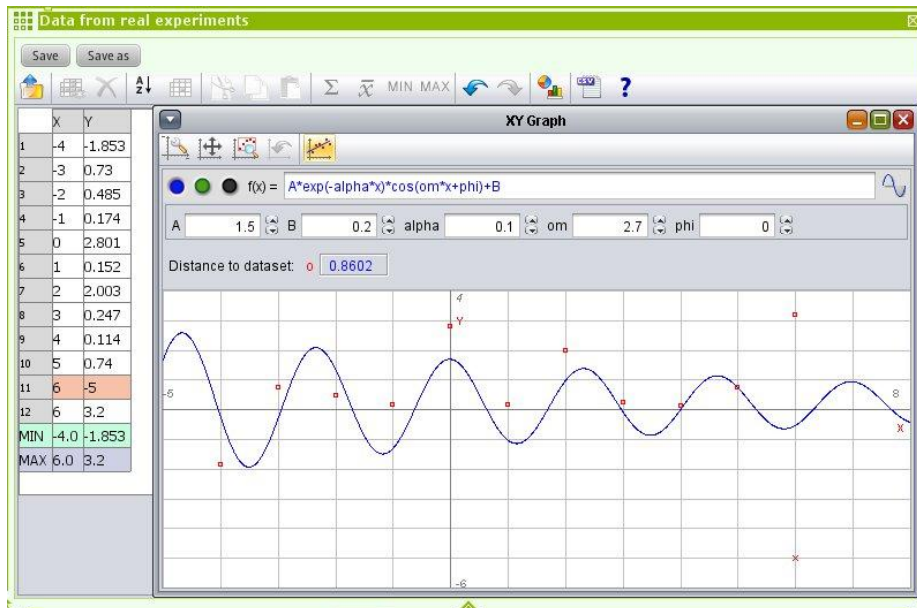


Figure 6: Screenshot of SCYData

4.6 SCYDynamics (Modeling) tool (also available as a snippet)

Description of the tool

SCYDynamics is a modeling tool that helps create and simulate graph-based models of complex problems and phenomena.

Purpose of the tool

SCYDynamics can be used to build models and run experiments in order to test hypotheses or generate data for analysis. The tool provides a language for representing dynamic systems. Basic elements of System Dynamics model are stocks (nodes) and flows (links between stocks). A stock resembles an entity that accumulates or depletes over time, whereas a flow describes the rate of change in a stock or between stocks. Hidden from the learner, a model is transformed into a set of (differential) equations that can be used to “run” the model, thus creating graphs or numeric tables that show the system’s behaviour over time.

What (Input) ELOs are required for the tool to work?

There is no required input ELO for the modelling tool to work.

What (Output) ELOs does the tool create?

The SCYDynamics Modelling Tool is able to produce System Dynamics models ELO. Furthermore, the construction of a model can be used to create simulation data that can be stored as a dataset ELO.

A SCYDynamics model ELO contains the graphical layout, values and formulas that are necessary to fully describe the model. A SCYDynamics dataset ELO contains a table of numerical values as a result of a simulation run of a model.

Which activities is the tool scaffolding/taking over?

The SCYDynamics modelling tool may be used in activities such as:

- *Design a (physical or virtual) artefact* – Design LAS
- *Define experiment goal* – Experiment LAS

Due to the diversity and complexity of the learners' action in the modelling tool, we foresee a large number of possible supportive elements and opportunities for scaffolding here. The following kinds of support and scaffolds will be subject to further investigation and implementation:

- Systematic behaviour

Repetitive behaviour: With the help of pattern matching techniques, repetitive action sequences can be detected and measures may be initiated. For example, changing only one variable at a time (VOTAT, Tschirgi, 1980¹, cf. DV.2) or changing multiple variables at a time can be detected by the system. According to the system's configuration, a certain time of exploration may be granted to the learner; after that and in case of non-systematic behaviour, a feedback message may be prompted to the learner, advising her to rethink her strategy of variable changes in order to gain insights of the modelled system. Regulation

- Regulation

As modelling is a complex activity, regulative support is deemed needed. Indicators for good regulation are behaviours in which the structure of the model is specified before the details of variables and relations are filled in. Support may stimulate learners to first draft this structure before meddling with the details of a specific model element. In detail, this support may activate or deactivate certain features of the modelling tool, such as:

- allowing the learner to explore the model, but not to change it,
- limiting the learner to qualitative modelling features only,
- giving the learner full control over all modelling features.

- Floundering

Progress: By comparing the current model to other peers' models or to an expert solution, the progress of a learner with respect to the quality of his/her model can be measured and used as a basis for feedback or to change a scaffold's configuration.

- Autonomy

With respect to scaffolding, the modelling tool may be subject to change the degree of support over timewhich is closely linked to the concept of Regulation (see above). In accordance to learner's experience, the tool may expose:

- draft models or equations
- instructional texts and tutorials on the usage of the modelling tool.

¹ Tschirgi, J. E. (1980). Sensible reasoning: A hypothesis about hypotheses. *Child Development*, 51, 1-10.

- Skills

Regarding the specific syntax and semantics of System Dynamics models, certain skills (or their absence, respectively) of a learner can be observed. Is a learner able to connect stocks with a flow? Does he have problems entering (syntactically) correct equations? Is he able to select variables and to create a meaningful graph? This information can then be input to further support or guidance, which would be similar to the means mentioned above. In addition to this, the learner may be proposed to work collaboratively with peers who have demonstrated their experience in the required domain.

Example of use

Students explore the model proposed by their teacher in SCYDynamics. When they run the simulation, a graph is produced (see Figure 7). Then, they can go back in the editor tab, change a value in the model and run again the simulation in the graph tab. The effect of these changes can then be observed. After several trials, students can formulate a hypothesis about what could be the reasons for the situation and start to plan an experiment to test their hypothesis in the experimental design tool.

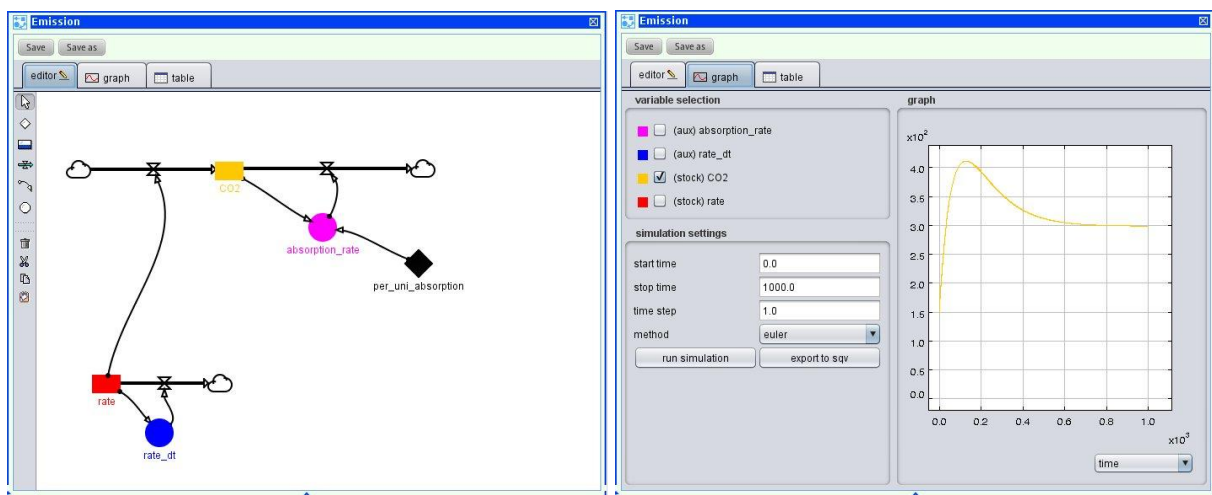


Figure 7: Screenshots of SCYDynamics

4.7 SCYUploader tool

Description of the tool

SCYUploader enables students to import external files into SCY-Lab as ELOS.

Purpose of the tool

The tool has two main functions: import an external file as an ELO in SCY-Lab and export an ELO as an external file.

What (Input) ELOs are required for the tool to work?

There is no required input ELO for SCYUploader to work.

What (Output) ELOs does the tool create?

After import an external file the tool can create 3 types of ELOs according to the external program:

- Rich text ELO (from any external word processing program)
- Presentation ELO (from any external presentation program)
- Drawing ELO (from any external drawing program)

Which activities is the tool scaffolding/taking over?

Any activities that involve the production and the import of an external file can be supported by SCYUploader. The following table provides some examples:

Output ELO	Activities supported (LAS)
Rich Text: description of conclusion	- Draw conclusion (Reflection LAS)
Presentation	- Propose a decision (Report LAS)
Drawing	- Build a (physical or virtual) artifact (Build LAS)

Example of use

Students make a drawing of their house with GoogleSketchUp. They save it as myHouse.skp on their computer (see Figure 8). Then students upload the file in SCY-Lab with SCYUploader and a drawing ELO appears on their SCY-Lab desktop. Students of their groups can now access the drawings by downloading the files on their computer via SCYUploader.



Figure 8: Screenshot of SCYUploader

4.8 SCYePortfolio tool

Description of the tool

The SCYePortfolio tool is used to save ELOs and build a Mission Portfolio (i.e., a collection of obligatory ELOs) to be assessed by the teacher. The structured reflection can extend the learning process beyond the Mission and engage the student in a meta-cognitive process meant to deepen his/her learning experience and develop higher-order thinking skills. The ELOs can be saved as the Mission progress or after the completion of the Mission, as part of an evaluation or reflection LAS.

Purpose of the tool

Using the SCYePortfolio tool students can:

- *Add ELOs to their ePortfolio*
- *Build a Mission Portfolio (e.g., CO₂ Friendly House portfolio)*
- *Submit a Mission Portfolio for summative assessment*
- *Receive and view the summative assessment of their portfolio*

When adding an ELO to their ePortfolio students must:

- Give a description of the ELO
- Identify the specific and general learning goals the ELO addresses
- Answer reflection questions addressed by the teacher.

When building a Mission Portfolio, a student must:

- Select an ELO from each ELO category. These are the different ELOs, in the Mission, for the student to include in the portfolio
- Reflect over the Mission, inquiry learning, collaboration and his/her own effort

Once the teacher has assessed the Mission Portfolio, the student can:

- View the summative assessment feedback

What (Input) ELOs are required for the tool to work?

Any ELO produced during a Mission can be added to the SCYePortfolio.

What (Output) ELOs does the tool create?

The SCYePortfolio tool produces a Mission Portfolio of ELOs.

Which activities is the tool scaffolding/taking over?

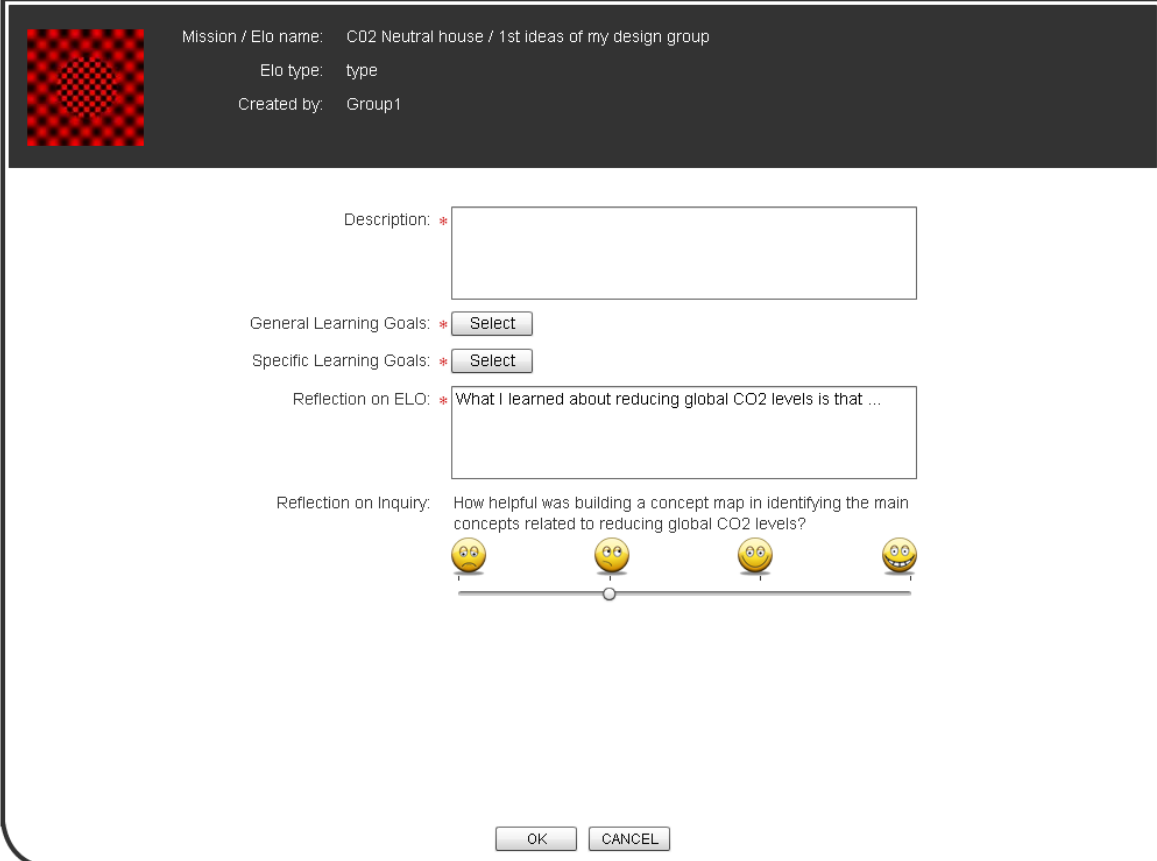
SCYePortfolio supports the following activities:

LAS	Activities supported
Reflection LAS	- Reflect on knowledge and skills - Reflect on processes
Evaluation LAS	- Evaluate ELO - Evaluate processes

Example of use

Adding an ELO

Figure 9 shows the screen where students add an ELO to his/her ePortfolio. Here the student must describe the ELO, select the specific and general learning goals that the ELO addresses (the student clicks on **SELECT** and a pop-up menu opens) and answer a reflection question about the ELO and the Inquiry process made by the teacher. Once this is complete, the student clicks on the **FINISH** button and the ELO is added to the ePortfolio.



The screenshot shows a form for adding an ELO. At the top, there is a red and black checkered square icon. To its right, the following information is displayed: Mission / Elo name: CO2 Neutral house / 1st ideas of my design group; Elo type: type; Created by: Group1. Below this, the form contains several fields: a text box for 'Description: *'; two dropdown menus for 'General Learning Goals: *' and 'Specific Learning Goals: *', both with 'Select' buttons; a text box for 'Reflection on ELO: *' containing the text 'What I learned about reducing global CO2 levels is that ...'; and a 'Reflection on Inquiry:' section with the question 'How helpful was building a concept map in identifying the main concepts related to reducing global CO2 levels?' and a horizontal slider with four smiley face icons (neutral, sad, neutral, happy) and a central slider knob. At the bottom of the form are 'OK' and 'CANCEL' buttons.

Figure 9: Adding an ELO to SCYePortfolio

Building a Mission Portfolio

Once the student has added at least one ELO to each ELO category, s/he can build a Mission Portfolio and submit it to the teacher for summative assessment. Figure 10 shows the screen where the student reflects on the Mission as a whole, the final step on building a Mission Portfolio.

Please reflect on your ePortfolio prior to sending

Your ePortfolio Selection: House data

Elo name: 1st ideas of my design
Created by: Group1
Created date: 16.02.2010 14:00

Reflection on Mission Reflection on Collaboration Reflection on Inquiry Reflection on Effort

Reflection on Mission: * The most important things I learned about CO2 neural houses are...

SUBMIT BACK

Figure 10: Reflection on Mission before submitting the portfolio

Finally, the student enters his/her reflection on the Mission, collaboration, inquiry and effort. When finished, s/he can click on **SUBMIT** and the Mission Portfolio is submitted.

4.9 SCYBrowser (flying-saucer) tool

Description of the tool

The SCYBrowser is a limited web browser. It can only show static web pages (text with images).

Purpose of the tool

The SCYBrowser presents information, in the form of web pages, to the student. In the current setup, the student can only interact with it, by clicking on the hyperlinks.

What (Input) ELOs are required for the tool to work?

The SCYBrowser uses a learning object ELO, with the home url in it. It cannot use/import any other ELO type.

What (Output) ELOs does the tool create?

None.

Which activities is the tool scaffolding/taking over?

SCYBrowser does not support any activities:

Example of use

The student can only read the presented information (in a web page) and click on hyper links (see Figure 11).

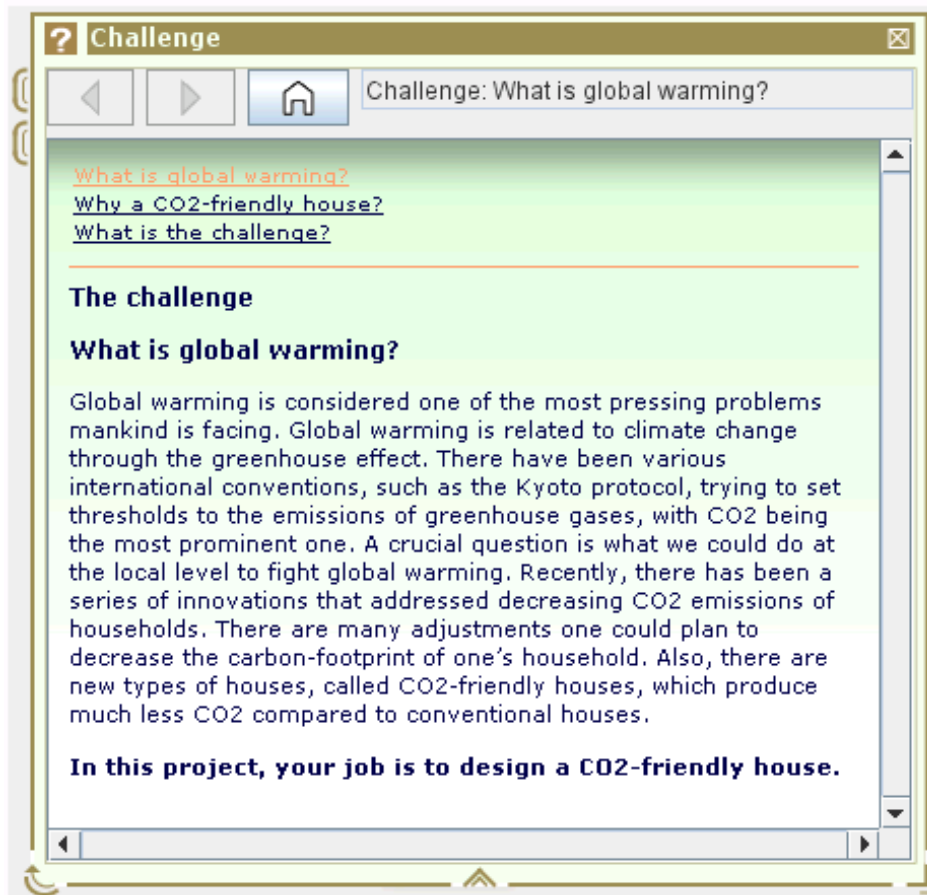


Figure 11: Static web page image from SCY Lab

4.10 SCYLighter tool

Description of the tool

The SCY-Lighter is a Mozilla Firefox extension for collecting relevant information on the web and saving it into the SCY-Lab.

Purpose of the tool

The SCY-Lighter enables learners to gather information from web sources and thereby gain background knowledge for working on a SCY Mission. With this tool, students can highlight and collect relevant parts from web sites, add comments and finally save the data and references as an ELO to the SCY-Lab.

What (Input) ELOs are required for the tool to work?

No input ELOs are required for using SCY-Lighter.

What (Output) ELOs does the tool create?

The output ELO contains a list of selected text and pictures, comments and references. The ELO can be printed and/or exported to the SCY-Lab.

Which activities is the tool scaffolding/taking over?

The SCY-Lighter can be used within different learning activities where collecting information and resources is required. Mainly, the tool may be used in learning activities *browse for information* (Information LAS) and *identify resources* (Orientation LAS).

Example of use

When using the SCY-Lighter, a learner first has to open the sidebar by clicking on the SCY-Lighter option in the Mozilla Firefox Menu Bar and select SCY Sidebar (see the figure below). As an alternative, the learner can use the shortcut “Ctrl+Shift+E” for opening SCY Sidebar.



Figure 12: SCY-Lighter option in Mozilla Firefox window.

In order to highlight, the learner has to select a part of a webpage, right-click on the selection and choose “Highlight selection”. The text will be highlighted (yellow) and a menu item appears in the sidebar. The tool will automatically add the web link to the sidebar, thus making it possible to get back to the full resource later. The learner, can also drag-and-drop images and selected text into the “Selection” box in the sidebar and add a title and comments to the ELO (see Figure 13).

The screenshot shows a web browser displaying a Wikipedia article on Carbon dioxide. The SCY Sidebar on the right provides a summary of the article's content. The summary includes the chemical formula $O=C=O$, a 3D ball-and-stick model, and a table of identifiers. The table lists the following information:

Identifiers	Value
CAS number	124-38-9 [†] , 1111-22-4 (¹³ C), 51-80-1 (¹² C)
PubChem	280 [†] , 10129801 (¹³ C) [†] , 10129801 (¹² C) [†] , 10129802 (¹³ C), 112300 (¹² C) [†]

The sidebar also includes buttons for "Preview!" and "Save ELO!".

Figure 13. Screenshot of a web-page with SCY Sidebar.

When the learner clicks on the button “Preview!” s/he can see the summary of collected text, pictures, comments and resources in a new window. The generated summary can be printed by clicking on the button “Print overview”. Finally, the learner can save the ELO and view the information later in SCY-Lab.

4.11 SCYText tool

Description of the tool

This is a simple text editor integrated into SCY-Lab that students can use for writing and editing text.

Purpose of the tool

The tool enables students to take notes during the application of SCY-Lab and to create different text based ELOs – research questions, hypotheses, inferences, arguments, etc.

What (Input) ELOs are required for the tool to work?

There is no required input ELO for the SCYText tool to work.

What (Output) ELOs does the tool create?

The SCYText creates text based ELOs. If necessary, the output ELOs can be printed out or saved as a text document (in .rtf format).

Which activities is the tool scaffolding/taking over?

The SCYText can be used in any activities that involve the production of textual information, such as in generating hypotheses (Conceptualization LAS), drawing conclusions (Reflection LAS) or constructing arguments (Debate LAS), etc.

Example of use

The SCYText is a very simple tool with minimal functionality that enables learners to write and edit text (see Figure 14). The tool includes some simple and basic functions. Learners can use **Bold** and *Italic* if they want to emphasize some parts of the text. There is also a possibility to underline text and use sub- and superscript functions. The ELO created can be saved into SCY-Lab or saved as an .rtf file that can be opened and further elaborated with any text editing software such as MS Word or OpenOffice. Learners also have the possibility to print the ELO.

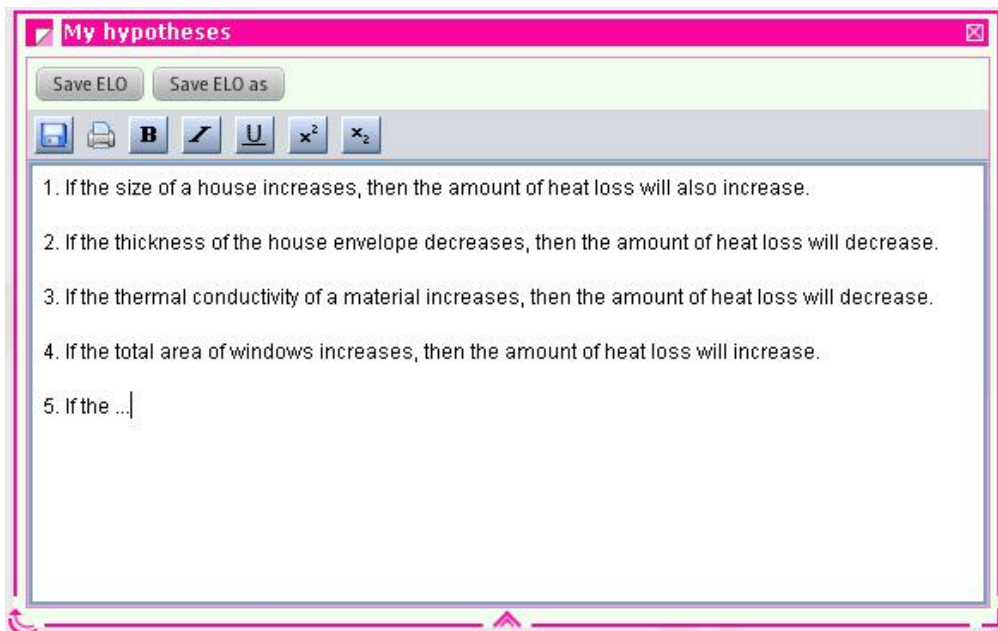


Figure 14. Screenshot of the SCY-Text tool.

4.12 SCYTeacher Assessment tool

Description of the tool

SCYTeacher Assessment is a tool with which teachers assess submitted Portfolios (summative assessment).

Using the SCYTeacher Assessment tool teachers can:

- Comment, assess and score individual ELOs
- Comment on and score the student's reflection over individual ELOs
- Comment and score the student's reflection over the entire Mission
- Submit the summative assessment

Purpose of the tool

Assessing an ELO involves assessing and scoring the ELO, and commenting on the student's reflection on the ELO. Assessing the overall Mission Portfolio involves commenting on the student's reflections over the Mission, collaboration, inquiry, and own effort and scoring the Mission Portfolio as a whole. SCYAssessment supports teachers in their summative assessment by providing flexibility in the organization and assessment of the ELOs and portfolios, and by integrating teacher specified assessment instruments.

What (Input) ELOs are required for the tool to work?

SCYTeacher Assessment requires a portfolio with ELOs (a Mission Portfolio).

What (Output) ELOs does the tool create?

SCYTeacher Assessment creates a portfolio of assessed ELOs (an assessed Mission Portfolio).

Which activities is the tool scaffolding/taking over?

The SCYAssessment tool may be used in activities such as:

LAS	Activities supported
Reflection LAS	- Reflect on knowledge and skills - Reflect on individual and group processes
Evaluation LAS	- Evaluate ELO - Evaluate processes

Example of use

The teacher opens the tool from the SCY web portal. From the ELO gallery overview of Mission Portfolios, the teacher can choose to view an individual student's Mission Portfolio (the whole collection of ELOs in one Mission), an individual ELO, or a collection of ELOs of one category (from different students). The ELO assessment screen (see figure 15) is divided into the presentation of the ELO together with its reflections (left side) and the assessment of the ELO (right side). To facilitate assessment of the ELO, the teacher can click on the thumbnail (a little picture) of the ELO, and the full version of the ELO is then displayed on the left side of the screen. If the teacher authored an assessment instrument, a click on the thumbnail displays the ELO on the right side of the screen. The teacher's assessment of the ELO is entered as comments, in the comment box, and by scoring the ELO (right side of screen). To comment on the ELO reflection, the teacher opens the Comment on Reflection pane.



Figure 15. ELO Assessment screen from SCYTeacher Assessment

Once every ELO in a student's Portfolio has been assessed, the teacher can assess the portfolio as a whole. Figure 16 shows the Mission Portfolio assessment screen where the teacher can browse through the assessed ELOs and can access the student's reflections on the Mission, Collaboration, Inquiry and Effort. The teacher can comment on, and score the Mission Portfolio as a whole before submitting the assessment.

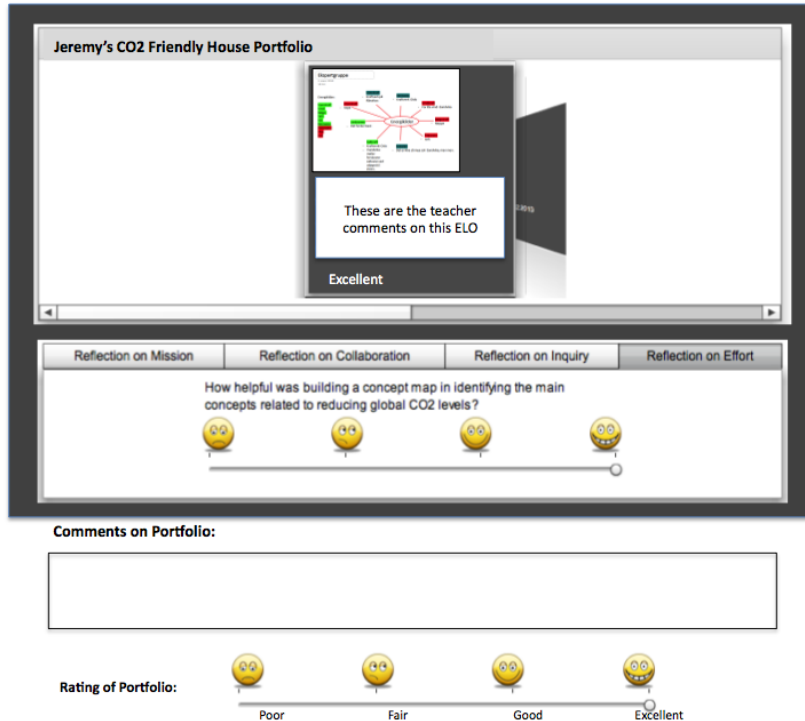


Figure 16. Mission Portfolio Assessment screen from SCYTeacher Assessment

4.13 SCYChat (drawers) tool

Description of the tool

The SCY chat tool allows learners to communicate with each other in SCY-Lab and thereby collaborate on ELOs. ELOs on which collaboration takes place are extended with two drawers. The upper drawer contains information about the peers collaborating and the drawer on the right side of the ELO enables learners to chat (see Figure 16).

Purpose of the tool

When working collaboratively on SCY Missions – exchange, share or create ELOs – students can communicate using the chat tool which enables them to write text messages to each other. SCYChat is used in combination with other tools (SCYMapper, SCYDynamics, etc) in order to support learners working on ELOs together.

What (Input) ELOs are required for the tool to work?

SCYChat is used jointly with other learning objects or tools (such as SCYMapper). No special input ELOs are required.

What (Output) ELOs does the tool create?

Chat conversations are saved with the ELOs that students are collaborating on.

Which activities is the tool scaffolding/taking over?

The SCYChat tool can be used in any LASs that presume communication between learners or collaboration on ELOs. For instance, the ‘Debate’ LAS comprises a set of learning activities that are realized in collaborative learning arrangements.

Example of use

SCYChat can be used during collaborative creation or discussion on ELOs. Collaboration session on an ELO is initiated by dragging a peer student’s icon into an opened ELO. The invited student receives a notification message inviting him/her to share an ELO. If the student accepts the invitation, the same ELO appears on both learners’ desktop and all changes made by one learner are visible to the other learner. While composing an ELO together, the students can write text messages into the chat window attached on the right side of the ELO (see Figure 17).

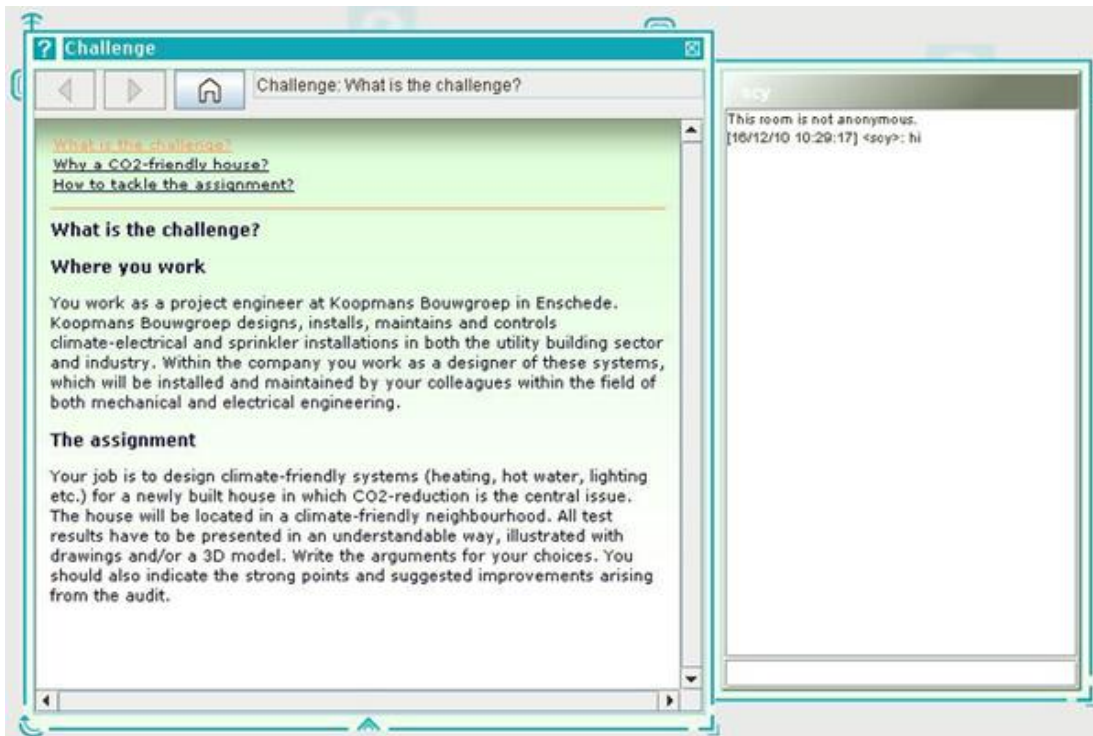


Figure 17. Screenshot of a learning object with a chat drawer active on the right side.

4.14 SCYTagging tool

Description of the tool

SCYTagging is a co-operative tagging tool used by students to organise, store, manage and search for ELOs in SCY-Lab. Tags are personally meaningful free-text terms students place on (if a new term), or agree or disagree with (if already existing term) on one's own and other's ELOs. Thus students tag ELOs from different perspectives and intentions. The tags provide insight into both an individual student's understanding of the content of the ELO and the students' collective understanding of the content of the ELO. Agreement and disagreement of tags can open for interesting dialogue between students.

Purpose of the tool

Using SCYTagging a student can:

- Create a tag for an ELO (implicit bookmarking)
- Agree with an existing ELO tag
- Disagree with an existing ELO tag
- View a word cloud of an ELO's tags

What (Input) ELOs are required for the tool to work?

The SCYTagging tool consumes any type of ELO.

What (Output) ELOs does the tool create?

The SCYTagging tool does not produce any ELO.

Which activities is the tool scaffolding/taking over?

The SCYTagging tool is available under all activities.

Example of use

Figure 18 shows the tagging interface. Each ELO tool has a drawer where tagging takes place. The tags currently assigned to the ELO (by all students) are listed, and immediately to the right of each tag are a “thumbs up” and a “thumbs down” buttons. Pressing the green “thumbs up” button adds the tag to the student’s collection of tags for that ELO and pressing the red “thumbs down” button indicates that the student disagrees with that tag. The green “+” or the red “-” button (to the left of the “thumbs up” and “thumbs down” buttons) indicate whether the majority agrees or disagrees with the tag. For example, the tag environment shows the green “+” as there are 3 votes for and 1 vote against the tag. Pressing on the “+” or “-” tag shows a list of names of students voting one way or the other. This highlighting of who agrees and disagrees with a tag might just facilitate discussion. For example, if a user tags his ELO as “CO₂ friendly house”, and a second user votes against, the first student could send a message to the first student asking for a clarification. Finally, at the bottom of the drawer there is a text input field where students can register new tags. Any new tag automatically assigns a *thumbs up* for the user, who initially registered the tag.

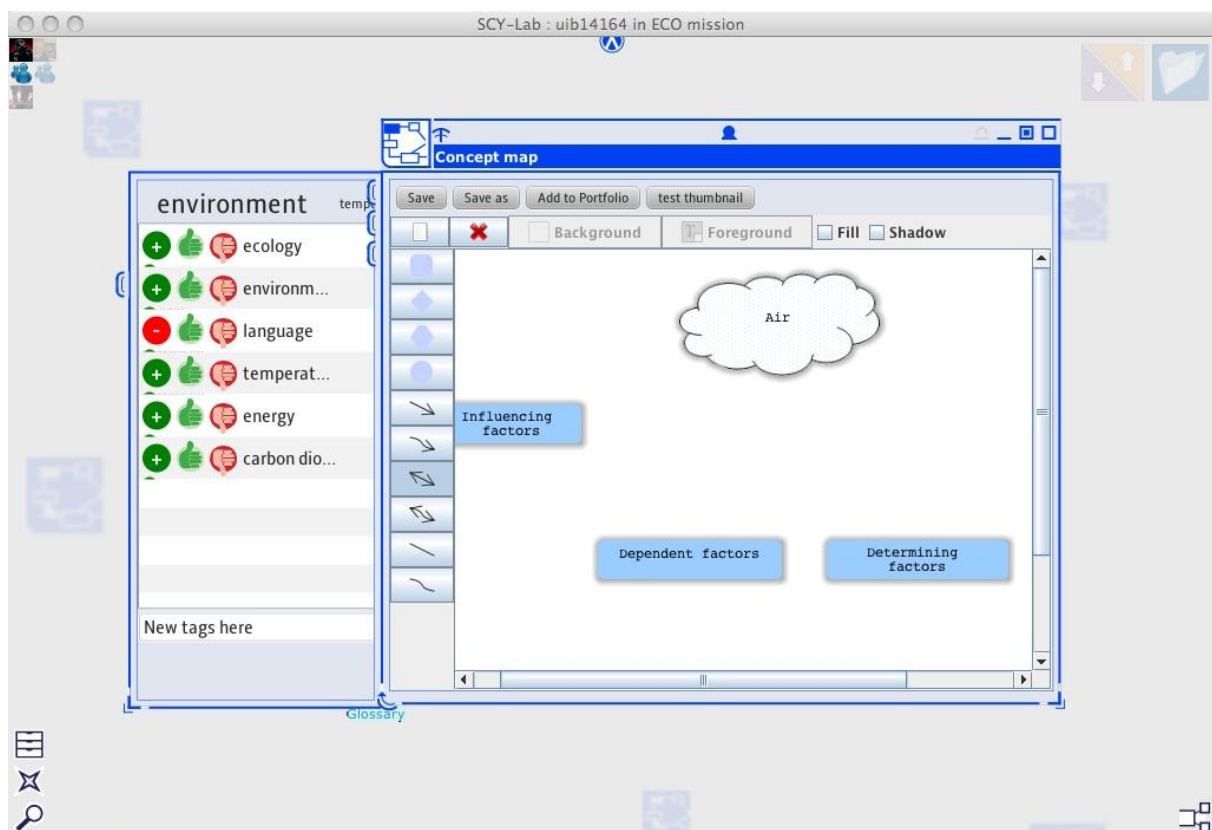


Figure 18. Tagging interface

The second aspect of the tagging interface is the display of the tags for retrieval (Figure 19). The tag display is a generic tag cloud, with functionality tailored for SCY-Lab.

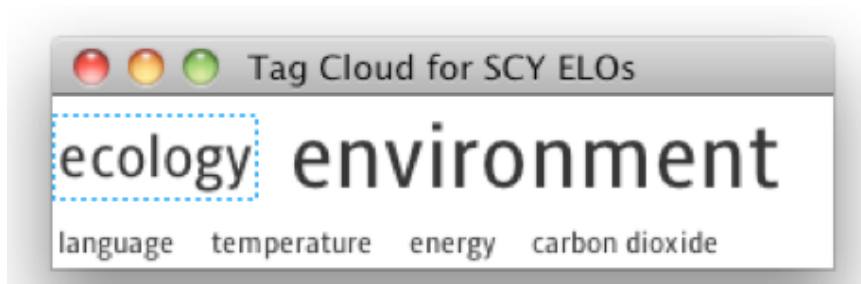


Figure 19. Tag cloud interface

The tag cloud display has three modes, and displays only positive tags:

1. All tags in the system: This shows all the tags for all the ELOs in the SCY-Lab. This can be used for finding ELOs by tags.
2. All tags for the logged in user: This mode allows tags to be used as personal bookmarks, since only ELOs bookmarked by the user will be retrieved after clicking a tag.
3. All tags for the ELOs on the current work screen: This is a mechanism, by which tags can be used to help identify ELOs on a cluttered work screen allowing to classify objects along dimensions of content, use, purpose, etc. for each user to pick a perspective helping identify the objects.

4.15 SCYFeedback tool

Description of the tool

SCYFeedback is a peer assessment tool with which students can easily ask for and provide feedback on ELOs as they are being developed in a Mission. Asking for feedback on an ELO involves asking a question or giving a comment on your own, or your group's ELO, and providing feedback requires selecting an ELO from an ELO Gallery on which to give feedback. By engaging in giving and receiving feedback the student becomes an active learner who takes charge of their own learning and engages in meta-cognitive processes that enhances students' learning through knowledge diffusion and exchange of ideas.

Purpose of the tool

Using the SCYFeedback tool students can:

- *Ask for feedback on their own ELO*
- *Receive feedback on their own ELO*
- *Browse an ELO gallery of ELOs submitted for feedback*
- *Provide feedback on any ELO in the ELO gallery*

While working on an ELO in SCY-Lab, a question related to the ELO is typed directly in the tool's feedback drawer and submitted for feedback. Once the ELO has received feedback, the student receives notice, opens SCYFeedback and views the feedback. Similarly, students receive notice when another student has asked for feedback on an ELO, whereupon they can open SCYFeedback, find the ELO in the ELO Gallery, and provide feedback.

What (Input) ELOs are required for the tool to work?

The SCYFeedback tool consumes any type of ELO.

What (Output) ELOs does the tool create?

The SCYFeedback tool does not produce any ELO.

Which activities is the tool scaffolding/taking over?

The SCYFeedback tool is available under all activities but may particularly support these activities:

- Debate LAS: Social interaction and argumentative activities
- Reflection LAS: Reflect on knowledge, skills and on processes
- Analysis LAS: Identify and categorise aspects and problems
- Evaluation LAS: Evaluate ELO, resources, models and processes

Example of use

Asking for feedback

Students activate the SCYFeedback tool (Figure 20), either from SCY-Lab (via the tool icons) or from a link in the SCY Web-portal, to either give or get feedback.

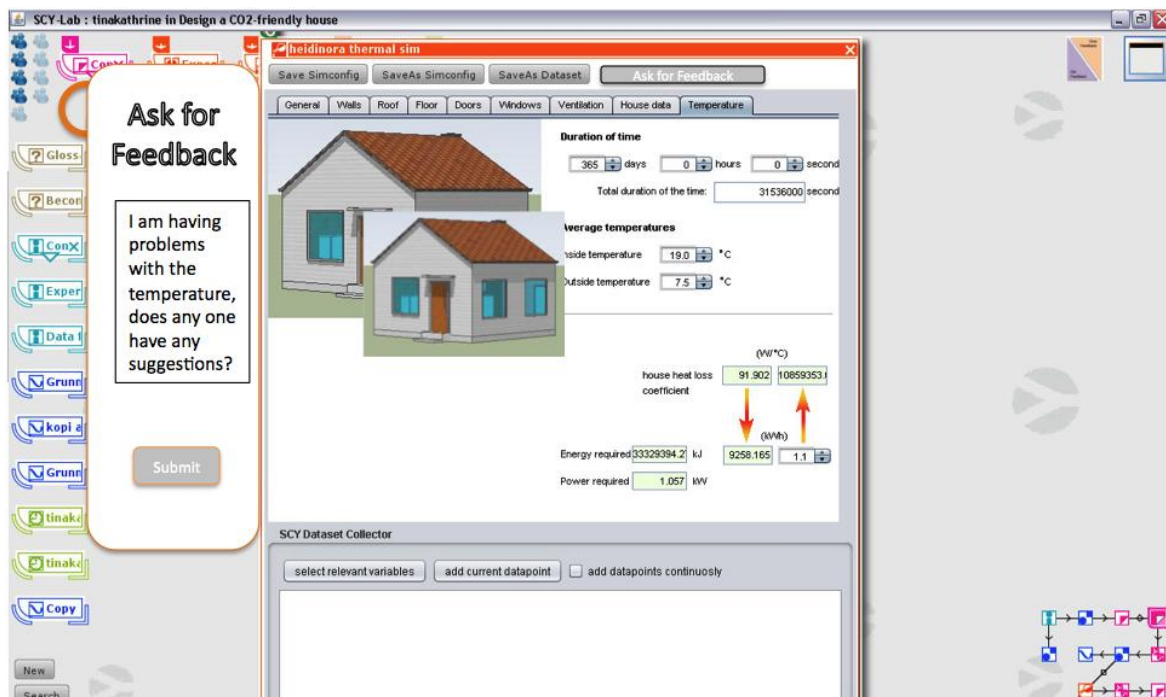


Figure 20. Feedback drawer in SCY-Lab

Giving feedback

In the Feedback tool the student is presented with an ELO Gallery of the most recently posted ELOs (i.e., those that are awaiting feedback). The student selects an ELO for which to give feedback by clicking on the ELO thumbnail. The first screen also gives easy navigation to an ELO Gallery of the student's own ELOs.



Figure 20. Description and reflection screen for adding an ELO to the ePortfolio

Figure 20 shows the ELO Feedback screen, where students can give or receive feedback on an ELO. Information about the ELO is visible in the top left of the screen, the comment/question on which to give feedback, a comment box and rating scale in the top right. A larger version of the ELO can be accessed by clicking on the ELO thumbnail. Once feedback is given, the GIVE FEEDBACK button is activated and the feedback can be saved. Under the ELO and feedback area, the feedback threads can be seen. The feedback is identified by date, time, and author. It is also possible to reply to the feedback by clicking the Reply to this feedback link.