

# Science Education for Action and engagement towards Sustainability (SEAS)

D6.8.

Report on a database of quality assured teaching resources and lessons provided by Acedu

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| Author: | Leif Östman, *EduQuality and Uppsala University* |

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# 1. Report on the construction of data bases, an incentive system and a digital platform

## 1.2. The system analysis

One of the fundamental bases for the strategy when developing the database was a general system analysis of the educational system. The analysis showed the following:

A. In order to implement the idea of open schooling within science education and in connection to the topic of sustainable development it is crucial to target the main custom of education and teacher's habits of teaching. It is well known that to implement the topic of sustainability in any traditional subject teaching is difficult, even if it is written into the curriculum. In case of open schooling it is in most cases not part of the curriculum, making it even more demanding to change the customs and habits.

B. The main traditional tool for changing educational customs and teacher's habits of teaching is in-service programs. Such in-service programs are targeted for capacity development. The weakness of such programs, and especially in the light of urgent sustainability problems that schools are supposed to be part in solving, is that they are focused on making the teachers to become more knowledgeable in the content to be taught and/or the didactics of teaching. The weakness of such a program is well-known: teachers have become more educated but this knowledge is seldom applied in developing new lessons and teaching habits. The reason is that to apply knowledge into a practice is a demanding and also a highly time-consuming task.

C. The second weakness of the traditional tool of changing educational customs and teacher's habits of teaching – i.e. in service training – is that it is in-efficient and very costly. It is in-efficient because it takes a very long time in order to make every science teacher, in for example Europe, to have gone through a relevant in-service program. Furthermore, there are very few countries that would have the resources to offer an in-service program for all science teachers.

The solution that is now been tried out in many countries in order to complement in-service programs is to create different ways for teachers and others (often authorities and NGOs) to share "practices". Such sharing can be done in different ways, for example through peer-learning and through digital libraries (see below). By sharing teaching practices the demanding and time-consuming process of applying new knowledge into a teaching practice is tackled. It is crucial to emphasize that sharing best practices does not take away the need of learning new knowledge. Learning new knowledge (regarding content and didactics) and sharing practices are

complementary when one is trying to efficiently (time and resource-wise) change educational customs and teacher's habits of teaching. If one should summarize the efforts that is done today to create efficient implementation tools for changing educational customs and teacher's habits of teaching it can be put into one sentence: break the problem that teachers are constantly re-inventing the wheel (i.e. teaching practices). Thus, teachers often develop lessons that someone already has invented. Since solving this ever-lasting problem of re-invention one can save huge amount of time and money and at the same time increase the quality of teaching and learning it is not surprising that many companies are starting up trying to construct technological (digital) solutions. One such digital and technological solution is the development of data bases, which also was an aim in the SEAS project.

## 1.3. Methodology: learning from others

On the basis of the general structural analysis we created a methodology for the development of the SEAS database designed to answer the following questions:

1. Does relevant data bases already exist that SEAS could cooperate with instead of developing a totally new one?

2. What experiences does key stakeholders have regarding existing data bases that we can draw on when constructing a data base?

In order to get answers on these questions we made analyses and arranged meetings with some of the main actors and below we describe the main findings that made us to take certain strategical decisions as well a starting up some investigations. The later and the results is described below.

A. Early in the process we arranged a meeting with Unesco Paris (Alexander Leicht) in order to get their input regarding their experiences with sharing materials and lesson plans internationally and regionally. We learned two crucial lessons. The first one was that it is very difficult to get teachers to share materials and lesson plans on platforms that are directed to an international audience, because of for example language issues. The second lessons we learned was that it is not easy for teachers to find materials that are relevant for their context – curriculum demands, school system, teaching traditions, pupils, language, etc. Thus, in order to be relevant and thereby helpful the materials and lesson plans needs to be designed in a way that do not require a lot of time and capabilities in order to be transformed in a way that fits the context that the teacher work within. The message was that it is crucial to develop databases that attracts teachers working within the same or very similar context. In reality this means that data bases, in most cases, needs to be national. From these national data bases excellent materials and lesson plans can, than, be translated and shared on trans-national data bases. For us it meant that we needed to complement the aim of the SEAS-project to not only develop an international one, but also national ones, if the project would be successful. The partners in the consortium where offered to be able to host a national

data base. The partners in Belgium wanted to develop one and therefore we decided to go all in and make the Belgium data base a pilot in the project. We started by creating a prototype that could be contextualised within any language and to different curriculum demands, educational systems, etc. Later we also took a further step in the development, described below.

B. One of the most, if not the most, successful national data base in Europe is situated in Flanders (Belgium) and it is called Klassiment. Klassiment, which has existed for a long time and is runed by the Flemish government, has (end of 2021) gathered 278.656 users and collected 72.165 teaching materials. Through a meeting with them we learned two crucial things. The first was that they experienced it very difficult to get a process of quality assurance and quality refinement to function, which means that the quality of the materials uploaded cannot be guaranteed respectively that the quality of the material will not be further developed over time. Teacher's do very seldom have time and incentiments to give authors of teaching materials and lesson plans constructive feed backs. They do satisfy with "thumb up"-type of feedback. This experience is in accordance of research investigating for example face-book groups: teachers very seldom get into time-consuming constructive feed-backs. If one compare to the practice of scientific research where the success to a high degree is dependent on efficient sharing (for example through journals), transparent quality assurance practices (for example peer-reviews) and a well-developed system of quality refinement (for example reference system), these two experienced problems can be devastating for students learning. By setting up sharing systems (for example data bases) is far from enough in itself: the systems need to build in quality assurance processes and quality refinement mechanism that will be used by teachers and others. In order to find out if there were any other data bases that had solved these two problems we made a general investigation of data bases and also made analyses of the "marcet" in Flanders (see below). The second lesson learned was that it was very expensive to change the structure in Klassiment's data base, which made us to take the decision that we, at least, needed to try to create a prototype of a national data base that could include both quality assurance and quality refinement that would function in practice: since we could create the data base almost from the scratch it would be much cheaper for us to try this mission out than to change an already developed structure.

C. In order to find out if there existed any European data base that we could cooperate with, rather than creating a new international one, we – on the recommendation of the CO – got in contact with Scientix. Scientix do share materials and lesson plans coming out of EU-projects and thereby one can assume that the material is of high quality. What is missing is a mechanism of quality refinement and here Scientix was very interested to create cooperation and connection to the national data bases created within SEAS. By such a cooperation it will become possible for materials and lesson plans shared at Scientix to be directly reachable in the national data base. The vision is that when teachers has downloaded the materials and developed new versions that can be uploaded to the national data bases and reviews by teachers using the material for Scientix will also be visible on the national

data base and be communicated to the authors of the material. In this way the material in Scientix will be connected to a process of refinement, thus making the cooperation a win-win situation.

D. By communicating with colleagues in Sweden and Belgium it become clear that one of the crucial contextual factors that needs to be taken into account when creating a national data base is teacher's habit of using digital platforms, apps. etc. in their everyday work. For example in Sweden a majority of teachers in using either Microsoft teams for educators or Google for education while in Flanders this is not the case. Furthermore, while in Sweden a lot of focus in digital development is to reduce the burden of teachers by for example SSO and different types of integrations. Because of these differences and the common advice that in order to attract teachers one has to be able to design the interface in relation to teachers habits and needs, we decided to develop two interfaces for the national data base – a website and an app in Microsoft teams – that creates flexibility for user-friendly design in different national contexts. The app makes it possible to integrate the data base in Teams and also make it possible, without great amount of work, to also integrate it to Google education. Since many communications platforms etc. is nowadays compatible with Teams and/or Google education it is also possible to create other solutions for integrations.

## 1.4. Methodology: investigations

As a result of "learning from others" we decided to make three investigations.

### 1.4.1. Different types of databases

Our findings indicate that there mainly exist three types of databases depending on the materials that is available for teachers, i.e.:

a) Teaching materials and lesson plans developed by teachers.

b) Teaching materials and lesson plans developed by others than teachers, i.e. NGOs, authorities and business.

c) A combination of a) and b).

The national data base will be in the form of c).

What is obvious is that many databases do not have any built-in mechanisms for quality assurance and quality refinement. The one that has some form of quality assurance does not involve researchers in the pool of potential "feed-backers". To involve researchers and experts (on the teaching content as well as on the didactics) is crucial in order to make the quality assurance to also become based on scientific results. There are many indications that without incentives there might

be difficulties to create a stable and big enough pool of people to become engaged in quality assurance. In order to create relevant incentives there are several try-outs (for example giving feed-backers extra possibilities for downloads, etc.) but one can draw the generally conclusion that the most efficient incentive is constructed when intermediary organisations do experience quality assurance work connected to the data base as enhancing the efficiency and/or the quality of their own work. When this happens there is a high chance that quality assurance work becomes integrated in their ordinary practice. If such incentives can be created than the quality assurance system becomes more "institutionalized", and as an effect more sustainable over time. So far we have not find any such examples connected to data bases. We have not either found any examples where quality refinement is built into the data base.

### 1.4.2. To "institutionalise" and digitalise quality assurance and quality refinement

As was obvious in the above investigation we did not find inspiring examples where quality assurance and quality refinement was built into the data base. What we did learn, however, was the need to create incentives for creating a stable and big enough pool of people that can get involved in the work of quality assurance, as well as in the quality refinement. In order to create such incentives that had a high degree of possibilitiy to make quality assurance and quality refinement to become institutionalised (become part of organisations ordinary practice) we looked for inspiration amongst the movement in Peer-to-peer collaborations (P2P) and the creation of commons. We took contact with the P2P Foundation's founder Michel Bauwens and started up a seminar series inviting guest lectures that shared their experiences of creating commons and P2P. This, but also research results from ongoing projects, resulted in a transformative task involving five elements:

a) Transform in-service programs to become product-oriented, i.e. that the capacity development will be achieved when producing teaching materials and lesson plans.

b) Transform in-service programs to become cooperative, making teachers and the facilitator of the in-service program to become partners in the production of teaching materials and lesson plans.

c) Make sure that the co-production process include many different competences (teachers professional knowledge and researchers and expertice in the teaching content and didactics) in order to create as high quality products as possible.

d) Make sure that to start the co-production, if possible, in already shared materials and lesson plans of high quality, making quality refinement possible and at the same time save time.

e) As part of the in-servie program the products developed and tried out will be up-loaded to the national data base.

The task executed resulted in the creation of a new form of in-service program involving what can be called product-oriented educational maker-spaces, but of convenience we have called them Lesson design workshops (LDW). By transforming in-service program to include LDW we have made it possible for many intermediary organisations – NGOs, authorities, teacher trainings, etc – to make quality assurance and quality refinement a part of their ordinary practice: they are already involved in in-service activities and this is a minor adjustment in their ordinary practice. Thus, this social innovation makes it possible to make the quality assurance and quality refinement institutionalised. As will be shown below, the partners in the Belgian SEAS network has approved this innovation. Furthermore, this innovation makes it possible to also steady feed the data base with high quality materials that is either totally new or part of the refinement process (i.e. it is built on already quality assured materials and lesson plans).

In order to support the integration of the institutionalised quality assurance and quality refinement into the data base we have created specific unique functions. One is the possibility for intermediary organisations involved in in-service programs to get an editor account in the data base, abling them to execute on-line LDW and to have direct access to relevant materials and lesson plans in the data base to build on. Other important digital functions are the reference system, the referencing index and the visualisation of the co-production process and what competences it involved. All these function makes the data base to become a digital platform for sharing, capacity development, co-production, quality care, quality refinement and new forms of visualisations of quality and quality development.

### 1.4.3. Belgian as a pilot case

Exploratory in-depth interviews with seven teacher (trainer)s and a survey for teachers (n=79) (Van Vooren 2021) complemented by an analysis of field notes and transcripts of meetings in the Belgian SEAS network and interviews with the actors involved in it, resulted in the identification of some key elements of the needs and habits of teachers.

- A majority of teachers are interested to have access to inspiring lesson plans and teaching materials: 43 out of 79 survey respondents indicate that they want to inspire and be inspired.
- Many teachers find it difficult to find materials of high quality: 42,7% of the respondents is not finding reliable sources while preparing their lessons; 52% indicate that making choices between all available materials while preparing their lessons is difficult.
- Text books are the main source of inspiration for creating lesson plans: 84,6% of the respondents uses an existing textbook as a basis for their lesson plans; nobody uses 100% prefab materials.
- Teachers' are already sharing lesson plans and teaching materials: 92,3% of the survey respondents already share lesson plans and teaching materials (95,8% of them in their own school, 27,8% on public platforms).

- The reason for not sharing materials are they are afraid that their work is not good enough or to get criticism: *'I think my work is not good enough"; 'I'm afraid that I'm not respecting the copy rights; 'I'm afraid for the criticism.'*

- Some teachers are involved in sharing materials in order to save time: 26 out of 79 respondents indicate that they share materials to save time; 16 out of 79 respondents indicate that they share materials for efficacy reasons (win-win situation, not reinventing the wheel).

- Teachers' share materials also because of collegiality: 40 out of 79 respondents indicate that they are sharing materials out of collegiality.

- Teachers seem to be willing to share materials as part of wanting collaborations: 40 out of 79 respondents indicate that they feel enthusiastic to share materials when they are helping others with it

- Teachers' willingness to give each other feedback is driven by the desire to help each other, to collaborate and to get feedback in return.

- Some teachers want to be compensated and/or acknowledged when sharing: 30 out of 79 respondents indicate that they want acknowledgement for their self-created materials; 4 respondents mention that they would like a system for copyrights.

- There are more teachers that download than upload: 65,4% of the respondents are using KlasCement, of which 46,2% mainly to download, 3,8% mainly to upload, 15,4% both as a downloader and uploader.

As a summary one can conclude that the habits and needs of the teachers are in line with the idea of creating a data base with built in quality assurance and quality refinement. They express a desire to get inspired by materials but also an experience of having difficulties to find material of high quality. Furthermore, there seem to be a willingness to share materials and give feed backs especially in relation to the willingness to collaborate and to help each other.

In order to get more knowledge crucial for the work of institutionalising the production, quality assurance and refinement of teaching materials and lesson plans we made analyses of documents, field notes, interviews (partly also from Van Vooren 2021), and transcripts of meetings, and 2) several reflection workshops by UGent researcher Katrien Van Poeck and EduQuality founder Leif Östman. The following strengths emerged from this analysis:

- The availability of strong, useful, diverse, and complementary expertise in the open schooling partnership.
  - Researchers with pedagogical/didactic expertise (incl. in sustainability education and open schooling) and experience in crossing boundaries between theory and practice (e.g. action research through co-creation in pilot studies).
  - Partners with useful content expertise: MOS coaches, environmental education centre, Flemish government's Department of Environment, etc.

  - Partners with decades of experience in coaching schools on sustainability education: MOS coaches, environmental education centre.
  - Teachers and principals with proven practical experience.
  - EduQuality with experience in developing tools and processes for the co-creation, sharing, and quality refinement of lesson plans and teaching materials.

- The developed SEAS library to share lesson plans and teaching materials as a potential vehicle for quality assurance and for avoiding to re-invent the wheel over and over again and, thus, to save time.

- The experience and tools to conduct product oriented educational workshops (for example LORET) where didactic researchers, content experts, teachers, and partners collaborate to co-create lessons and teaching materials as a driver for quality assurance and refinement, for 'feeding' the library with useful and high-quality materials, and for the development of a collegial community that can empower and inspire teachers.

- Concrete methods and tools for quality refinement system as for example referencing system for tracing how users build on and adjust each other's work (e.g. to contextualise it to diverse settings, to update it), protocols for reviews by teachers, protocols for reviews by researchers.

## 1.5. Outcome

The outcome of our work are the following:

i. An international data base where most of the educational materials and lesson plans produced in the SEAS-project are situated.

ii. A prototype of a national digital platform for sharing, capacity development, co-production, quality care, quality refinement and new forms of visualisations of quality and quality development.

iii. An innovative transformation of traditional forms of in-service program making it possible to institutionalise the co-production, the quality care and the quality refinement of materials and lessons plans to be up-loaded to the national data base.

iv. One national digital platform (ii) specifically contextualised for the Belgium context. Here the teaching materials and plans produced in Belgium are shared.

v. Two different interfaces: a web page and a Microsoft team app.

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