Evaluation report

of the project called

4D Simulated and Managed Interactive Learning Experiences (acronym: 4DSMILE)

(reference number of the project: 08/0025-L/4015)

Doncaster
30th November 2010

Content

Introduction

The innovative 4DSMILE project was written to support the introduction of 4D technology into education into two countries, Finland and Hungary. The application was approved on 11th August 2008 is one of 12 TOI applications that were approved in Hungary that year.

The following organisations were involved in the delivery of this project:

Lead partner: Kossuth Zsuzsanna Szakképző Iskola és Kollégium, Hungary

Partners: Doncaster College, UK
Kokkola Vocational Institute, Finland

The following work packages where delivered through the 2 year duration of the project.

Work Package 1 – Project Management and quality assurance

Joseph Halasz was responsible for project management along with Marta Pavics who was responsible for financial matters and Gyula Kosztolányi, who was responsible for educational matters. Later he was replaced by Péter Stégner who is at the same time the headmaster of the Kossuth Zsuzsanna.

Also as part of the project management structure, the Hungarian management were supported by one management liaison from the UK (Helen Richardson) and one representative from Finland (Tom Bjon).
This was an extremely important role within the project as each partner had different term times and many other responsibilities within their organisations. The co-ordination of the partners and scheduling of events was critical to ensure that the project met the relevant milestones, project aims were achieved and delivery remained on track.
It is fair to say that this was challenging at times however the project has been successfully completed and the three organisations are now using the six learning objects to support the delivery of curriculum.

Classroom monitoring – in the Hungarian organization after the projection system was installed at least 300 lessons were carried out in the academic year of 2009/2010. Out of these at least 150 lessons were monitoring lessons where the project member were observing classes in order to gather experiences.
Evaluate test results, assessment activities, tracking system and students progress – the final and formal evaluation took place in Hungary at the closing conference, where every single project member gave a summary about how he or she saw the project from her/his own point of view. To summarize these presentations, it can be said that everyone was satisfied with the results of the project as well as everyone expressed their willingness to continue the work, so after the closing event the project management decided to launch another

project, possibly a Development of Innovation one that would aim to make the 4D method even wider among all the teaching staff at European level.

Work Package 2 – Training 3D/4D technologies

This work package saw 5 IT experts from Hungary and 5 from Finland travel to the Doncaster College (Hungary: László Bambuk, Zoltán Boruzs, Gábor Buncsák, Géza Gémes and József Halász. Finland: Tom Bjon, Kuisma Peura, Sisko Peura, Tarja Slotte, Helena Salli) UK to attend a training session on the use of the 4D technology and software currently being used within Doncaster College. The training lasted 5 days and took place in January 2009. This week was a great time for all individuals from each partner organisation to get to know each other and form the bonds that have obviously made this project such a success.

Feedback from the training included some criticism from the Finnish team as they would have liked more training on how to create the stereoscopic effect associated with 3D. In response to this feedback the project management along with the UK partner suggested to have a further training session and this was carried out in the prolonged project period in Hungary.

The 4D team at Doncaster College have been working with the technology since 2006 and are extremely knowledgeable and competent on the application of the technology and how it is best used. The teams experience has derived from working on a previous EU project called LETS (Leading Edge Technology Solutions). This was a £3.8 Million ERDF project that funded the development of the 4D team along with the setting up of their 4D facilities at Doncaster College.
During this project the team met with many local businesses and trained them on the use of the technology and also developed 4D applications for them to help promote and communicate their products and services. Today the team are using their experience to create and introduce 4D learning objects into Doncaster College.
During the training session this knowledge was transferred to the partners through practical demonstrations and theoretical workshops and certificates were issued to all participants.
After the training week some participants were keen to have further training to expand their knowledge further on the subject. In August all partners were found to have funds available from the bid to attend a further course. Permission to allocate the remaining funds to a further training event was given by the Leonardo office. A further training session was organised as part of the closing conference and experts from the partners attended the session that was held in November 2010 (15th – 19th).

Two experts Jon Martin and Marcin Kasica from Doncaster College delivered the training. An introduction to Unity 3D, the advanced software used to create the interactive applications at Doncaster College was delivered and this covered subjects such as how to import 3D models into Unity, how to apply functionality to these models, how to create the stereo 3D effect and how to write basic scripts. Feedback after the training was positive and all attendees were confident that they had greater knowledge of the subject. The participants were as follows: Hungary: László Bambuk, Zoltán Boruzs, Gábor Buncsák, Géza Gémes and

József Halász. Finland: Tom Bjon, Kuisma Peura, Sisko Peura and Tarja Slotte); besides, on Hungarian side some competent students attended in the course as well.

This extra training was an extremely positive addition to the project and came at a perfect time as it was a way of consolidating all of the knowledge transferred throughout the project duration.
Conclusion: from the Hungarian point of view the training was useful with regards to how to organize similar courses in Kossuth Zsuzsanna, so it was more than a mere training session as in the Kossuth Zsuzsanna there is a strong intention to launch adult education courses, so that was a definite added value for the Hungarian organization. As for the question of how the knowledge is going to be exploited in respect of the teachers, it is quite clear that not all of the teachers can develop learning objects on a daily basis as they have many lessons per week, but because of this the Hungarian side involved teacher assistants into this activity and trained them to learn this software, so this is the way that this activity can be sustained in the future.

Work Package 3 – Learning Object Development

Seemingly this part of the project was the most time consuming and also the most critical to get right as the outputs from this would impact heavily on the quality of the remaining work packages. Feedback from the British partner highlighted the importance for a detailed design brief for each of the 6 learning objects. Work relating to this was slow at the beginning as it was so important for each partner to understand and communicate to the British team exactly what needed to be included in each learning object and how it would meet the curriculum. There were several conference calls between all partners as all of the relevant information was put together.

This was an important learning experience in as all partners now have an understanding of how time consuming but important this part of the content creation is. It also highlighted how important communication between the developers and the teachers is. Should the partners participate in a further project of this nature the design briefs will be put together far quicker.

The first draft of the 3 Hungarian learning objects was developed in time for presentation at the Hungarian roadshow in May 2009. The objects were positively received and after the roadshow feedbacks were provided by the curriculum team in Hungary and further enhancements were made to the learning objects during the months after the roadshow.
The first draft of the 3 Finnish learning objects were delivered prior to and presented during the Finnish roadshow in November 2009. Similarly to the Hungarian objects they were received positively and enhancements were made to the objects during the months after the roadshow.
However, it must be emphasized that in this part that the real added value of this WP is not the learning objects themselves, but the knowledge that the partners learned how to cooperate in the activity of creating learning objects. It would give them an advantage in the future if it is decided to undertake jointly curriculum development assignments in the future.

The purchase of capital equipment was also part of this work package. The Hungarian partners purchased their equipment in April 2009 and it was delivered in time for the roadshow in May 2009.
By purchasing the equipment it gave the Hungarian partner lots of experiences as they had more than a year to experience the system before the project closes. After the system was delivered they started to use it in the classrooms, also testing was carried out in every aspects, so the result of the testing was that they became experts in projection systems, for example they became aware of the difference between circular and linear systems, also the hardware items of the 3DPT, so the testing period gave enough expertise to start the everyday teaching activity after the project closes.

The purchase by the Finnish partner took a little longer and their equipment was not delivered until summer 2010. One of the weaknesses of the project was the activity of purchasing the system later than it was scheduled, and it was because the Finnish team this way have not had enough experience in using the system in different aspects. Also, as it is a new technology, in retrospect the Finnish partner should have relied more on the UK partner on the system specifications.

Work package 4 – Testing and piloting

Hungarian partner

At least 300 4D lessons took place during the project lifetime. These lessons took place each week in the testing period and last for 45 minutes each. Students reacted positively to the use of 4D within their lesson and often ask when 4D will be used again. As for the impact of these lessons it must be emphasise that this much positive reception never before happened with any kind of equipments in the Kossuth Zsuzsanna, so obviously this is even more engaging than any other technical equipment or simple 2D projection systems, and most importantly the students enjoyed these lessons and were really enjoyable activities to the teachers as well, so besides learning they felt different in a positive sense which unfortunately not often the case in traditional lessons.
What the students like about it is the fact that this way they understand more about the subject, because in most cases their behaviour often not proper as they don't understand the course of the lesson. Also, this method gives them some self confident by presenting the materials in a very understandable way.
With respect to the intention of introducing the 3D method on a permanent basis, in the Hungarian school, unfortunately the teachers who did not attend in the project are still reluctant to use the system by their own, so it is suggested that at the beginning they would need a teacher assistant to attend in a 4D lesson in order to help out to handle the system.

Finnish Partner

As for outcome of the transfer, from the point of view of adapting organizations, the actual result of 3D application was different from how the Doncaster College applies the 3D

methodology. Moreover, with regards to the two adapting organizations the application approach is different from each other: while the Kokkolan ammattiopisto uses mainly the 3D stereoscopic method for providing further training for the students specialized on CAD software, the Kossuth Zsuzsanna tries to involve as many teachers and subjects as possible in order to maximize the number of lessons when the 3D methods are used.

Work Package 5 - Study Exchanges

In the application it was planned that two teachers from Hungary and two from Finland would attend in the study exchanges, however this number has extended as a request based on the contract modification. The representatives had met previously with their team and travelled to the other partner to observe how the objects were being used to enhance curriculum delivery. With this being such a valuable part of the project in terms of how the learning objects are best used each partner had identified that they were interested in feedback relating to:

Hungary: from the Finnish side the teacher exchange took place during the same week as the closing event and the final training course due to the Finnish team being in Hungary in the capacity of observing lessons as well. The week was full of events but it was also a responsibility from the Hungarian side to demonstrate the way of how the Hungarian partner use the 4D classroom.

Work Package 6 – Dissemination

Several dissemination activities took place to communicate and promote the benefits of the use of this technology within the curriculum. These activities were:

Creation of project webpage

The domain www.4dsmile.eu was purchased and a site was developed to communicate activities as they took place. The site was published in Hungarian, Finnish and English. It was agreed that in the case of future projects the website would be updated more frequently and would include more project news updates.

Roadshows

A one week roadshow took place in Hungary during May 2009 and Finland during November 2009. During the roadshows presentations were given by the British team and teachers from each partner. All partners attended this event along with approximately 400 delegates from local authority, local and national businesses.
Students and teachers from the hosting partners also attended when the event was held in their respective country. Local media also attended and the Finnish roadshow and the event was broadcast over the web to capture a wider audience. Both events were also captured in the local newspapers.

Footage from the Hungarian roadshow was later developed and presented on DVD at the closing conference in November 2010. The video is available on you tube http://www.youtube.com/user/fusedworks#p/u/0/tKYW7_it9V8 . Promotional material such as banners, leaflets and DVD's were produced and used to promote the roadshows. They were also used at subsequent events/workshops by the partners.

Presentations at Leonardo Office

The first event was an information day for the possible new applicants for the Transfer of Innovation call, this happened in November, 2009. The Hungarian Leonardo Office organized this meeting in order to inform the applicants about how to apply to TOI projects, so in the morning representatives of the Leonardo Office made presentations about different aspects of the call (preferred activities, rules of finances etc.) and after this two ongoing projects (one of these is obviously 4dsmile) were presented as a good examples of how to apply and carry out TOI projects by a 30 minutes long PP presentation about how the project started, the subject and aims of the project.

The second event was the 15th Anniversary for Leonardo in 2010 and the project has been invited to a conference on 19th Nov (photos on this link):

http://www.tpf.hu/pages/content/index.php?page_id=1058

Here the project was exhibited along with as far as 14 other projects. These 15 projects were selected and invited by the Leonardo Office to the anniversary event as the most successful projects of the last 15 years. The 4dsmile "booth" was a table, where was placed the 3D computer with active glasses in order to inform the visitors about the 4dsmile.

Open days in Finnish and Hungarian schools
Open day in Hungary means that the students from the last grade of the primary school (primary school in Hungary provides 8 year general education from 6 to 14 years old pupils) are allowed to have couple of days off from the last grade to visit secondary schools in order to make a good decisions about their futures. All secondary schools at this time of the year naturally try to attract the students, and also quite naturally the Kossuth Zsuzsanna exploits all the technology available, most importantly the 3D projection system and its content, and the outcome always the same: the students enjoy this and the 3D technology is one of the strongest arguments to choose Kossuth Zsuzsanna and not another possible secondary school.

Besides the open days, lots of other events (conferences, workshops etc.) were organized during the course of the year, and the KZS management always shows the technology to their guests. On one occasion the school had a group from one of the kindergartens; and they had a fantastic experience as the kids were screaming, wowing and waving!

Closing conference

The closing conference took place during November 2010. This coincided with the second more advanced training course that was delivered by the British team.

The main purpose of the closing conference was to bring all partners together and share the 'lessons learned' through the project. Each individual from the project gave a brief presentation and suggested ways that the project could be sustained. Feedback from this event is summarised below under the heading Lessons Learned and Future Sustainability.

Lessons Learned and Future Sustainability

The following lesson learned and suggestions for future sustainability should be considered when moving forward from this project:

3D hardware

The original plan was to purchase a 3DTV however after the demonstration of technology by the British partner the Hungarian team concluded that they would be able to benefit more students at one time if they purchased a 3D projector system rather than a small 42" 3DTV. The projected image was far greater in size and maximum impact could be achieved with this system. Permission was sought from Leonardo before they made this purchase.
The Finnish team kept to the original plan (with some amendments) and decided to purchase a 3DTV with active eyeglasses.

Train the trainer sessions

The 'new' 4D technology is perceived by many teachers in the partner organisations as being difficult to set up and use. Feedback suggested that there is a perception of it being a hindrance to curriculum delivers rather than an enhancement. To overcome this and help promote its positive impact a series of train the trainer sessions should be held in each organisation to filter down the knowledge and familiarity of using 4D that has been obtained by individuals during the project. So, it is the suggested way to make the 4D method popular among the fellow colleagues. However, the way of how the training session is conducted crucial as formal training session would make any difference. It is our suggestion to reach the teachers individually and possibly use the tutor teacher method to train them; it is also suggested that the 4dsmile project members should observe a lesson of a targeted teacher and provide her/his all the training and assistance in her/his own lesson. A tutor would do this assistance as long as it is needed; it needs human resources to be provided, though this investment would be sure returned after a short period of time.

Workbook

It was felt that a workbook would be helpful to both organisations and it was suggested that this be put together with the main focus of helping teachers that weren't involved in the project, in order to understand how 4D can be used to support their delivery to students and enhance the learner experience.

The workbook would also include an 'easy to use' guide of how the 4D equipment works. It was felt that many teachers have avoided using the hardware as they are unfamiliar with it's set up and fear it to be more difficult to use that it really is.

Timetable 4D lessons

The Hungarian partner plans to include the 4D suite into timetabling so that lessons are actually held in the suite and therefore encouraging teachers to use the technology by making it easier for them. The timetable will be distributed via new digital software to make access easier for all.

Presentations

The Finnish team presented the project to board of education along with other institutions in Finland and hopefully they will get the support they need to produce further learning objects.

Exchange of good practice

Now that all partners are competent in 4D the focus should now be on developing best practice in its use. It was suggested that further sessions should take place over the next few years to keep abreast of the use of the technology within the classroom and continue to learn from one another. Ultimately the partners could transfer this technology out to further organisations within Europe.

SWOT analysis

• Strengths	• Weaknesses
• Pedagogical benefits such as: • the system has a benefit that there is no similar device available the students at home, so this is one of the reasons it attracts them; • very strong benefit that the 4D technology is currently the most sophisticated projection technology available; • if the system is properly set up, then it is certainly a benefit to easy to handle; • within the education as a general area there is the vocational education, and most of the trades requires advanced ability of explaining complex objects;	• learning objects are required specific to each subject; • time consuming to create learning objects; • an average school does not have a capacity to create a 3D LOs (unlike a pp presentation, which is very easy to prepare); • some settings need to be adjusted when setting up learning objects; • the technology still considered to be expensive nowadays as a good 3D PT is approx. 20.000 euros; • in order to install a 3D PT certain adjustments need to be done before the lesson starts (to make the room darkened, to protect stealing the

•	eyeglasses) • it is always a certain weakness if something is new as some people suspicious about it as a "useless' device; •
Opportunities	Threats
• technology is attractive, and it becomes more and more attractive as the technology is improving; • educational case studies exist worldwide; • as the technology are introduced more and more educational organizations it would boost the educational 3D content market and hopefully a really wide range of i3d LOs will be available in an affordable price; • similarly, if the technology proves to be effective in the classroom, then the 3D equipments would be even more user friendly; • the utmost opportunity would be that the 3D technology really would improve the level of education;	• lack of skills make teachers resist; • unpredictable hardware and software environment; • at 4dsmile project level the only serious threat would be if the partners would fail to address the 3D methodology into the wider group of staff;

Reasons to use 4D

1. Motivates students and teachers

   This is evident from the project. Methodology projects are normally tedious and not enjoyed by lecturers and many of the outcomes are not easily used in education. The 4D is good because they don't have to motivate the students or as many teachers to participate.

2. Efficiency

   Using 4D is efficient because it is based on visibility. One teacher quoted that approximately 95% of information is visible. This however is not enough. We have to know how efficient it is and further evaluations should be carried out to prove and document this.

3. Easy to handle

Learning objects that are produced in the future should be produced in a way that that a user does not have to do anything with them i.e. adjust stereo.

4. Applicability

Future learning objects should be tailored to suit the structure of teaching. e.g. average length of lesson in Hungary is 45 minutes.

The best learning object is one that can be taught in as many lessons as possible e.g human body. This can be taught at different levels from kinder garden to adults. Design subjects that cover as big an audience as possible would be best.

5. Accessibility/availability

As the use of this technology is promoted software and hardware availability will improve. All partner organisations should continue to promote its use.

Appendix:

Handbook of sustainability – recommendation to be adapted by the Kossuth Zsuzsanna and Kokkolan ammattiopisto (as adapting partners)

Oktatás és kultúra
Egész életen át tartó tanulás program
LEONARDO DA VINCI

TEMPUS KÖZALAPÍTVÁNY

4DSMILE Project
Handbook of Sustainability

This handbook was prepared in the scope of the 4Dsmile project
(4D Simulated and Managed Interactive Learning Experiences)
Reference number: LLP-LDV-TOI-2008-HU-015

November, 2010

Content

Foreword

Background of the sustainability report

This report tries to summarise the principles, methods and the quality assurance systems of the 4Dsmile project sustainability period.

In addition to providing an evaluation and a summary of the project activities the main objective is to list the ways in which the project can be sustained in the longer term. As with any other EU funded project 4DSMILE can be sustained for at least 5 years. The partnership intends to sustain the project not only because it is compulsory but also for the benefit of each partner as the project has made significant contribution to widening educational methods in the adapting organisations.

This document should act as a guide for the adapting organisations to use support the use of the technology within their organisations. Each organisation may want to adapt this to suit their own needs and priorities. The main target group for this document are the teachers themselves because this would function as an information guide for them by giving clear instructions and advice on how best to use the 3D classroom and the 3D content prepared during the 4Dsmile project.

Information sources used for this report

The report is based on many personal consultations with representatives of both partner organisations including teachers and project members. The results of the surveys were also taken into consideration along with points raised during the closing conference which was an excellent opportunity for more in depth discussions around this subject and was a perfect occasion for summarising all partners' thoughts.

Challenges for sustainability

The main challenge for sustainability is the fact that once the project is closed and the funding ceases there is no financial source dedicated to ensuring the project is sustained in both adapting organisation. The project was focused around the transfer of technology and methods to the adapting organisations, Kossuth Zsuzsanna and Kokkolan Ammattiopisto; however during the course of the project Doncaster College, the transferring organisation also learned some valuable lessons with regards to the use of 3D within education and so it was felt important to feedback on the experiences of all three organisations in this document.

With regards to the expectations of sustainability it is very clear that the 3D content together with the 3D equipment are expected to be used on a daily basis. Another important aspect of sustainability is the need for all three partners to continue their co-operation regardless of future funding. The sustainability cooperation should include and focus on the following activities: 1) sharing thoughts and good practices about the daily use of the system, 2) Sharing 3D content that is developed individually.

A further important input to this report was the teacher exchanges and the class observations in Dabas and in Kokkola. The survey was put together by the project team and was carried out by the teachers and the students who attended the 3D lessons. The questions used were deliberately simple to ensure that they were not misunderstood resulting in a false conclusion. The questionnaire was also used as a sample for future surveys relating to the 3D methodology. In addition to the consultations, survey and the closing conference the final input for this report came from the last consortium meeting that happened in Dabas in November, 2010.

Technological environment

In both adapting organisations the use of ICT was a good starting point to introduce the 3D technology. In Kossuth Zsuzsanna the interactive boards have been in use since 2002 and up to now there are 15 interactive boards in the Hungarian school. As part of the active boards

system installed a voting system is available with may be a good basis for making digital evaluations in the future.

In addition to the technological basis it is also important that the Kossuth Zsuzsanna has experiences in carrying out a wide range of projects including Leonardo mobility, Comenius partnerships and moreover some quite large projects financed by the European Social Funds and European Regional Development Funds. From the 4Dsmile point of view these experiences are a good basis in respect of sustainability for the 4Dsmile.

Kokkolan Ammattiopisto also has a wealth of experience in European Leonardo da Vinci projects as a coordinator and partner. They co-ordinated one of the very first Leonardo pilot projects starting in 1995 (Teaching Chemistry by Vegetable Oil Theme). They have also had one share project in Bosnia and they have been partner in three Leonardo pilot/transfer of innovation projects. Through its networks the institute has gained excellent international connections in relation to working life and other institutes. They have several co-operative schools and places for practical training in most European countries and China. In the Department of Technology they offer the use of modern technology in various ways including network based studies. The organisation is well known for its strong relationship with the local business community. ICT including 3D technology and new technologies are an integral part of teaching and training in Kokkolan Ammattiopisto. Through this project it was evident that they have the most advanced CAD expert in the partnership; Kusima Peura has many regular CAD lessons with his full time students. This aspect is important with regards to 4Dsmile sustainability and 3D production in particular as Kusima and his team could develop a strong 3D content developing unit similar Doncaster College's 3D unit that is now called Fusedworks (www.fusedworks.com).

As a consequence both organisations technological conditions are promising with regards to the chances of high level sustainability.

Summarizing the latest 3D stereoscopic equipment

This project was not around pure technological transfer as most of the project activities were about methods, ways of application, exchanging of best practice, teaching experiences etc. It is also clear that 4Dsmile sustainability cannot be separated from the latest technological conditions and the available equipment because after all there is no 3D methodology without 3D equipment. In this respect the term 'equipment' refers to any and every kind of platform and device that are able to show images in 3D and in 3D stereo. From the sustainability point of view, it is an important condition for continuous development that both the adapting organisations should be aware of the latest technological developments. The 3D stereoscopic applications are in a constant state of development and therefore the technical opportunities have not fully been recognised and exploited as yet.

Below is a summary about the latest technological ways of how the 3D images can be shown in an educational environment. This takes into consideration the financial aspects of an average secondary school/college so the extremely expensive multiwall systems are not listed below.

As a starting point there are several technical ways of showing stereo images and more and more ways are being developed all the time. As we are mainly talking about education environments, it is another crucial point that before deciding to purchase 3D equipment every school has to be aware of it own needs and classroom environments as some systems may be more suited to certain classroom conditions.

The Kossuth Zsuzsanna purchased a 3D Portable system which has two projectors and from the point of view of daily use it has the following characteristics:

- The system is contained within a wheeled case and is not fixed in any way but rolled into place. This design has some inconveniences in that it can be easily knocked by students and then the projector alignment has to be fixed again. This means that the supervising teacher must take on the extra responsibility to ensure the safety of the system while the students are coming in and out of the

classroom. It is also advised not to form groups or any activities that includes motion or action in any way.

- The polarising lenses are an integral part of the system that are placed in front of the projectors. If the lenses are removed the projectors can be used as traditional simple projectors so this is an added value. A teacher must be very careful about removing or placing it back again. It is also important that the two projectors (if one is used separately) must be used proportionally as disproportional use may result in misalignment.

- Eyeglasses are supplied with the unit and these need to be warned in order to view the stereo effect. As a consequence it also puts responsibility on the teacher's shoulders as he/she has to check that all eyeglasses are returned after the lesson is over. Experience has shown that this can work well and no incidents of misplaced glasses were recorded. Students were all very well behaved and understood that not returning them will have no advantage to them in the future.

The main factor required to use the system in full stereoscopic mode is the availability of 3D content and this content should be easily accessible by the teachers in the subjects specific to them. It is therefore advised that the learning objects are organised in a very clear folder structure and the files should be named in a way that the content can be easily recognisable at first sight. The files should also be named in the local language; in this case Hungarian and Finnish because during the project English or individual names for the files have been used which unfortunately has discouraged the teachers.

3D lessons are not separate lessons, but rather very 'normal' ones and should be registered in a way that the other lessons are registered (registering means: indicating the absents and to record the curriculum of a particular lesson). Both adapting organisations have a different class register systems and whilst these were sufficient for this project in the longer term it is advised to have a digital class register which would mean that statistics relating to the use of 3D could be captured very easily.

In Kossuth Zsuzsanna, the digital class register has already been introduced and as a consequence an easy summary can be retrieved at the end of the year about how many 3D lessons were actually held. As it is mentioned above the general aim is to maximize the usage of the 3D system and classroom so in this respect the school management should give every help to the teachers to do so. It could be a clever instrument if the PC that runs the 3D system is connected to the school's local networks as this way the teachers can enter into the 3D room after teaching in order to prepare the forthcoming lessons. By doing so the teacher may need to access to the local network for reaching its curriculum or study aids so it is the school managements' responsibility to manage the local network accordingly.

A digital class register is useful because not only can the 3D lessons be recorded and retrieved easily but this way the teachers can communicate with each other through the platform by exchanging teaching ideas, good practices and curriculum units.

Added value to the 3D stereoscopic system – one the main added values is the stereo effect, since this is the only thing is for sure that the students cannot experience at home and because of this it is an appropriate tool to raise interest and keep students engaged.

Target groups

The main target group of the sustainability period (as it was in the project lifetime) is the students of the adapting organisations. This means that all students of Kossuth Zsuzsanna and Kokkolan Ammattiopisto are target groups regardless of their age or classes. It is true though that in some cases the 3D methodology is better used than in other cases. For example in some very rare cases the 3D effects don't have any added value (mainly in some theoretical subjects, like legal studies), although this is also dependant on good ideas and creativity so as not to exclude the face that in the future there will be excellent 3D learning objects in those theory subjects as well. However, there are some subjects that the 3D effect provides an excellent added value e.g. architecture, logistics, commerce, textile, timbering, metal work, hairdressing and other trades. Besides this there is primary use in most cases of science subjects, like biology, physics, astronomy, chemistry etc.

Taking into consideration the target groups both organisations are in a good position to reach other VET institutions. In Hungary the Kossuth Zsuzsanna is part of a wider school association called 'Orszaágközepe TISZK' which includes five further VET schools in the area. The association means that these schools are in regular contact which is a good basis for disseminating and validating the 3D methodology. Similarly, in the case of the Finnish organisation, the Kokkolan Ammattiopisto can reach easily all the VET organisations in Central Ostrobonia so it is strongly advised that the direction of dissemination in the sustainability period should be these schools.

In order to maximize the lessons taught in the 3D classroom it is advised to 'outsource' the classroom in vacant periods so student groups could come to Kokkola and Dabas and this way other potential stakeholders could experience/test the system.

Local Organisations

As Dabas has 17.000 inhabitants and Kokkola over 40.000 inhabitants there is a potential for dissemination the system to the local organisations e.g. primary schools and kindergartens. We suggest the kindergarten children in particular because during the project in Dabas a group of children visited in the 3D classroom and the outcome was frantic and fantastic at the same time as they became mesmerised by the graphics and effects. Based on this success the school assumed that this could be true to the students aged between 6 and 14. It is strongly advised for the partnership to explore the use of 3D with other possible target groups.

One of the main dissemination goals was for the project to make the 3D methods known at national level; both in Hungary and Finland. Whilst there are not enough resources to make an intensive dissemination strategy it is still worth to considering as target groups other schools in the country. The suggested method of dissemination towards them is very simple both to the Kossuth Zsuzsanna and Kokkolan Ammattiopisto. It suggested that a invitation

to view the technology be added to each organisations website. Here conditions of the visiting the school and seeing to 3D system would be included.

Timing of the project

It has to be said that project timing was near perfect since it is clear that education needs such methods, techniques and technologies that are able to keep up student's.

The project began at a time when 3D technology reached the level of applicability in a real classroom environment. It is also true that the 3D stereoscopic application is brand new, not only in Finland and in Hungary, but also all over the European Union countries. That said the project team believes that the methodology is not fully worked out yet and although the 4Dsmile project pioneered the first steps of using it in a real classroom environment, widespread usability will require a very strong quality assurance back up as well. The project tem can confirm that it is worth continuing to proceed on this path as this method is ideal for raising student's interest. If there is 3D content available and a competent teacher using this future lessons could be more fantastic and enjoyable than ever before and partners believe that once a teacher experiences this he or she would be the first to demand being in the 3D classroom.

From the point of view of usability, it is important to state that the 3D classroom and methodology cannot independently exist in the school environment in a broader sense. If 3D methods are backed up by other local ICT networks, systems or programmes the 3D classroom would be even more effective. So, it is a crucial aspect in the sustainability period that these systems now communicate and support each other. The most important systems that can support the 3D methodology in particular are:

- Digital class register
- Digital evaluation and assessment system
- Learning management system

In the following sections these systems are analysed strictly from the point of view of the 3D methodology.

Digital class register

These days there many digital class register systems are available not only in Finland or Hungary, but all over the EU countries. Some of them are free, some of them are to be paid for, some countries need to be accredited by the Ministry of Education, in some countries there is not such need. It has to be emphasised that the digital class register has many advantages, and backing up new teaching methods (in this case the 3D method) is just one of them. In the case of the adapting organisations the Kossuth Zsuzsanna fully introduced the system in all classes of the organisation. In this respect the organisation is an excellent case study to show how a digital class register could support the 3D teaching process. One advantage that can be seen now is the ability to analyse classroom distribution. The information about specific teachers and when they taught a lesson in the 3D classroom is available and can be used for user statistics.

The digital class register is naturally able to store the data that the paper based register recorded; subject of the lesson, when it was held, absent persons etc. The digital register is able to store additional data such as what kind of 3D material are used so giving a clear indication to the school management as to what the most popular learning objects are. Information such as this is useful because one of the most difficult parts of developing 3D objects is the creative work. This area often involves a brainstorming session between the developers and the subject specific teaching staff. This kind of digital feedback tracking system would help in giving ideas to creating or purchasing further 3D objects.

The digital class register is able to store study aids digitally to a particular lesson. It could be any digital file format and in fact it is up to the teacher what sort of study aid is uploaded to a 3D lesson. The opportunity of linking a study aid to a lesson and to a 3D object is very important since this way lots of other methods/resources can be combined with the 3D methods.

Digital evaluation and assessment system

The digital evaluation system is a similarly clever application that enables users to store student assessments digitally which is more cost-effective compared with the paper based evaluation. The reason that this system is mentioned in the 4Dsmile sustainability report is the fact that it is suggested to create and distribute regular, widespread digital questionnaires about the 3D system designed to capture information about its advantages and disadvantages. This way up to date statistics of this kind could be maintained and would be more precise as it would be based on a greater number of answers. Also, particular learning objects and particular 3D systems could be tested in this same way and most importantly the students' results could be measured compared to the traditional way of teaching. Measurement of students would be as important as measurement of teachers so in this way teacher attitudes could be assessed towards the efficiency of the 3D method. As for the content of the measurement in the sustainability period, the following subjects for the questionnaires are suggested:

- 3D efficiency and methodology in general to a particular class (it would make sense to understand if there was significant difference in attitude towards the 3D system comparing one group to another. For example whether there is a difference in preferring the 3D method in age, in different professions etc.

- It is also worth measuring a particular learning object during whilst it is being prepared. Preparing 3D (or any other digital resource) learning objects is a creative process and needs lots of feedback from the future end users which is very often difficult. In some cases the outcome needs improving as there was no real feedback during the preparation process.

- A questionnaire to establish how the 3D room should be furnished. This is an important area as the arrangement of seats and lights are important aspects with regards to the added value of the classroom. The seats can be arranged in a way to form small groups and there should be the possibility to make notes (if the 3D

content is projected, naturally there is no need to see anything in the room, but it may be worth considering installing small spot lights that don't influence the quality of the 3D projection. These small remarks may seem irrelevant however it was an important aspect of the teaching experience and such small things influence the lesson as a whole. It is strongly suggested that student's ideas in relation to this are collated.

- The assessment system is an excellent tool to carry out tests or regular school exercises. Tests could be completed when some of the objects are projected and the students would answer questions relating to the projected objects. In this case there should be PCs available to every student which is a suggestion that should be considered and could be related to many other purposes.

Learning Management System

Similarly to the class register and the assessment system the learning management systems are also popular instruments to back up teaching processes. These systems are particularly useful in managing digital content and can be reached by students online. Tests could be completed by the students, teaching materials could be sent etc.

It is also a valuable tool for teachers preparing curriculums, digital study aids and as an added value the system organises the digital materials according to a given standard. In respect of the 4Dsmile project, the main advantage and opportunity would be to organise online courses to the students who attended the 3D lessons.

The advantages of the LMS systems are:

- A register available with information on the users. It also registers the usage of students so a teacher can check who uses the system and how frequently;
- Marks and testing results can be recorded in the system;
- It could function as an online database and some elements of the 3D curriculum content could be uploaded as well (not in stereo but in some cases the students) ;

- The LMS system could function as a communication platform. It is very important that the teachers who use the system communicate with each other about their experiences. The platform can offer help and guidance in this area. The school management could also follow up the process of its use;
- The 3D system is motivating itself but backed up with the LMS system the two instruments together could reach more students and persuade them to participate in the tasks;
- The system is good for the teachers to carry out self evaluation about their habits of how a teacher conducts a lesson;
- It is an excellent tool to organise web conferences, web seminars in any subject related to 3D lessons;
- The system supports virtual group work;

What is important from the point of view of the project is that the LMS system is an excellent instrument to share any 3D learning object (not in stereo) for students to revise from.

The LMS system can also be used in respect to the fact that in the 3D classroom there is not normally much opportunity to support group work. Usually a teacher would show the 3D image in the darkness and the student would listen to the teacher's explanation.

Guarantees of sustainability

One of the main purposes of this document is to validate the use of the 3D content developed in the 4Dsmile project. The question is how can a single document validate the project? The answer is that it is advised that both Kokkolan Ammattiopisto and Kossuth Zsuzsanna would accept this report as a part of the official documentation of the school and based on that both schools can make a schedule about how to carry out these tasks.

3D classroom and conditions of permanent use

It is a basic condition of any system that it should be foolproof. If the teacher would try to switch the system and it doesn't work then it is almost sure that he/she would not try it again. Similarly, after switching it on the system should work for the duration of the lesson. If this was not the case it would result in the same effect and the teachers would no longer use it. This has been evident in the use of other systems that have been procured over the last few years. The new methods like the 3D stereo methodology should have not only good equipment and good quality results but also the 3D method requires good marketing as well. Another important aspect is that the system should be user friendly since the easier it is to handle the more teachers would use the system on a daily basis. It is in fact true that the system is very user friendly itself, but it is also important that the ICT expert do not make any changes in the file structure of the PC. They should not dismantle the system without notifying other the users. These requirements may sound very low level but a common set of rules are very important in order to use a 3D classroom.

To summarise it is recommended that the following conditions are necessary:

- As the most important target group are the learners of Kokkolan Ammattiopisto and Kossuth Zsuzsanna from this year onwards the systems should not be removed from the school for outside presentations until lessons are over;

- There should not be any more administrative requirements for the teachers if they intend to use the system so the 3D lesson should be a usual lesson with the same duties and certainly not more tasks so as not to hinder its use.

- The system should be adjusted in a way that switching on and off should not take more than 3 minutes from the lesson;

- The 3D system is backed up by a digital assessment system so in the longer term the school management would have feedback about statistics of permanent lessons;

- The 3D system is backed up by an LMS system that makes it possible to carry out further studies at home or at the school library via a PC;

- Both schools (Kokkolan Ammattiopisto and Kossuth Zsuzsanna) must include the technology into their procurement strategy with the intention of purchasing further 3D content since the 3d teaching is sustainable only if there is ample range of 3D learning objects;

- Accessible, clear and understandable file structure for the 3D learning objects should be in place;

- At the beginning of the academic year it is advised that a resource analysis is carried out to identify what learning objects are available to support this;

- Refer to the 3D method in any relevant institutional charter ensuring that 3D is part of the official school policy;

If the above mentioned conditions are met then this will improve the chances of 3D methodology being used in the longer term.

Preparing for Sustainability

Once the project management team has submitted the final report to the financing body and it is approved the project will close. That said the communication that has started as a result of the project should not end. It is extremely important and primarily the job of the project manager to keep the partners together. This is good practice but also is compulsory under the terms of the project contract in that the project should be sustained for at least five years. All partners believe that the 3D technology backed up with clever teaching techniques adds significant value to education and this should not be ignored. One of the strengths of the project was its simplicity as the main activities (training – curriculum

development – testing and piloting – exchanges good practices) are easy to understand and easy to disseminate. In summary this successful project is an excellent starting point to a successful sustainability period. In this respect the most crucial activity to maintain sustainability is the delivery of 3D lessons on a regular basis by both organisations. As the project was a transfer of innovation project sustainability will also be reflected in the continuation of the exchange of ideas and the exchange of further 3D objects by both organisations.

During the consortium meetings there have been discussions around the sustainability activities from the perspective of a regular teacher and the most important activity identified is the service the school management provide in terms of supporting the teachers to identify the lessons would be most appropriate to hold in the 3D classroom. It is advised that former project members should be distributed amongst teaching staff to look at approximately 10-12 syllabuses each with the view to identifying appropriate lessons for the 3D classroom. Partners are confident that the teachers would not resist this and believe that this is an excellent way to strengthen the professional relationship among members of staff. Support could also be given through classroom observations where new ideas could be exchanged and professional confidence reinforced.

A further experience of the project was that some of the teachers were reluctant to start using the system as they were not sure of the pedagogical advantages. It was one of the 4Dsmile project ideas to identify the foreign language lessons as potential exploitation areas. In Finland the language teaching is traditionally very successful whereas in Hungary it is not. The Hungarian partner reported that the students don't have good enough results when compared internationally. This seems an obvious opportunity for the language teachers to test the 3D system to see if the technology can help improve their results.

One other area that has not been fully exploited during the project lifetime is the benefits to recruitment policy as the use of 3D within the organisation could be perceived as forward thinking and at the forefront of the latest teaching methods. This would strengthen recruitment and retention of staff. It would also contribute toward the recruitment of new

students that have to make the difficult decision of what secondary school to select. In this respect both the Hungarian and Finnish organisation would clearly exceed against their competitor organisations.

It has been emphasised above that the number and quality of the 3D objects are a crucial factors for the sustainability of the project. The most effective method of capturing this information would be to ask the teachers what kind of 3D materials and content should be procured. This would be an excellent satiation to exploit the digital questionnaire system.

This report is primarily a summary of how the project should be sustained in the forthcoming years so different suggestions have been listed above. There is another possible added value of this report and that is the opportunity for the report to function as a handbook for the teachers who will be using the 3D method. This document could be adapted and included in the charter documentation of each organisation. It is also advised to share this in the relevant platforms of the organisations such as the school web page, intranet, digital class register etc.

In order to reinforce teachers' confidence around the 3D methodology it is advised for the school managements to consider organising a teacher training course. This doesn't have to be an accredited or state organised course but instead could be conducted by the former members of the project with the possibility of some parts being held within the project partner institutions.

3D curriculum development

3D learning objects could be acquired by purchasing 3D content from the education market however it is also a possibility to continue the curriculum development with the existing capacity of each organisation. The Finnish organisation has a strong department that specialises in CAD production so they certainly have the ability now to produce further 3D learning objects for other departments. In Kossuth Zsuzsanna the teachers have certainly acquired the skills to produce 3D learning objects; however they would need to make some decisions with regards to defining clear responsibilities for maintaining the 3D curriculum

developing team. Currently all Hungarian project members are full time teachers so provision would need to be made to free resources to develop further 3D objects.

There is also an opportunity to maintain a development team as both adapting organisations have purchased the developing software including needed to produce fully interactive learning objects in 3D stereo. Lastly both organisations are now competent in putting together thorough storyboards which are crucial element when producing high quality 3D learning object around specific learning outcomes.

Doncaster, 2010. November

Appendix

List of learning objects procured during the project (not taking account the learning objects that the project team developed)

(Architecture) 1

1.1 Ambraxis
1.2 Anchors
1.3 Apartment
1.4 Apartment 2
1.5 Art gallery
1.6 Bechtel airport
1.7 Chamber
1.8 Chinese temple
1.9 Church
1.10 City of troy
1.11 Classic room
1.12 Colours
1.13 Fitness room
1.14 GIS city
1.15 Hall
1.16 House with ext.
1.17 Italian room
1.18 Ivolve city
1.19 Lojtnanten
1.20 Old Chinese school
1.21 Poseiden buildings
1.22 Seoul city
1.23 Siquant river
1.24 Tacoma Narrow bridge
1.25 Virtual Reality
1.26 VR concave
1.27 Wirlpool1
1.28 Wirlpool2

(defense) 2

2.1 737_xbox
2.2 CH850
2.3 City explosion
2.4 Control Room Smoke
2.5 F16
2.6 Hls
2.7 Honey well flight
2.8 Infomax smoke
2.9 knife
2.10 Kwangyang

2.11 Oil Rig smoke Olajfúró sziget füstölés
2.12 Pistol
2.13 Tiger tank
2.14 Trinindad

(Extras) 3

3.1 Eon Icube 3 wall reconfig
3.2 Eon Icube 4 wall reconfig
3.3 GIS landscape
3.4 Goul dance
3.5 IDC
3.6 IPCM
3.7 Multilayer (többréteg)
3.8 Office room (iroda szoba)
3.9 SBL
3.10 Wolf (farkas)

(Furniture) 4

4.1 HON chair
4.2 Kitchen
4.3 Roomconfig
4.4 Viking desk
4.5 Werner restaurant

(Historical) 5

5.1 Athens
5.2 Castel plaza siquant
5.3 Colloseum
5.4 Gotheborg

5.5 Heritage Dubai
5.6 Kingtut
5.7 Korean Museum
5.8 Madonna
5.9 Portugal town
5.10 Senate
5.11 Viking
5.12 Wyland Gallery
5.13 Zhongs house

(Industria) 6

6.1BOC pump
6.2 Car front
6.3 Compressor
6.5 Engine1
6.6 Engine2

6.7 Excavator
6.8 Fishing reel
6.9 Formula1
6.10 GP 7000 engine
6.11 Grill
6.12 Jet engine
6.13 Machine
6.14 Palm pilot
6.15 Plant floor
6.16 Pneumatics cylinder
6.17 Refrigerator
6.18 Semiconductor
6.19 Toyota assembly line
6.20 Turbo pump
6.20 Valve
6.21 Washing Machine

(Resources) 7

7.1Icatcher 100
7.2 Master

(Sience) 8

8.1 3D eye
8.2 Body
8.3 Brian

8.4 Brian2
8.5 Brian3
8.7 Cancer
8.8 Cervical
8.9 Cfd
8.10 Conix snake
8.11 Dinopark floor 1
8.12 Dinopark floor2
8.13 Dinopark floor 3
8.14 Dinopark outside
8.15 Fish
8.16 Heart
8.17 Molecules
8.18 Solar system
8.19 Teeth
8.20 Titan satellite
8.21 Tooth

(Training) 9

9.1 Cellphone
9.2 Compaq
9.3 Critical Care
9.4 Engine training
9.5 Gerbox assembly
9.6 Horiba
9.7 Lathem payclock
9.8 Military tarining
9.9 Surgery
9.10 Teethsurgery1
9.11 Teethsurgery2

(Vehicles) 10

10.1 Atv motorcycle
10.2 Audi Avu
10.3 Audi TT
10.4 BMW
10.5 G35 town
10.6 Imp Col car desert
10.7 Imp Col car flakes
10.8 Metal Flakes
10.9 Sports car

10.10 Train car
10.11 Truck
10.12 VL800
10.13 Volusia config