



**CELEBRATE project**

**National Report on Finnish Piloting of  
The Learning Objects**

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## **Background information on the CELEBRATE project**

The consortium co-ordinated by the European Schoolnet, including also the Finnish Finnish National Board of Education, applied for financial support from the European Commission in the autumn 2001 in order to launch a pilot project on production and testing of learning objects with ten other countries. The project was approved by the Commission and it was launched in early June 2002.

The duration of the project was set at 30 months and it was named CELEBRATE (Context eLearning with broadband technologies). The participants of the CELEBRATE project included national ministries of education or corresponding institutions, publishers and universities.

The main objective of the project was to find new methods for the production, distribution and application of small-scale electronic learning objects (LOs) in the web learning environments. The project was involved in the following areas:

**Needs of the users (WP 1)**

**New pedagogical models (WP 2)**

**Distribution system (WP 3)**

**Learning object production (WP 4)**

**Demonstration Portal (WP 5)**

**Piloting in schools (WP 6)**

**Evaluation of the project (WP 7)**

**(WP = Work Package)**

The Finnish piloting reported here was carried out as an internal part of the European-level Work Package 6 (WP 6).

# **1) Preparations for the piloting**

## **1.1 Pilot schools**

### **Choosing the pilot schools**

The CELEBRATE project was launched in June 2002. The following spring, the Finnish National Board of Education (FNBE) initiated the search for schools to participate in the piloting. Information on the project was distributed by letter. The project was introduced to the schools having participated in the earlier projects of the FNBE as well as in the national Virtual School events in March 2003. Some municipalities were sent information on CELEBRATE separately. The letter introducing the project mentioned that the FNBE sought, in particular, schools providing basic education; however, some general upper secondary schools and vocational institutions would also be included. Those schools interested in the project were urged to send in their applications by 21 March 2003. There were a little over 100 applications, 80 of which were accepted for the piloting.

The selection criteria for the CELEBRATE project required that the pilot school had the necessary equipment and previous experience in the utilisation of ICT in teaching as well as a completed strategy for the use of ICT in education. The FNBE requires such strategy from each Finnish school and educational institution. It was considered that those schools that had not yet achieved one were not ready for a project such as CELEBRATE.

### **Schools withdrawn from the project**

At the very beginning, seven schools withdrew from the project. The reasons given for their withdrawal were, among others, changes in the staff and lack of time. In one upper secondary school it was stated that there were not enough learning objects available for the upper level. After the initiation of the actual piloting and the initial training, none of the schools opted out of the project.

### **Number and the geographical distribution of the CELEBRATE schools**

The total number of CELEBRATE schools was 73. They were distributed between the various educational levels as follows: a majority, 81 % of the schools, were comprehensive

schools (grades 1 to 9 of basic education); 12 % general upper secondary schools; 4 % vocational institutes, and 3 % secondary schools (combined of forms 6 to 9 of basic education and general upper secondary schools). 11 of the schools were Swedish-speaking, which amounted to a 15 % of the total number.

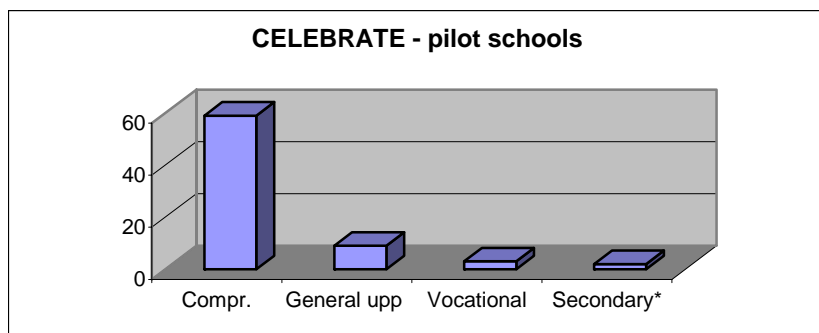


Table 1 Number of the CELEBRATE pilot schools.

\* Grades 7 to 9 of basic education + general upper secondary education

There were pilot schools involved in the project from various parts of the country. A majority of the participating schools, 74 %, were located in the provinces of Southern Finland and Western Finland. Below, the CELEBRATE schools are listed by provinces and regions. The schools are listed here by their official names.

### Province of Southern Finland (36 schools)

**Tavastia Proper:** Luolajan koulu

**Päijänne Tavastia:** Launeen peruskoulu and Nastopoli-lukio

**Southern Karelia:** Kasukkalan koulu, Lauritsalan koulu, Myllymäen koulu, Sammonlahden koulu, Simolan koulu and Vainikkalan koulu

**Uusimaa:** Auroran koulu, Eestinkallion koulu, Espoon maahanmuuttajaopetus, Espoon yhteislyseon koulu ja lukio, Harjun koulu, Helsingin yhteislyseo, Helsinki Business College, Höjdens skola, Jupperin koulu, Juvanpuiston koulu, Kaivokselan koulu, Karakallion koulu, Kilterin koulu, Kirkonkylän koulu, Klaukkalan yläaste, Kyrkbacka skola & Kyrkslätts högstadieskola, Mäntymäen koulu, Pohjois-Tapiolan koulu, Pohjois-Tapiolan lukio, Postipuun ja Eestinmetsän koulu, Sjundeå svenska skola, Tammikoulu – Ekskolan and Österby skola

**Eastern Uusimaa:** Huhtisen koulu, Sipoon yläaste ja lukio, Strömborgska högstadieskolan and Svartså skola

**Province of Western Finland (18 schools)**

**Central Finland:** Cygnaeus-lukio, Niinilahden koulu and Viitaniemen koulu

**Pirkanmaa:** Hatanpään lukio, Lempäälän lukio and Ylöjärven lukio

**Ostrobothnia:** Borgaregatans skola, Närpes högstadieskola and Vasa gymnasium

**Central Ostrobothnia:** Karleby handelsinstitut

**Satakunta:** Itä-Porin koulu and Ulvilan–Kullaan koulu

**Finland Proper:** Kemiönsaaren keskuskoulu, Puolalan koulu, Puolalanmäen lukio, Puolalanmäki, Pyhämaan koulu and Turun normaalikoulu

**Province of Eastern Finland (8 schools)**

**North Karelia:** Enon ala-aste, Kolin koulu, Ristin koulu, Ruppovaaran koulu, Surpeenvaaran koulu and Tietäväisen koulu

**Southern Savonia:** Olkkolan koulu

**Northern Savonia:** Kiuruveden yläaste

**Province of Oulu (6 schools)**

**Kainuu:** Ruukinkankaan koulu, Suomussalmen lukio and Suomussalmi-opisto

**Northern Ostrobothnia:** Haapaveden yläaste, Oulun normaalikoulu and Torangin koulu

**Province of Lapland (5 schools)**

**Lapland:** Kitisenrannan koulu, Menesjärven koulu, Orajärven koulu, Peltovuoman koulu and Sattasen koulu

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Fig. 1: Geographical distribution of the CELEBRATE pilot schools.  
Outline map retrieved from: <http://www.nba.fi/NATMUS/MUSEUM/Opetus/kartta.htm>.

## **1.2 Choosing the pilot teachers**

The selection of the pilot teachers was carried out as an internal arrangement within schools, most often on the basis of the teachers' own interest.

## **2) Initiation of the piloting**

### **2.1 Orientation courses**

In November–December 2003 the Finnish National Board of Education organised four two-day courses in various parts of the country. One of the courses was directed to Swedish-speaking teachers and held in Swedish. The teachers were able to choose the course according to which times and places suited them best. Two teachers of each school were invited to the training. The FNBE reimbursed their travel and accommodation expenses from national state grants. In addition to the representatives of the FNBE, the instruction was provided by teachers Barbro Carlström and Petri Ahokas, who had participated in the “summer school” of the testing phase of CELEBRATE.

The main content of the training involved an introduction to the Demonstration Portal (DP) and the LOs available. The first object of study was the registration into the portal, which was required before its use was enabled. The teachers were introduced the facility to collect LOs of interest into the basket for convenient future use. Another function presented to the teachers was the Virtual Classroom developed by Digitalbrain plc.

There were numerous other functions in the DP, some of which were added into it at a later phase of the piloting. For example, the utilisation of the Discussion Forum remained dependent on the personal interest of the teachers, as it did not yet exist during the orientation course. However, the discussion forum of the FNBE, where the lesson plans of the pilot teachers were gathered, was in use during the orientation course.

The training also included a lecture on learning objects by researchers of the project Liisa Ilomäki and Minna Lakkala.

## Technical problems during the training

It was discovered during the orientation courses in Espoo and Tampere that the DP was closed for construction by the European Schoolnet office in Brussels, despite the training schedule sent for their information. Although we managed to have the DP opened for the afternoon so that the training could be continued, this technical disturbance was likely to have a negative effect on the initial enthusiasm of some of the teachers attending the course.

Also, the delay in the original schedule of the availability of some learning objects may have presented the teachers with a limited image on the opportunities CELEBRATE could provide.

In other respects, the orientation courses continued smoothly and the teachers got a clear view on what they were expected as contributors to the European development work

<b>Date</b>	<b>Location</b>	<b>Participants</b>
14–15 November	Helsinki, Southern Finland	46
19–20 November	Espoo, Swedish training	20
28–29.November	Tampere, Western Finland	27
1–2 December	Oulu, Northern Finland	26
	<b>Total number of participants</b>	<b>119</b>

Table 2: Orientation courses.

## 2.2 Registration into the Demonstration Portal

It was discovered already during the orientation course that the registration into the portal was complicated. This was mainly caused by the programming features of the DP requiring an exact manner of registration, which caused that frequently, even after a successful registration, the user did not have access to the system again. The problem was gradually solved in the course of the piloting; however, it impeded the start of the piloting considerably. Those attending the training, i.e. mainly the ICT co-ordinators, instructed the colleagues in their schools in registration with the help of transparencies sent to them.

In October (1 Oct, 2004), the number of teachers registered in the Demonstration Portal was 338. However, the actual number of the teachers was higher, since some of them used the LOs through direct web links and were thus not shown in the user statistics.

## 2.3 Communications and the follow-up of the piloting

The project co-ordinator contacted the teachers by e-mail on a weekly basis. This way the CELEBRATE teachers from different parts of Finland could be easily and quickly reached. The CELEBRATE mailing list of the FNBE included the ICT co-ordinators of the schools as well as those teachers who had attended the orientation course at the initiation of the piloting phase of the project. The communications were organised so that the other pilot teachers received the information on the project through them.

The e-mails contained information on the project, such as new LOs added to the DP, courses and other current news. Meetings with teachers were also important, and there was an opportunity for this during the interviews and the training we provided. The progress of the piloting has been followed by means of the web feedback forms completed by the teachers.

## 3) Realisation of the project

### 3.1 Feedback from the teachers

The FNBE gathered feedback from the teachers with two web forms presented in the appendixes 1 and 2. All the pilot teachers of the educational institutes granted national funding completed the web inquiries of the FNBE by the end of the project.

In addition to the structured background information fields, the FNBE's own **experimental web inquiry form** contained free answer fields where the teachers were able to give brief descriptions on the teaching arrangements, the teaching methods used, as well as an evaluation of the tested LOs. The form included prompt questions to give guidance in the writing. More detailed feedback was desired on learning results and impacts of LO use in the teacher's work. By the end of August 2004, we received 316 of these web feedback forms.

**The school-specific web feedback form** included a summary of the experiences from the spring by the school's ICT co-ordinator or the headteacher. This form also included free answer fields with prompt questions in addition to the structured background information fields. The forms included a brief description of the piloting arrangements as well as the

experience from the project. More detailed feedback was desired specifically on the LOs, the functionality of the Demonstration Portal, the school's equipment, the teachers' competence, the pupils' reactions and how experimenting with LOs contributed to the development of new teaching methods. When interpreting the feedback, it is important to consider that not all the respondents answered directly to all the prompt questions, but reported freely on their experience. By August 2004, we received these summaries from 51 schools, which comprise 70 % of the pilot schools. In addition to these forms made by the FNBE, the teachers completed the three evaluation forms of the Demonstration Portal, the information of which was passed directly to the research group of the project.

Further information was gathered by interviewing 21 teachers and 10 headteachers or deputy headteachers on the commission of the research group in the spring 2004.

The following sections 3.1.1 through 3.1.2.6 provide a detailed presentation of the feedback from the teachers. The feedback is based on the above-mentioned feedback forms of the FNBE as well as on the interviews.

### **3.1.1 Technical issues**

#### **3.1.1.1 Telecommunications connections and the equipment**

According to the feedback we received, **the technical preparedness** of the Finnish pilot schools **was fairly good**. It was inquired in the FNBE web feedback form how the hardware and telecommunications connections of the school supported the experiments with the LOs. More than half of the schools commented on this question, **in 61 %** of which it was considered that that **the school's hardware and telecommunications connections supported the experiments well**. **In the feedback stating that their hardware resources were worse**, which was 39 % of the responding pilot schools, **the following issues were raised:**

##### **Functionality of the telecommunications connections and the hardware**

Six schools mentioned in their feedback that they had problems in the Internet connections. In some schools, the new hardware delivered during the piloting caused confusion.

##### **Sufficiency of the ICT facilities and hardware**

In Finnish schools, ICT education is mainly given in the ICT facilities of the school. Reserving the ICT facilities caused inconvenience for some teachers, e.g. in upper secondary schools, where the teachers have always a certain group at a certain time and the ICT facilities are not necessary vacant during that time. At the lower level comprehensive school there were no problems with such arrangements, since the teacher has the same group for a longer period of time and therefore more opportunities to reserve the facilities more flexibly. Some pupils were also able to study the LOs at home.

### **Other issues causing problems with the use of LOs**

One of the schools used Macintosh operating environment, where the portal did not function. One school had a renovation during the piloting.

### **How the problems were solved**

The ICT co-ordinators improved the resources of their schools during the project. Some schools invested in a wide screen television projector, and some upgraded the connection speed of the ADSL. When technical problems occurred, help was provided by the ICT co-ordinators, the CELEBRATE teachers of the same school, as well as other colleagues via the Discussion Forum or by e-mail. The CELEBRATE instructor and the FNBE were also asked for advice. In many schools the teachers solved technical problems together. In the future, more equipment is preferred, especially wide screen television projectors and computers. Regarding the development of the use of ICT in education, particularly interesting is the teachers' wish to have more Internet connections to the classrooms.

#### **3.1.1.2 Functionality of the Demonstration Portal**

According to the pilot teachers, the Demonstration Portal was **too incomplete** at the beginning of the project. **Problems occurred e.g. in finding LOs, i.e. in the functioning of the search engine, and in the registration, as well as due to the interruptions in availability.** A few ICT co-ordinators also mentioned that instalment of the utility programmes required for the functioning of the DP caused extra work. The FNBE informed the pilot teachers on these necessary instalments by e-mail. One ICT co-ordinator commented that if all the instalments were done already at the initiation of the project, the DP functioned more reliably afterwards. In the FNBE web feedback form, the functionality of the DP was commented in a less than half of the total number of the pilot schools. **In 53 %** of the

responses, it was stated that the **DP functioned poorly**, in 16 % rather well, and only 31 % reported that the portal had functioned well.

### **The search engine of the Demonstration Portal**

At the user level, **the search engine functioned illogically** at the beginning of the project. This means that a certain LO could be found when the title was written with a capital letter in the search engine, whereas in order to find some other LO, its title needed to be written completely in lower case letters. At the beginning of the project the fuzzy search of the search engine did not function either, i.e. in order to find a certain LO from the portal the title had to be written precisely correctly with exactly matching inflections etc. The FNBE tested the search function with single LOs and the results were reported to the technical team, who set to work on the reported problems without delay. In the course of the project, the functionality of the search engine improved.

Since the functioning of the search engine was particularly unstable at the phase when the Demonstration Portal was introduced to the teachers, **the FNBE resulted in sending the direct links to the domestic LOs**. This procedure was to ensure the optimal availability of the CELEBRATE LOs to the teachers. Due to the above practice, the user statistics of the portal are incorrect, because all the Finnish pilot teachers are not shown there.

### **Other problems with the Demonstration Portal**

The registration was commented in 10 % of all the pilot schools. More than one fifth of the responding pilot schools reported difficulties in **registration**. In some schools the registration was particularly difficult to the pupils. The construction of the portal coinciding with pilot lessons caused **interruptions in use**. Due to this, the experiments with the LOs remained completely undone with some pupil groups. Later, the technical team began to inform the CELEBRATE co-ordinators on the construction dates and times so that they could inform the teachers in advance. In some schools the technical problems were solved by linking the LOs to the portal of the sub-region or by using the direct links to the LOs sent by the FNBE.

**A reported advantage of the DP was that the portal provided a secure and restricted user area for the pupils**, which enabled them to login to the portal even at home, alone or with parents without the risk of going astray.

#### **3.1.1.3 Technical problems in the use of LOs**

Although the experimenting with LOs eventually turned out well, the teachers had some technical problems with them. **The downloading of some learning objects consumed plenty of time and all of them did not open.** Some LOs lacked user instructions. It may be that these LOs were a part of a larger unity, where the instructions are included only in the first part.

In the Espoo schools problems occurred at the beginning of the project due to the fact that the pupils were not allowed to save LOs in the C drive, although this was required by the automatic functions of some LOs. The problem was solved when the default settings of these LOs were changed. One teacher told that if the LO did not download at the first attempt, some pupils clicked the buttons so many times that the programme crashed. This could be prevented with the information "The LO is downloading." appearing on the screen. **A simultaneous login of the pupils also caused a network crash;** however, in one school, this was solved by a few seconds' staggering of the login time.

### **3.1.2 LOs as a part of teaching**

#### **3.1.2.1 Teachers' ICT skills**

It was inquired in the school-specific web feedback form **whether the teachers possessed sufficient technical and pedagogical competence for the use of LOs.** The question was addressed in nearly one third of the total number of the pilot schools. **A majority of 85 % of the responded schools found that the competence had been sufficient.** Only 15 % of them reported that they had not sufficient competence. Those schools which reported a lack of competence meant that **some of the teachers possessed strong ICT skills while some had poorer.** For example, in one school the discrepancy between the levels of ICT competence manifested itself between the younger and the elder teachers, the younger being more competent. In one school it was suggested that ICT pedagogy is only learned by daring to try the work on LOs.

#### **3.1.2.2 Selection criteria for the LOs**

Below, there is an introduction of the selection criteria for the LOs mentioned by the pilot teachers during the spring interviews.

##### **Suitability of the LOs to the taught subject contents**

For the Finnish teachers the most significant criterion for choosing an LO was its suitability for the subject contents. This was mentioned by more than half of the teachers interviewed in the spring.

### **Additional value brought by the LOs**

The selection criteria for an LO include that it is considered to bring additional value to teaching and serve learning. Additional educational value involves illustrative elements, such as **animations, diagrams or tools** with which the teacher can draw e.g. mathematical lines etc.

### **Mother tongue aspect**

Particularly in comprehensive schools, the pupils do not possess sufficient skills to adopt information in a foreign language; therefore mother tongue (Finnish/Swedish) was considered a significant factor in the electronic material as well. At the beginning of the project there were rather few mother tongue LOs available; however, in the course of the project their number increased, as the translation project of the foreign LOs into Finnish and Swedish was begun in the FNBE in January 2004. Below, web feedback is quoted on this issue:

*"In spite of the fact that we are aiming at raising multi-lingual citizens, the number of lessons, their scope and learning objectives are so strict, that the teacher of general studies must have the material in the language of teaching, at least still at the comprehensive school. "*

### **User-friendliness**

User-friendliness includes all the issues relating to the ease of use, such as the functionality of the LO on the school computers. This user-friendliness involves, for example, that the LO is clear in structure, so that the pupil is also able to use it independently and even at home.

**Interactivity** is also an important aspect of user-friendliness.

## Potential for differentiating

Differentiating the teaching of a group is possible, if the LO contains diverging exercises or exercises of different levels, where the advanced pupil can progress at his/her own pace and the less talented pupil can practise the same exercise for more times.

## Applicability of the LOs to the pupils' everyday lives

If the content of the learning object is applicable to their everyday lives, the pupils are more likely to work more intensely on the exercises.

### 3.1.2.3 Teaching methods used in the piloting

During the piloting, it has been clearly observed that the use of **LOs** in education has **encouraged the teachers and pupils to adopt new and more versatile working methods**. One question for the pilot teachers in the school-specific web feedback form was whether the LO experiments promoted the development of new teaching methods. Nearly one third of the pilot schools responded to the question. **81 % of the respondents gave a positive answer to the question**. 19 % of the respondents saw that the learning objects did not promote developing of new teaching methods. In the schools which gave a negative feedback, the impression was that the piloting did not promote new teaching methods or their development as such; nevertheless, the piloting was a development to be pursued.

During the LO teaching period, **the teachers used various teaching methods flexibly combined**. Most frequently the methods used in parallel with each other were **teacher-led and independent work**, this could involve e.g. that the teacher had an introduction in the regular classroom and then guide the pupils independent work in the ICT facilities. In the following, we have a more detailed analysis of the teaching methods used by the pilot teachers. It is to be noted in the percentages that the mentioned teaching methods as such may already include other teaching methods of the list. E.g. collaborative learning may have been investigative in its approach, or the independent work of the pupils may have included work in pairs, although the teacher has not mentioned this in the feedback.

<b>Teacher-led teaching/independent study</b>	approx. 63 %
<b>Collaborative learning</b> (involves work in groups or pairs)	approx. 21 %
<b>Investigative approach</b>	approx. 10 %
<b>Class discussion</b>	approx. 5 %
<b>Presentative approach</b>	approx. 0,5 %
<b>Listening and empathy</b>	approx. 0,5 %

In the following we have three samples of the feedback from the pilot teachers, reporting the teaching methods used in the experiments with the LOs.

### **Example 1:**

*Working method: group teaching*

*Approach: discussion, work in pairs studying the book, teacher-led elucidation, elucidation of the issue in a group by computer*

*Grade level: 0 to 2*

*Theme: the year, the seasons and the months*

*LO: [http://www.indire.it/celebrate/phase1/virtual\\_lab/Fisica/Gravitazione/HPfisica\\_en.htm](http://www.indire.it/celebrate/phase1/virtual_lab/Fisica/Gravitazione/HPfisica_en.htm)*

*Teaching arrangements: We started by discussing the presumptions and knowledge of the pupils. In one lesson we examined the orbit of the Earth in the pictures of the book and illustrated it with a drawing. In the second lesson we dealt with the movements of the Moon around the Earth. The issue was studied from the pictures of the textbook, as well as the full moon, half-moon and new moon were illustrated with a lamp and the lamp of the overhead projector. The computer was used to put these two things together.*

*Experience: The LO clarified the conceptions of the pupils. It is easier to illustrate by computer than with balls and lamps.*

### **Example 2:**

*Working method: independent work*

*Approach: teacher-led introduction/teaching, problem-solving*

*Grade level: 5*

*Theme: time zones*

LO:

[http://content.opit.wsoy.fi/celebrate/matikka6/6\\_2/6\\_2.htm?CFID=1774211&CFTOKEN=23848897](http://content.opit.wsoy.fi/celebrate/matikka6/6_2/6_2.htm?CFID=1774211&CFTOKEN=23848897)

*Teaching arrangements: The time zones are usually dealt with in mathematics in the 6th grade. The teacher gave an introduction on the time zones with examples and led two examples of time zone calculations.*

*Experience: None of the 22 pupils present had dealt with time zones before the teaching session, thus the matter was completely new to them. 5 pupils (4 boys and 1 girl) assured after studying the time zone LO that they understood and the time zones well. 12 (6+6) pupils told to have formed a rather good or at least some idea of the time zones with the help of the LO. 5 girls told they were completely "lost" with the time zones. The boys seemed to learn the completely new, applied mathematical issue better than the girls when information technology was used.*

### **Example 3:**

*Working method: independent work*

*Approach: problem-oriented teaching*

*Grade level: 8*

*Theme: properties of light*

*LOs: various Celebrate LOs related to light, such as*

*<http://www.hachette-multimedia.com/celebrate/data/HMLOPHOP0000EN/global.swf>*

*Teaching arrangements: The pupils worked in pairs, each group studying themes related to light. One aim was to make a PowerPoint presentation for the other pupils. This assignment was preceded by an exercise in which the pupils were to write down as many questions related to light as possible. We had no actual collective studying on light. There was a brief introduction to oscillation at the start.*

*Experience: The study of the LOs clearly helped to understand the issues, and naturally helped the teacher's work, as soon I had found the LOs and gathered them into the basket.*

### 3.1.2.4 LOs and learning

According to the material collected in the piloting, it can be clearly observed that **the use of learning objects has contributed to learning**. Of the interviewed teachers, a majority of 67 % shared this opinion, and the responses to the FNBE's experiment-specific web feedback form also appeared to confirm this. A little over one third of the interviewees are more cautious in their evaluation of the effect of the LOs on learning; nevertheless, no one thought they had any negative effect. The teachers find that **the use of LOs confirms learning**. The LOs were used much to revise issues and **the pupils' learning results improved by repetition**. For example, in a mathematical LO the same problems appear several times, thus there is plenty of practice and the ideas are learned by repetition. At best, the pupil is also given direct feedback by the computer. Some teachers mentioned that on the basis of these experiments, they were not able to make more profound conclusions on the learning results, since the experiment had perhaps been very short or involved only a few LOs.

**The use of LOs would seem to support well the differentiating of teaching.** Especially **with the weaker pupils, the learning results frequently improved** as they worked on LOs. According to the experience of a mathematics teacher, the weaker pupils lose their interest very quickly while measuring angles during conventional classroom teaching, whereas while working on the LOs they were able to focus on studying hard for a longer period. One language teacher told about a pupil who did not understand grammar and was not willing to pay attention during the lessons. The teacher had the pupil do a "was/were exercise" independently by computer for a short period of time. Fairly soon the pupil understood the whole point – which no one had been able to explain to him verbally. As a result, he was very content with himself.

**The talented pupils also benefited** from the working on LOs, since they were allowed to proceed at their own pace during the LO lessons, while the teacher focused on instructing the weaker pupils. For example, some more advanced pupils continued from an LO designed by a mathematics teacher to his website and started to search and do exercises there. Some pupils **studied the LOs even at home** with their parents. According to the teacher feedback, some pupils had **improved their listening comprehension skills** during the LO teaching period, which was discovered in the national listening comprehension examinations.

**At best**, studying by means of LOs, **the pupils learn to take responsibility for their learning**, as they study independently on computer. The pupils of one teacher, for example, recorded in their notebooks which LOs they had solved correctly when they were practising

multiplication. Thus, they have been able to follow their own progress. One teacher mentioned, though, having had to make much effort for making some pupils understand their own responsibility in learning, since at the beginning of the LO period these pupils were in the habit of coming to the LO lessons “just to play”. When working in pairs, **game-like LOs were experienced as an inspiring and entertaining break in the teaching**, as the pupils were able to challenge each other in the playful competitions.

**The illustrative elements** of the LOs, **such as animations and diagrams, helped the pupil to internalise broader thematic entities**. For example, with the geography LOs, it was discovered that the pupils internalise Europe better through studying with the map LOs than with conventional methods. Also, the brain structure and functions were understood better by means of the corresponding LO than by conventional methods, and the Orchestra LO helped to perceive the various parts of the assembly.

According to the teachers, the use of LOs **brings variety to school work, and has a positive effect on the school atmosphere**. What is new and different is inspiring to the pupils; they are **motivated** to work on the LOs. One of the teachers reported that many of his pupils became notably enlivened in the LO lessons during the spring. After using them for a period of time, they also become more critical. The important task remains for the teacher to choose the LOs to be used, and to consider to which part of the curriculum they apply best.

In the future, it would be interesting to find out **what kind of learning styles working on LOs support**. Does this method support some styles of learning more than the others, and are the pupils receiving poorer results in the standard education those for whom absorbing information is easier by their own doing and working on learning objects than through reading textbooks.

### **3.1.2.5 Other benefits from the use of LOs in education**

Working on the LOs **contributes to the pupils’ command of ICT**. The pupil sees that in addition to everything else, such as playing games, the computer can be used as a tool for learning. **At its best, learning ICT skills promotes to the pupils’ self-esteem**, as they realise being able to use technical appliances. When the pupil learns how to use one LO successfully, it is likely to have positive multiplicative effect on learning the next LO.

**The use of LOs facilitates the teacher’s work**, since working on them as such already motivates the pupils, so the teacher does not need to make so much effort to motivate them.

The teacher does not necessarily need to copy or prepare additional material for the LO lesson, provided that the desired LOs function well. During the pupils' independent work on LOs, the teacher has time to assist the weaker pupils, while the more advanced pupils proceed at their own pace. In spite of the fact that at best the use of LOs facilitates the teacher's work in many ways, **the preparation i.e. the familiarising oneself with the learning objects and controlling their functionality consumes plenty of the teacher's time.** The teacher also needs to reserve the ICT facilities for the class in advance.

During LO work, also other important knowledge and skills can be acquired, including teamwork abilities. According to some teachers, the work on the LOs **increased the pupils' co-operation.** One teacher raised the subject of **copyright laws**, when teaching with LOs in order to make the pupils understand what can be adopted for the user's own use, and what remains exclusive for the author. This is easier if the LO clearly states its copyright claims.

Below, there are some comments by the teachers gathered from the FNBE web feedback:

*"The learning objects support the independent and active acquisition of information and help them to work in co-operation with other pupils. Thus the LOs contribute to the developing of the school towards constructivism."*

*"What was significant was the great amount of discussion when working in pairs. According to my personal experience, methodically, the most successful was the work in pairs, and this was also shown in the learning results of mathematics and English (in the national examination the grade average was nearly 8,5 and half of the group had excellent grades!)."*

*"The work on the LOs resulted in greater interaction in the class, particularly when studying languages. When two equal pupils worked together, they supported and inspired each other."*

*"I find that I received material for differentiating the teaching and providing more individual tuition, and in a "double" combined class (grade levels 3 to 6) this is in great demand. In a combined class there is a great need for differentiating in all subjects, for which purpose the above-mentioned LOs suit particularly well."*

### 3.1.2.6 Feedback from the experiments with the LOs

According to all the feedback we have received, there was a sufficient total number of CELEBRATE learning objects available. However, **the learning objects** available in the project **were unevenly distributed between different subjects**. LOs were available more abundantly only for certain subjects, such as mathematical and scientific subjects and English. For example, for arts and crafts, or for the youngest pupils, there was hardly any material. Thus, those more actively involved in the project were teachers who were able to find suitable material for their own subject.

Most teachers found that a majority of the tested CELEBRATE LOs **conformed well to Finnish and local culture**. Only one teacher disagreed, nevertheless on positive grounds: she saw that all the LOs do not need to suit everybody, as that is exactly the richness the variety of cultures bring. The target age groups of the CELEBRATE LOs were quite broad, and **the age recommendations have rather been used as advisory information** when choosing LOs for teaching. The teachers find that **by adapting the assignment they can contribute to the suitability of the LO for pupils of different ages**. Some LOs, such as “Car race”, “Tangram” or “The human brain”, were also suitable for even younger pupils than what is recommended. More often the teachers made such applications in which LOs designed for older pupils have been used with younger ones than vice versa. One lower level comprehensive teacher contemplated that there were many LOs that would be more applicable to lower level comprehensive school if small changes were made. The experiments with LOs were made mainly in the ICT facilities of the school, where the teachers have several computers available. **There is a demand for more ICT facilities and equipment for the schools, in order to arrange the LO teaching more flexibly and integrate it to the everyday education.**

#### Foreign language LOs used most

Of the foreign language LOs, most experiments were made with the material on human biology, physics and chemistry by Norwegian Board of Education. According to the feedback from the teachers, this was most likely caused by the fact that the Norwegian LOs were designed so that the level of English skills does not bear a great significance on the comprehension of their contents. They contain **plenty of animation and images and not so much text**. There would also appear to be plenty of use for this kind of learning objects in the future. In late spring, Norwegian and Hungarian LOs were translated into Finnish and Swedish in the Finnish National Board of Education. Among the other learning

objects produced by foreign publishers, the pupils tested e.g. the Orchestra LO by Indire, as well as several natural science LOs by Digitalbrain plc and Hachette Multimédia, such as the “Nine planets” LO.

Below, there is a sample of web feedback on foreign LOs which had plenty of testing. Some of the LOs were translated into Finnish and some were used in English. The summary is made in August 2004 and it is based on the experiment-specific web feedback forms of the FNBE.

### **Norwegian Board of Education (*Læringsenteret*)**

LO: [http://celebrate.ls.no/english/animations/science/hjernen\\_animasjoner.swf](http://celebrate.ls.no/english/animations/science/hjernen_animasjoner.swf)

Theme: environment and nature studies;

Number of lessons: 3

brain functions

Working premises: ICT facilities

Grade level: 2

Working method: independent studying

Group size: 23

Approach: an investigative approach

*Teaching arrangements: We study human anatomy and functions. We have made life-size models of human bodies for five groups. The bone structure and vascular system have been accomplished already for all the models. Of the internal organs we did first take the brain. We had an introduction in the class, discussing the importance of the brain. After the computer lesson we drew the brain on paper and attached them with blue-tack in the place, considering simultaneously in which parts of the brain various functions are located.*

*Experience: The pupils felt that they found the functions of the various centres. The motivation was also high. The teacher’s work was made easier, as the taught theme would be difficult to illustrate without this kind of programme.*

*Evaluation of LO: the LO was easy to use and illustrative. The pupils found it also entertaining.*

### **Indire**

LO: [www.indire.it/celebrate/phase1/orchestra/orchestra\\_en.htm](http://www.indire.it/celebrate/phase1/orchestra/orchestra_en.htm)

Theme: music, instruments of symphony orchestra

Grade level: pre-primary education, 1 and 2

*Group size: 11*

*Number of lessons: 2*

*Working premises: ICT facilities*

*Working method: group teaching*

*Approach: listening and empathy, teacher-led, but question-based, revision of previously learned themes, studying the same theme with different media*

*Teaching arrangements: 1. Listening the musical fairy tale Peter and the Wolf and the introduction of the various instruments in it (in a previous lesson).*

*2. Listening the composition of Bach and recognising the instruments in it.*

*3. Listening the music samples and recognising the instruments with the help of the LO (projection with a data projector) and a handout.*

*Experience: - the pupils inspired, the Internet is a motivating media*

*- The teacher escaped the hunt of sound samples; nevertheless the themes of the LO could also easily have been taught without the LO.*

*Evaluation of LO: - In principle, this could have been done conventionally with a CD player and a transparency or such, on the other hand the samples were now readily available "in the same package", the samples could have been more versatile, and all the instruments did not function. Perhaps there could also have been some further information on the instruments.*

*Evaluation of LO from another teacher: The programme was otherwise good, but whether we were not able to use it correctly, or why, but only one of the woodwind instruments produced a sound, although there four in the picture. Such a thing causes confusion and extra questions among the pupils.*

### **Domestic LOs used most**

The most tested among the domestic LOs were the mathematics and natural sciences LOs by SanomaWSOY, such as "Estimating and measuring angles", or "Construct molecule models". **Among the LOs produced by the FNBE, the most popular were the physics LOs** "Sound, noise and hearing", as well as parts of the "Electric tests" LO series, LOs for English teaching, such as "Flying with prepositions", and mathematical LOs, such as "The

sky is falling". Below we have a summary of the web feedback on the domestic learning objects used most.

## **SanomaWSOY**

*LO: [http://content.opit.wsoy.fi/celebrate/matikka5/5\\_2\\_1.htm](http://content.opit.wsoy.fi/celebrate/matikka5/5_2_1.htm)*

*Theme: Mathematics; estimating and measuring angles*

*Grade level: 5*

*Group size: 25*

*Number of lessons: 1*

*Working premises: ICT facilities*

*Working method: independent work*

*Approach: independent work*

*Teaching arrangements: The pupils had familiarised themselves with the protractor and its use in measuring angles in their previous mathematics lesson. We began the lesson by revising the concepts: acute angle, obtuse angle and right angle. I gave the pupils an assignment to do the mentioned LO and use the concepts for help. The pupils had their own protractor and copybooks with them for help (e.g. for drawing the angle in the copybook and think how it could be measured with the protractor). At the end of the lesson I asked how the pupil had used the concepts in solving the exercises. We also discussed how the pupils had estimated the angles and how they had succeeded and developed in it. In the next lesson we continued drawing angles with the protractor. We began the lesson by discussing how the things we had learned during the previous lesson would help learning the content of this lesson.*

*Experience: There were enough challenging exercises to do, since those pupils proceeding the most quickly could do other exercises as extra, and I could concentrate on instructing those pupils who needed help with the exercise. I have an impression that the pupils benefited greatly from the lesson.*

*Evaluation of LO: The LO was very good for confirming the pupils' comprehension on angles and prepared their estimation skill well. The degree markings of the protractor caused trouble for some pupils, since they were said to be too small print and difficult to see.*

## SanomaWSOY

LOs:

[http://content.opit.wsoy.fi/celebrate/ke7/9\\_3.htm?CFID=1774211&CFTOKEN=23848897](http://content.opit.wsoy.fi/celebrate/ke7/9_3.htm?CFID=1774211&CFTOKEN=23848897)

[http://content.opit.wsoy.fi/celebrate/ke7/12\\_4.htm?CFID=1792767&CFTOKEN=24660161](http://content.opit.wsoy.fi/celebrate/ke7/12_4.htm?CFID=1792767&CFTOKEN=24660161)

Theme: chemistry

Grade level: 8

Group size: 16

Number of lessons: 1

Working premises: ICT facilities

Working method: independent work

*Approach: The teaching methods were pupil-centred experimental method, and teacher-led method based on questions.*

*Teaching arrangements: Before the use of the LO, both of the content matters had been dealt with in the class. The teaching aids used were blackboard, chalk and overhead projector. After the testing we discussed the usefulness of the LOs and whether they helped to learn something new. Since working on computer was a welcome change compared to a usual chemistry lesson, the pupils reacted positively towards the testing, and felt that their skills had strengthened, at least.*

*Experience: Since the themes of the LOs had already been dealt with earlier, the main purpose of using them was to strengthen the skills. In this purpose, the LO made the teacher's work easier.*

*Evaluation of LOs: It can be said about the LOs used that they were both clear and good. Even the restless pupils were focused! Regarding their level of difficulty, the LOs were appropriate, thus giving challenge to pupils with unequal skills, and the interest of even the poorest pupils was maintained in this "restless" group. There could have been more examples in the latter LO!!!*

## **Finnish National Board of Education (FNBE)**

*LO: [http://www.edu.fi/oppimateriaalit/aihiot/eng/physics/electricity/electricity\\_8/home.htm](http://www.edu.fi/oppimateriaalit/aihiot/eng/physics/electricity/electricity_8/home.htm)*

*Theme: Physics; range of uses of transistor*

*Grade level: upper level secondary school*

*Group size: 20*

*Number of lessons: 1*

*Working premises: regular classroom*

*Working method: independent work, guidance from teacher if necessary*

*Approach: problem-oriented approach*

*Teaching arrangements: At first, we studied the functions of the photoelectric switch in theory, and then with the help of the test circuit board.*

*Experience: "Transistor as an amplifier" works well. Speeds up and makes the teacher's work easier in drawing the graph. If we could also have the graph easily displayed, we would be verging on the perfect.*

*Evaluation of LO: Improvement of the functionality. After changing the values for a while, the function may get muddled up. "Transistor as an amplifier" is good. If only the values could be taken from there to the graph, it would work really well.*

## **Finnish National Board of Education (FNBE)**

*LO: [http://www.edu.fi/oppimateriaalit/healthy\\_meal/](http://www.edu.fi/oppimateriaalit/healthy_meal/)*

*Theme: environment & nature studies; significance of meals for the well-being of a growing child*

*Grade level: 5*

*Group size: 31*

*Number of lessons: 5*

*Working premises: ICT facilities*

*Working method: independent work*

*Approach: The pupils' personal notes on their daily meals.*

*-Transfer of the information into the LO.*

*- Use of the gained values in the mathematics lesson in calculating averages and fractions relating to the distribution of the total energy amount between the daily meals*

*Teaching arrangements: We had a project titled “Healthy meal” in which we first told about the meaning of nutrition in the well-being of a 5<sup>th</sup>-grader (staff of the school cafeteria: school lunch, and school nurse: model of healthy meals and their total number). The pupils wrote down their meals for a week (breakfast/lunch/dinner/supper). We used the LO to mark the meals, and printed it out and calculated the calories gained from the meals in the mathematics lesson. For comparison, we had the values given by our school nurse. This project was carried out only with my class, and I took care of the planning on my own.*

*Experience: –The teacher’s work became easier as the children were doing their own notes. – In my opinion the learning results were good, since the pupils were allowed to make notes themselves and mark their results. The motivation was high.*

*Evaluation of LO: –The LO in question was good, but requires certain improvements in order to work even better. E.g. the name of the pupil and the name of meal/day should be allowed to be written in a certain space. – The information should be able to be saved somewhere, so that e.g. the meals of the day could be combined or printed out at the same time. – In spite of its relative extent, the menu was insufficient and we needed to make far too much use of the so-called “applicable part” in marking the meals.*

### **3.2 Other training**

#### **a) Continuation course: learning objects and web pedagogy**

In January–March, the FNBE organised a three-stage continuation course where the teachers were able to make searches for learning objects suitable for their own use and also had a brief introduction to the Authoring Templates (software for making LOs). The course consisted of distance learning and three contact teaching periods. The number of participants was 22.

#### **b) LO creation course**

In April 2004, the FNBE organised a small-scale two-day course for those interested in creating new learning objects. The course was held in two languages: both Finnish and Swedish. The participants familiarised themselves with the Authoring Templates of Giunti Ilabs and Digitalbrain plc. There were 14 participants in the course. Hachette Multimédia,

which was also involved in the project, has also produced authoring templates, but they were not completed by the time of the course.

### **c) Training provided by the ICT co-ordinators**

During the spring term 2004, the ICT co-ordinators organised orientation training for the pilot teachers in their own schools. The training practice varied according to the schools. One school had three instructional meetings, whereas in another, training was organised in two afternoon seminars, while in a third school, the ICT co-ordinator gave a one-hour demonstration. Otherwise, the practice was that the pilot teachers studied the LOs and the portal independently. When problems occurred, they were dealt with together with the ICT co-ordinator.

### **d) Training in the use of other virtual learning environments**

During spring 2004, some schools also provided user training for other virtual learning environments (VLE) or learning content management systems (LCMS) designed for educational purposes, such as the OPIT by SanomaWSOY or Moodle by Mediamasteri Oy. In some schools this concurrence was felt demanding.

### **e) CELEBRATE meetings with the FNBE and SanomaWSOY**

The FNBE and SanomaWSOY arranged two afternoon seminars in co-operation for the pilot teachers on electronic learning material. The seminars provided an opportunity to gather experiences and develop ideas for production of electronic learning material. The meetings were held on 8 Nov 2003 and 18 May 2004. There were 25 teachers in the first meeting and 11 in the second.

### **Teachers' feedback from the training**

It was felt that there had been provided sufficient training and it supported the use of LOs in class well. As already mentioned, problems in registration occurred with some teachers during the orientation course. The computer did not always signify, whether the registration was successful. Some teachers had had an interruption in use for some time, as at the time the learning material had been illogically organised and difficult to find with the search engine, and there had not been much material available in mother tongue.

In the continuation course the teachers made again progress with the LOs. 81 % of the teachers participating in the continuation course awarded the course on a scale of 1–5 a total grade of 4. Positive aspects of the training included among other things **the evaluation of the LOs and changing ideas with the colleagues** and that **time was given for the search of LOs**. One teacher mentioned that the pedagogical thinking had broadened during the training. Below, a quotation from the web feedback:

*”The best offerings of the training was the opportunity to familiarise oneself without haste with the potential of using the computer in education”*

### 3.3 Controlling the completion of the evaluation

The teachers were informed already in the first orientation course that the project would involve evaluation work. After the evaluation forms had been composed, the teachers were sent more detailed information and the links to the forms etc. by e-mail. **The e-mails emphasised the significance of the evaluation and the fact that the results would be reported both at the national and international levels.** The completing of the FNBE’s web feedback forms could be followed by means of the statistics of the web site.

### 3.4 Statistics

**Not all the Finnish pilot teachers are included in the following user statistics of the Demonstration Portal, since some of the teachers used the LOs directly through the links sent to them.**

User	Total number
Teachers	339
Authors	24
Counsellors	9
Learners	479
Managers	12
Others	58
Total of the registered	921

Table 2 Number of those registered in the DP on 13 Oct 2004.

### 3.5 Feedback from the pupils

The focus of the evaluation was in the teacher feedback. Feedback from pupils was not gathered; however, we received information on the pupils' reaction towards the LO experiments from the teachers through the FNBE's school-specific web feedback form. More than half of all the pilot schools responded to the question on the pupils' reactions. **“Very positive” and “positive” responses were given by the pupils in a majority of 88 % of the responding pilot schools, and “sometimes positive” in 12 % of the responding pilot schools.** Below, we have sample comments from the web feedback:

*“The pupils reacted very positively towards the testing. They have generally found that the LOs gave good explanations to various phenomena. The work on the LOs has also been felt as a nice variety.”*

*“The pupils were very positive towards the experiment being often allowed to choose the method of studying themselves. They also felt having somewhat more responsibility of their own learning. It can be said thus that they have become more self-directed learners.”*

In addition to the above responses from the pupils, the FNBE was sent **individual feedback** by two teachers who had made polls among their pupils on their own initiative. This direct feedback from the pupils was received from the 7<sup>th</sup> and 8<sup>th</sup> grades of Ruukinkankaan koulu (Ruukinkangas comprehensive school) as well as three groups of students from the vocational Suomussalmi-opisto (Suomussalmi Institute). A majority of the feedback consisted of the evaluation of the tested LOs; therefore they were sent directly to the publishers of the LOs. Particularly interesting was the evaluation by the 7<sup>th</sup> grade. The pupils had tested the following three geometry LOs:

SanomaWSOY:

Estimating and measuring angles; [http://content.opit.wsoy.fi/celebrate/matikka5/5\\_2\\_1.htm](http://content.opit.wsoy.fi/celebrate/matikka5/5_2_1.htm)

Identifying triangles; *(in Finnish)*: [http://content.opit.wsoy.fi/celebrate/fi/matikka7/5\\_0.htm](http://content.opit.wsoy.fi/celebrate/fi/matikka7/5_0.htm)

LEO by Young Digital Poland:

Geometric figures part 1: [http://leo.ydp.com.pl/data/NE/math/gm1\\_03.flo?javatype=microsoft](http://leo.ydp.com.pl/data/NE/math/gm1_03.flo?javatype=microsoft).

The teacher requested the pupils for free form feedback of the LO experiments. In addition, he had also made prompt questions for discussion and inquired e.g. whether the pupils found that the LOs helped learning, and how they found their level of difficulty. The pupils answered to the questions in pairs. **66 % of the pairs found that the LOs helped learning.** This response supports the positive feedback we have received from the teachers. **According to some pupils, 46 % of the respondents, the level of difficulty was raised by the fact the LOs were in English,** whereas some pupils, 27 % of the respondents experienced the foreign language as a positive challenge.

### The 7th grade of Ruukinkankaan koulu (Ruukinkangas comprehensive)

#### Do the LOs help learning?

Answer	Number of pairs	Percentage
Yes	7	64
Perhaps/ cannot tell	2	18
No	1	9
-	1	9
Total number of pairs	11	100

Table 3 Learning objects and learning.

#### English as the language of LOs

Result	Number of pairs	Percentage
Impeded	5	46
Positive challenge	3	27
Not mentioned as factor	3	27
Total number of groups	11	100

Table 4 Impact of English as the language of LOs.

## 4) The Future

### 4.1 Increasing the use of LOs: viewpoint of the school administration

In the spring interviews, the headmasters were asked the following questions: “What adjustments are required in the school practices (at the school or the class level), in order to enable the use of learning objects or its expansion?” The following issues were raised in the responses:

\* **Smaller groups:** i.e. a possibility to divide pupils into smaller groups (30 pupils is too large a group for the ICT facilities).

\* **ICT equipment:** more hardware, an internal network and Internet accesses to the classrooms.

\* **Facilities:** more facilities which are convertible and flexible. The problem regarding facilities in the schools with older premises is that there is not necessarily enough room for new computers, since desk space suitable for other kind of work is also required.

\* **Training:** versatile training is required, such that strengthens both the pedagogical and the ICT skills. This must be taken into account in the continuing education of the teachers.

\* **Co-operation:** teamwork between teachers, e.g. encouraging colleagues to have further training.

The realisation of the issues mentioned by the headteachers above requires thorough and long-term planning as well as financial and pedagogical support to the schools.

### 4.2 Teachers' wishes regarding digital learning material

Both the interviews and the school-specific web form included questions about teachers' wishes for future learning material. The following issues were brought up in the feedback.

## Versatility

Here, with versatility, it is meant both **the diversity of the LO types** and **multifaceted contents** which enable the use of various teaching methods. The teachers' wishes regarding the scope of the LOs vary according to the situation and the grade level, i.e. there is a demand for several types of LOs. There have been plenty of drill and practise type of LOs available in CELEBRATE; the supply could thus be diversified also into material promoting more deeper-level learning, perseverance and the pupil's own thinking. The LOs could include various levels for the basic user and the advanced user. The different subjects should be catered for. For example, the science LOs in the Celebrate project have focused very much on physics. There is a need for LOs also in biology, e.g. for material on animals. Below, we have some examples of the feedback gathered through our web form.

*"When doing the exercises, a good pupil finds a formula or regularity which the exercise is trying to teach, whereas the weaker pupil remains at the level of mere performance, and hardly learns the idea by him/herself. The exercises could be more clearly diverging, so that the pupil who does not comprehend the matter easily could have an opportunity for repetition, and the one who solves the exercise easily would have a more demanding challenge."*

## Content creation: curriculum and the pupils' environment

In the content creation of the LOs **the curriculum** must be taken into account. A systematic production of LOs could be started on the basis of the central parts of the curriculum. This would benefit from the idea that all the textbook publishers would include web material in their learning material. Essential in motivating the pupils is to ensure that the LOs take the pupils' everyday lives and environment, e.g. hobbies, into account. Below, we have some teacher comments:

*"LOs should be produced course by course through the whole curriculum of the upper secondary education. Even 10 LOs per course on the central and easily demonstrated issues would be a very good thing. Especially this kind of LOs are excellent: <http://celebrate.ls.no/english/animations/mathematics/cosinus/index.html> – since they are difficult to illustrate with just plain chalk and talk."*

*"There could also be co-operation with YLE in order to develop educational programmes for television. At least currently, the educational programmes on mathematics are almost completely unsuitable for the (upper secondary) education. (Perhaps a student in a distant upper secondary may find motivation from them.) ...I wish they would produce programmes with applicable LOs for a certain course among which the teacher then could adopt those s/he prefers"*

### **Various user groups**

After CELEBRATE, among various user groups, special attention should be paid to **the youngest pupils**, and even more importantly, **the pupils with special needs** as well as **teenagers**. The youngest pupils would be best served with spoken and visual instructions, and the pupils with special needs would benefit from visual clarity without flashing elements which easily distract them. With teenagers, attention should be paid for themes of interest to them and high quality layout, since the teenagers often design even their own web pages.

### **Exploitation of multimedia**

By means of multimedia, **different senses (hearing, sight)** can be taken into account. This is possible particularly with LOs, thus the potential of multimedia should be thoroughly exploited. Below we have some web feedback:

*"It is preferred that the LOs would be interactive, combining vision, hearing and action, A plain text does not motivate."*

*"All kinds of animations, mostly in environmental and natural sciences, were the most useful ones according to our experience. To illustrate the ideas in a comprehensible manner is always the key challenge of this profession."*

### **User-friendliness**

The teachers mentioned such aspects on LOs that describe their user-friendliness. **High quality and functionality with different browsers** are desired. They should be as **easy to use and clear in their instructions** as possible, so that the pupils could use them also independently at home. When a question arises while working, there could be **a link to a**

**more extensive information section.** User-friendliness includes also that the copyrights and age recommendations of the LO are clearly stated.

**Interactivity** is another important part of the user-friendliness. The pupils are likely to focus on studying on the LO more persistently, if they are able to be more involved in the LO and have feedback from their work. The LOs could be attached a function for further editing, i.e. a tool for the teacher to make questions of his/her own on the content of the LO, or translate the text into mother tongue. Below, we have quoted some feedback from the teachers.

*"I would prefer the future LOs to be such that the pupil would be able to influence more in their functions, and that they would reach the causes as well, and not only the effect as such. The pupil should have an opportunity to develop insight and make conclusions.*

### **Mother tongue aspect**

An important aspect in selecting the learning objects for use is that they are available in mother tongue. The teachers found that the pupils do not possess sufficient skills to acquire information in a foreign language. This must also be taken into account in the future production of learning objects.

In addition to the above, a wish was expressed that the producers would test the LOs for different browsers and add a direct link to their installation programmes.

### **Demand for LOs by subjects**

In the following there is a list organised by subjects (*There is currently a more detailed demand survey in the making in the FNBE on digital learning material for vocational education.*)

### **Physics and chemistry**

LOs in physics and chemistry are needed in lower level comprehensive schools, as they are new subjects in the curriculum of Finnish lower level education. In upper level comprehensive, there is a demand for physics LOs on optics and mechanics.

## **Geography and biology**

The geography LOs by CELEBRATE mostly dealt with Europe. More LOs and map exercises in particular are requested also on other continents, the USA, Africa and the problematique of the developing countries. A demand for material presenting foreign cultures and customs was expressed.

For lower level comprehensive more LOs on environment and natural sciences, particularly on animals, would be preferred. For upper level comprehensive and upper secondary, more cell biology LOs and material illustrating food chain are desired. An LO presentation of the cell could be integrated with chemistry.

## **Mathematics and ICT**

In mathematics, there is a request for LOs which promote perceptual abilities and thus facilitate learning by the pupil's own insight. There would also be use for LOs which would enable a precise restriction of the range of numbers. For the advanced syllabus of mathematics in the upper secondary school, such integral exercises are desired, where integrals are used in calculating areas, as well as LOs for drawing descriptors. Also, material about polynomials and rational expressions and their reduction are in demand. For ICT education, more web material in general is requested.

## **Foreign languages and mother tongue**

For the English teaching in upper level comprehensive school, especially material for systematic and diverse teaching of the tenses in 7th and 8th grade is requested. At the present, in one English teacher's opinion, the topic is currently approached too cautiously. There would also be a niche for listening comprehension material of an analytical approach, as well as exercises of politeness phrases (Swedish and English). Generally, LOs for teaching German and Swedish are also requested.

There is also a demand for material dealing with mother tongue grammar and literature. For the youngest pupils, a request is expressed for such syllabification LOs where the words would be divided into categories by themes.

## **Arts & crafts and music**

Material presenting the notes and the rests was wished for music classes, as was more material for arts and crafts in general.

## **Religious education and history**

For religious education, material containing exciting elements is requested. The current material is considered rather uninspiring. In the teaching of history a general wish is for more web material particularly for the younger pupils.

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# **5) Conclusions**

## **5.1 Telecommunications connections and hardware in the schools**

**The level of telecommunications connections and hardware in the pilot schools sufficed well for the realisation of the piloting.** Nevertheless, the feedback showed that **the Internet connections** in some schools **require renewal**. The carrying out of the project in these schools was more laborious usually due to the inferior connections. Outside the CELEBRATE pilot schools, these problems are fairly common. This suggests that a more extensive introduction of learning objects by means of such portal as the current one could cause difficulties. However, the connections improve all the time and the problem will be diminished on that part.

The utilisation rate of the current ICT facilities of the schools is high, and there will easily be concurrence in reservations, therefore more facilities equipped with modern technology are required. Among the equipment, especially more wide screen television projectors and computers are preferred in the future. With a wide screen television projector, the teacher could use the learning objects as interactive illustrative material by projecting e.g. an animation on cell biology to the pupils. **Investing in ICT equipment would enable a more flexible use of LOs and various teaching methods in everyday education.**

## 5.2 Impact and achievements of the project in Finland

The CELEBRATE project was perceived as new, interesting and **focused on the current issues**. Among its advantages were its extent and internationality. In many schools, the participation in the piloting was given impetus by the enthusiastic teachers. The teachers' ICT utilisation rate increased in the course of the project. In the CELEBRATE training, the teachers received new ideas for their work and met colleagues. The project has brought more perspective of the comprehensive schools into the developing of ICT in education.

The teacher feedback and the research done in the project provided significant information for all those working on digital learning material. The general awareness of the LOs increased. In Finland, the FNBE, among others, uses the information gained through the project. CELEBRATE has resulted in several articles as spin-off products, as well as a publication by researcher Liisa Ilomäki: *Opi ja onnistu verkossa – aihiot avuksi*<sup>1</sup> (Publisher: FNBE (*Opetushallitus*), ISBN 952-13-2067-2). Among other things, the publication defines the term learning object, discusses the presentation of information in an LO, and offers pedagogical advice for the use of LOs in education. The book divides learning objects into the following categories according to their purpose of use: evaluation, exercise, source of information, vocabulary, guide, experiment, open action and tool LOs. All these types of LOs are in demand.

### On the effects of the use of the LOs in education

According to the teachers, it is difficult to find suitable learning material in the Internet, and the pupils may go astray on undesirable pages. The Demonstration Portal with its learning objects provided a solution for these problems as a tested and secure user area for the pupils, enabling them to login to the portal even at home, alone or with the parents, without the risk of going astray.

We have received **important, positive results** with the work done on LOs. The LOs can be used for teaching a completely new theme, or for revising the previously learned ones. As presented in chapter 4, the teachers need LOs of many types with contents relating to the curriculum and/or the pupils' everyday lives, including hobbies. **At their best, versatile LOs promote the flexible use of various teaching methods, as well as different styles of learning.** What is significant here is the fact that a majority of the teachers consider that the

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<sup>1</sup> The Finnish title translates roughly as "Learn and succeed in the web – with learning objects".

use of LOs in teaching **contributes to the pupils' learning**. It also appears that the use of LOs benefits those pupils, in particular, who learn better by doing than by reading textbooks. In addition to them, the so-called gifted pupils also benefit from the LOs, provided there are exercises with diverging levels of difficulty available for them. **The LOs are suitable for differentiating the teaching.**

An excellent aspect in the LOs is the potential of the multimedia in illustrating the taught theme. The LOs help the pupil to internalise broad thematic entities, such as the map of Europe, better than by conventional textbook teaching. Among the foreign LOs, the most popular were those, in particular, which contained plenty of animation and images.

The use of LOs brings variety schoolwork and has a positive impact on the learning environment. This is encouraging, as Finland has not been among the top countries regarding how the pupils enjoy their school. **The pupils are motivated to work on the LOs and, at best, learn to take responsibility for their learning with the help of LO work.** Generally, the use of LOs also confirms the command of ICT, which has a positive impact on the self-esteem of the pupils.

### **5.3 What would we do differently?**

As the LOs were strongly focused on certain subjects, and, partly, as there were technical problems in the portal and the LOs, the ICT co-ordinators had difficulties in marketing the project in their schools at the beginning of the project. The teachers felt that the DP was too incomplete at the initiation of the project. It would be advisable in the next ICT project to **make the DP and the search engine in particular more complete already at the pilot stage, and make an even more diverse variety of LOs available. The construction of the Demonstration Portal should be carried out outside pilot lessons so as not to disturb teaching.**

Considering the research on the project, it was extremely troublesome that the evaluation forms made by the international research team and published in the DP were available to the teachers only as late as in the last weeks of May, when the Finnish teachers are in the middle of evaluating their pupils and have the most pressing time of the year. We wished to allow more time for the response, and the teachers were requested to complete the evaluation forms by 30 June, i.e. during their summer vacation, which is likely to have

influenced the response rate. In case of similar evaluation procedures in the future, **the publication date of the forms needs to be adjusted according to each country.**

## **5.4 Final conclusions**

In the other aspects, **the project was implemented in a very positive spirit.** The main objective of CELEBRATE was to find new methods for the production, distribution and application of learning objects (LOs) in the web learning environments. **Through piloting, these objectives were accomplished to a considerable extent.**

The teachers expressed a wish that, to secure versatility, in future projects of this kind an opportunity would be offered for both smaller and larger-scale publishers to provide learning material in the web. Through the portal, such contact information of these producers, authors and other ICT experts could be shared with the teachers that would indicate who would be able to provide e.g. a supplementary technical function for a game etc. made by a teacher. The Finnish teachers involved in the project also wish to receive contact information of CELEBRATE teachers from other participating countries.

The project added spice to the basic work of the teachers, and according to the feedback from the teachers, it can be stated that **LOs are an imperative tool for modern education. Our duty is to enable the use of LOs in the education in our schools in the future as well, taking the issues raised by the headmasters (See chapter 4) into account. Expanding of the use of LOs in the schools requires thorough and long-term planning, as well as financial and pedagogical support to the schools.** Regarding the project, it would be desirable that it would continue in some form or another after November, so as not to lose the significant efforts made.

## 6) Abstract

The main objective of the CELEBRATE project was to find new methods for the production, distribution and application of small-scale electronic learning objects (LOs) in the web learning environments. The LOs were tested in piloting in which involved 73 schools throughout Finland. A majority of 81 % of the schools were comprehensive schools. To be accepted in the CELEBRATE project, the pilot school was required to possess the necessary equipment and previous experience in the use of ICT in education, as well as have completed strategy for the use of ICT in education. Approximately 800 LOs were produced for the project, and many of them were translated, thus **the total number of the LOs resulted in 1500** (13.9.2004). The LOs were distributed for the pilot use for the teachers through a demonstration portal (DP) in the web.

Teachers were gathered plenty of feedback on the piloting with web forms and interviews. In addition, a Finnish research group carried out classroom observations, the results of which are available in the publication by Liisa Ilomäki: *Opi ja onnistu verkossa – aihiot avuksi* (Publisher: FNBE (Opetushallitus), ISBN 952-13-2067-2). **The feedback from the teachers and the research** done in the project **provided significant information** for all those working on digital learning material.

Despite its incompleteness, **the DP was found a secure and restricted user area for the pupils**, as according to the teachers, it is difficult to find suitable learning material in the Internet, and the pupils may stray on undesirable pages. The teachers' and pupils' **work on the LOs produced significant, positive results** (See chapter 3). **A majority of the teachers found that the use of LOs contributed to learning. The LOs suited the differentiating the teaching** quite well. An excellent aspect in the LOs is the potential of the multimedia in illustrating the taught theme.

In Ilomäki's book, the LOs are divided into the following categories according to their purpose of use: evaluation, exercise, source of information, vocabulary, guide, experiment, open action, and tool LOs. On the basis of the research findings, it can be maintained that **the teachers have demand for these various types of LOs**. The contents of the LOs should relate to the curriculum and/or the pupils' everyday lives, e.g. hobbies. The teachers also prefer the LOs to be in **mother tongue**, since, according to the teachers, the pupils of the comprehensive school do not yet possess the necessary skills to acquire information in a foreign language. At their best, **versatile LOs promote the flexible use of various teaching methods, as well as different styles of learning**. During the piloting, the pilot

teachers used different teaching methods flexibly combined. **The pupils were inspired by the working on LOs**, and this was reflected in the positive atmosphere.

Although the technical preparedness of the schools was adequate, regarding the implementation of the piloting, it can be stated on the basis of the feedback that **the Internet connections in some schools require renewal**. The utilisation rate of the current ICT facilities of the schools is high, and there will easily be concurrence in reservations. Therefore, in order to expand the LO experiments in the future, more facilities equipped with modern technology are required for the schools. **Upgrading the level of ICT equipment would enable a more flexible use of LOs and various teaching methods in everyday education**. A possibility to divide pupils groups into smaller units also needs to be secured in the future. Expanding of the use of LOs in the schools requires thorough and long-term planning, as well as **financial and pedagogical support** to the schools, which we hope will also be provided for the teachers in the future, e.g. in the form of high-quality ICT training.

The CELEBRATE project was appreciated as new and interesting, as well as **focusing on the current issues**. Among its advantages were its extent and internationality. In many schools the participation in the piloting was given impetus by the enthusiastic teachers. **In the course of piloting, the objectives of the project were accomplished to a considerable extent**. The teachers' competence in ICT was increased e.g. in the CELEBRATE training, which offered new ideas for everyday education. On the basis of the feedback from the teachers, it can be maintained that LOs are an imperative tool for modern education.

## APPENDIX 1 Experiment-specific web feedback form of the FNBE



### EXPERIENCES FROM THE USE OF LEARNING OBJECTS (LOs)

Each experiment is reported separately. This learning event may involve one or more teachers using one or more LOs related to a specific theme. What is essential is how the used LO(s) has/have contributed to the preferred view on learning.

Name of school	
Does your school utilise the OPIT e-learning environment?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Name(s) of teacher(s)	
Teaching group	Grade level: ___ Size: ___pupils
LO(s) used	Titles  URLs
Taught theme (e.g. blood circulation, prepositions or such)	
Subject	

Use of LOs in teaching	Started (e.g. 2.4.2004!!) _____ Finished (e.g. 2.4.2004!!) _____ Number of sessions _____
Working environment	<input type="checkbox"/> ICT facilities <input type="checkbox"/> Group's usual classroom
Teaching method	<input type="checkbox"/> Group work <input type="checkbox"/> Individual instruction <input type="checkbox"/> Independent work
<b>Teaching arrangements</b> (E.g. description of the teaching event preceding the use of the LO, other learning material and equipment used, and continuation of the work.)	
<b>Teaching methods</b> and pedagogical approach used	
<b>Pedagogical experience</b> gained from the experiment (E.g. was there improvement in learning results, or was the teacher's work facilitated/impered by the use of LOs?)	
<b>Evaluation of the LO used</b>  Did the LO bring something new to the teaching? How could the LOs you mentioned be developed further?	
Which LOs should be translated into Swedish? (Give the title and the URL of the LOs, if possible.)	
<b>Submit Reset</b>	

## APPENDIX 2 School-specific web feedback form of the FNBE

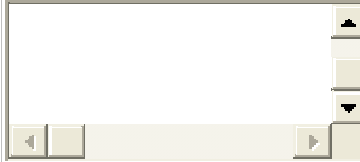


### SCHOOL-SPECIFIC REPORT

Name of school:	<input type="text"/>
Does your school utilise the OPIT e-learning environment? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Name of submitter:	<input type="text"/>
Status of submitter:	<input type="text"/>
Number of teachers participating in the project:	<input type="text"/>
Number of teaching groups participating in the project:	<input type="text"/>
<b>How was the training of the teachers participating in the project arranged?</b>	
a) The training organised by the FNBE in the autumn 2003 was attended by <input type="text"/> teachers.	
b) The OPE.FI user training by OPEKO was attended by <input type="text"/> teachers.	
c) The teachers participating in the above training trained <input type="text"/> colleagues.	

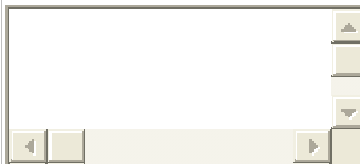
**A brief description of the project arrangements**

(Was the piloting integrated in the normal education, or was a separate project required? How was the piloting attached to the curricula and the normal progress of the teaching? Did the teachers plan the piloting in cooperation, or did each teacher carry it out individually for their own part; did the school administrators participate in the planning of the piloting?)



**The experience from the project**

(The LOs and the Demonstration Portal: Was there a sufficient variety of LOs available for each participating teacher? How do the LOs contribute to the pedagogical development of the school? Did the teachers have sufficient technical and pedagogical competence for the use of the LOs? What kind of LOs would you prefer in the future production? What was the functionality of the DP like? How did the school's equipment and telecommunications connections facilitate piloting? How did the pupils receive the piloting? Did the piloting promote developing of new teaching methods? Was there something that failed in the project?)



**Submit Reset**