OECD/CERI ICT PROGRAMME

A Case Study of ICT and School Improvement

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EXECUTIVE SUMMARY

This is a report of a case study investigation of the extent and the ways in which the use of ICT in Greek schools was related to educational innovation. The use of ICT was studied in depth in five school settings which were chosen so that they conformes to the requirements of OECD/CERI research design. Three of these belonged to the first large-scale national project to integrate ICT in all school subjects in Greece, Odysseia . The project was Funded by the European Community and the Greek Ministry of Education. It was part of the Ministry w Operational Programme of Educational and Initial Vocational Training (2nd Community Framework Support). It was implemented by the Ministry s Directorate of Studies for Secondary Education and the Pedagogical Institute (PI). The Computer Technology Institute, a Univeristy based research institute administratively supervised by the Ministry, consulted, co-designed, planned, provided technical support and monitored all sub-projects of Odysseia. These were implemented by dosens of organisations, Universities, Research Institutes, Companies and 385 schools. The three schools belonged to the first Odyssei project, Odysseas which involved all actions in a small scale of 60 schools and was implemented by the

Computer Technology Institute, the Pedagogical Institute and the Institute of Language and Speech Processing (ILSP). At the time of the research, the first 18 Odysseas schools had been involved in the project for 14-18 months and were thus border line case with respect to the OECD/CERI requirements. We thus chose another two schools with much lengthier but similar experience with the use of exploratory software through their participation to university research projects. These projects involved combinations of software development, teacher education and study into classroom practices through the implementation of ICT based innovation. They addressed the whole of the school community. The University provided consultancy and educational support as part of the arrangement. This collaboration between University and the schools was long term, since the same schools were employed for consecutive projects. School A had thus begun in 1986-87 and school B in 1995-96. With respect to this particular Univestisy research team, this collaboration is seen as on-going. The main findings related to the hypotheses from each case study, as well as conclusions drawn from the synthesis of the case studies follow. It has to be noted that the fourth and fifth hypotheses are not discussed due to insufficient evidence.

A. FINDINGS RELATED TO THE HYPOTHESES FROM EACH CASE STUDY

School A

1. ***Technology is a strong catalyst for educational innovation and improvement especially when World Wide Web is involved.***

The introduction of ICT functioned as a catalyst for educational innovation. Through the use of ICT, students were encouraged to work in groups, to solve problems and construct their knowledge while the teachers became co-ordinator of the activities. Soon this kind of innovative approach to teaching and learning was generalised in other classroom activities. Sixteen years later, the teachers do not consider any more the use of ICT as an innovation since group working and investigation are a part of the every day practice. They rather consider that ICT supports other new innovative attempts. The use of the WWW has not been yet generalised in the school. Therefore we do not have evidence to validate the second part of the hypothesis.

1. ***The diffusion of the innovation/improvement (and therefore of ICT) followed the traditional diffusion pattern for innovations, as outlined by Rogers (1995).***

The members of the staff were all involved in the project from the beginning. Since they are employees of a private school, they were expected to follow school s policy concerning the innovation. Since, there was a pressure on the members of the teaching stuff to use ICT, practically all of them were involved in the project. However, the more experienced teachers had a more advanced role, undertaking the responsibility to support the other teachers in their work in the computer lab.

1. ***Successful implementation of ICT depends mostly upon staff competence in the integration of ICT into instruction and learning.***

The school A has put strong emphasis on the training of the staff on the use of ICT in the

classroom. An academic research group has undertaken to support them in their work. Moreover, the teachers of the school are highly qualified teachers and many of them have done graduate studies. The implementation of the ICT in the school was successful. Sixteen years after the introduction of ICT, the school continues to support this innovation and is looking forward to expand the use of new technologies. However, we cannot claim that the successful implementation was due to staff s competence unless we compare school A with other schools where no training was given to their staff.

School B

1. ***Technology is a strong catalyst for educational innovation and improvement especially when World Wide Web is involved.***

At the beginning, school administrators perceived the use of ICT mostly as an important administrative task, rather that an innovation. Moreover, the computer use would indicate the school s high quality level among all the other local schools. At present, the use of ICT in the school is an educational innovation in the sense that it aims to encourage new learning environments for teachers and students. Moreover, group-work within the lab was a motivation for some of the engaged teachers to try innovative approaches in their traditional classroom (i.e. separation in teams, discussion, investigation etc.). However, less experienced school teachers with little educational training seemed to use ICT tools (i.e. educational programs taken from the web) as active textbooks that enriched the existing teaching material. These teachers used the computer as means of more attractive presentation of the lesson.

2. The diffusion of the innovation/improvement (and therefore of ICT) followed the traditional diffusion pattern for innovations, as outlined by Rogers (1995).

Experience and training influenced the diffusion of ICT in the school. The initial introduction of ICT was through the participation of the school to a University research project. The co-operation with the university team was a catalyst for the ICT use, since it provided the teachers training on using exploratory software in the classroom. Although there were no resisters in the school, the majority of the old teachers remained uninvolved. However, the early users developed an experienced group within the school that still supports on technical and educational issues the new interested teachers. Moreover, the presence of technical support in the lab during the lesson encouraged the new teachers to use ICT.

3. Successful implementation of ICT depends mostly upon staff competence in the integration of ICT into instruction and learning.

The presence of technical support in the lab during the lesson ensured unobstructed implementation of the computer-based activities. Moreover, problems on technical issues were not reported since the equipment was newly installed. However, the innovative uses of ICT such as collaborative learning and use of real time data seemed to be accounted to experience on computer use and training provided on educational issues.

School C

1. ***Technology is a strong catalyst for educational innovation and improvement especially when World Wide Web is involved.***

The computer use, although it provided a modern multidynamic tool, it was used to support existing practices of teachers, traditional or progressive. The teachers modernised their teaching in terms of materials used, and tried to shift to more open learning approaches. Most of them, however, did not manage to avoid returning to the traditional teacher centred teaching model.

1. ***The diffusion of the innovation/improvement (and therefore of ICT) followed the traditional diffusion pattern for innovations, as outlined by Rogers (1995).***

The school introduced the use of ICT participating in the national project Odysseas , since most of the teachers at that time were willing to participate and organise pilot computer based lessons. However, the involvement of the teachers was by no sense obligatory, and there was no specific school policy related to the aims of the computer based activities or specific subjects for ICT to be used. It was up to interested teachers to get involved and use ICT in their teaching. Still, it is the interested teachers who use ICT in their teaching. It seems that insufficient in-service training on the use of ICT in the teaching practice and lack of technical support in the lab discouraged the rest of the teachers to risk and get involved in the innovation. It has to be highlighted that the effort of the school and of the introduction of ICT use in Greek schools in general is very recent. Thus, there was not the necessary time to allow the appropriate structures for training or support to be built.

1. ***Successful implementation of ICT depends mostly upon staff competence in the integration of ICT into instruction and learning.***

Teachers worked very hard and additionally to their teaching duties to familiarise themselves with the computer use and applications, to prepare the computer based lessons, and try them out before entering the classroom. They were very enthusiastic with what they were doing and committed to try out at least some computer based lessons. In this sense, and considering how recent was this effort, they succeeded to integrate a modern tool in their classrooms overcoming technical problems and frustration. It will need though more time for these teachers to reflect on these first try outs and move forward to the next step of using the computer to upgrade their own teaching objectives. Moreover, it will need support on the pedagogical issues of using ICT and development of communication networks between teachers to exchange ideas and share activities.

School D

1. ***Technology is a strong catalyst for educational innovation and improvement especially when World***

The school has long before introduced ICT use, aiming to familiarise students with computer use. Therefore, the introduction of educational technology primarily aimed to expand the computer use and secondly to innovate the educational process by means of providing teachers with new multidimensional instructional tools in order to proceed to the implementation of innovative subject instruction. This innovative concept seems to have been well perceived both by teachers and students. However, the input as been applied by the teachers at the above school did not assure an innovative instructive/learning model although the process followed consisted of different from traditional teaching methods. This seems to be owed to the insufficient teacher training on computer use in curriculum subjects as well as to the limited time of implementation.

1. ***The diffusion of the innovation/improvement (and therefore of ICT) followed the traditional diffusion pattern for innovations, as outlined by Rogers (1995).***

As for the diffusion research analysis proved that only the one third of enthusiastic teachers was involved in computer based activities. As there was no school policy only enthusiastic teachers initiated the process. It is also worth mentioning that this teachers initiative was not influenced by any present or future incentive or reward but it was purely a volunteer involvement addressed by their ideological belief, professional development and their need to take part in the future challenges. Second, the lack of technical positioned person during this school year created problems to the involved persons as they kept fearing possible technical problems. However, this fear was partly reduced by the support of the area positioned trainer who visited their school twice a week (he also covered three more schools in the area) to solve some technical and educational problems. This trainer, as it was observed, did not provide them with any specific subject instruction training being a mathematics teacher himself- but only supported them by means of resolving basic computer use and technical problems . Therefore, the diffusion process was mainly based on the core of the enthusiastic teachers as well as to the intrinsic support and encouragement offered by the school Headmaster.

1. ***Successful implementation of ICT depends mostly upon staff competence in the integration of ICT into instruction and learning.***

Teachers, in their effort to develop the best of a technology based instruction, succeeded in applying some aspects of the educational technology concept but they did not manage to differentiate their computer based teaching sessions from the ones in the traditional classroom. This, as it was observed, was the result of insufficient training on the specific subject instruction as well as the lack of appropriate time for the consolidation of important issues on modelling their instruction for successful implementation of educational technology

School E

1. ***Technology is a strong catalyst for educational innovation and improvement especially when World Wide Web is involved.***

Teachers used a variety of ICT tools in their practice. The computer use, however, was not in the most cases a catalyst for educational innovation, but a modern multidynamic teaching aid and information resource that enriched teaching. Some of the teachers used a power point application to develop tutorials for their students on specific teaching units. There was a linear sequence and students were mostly observing activities. Some of the teachers used the Internet and gave the opportunity to their students to look for information on the specific teaching units they taught. Teachers also used educational software. However, all except one teacher did not escape the traditional teacher centred teaching model, where the teacher has the central role in learning that focuses on the product and not on the process of learning

1. ***The diffusion of the innovation/improvement (and therefore of ICT) followed the traditional diffusion pattern for innovations, as outlined by Rogers (1995).***

School E introduced the use of ICT in the school participating in the national project Odysseas, since the Headmaster of the school and the most of the teachers at that time were willing to implement pilot computer based lessons. The school fought for its participation since many

schools also claimed participation. As in all schools that participate in the project Odysseas, the involvement of the teachers was by no sense obligatory, and there was no specific school policy related to the aims of the computer-based activities or specific subjects for ICT to be used. It was up to interested teachers to get involved and use ICT in their teaching. It is still the interested teachers who use ICT in their teaching. However, there is a very positive climate in the school in relation to the use of ICT in teaching. The Head of the school is very supportive and encourages all teachers to use computers into their teaching. Teacher training has been organised and takes place regularly each week for all interested teachers. In parallel, a person responsible for provision of technical support has been positioned. He also helps teachers in the lab when teaching. Finally, strong parents involvement and support not only helps teachers with the preparation of their lessons, but also encourages them to use computers in the sense that they acknowledge their effort. It had to be highlighted though that the effort of the school to introduce ICT use in Greek schools is very recent. Teachers have a long way to go with the use of ICT, but they surely have made the first most important steps.

3. Successful implementation of ICT depends mostly upon staff competence in the integration of ICT into instruction and learning.

As already mentioned, most of the teachers that used ICT in their teaching enriched their teaching by giving the opportunity to their students to use modern multidynamic tools. There was a very positive climate in the school in relation to the computer use and all the school community tried hard to integrate them into the different curriculum subjects. The presence of technical support in the lab during the lesson ensured unobstructed implementation of the computer-based activities and the ongoing in-service training encouraged teachers to get involved with ICT use. However, most of them did not manage to shift their students learning to student centred approaches. It will need more time for the teachers to reflect on these first try outs and move forward to the next step of using the computer to upgrade their own teaching objectives. Moreover, it will need more support on the pedagogical issues of using ICT and development of communication networks between teachers to exchange ideas and share activities.

B. CONCLUSIONS DRAWN FROM THE SYNTHESIS OF THE CASE STUDIES

In all schools which were studied, an effort to incorporate ICT use in teaching was under way. Two of these schools had long experience with the use of ICT, while the rest three schools had recently joined the national systemic project for the introduction of computers into the teaching practice. The extend to which computer use was a catalyst for educational innovation, could be better understood if one took the Greek Education curriculum system under consideration. The Greek schools implement the implied by the Ministry of Education curriculum mainly giving emphasis on the subject content, while the educational practice is characterised by the application of the traditional teaching/learning model with its teacher-centred face-to-face approach.

Looking at the way that computers were used in the schools in relation to innovative practice in the Greek context, as the analysis of data revealed, two different types of ICT exploitation were observed. In the first three schools teachers used ICT as modern multidynamic tools to enrich

their teaching. They did not though change their role or focus of their students learning. In the rest two of the schools teachers used ICT to change their previous traditional teaching practice, as well as to change the focus of their students learning. These two different ways of using ICT are discussed neither to present typologies of schools in relation to the use of ICT, nor to evaluate schools in terms of ICT use. Rather they attempt to explain different ways of ICT use in schools.

In the three schools that recently introduced the use of ICT, the teaching and learning process had been enriched since computers were used as modern dynamic teaching aids or as information resource. The computer use had the warm enthusiasm of the whole school community. Teachers organised work groups and tried to offer more autonomy to students in the learning process. However, most of the time instructions supported a face-to-face teaching where the teacher played the central role. Computer-based lessons were designed by the discipline teacher in his own initiative without being obliged by a specific school policy implied, or the Ministry of Education. These schools had only recently integrated computer use into teaching, participating in the national project that encouraged the use of computers as tools to realise educational goals unrelated to technology, through student centred exploratory learning approaches that were not a usual practice in Greek schools. Moreover, they had been provided with in-service training focusing not only on teachers familiarisation with computer applications and software, but also on pedagogical issues related with the use of ICT in teaching. However, the limited time of project implementation, although encouraged the ICT use, did not allow a change in teaching methods from a traditional teacher centred to student centred one. It seems that limited time of project implementation did not provide for sufficient time for teacher education to go beyond training on introductory issues on class exploitation. It seems that teachers did not have the time to reflect on the computer use in their teaching and integrate new ideas of its use.

The importance of time as well as of long term training in the process of the integration of computers into teaching practice is revealed when looking at the other two schools that had long experience with using exploratory software in the classroom. In these schools computers were used as a mean to develop students critical thinking and cultivate methodological skills. The school team in collaboration with a University research team designed the lesson plans. Students worked in-groups collaborating in educational activities that encouraged experimentation, communication, and hypothesis testing. Teachers supported and encouraged students to explore, intervening whenever they considered it necessary. This type of instruction encouraged the application of open learning models, simultaneously achieving the educational goals. It seems that the long time that teachers had to try out computer-based lessons, in combination with long term in-service training on pedagogical issues of computer use, gave them the opportunity to develop confident and confidence on using computers in their teaching, as well as to reflect and evolve their own practice.

As far as diffusion process is concerned, only in school A all teachers were involved in the use of ICT in their classroom, due to a strong school policy. However, research data was not sufficient to look at the way teachers actually used computers and the extent to which these teachers changed their existing teaching practices. Additionally, long period of implementation allowed for a core team of interested and experienced teachers to be developed, which in its turn supported and encouraged new teachers to integrate computers into their teaching. Finally, it was revealed that in inexperienced schools, technical support in combination with available training on pedagogical issues on computer use and positive climate in the school community

were important factors for the non-enthusiastic teachers to use computers into their teaching. How does this research inform the educational policy maker? On the one hand, we have three schools at the receiving end of a systemic service to integrate technology into their educational practice. Although the service is organised within the framework of principles deriving from the long term University supported schools, the research took place far too early to be able to be able to notice some significant innovation. It would be reasonable to expect such innovation to gradually emerge if this type of supporting service is consistent, longterm, valued, recognised and systemically established. This, however, is a function of the kinds of influence exerted by the changes in office within the policy decision making institutions. Only if this type of service is seen as infrastucture (similar to telecommunications, transportation etc) there may be hope for support to be of some substance. In other cases, teachers, parents and educational practitioners perceive it as just another innovation to be implemented and then moved onto the next one. With respect to the two long term user schools, although the educational paradigm had shifted through the use of ICT, it needed enourmous first level support by educational research teams. This of course can only work for a very few cases and for a relatively short time, since it cannot be perceived as anything more than an add-on to one or a series of consecutive research projects which by definition have other agendas than that of supporting schools. The policy maker, however, is informed by case study experience with respect to the type and the quality of support needed in the large scale and through the knowledge accrued on the emerging teaching and learning processes and on ways of accounting for educational outcome.

THE GREEK CONTEXT

The Greek State offers free access to all Greek citizens, to general education. The basic principle of the Greek educational system is to provide an education that fights to secure equal opportunities, access and support for all students in all levels of general education. (MNER 1994: p.21)
The Greek general education consists of two levels; Primary and Secondary. Primary Education caters for pupils of 6 to 12 years of age, comprises six grades, and is compulsory for all Greek pupils. Students proceed from primary to secondary education on condition they have the certificate of graduation from the first level.
Secondary Education caters for pupils of 12 to 18 years of age, and is divided in two stages, Gymnasium and Unified Lyceum. Gymnasium caters for pupils of 12 to 15 years of age, comprises three grades, and is also compulsory for all Greek pupils. After graduation from gymnasium students continue their studies in general education (Lyceum), or enter technical education. Lyceum caters for pupils of 15 to 18 years of age, comprises three grades and is not compulsory. Students proceed from gymnasium to Lyceum without examinations on condition they have the certificate of graduation from the previous level. Students who have graduated from Lyceum and succeed to the Pan-Hellenic examinations register for University. Graduates from Lyceum who failed in the Pan-Hellenic examinations, either participate again next year, or enter the work market.
The Greek Educational system is highly centralised. The Ministry of Education is responsible

for all educational matters. The spinal column of the educational system is the National Curriculum, which is centrally developed under the authority of the Ministry of Education. All Greek schools must follow the National Curriculum and the proposed school time schedule. The National Curriculum is accompanied by the student textbook, which is distributed free of charge to all students in public schools and bought by all students in private schools. The educational practice in the majority of schools reflects a product-oriented teacher centred system (OECD 1997).

The existed educational law has recently jointed the innovation of the system in many areas especially in Lyceum subjects and University entrance qualifications.

Information Technology has been fully introduced into the secondary education National Curriculum as a separate school subject aiming to familiarise students with technology and computer applications. In parallel, in the mid-nineties, the Ministry of Education has launched a project (Odysseia, http:\\odysseia.cti.gr) for the integration of computers in schools within curriculum subjects.

The European Community and the Ministry of Education funded the project, which was designed and supported by three key Greek institutions: Computer Technology Institute, Pedagogical Institute and Institute for Language Processing. The project was designed to support three main areas: development of technical infrastructure, development and provision of software, and teacher education.

The integration of ICT within school curriculum is currently in a pilot phase, and aims to develop the necessary critical mass of school communities that will integrate technologies as an every day tool, and in parallel, it will provide valuable experience for further diffusion. The aim of the computer use in schools within this framework aims to encourage exploratory and co-operative learning, as well as to encourage development of communication skills of students. Odysseia includes many Actions related to the development of technical infrastructure (hardware provision and maintenance, provision of technical support, development of networks, development of educational software), and of human resources (in-service training, support). Currently, two hundred seventy schools participate in the project, representing the 5% of Greek schools.