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IBM KidSmart Early Learning programme European Evaluation

John Siraj-Blatchford
University of Cambridge

Iram Siraj-Blatchford
University of Wollongong, iram@uow.edu.au

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Abstract

Information and Communication Technologies (ICT) have become essential tools in modern life and their use in education is increasing rapidly at all levels. It is only recently, however, that they have been introduced more widely to children of pre-school age and one very important reason for this is to prepare them for their future lives in the knowledge society. In Europe there is a growing awareness that the foundation for technological literacy, life-long learning and creativity should be laid in the earliest years of a child's education. The pre-school education sector is still, however, at a very early stage of its development in incorporating ICT effectively into teaching and learning and it is in this context that the contribution of IBM's KidSmart Early Learning programme is particularly significant. The programme was designed as a specific initiative to address the 'digital divide' in under-resourced communities and aims to support the newly identified need to develop enriched teaching and learning through the use of ICT, a key element of which is the promotion of teacher skills and confidence. The programme began in 1999 and $40 million has been invested to date. 20,000 KidSmart Early Learning Centres have been donated to over 50 countries worldwide and 4,500 Centres are now distributed in Europe, benefiting over 200,000 children. In IBM's EMEA region (Europe, Middle East and Africa) it was introduced to nine countries in 2000 and in 2004 it will be in 23 countries. 9,000 European teachers have received ICT training as a direct result of the programme. The KidSmart Early Learning Centre consists of an IBM desktop computer housed in durable and colourful furniture, specially designed for children aged three to six in association with the toy manufacturer Little Tikes. Award winning educational software from Riverdeep is installed in most national languages and a Web site provides advice for early education teachers and the parents of young children on the appropriate use of ICT to support child development1. IBM implements KidSmart in partnership with early learning organisations, usually Ministries of Education or leading professional bodies, who provide high quality training, participate in the selection of schools and contribute to programme evaluation. In 2003 IBM organised the first European Conference on ICT in early education. This conference brought together policy makers, researchers and leading teachers from 20 countries with the European Commissioner for Education to showcase innovative practice and to propose recommendations for policy development.

IBM KidSmart Early Learning programme European Evaluation

France, Germany, Italy, Portugal, Spain and UK
Final report June 2004

John Siraj-Blatchford
Iram Siraj-Blatchford

www.kidsmartearlylearning.org

In the emerging Knowledge Society, reaching higher levels of educational achievement is fundamental to driving economic success. Governments across Europe recognise the importance of 'knowledge' and 'knowledge skills' as key differentiators for competitive advantage. They have introduced lifelong learning policies to develop and sustain high skill levels, and recently have started to address the enormous potential of early learning. At the same time, governments are emphasising the importance of digital inclusion as a key policy for overall economic success.

IBM developed the KidSmart Early Learning programme to contribute in two important areas: to help bridge the 'digital divide' in access to IT and acquisition of IT skills, and to raise the bar on overall student achievement. The programme reflects the fact that children now live in a media-rich environment. KidSmart was designed to meet the need for enriched teaching and learning through the use of Information and Communications Technology (ICT), with the potential to teach even very young children new forms of creativity, communication and collaboration.

This evaluation of the KidSmart programme across six countries in Europe reports extremely positive results. It shows marked improvements in teaching and learning with ICT in just one year; that early education practitioners are more confident and sophisticated in their approach to using computers and that the KidSmart programme has supported significant curriculum development in early education. IBM implements KidSmart in partnership with early learning organisations,

either Ministries of Education or leading professional bodies and I would like to acknowledge their strong contributions to these positive results.

IBM delivers the KidSmart programme in more than 50 countries around the world. In Europe by the end of 2004, we will have donated more than 5,000 KidSmart units to disadvantaged communities in 20 countries, including a number of those joining the EU this year. More than 8,000 early education practitioners will have received training in teaching and learning with ICT and the programme will reach more than 300,000 children. KidSmart has stimulated innovation in teaching and learning methods in early education across Europe. The programme is proving effective as a catalyst to further development, both at policy and practitioner levels.

This evaluation of the KidSmart programme demonstrates strong value in introducing ICT based learning into early education and recommends widening availability across the early education sector. IBM is committed to build on KidSmart's success and its contribution to Europe's long-term economic prosperity.

Hans Ulrich Maerki
Chairman and General Manager
IBM Europe Middle East Africa

Research Directors:
John Siraj-Blatchford
Faculty of Education, University of Cambridge
js303@cam.ac.uk
Iram Siraj-Blatchford
Institute of Education, University of London
i.siraj-blatchford@ioe.ac.uk

With:
Hans Eirich
Staatsinstitut für Frühpädagogik, München
hans.eirich@extern.lrz-muenchen.de
Maria-Jose Lera
Faculty of Psychology, University of Seville
lera@us.es

At the Lisbon European Council in 2000 European Heads of State set the European Union a new and ambitious strategic goal, namely to become the most competitive and dynamic knowledge based economy in the world by 2010. Following on from Lisbon, in 2002 the Barcelona European Council approved a detailed work programme to achieve 13 concrete objectives in education and training. At the centre of our efforts is the concept of lifelong learning. This widens our concept of what happens in school and the role of formal education throughout life. If a policy based on the concept of lifelong learning is to achieve its full potential it is vital that we think in terms of a continuum, beginning at the earliest stages of education and continuing, essentially, throughout the individual's lifetime. Developing skills for the knowledge society and ensuring access to ICT are important components of this.

In Europe we have become increasingly aware that the first six years of a child's life are an important phase in the development of its abilities and aptitudes. Early social interactions and early acquisitions have a decisive effect on a child's ability to act and to learn throughout its life. It is therefore a matter of great satisfaction to me that this is being addressed through the KidSmart early learning programme in 18 EU Member States.

As I was able to observe at the European Conference on Early Learning in the Knowledge Society in May 2003, KidSmart is stimulating wide discussion on the role of ICT in early education and a great deal of innovative teaching practice is emerging. Teachers are at the core of education. They are the mediators though which societal demands on the school can be addressed, as well as being the facilitators of the learning process of young people. For this reason, one of the 13 objectives approved at the Barcelona European Council is to improve education and training for teachers and trainers themselves.

The results from this evaluation of the KidSmart programme in six Member States are impressive. The positive impact delivered for teacher skills and confidence through the programme is highly significant, as is the success of the programme in facilitating access to knowledge society skills for children from disadvantaged communities at an early age. The programme is making an important contribution to the goal of establishing a sound lifelong learning culture in Europe.

Viviane Reding,
European Commissioner for Education and Culture

Franca Rossi & Marcello Visocchi
Dipartimento di Psicologia, Universitá La Sapienza, Roma
Fr.rossi@uniroma1.it, marviso@tiscalinet.it
F. Francis Strayer
Laboratoire Dévelopement, Université de Bordeaux II
strayer@u-bordeaux2.fr

Maria Assuncao Folque
Departamento Pedagogia e Educacao – University of Evora
mafm@evunix.uevora.pt
Ray Arnold
Research Officer, University of Cambridge, Faculty of Education
rsa25@cam.ac.uk
Pascal Cazenave-Tapie
Researcher, Université de Toulouse II
cazenave@univ-tlse2.fr

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1. Executive summary

1.1 The KidSmart programme

Information and Communication Technologies (ICT) have become essential tools in modern life and their use in education is increasing rapidly at all levels. It is only recently, however, that they have been introduced more widely to children of pre-school age and one very important reason for this is to prepare them for their future lives in the knowledge society. In Europe there is a growing awareness that the foundation for technological literacy, life-long learning and creativity should be laid in the earliest years of a child's education.

The pre-school education sector is still, however, at a very early stage of its development in incorporating ICT effectively into teaching and learning and it is in this context that the contribution of IBM's KidSmart Early Learning programme is particularly significant. The programme was designed as a specific initiative to address the 'digital divide' in under-resourced communities and aims to support the newly identified need to develop enriched teaching and learning through the use of ICT, a key element of which is the promotion of teacher skills and confidence.

The programme began in 1999 and $40 million has been invested to date. 20,000 KidSmart Early Learning Centres have been donated to over 50 countries worldwide and 4,500 Centres are now distributed in Europe, benefiting over 200,000 children. In IBM's EMEA region (Europe, Middle East and Africa) it was introduced to nine countries in 2000 and in 2004 it will be in 23 countries. 9,000 European teachers have received ICT training as a direct result of the programme.

The KidSmart Early Learning Centre consists of an IBM desktop computer housed in durable and colourful furniture, specially designed for children aged three to six in association with the toy manufacturer Little Tikes. Award winning educational software from Riverdeep is installed in most national languages and a Web site provides advice for early education teachers and the parents of young children on the appropriate use of ICT to support child development[1].

IBM implements KidSmart in partnership with early learning organisations, usually Ministries of Education or leading professional bodies, who provide high quality training, participate in the selection of schools and contribute to programme evaluation.

In 2003 IBM organised the first European Conference on ICT in early education. This conference brought together policy makers, researchers and leading teachers from 20 countries with the European Commissioner for Education to showcase innovative practice and to propose recommendations for policy development.

1.2 The evaluation
Aims and scope

The study investigated the impact of the IBM KidSmart Early Learning programme on teacher confidence in the use of ICT and on the quality of their application of ICT to teaching and learning in pre-school settings in France, Germany, Italy, Portugal, Spain and the UK. It also looked at its impact on the digital divide and parental involvement and evaluated the ergonomics of the KidSmart Early Learning Centres.

The research was carried out over a two year period between October 2001 and November 2003. 117 pre-school settings in the six countries were selected from the KidSmart programme as a representative sample (20%). Comparable control group settings were also selected to allow clear identification of the contribution made by KidSmart.

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1   www.kidsmartearlylearning.org – This Web site is available in Brazilian, Portuguese, Chinese, Japanese, English, French, German, Italian and Spanish.
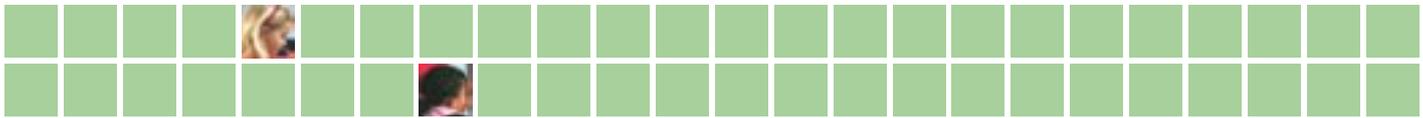
Methods

Research partners in each of the countries were trained in the application of each of the research instruments and in the curriculum philosophy and guidance developed by the research directors. The partners were also provided with training materials which were translated and revised to suit international contexts. Three two day research team meetings took place over the period of the evaluation, during which participants discussed interim results and measures were taken to ensure comparability and reliability.

Research instruments:

- An ICT environmental sub-scale, modelled on ECERS[2] was applied on each of the three visits to demonstrate progress in curriculum development ranging from inadequate (level 1), through good (level 5) to excellent (level 7) in the three areas of :

  1. Information Handling and Communication Skills
  2. Access and Control of ICT tools
  3. Learning about the uses of ICT

- A practitioner questionnaire

- A parent questionnaire providing details of parental occupation and of ICT provision in the home

- Interviews with pre-school managers and teachers

- Analysis of photographic evidence.

1.3 Report findings

Key achievements of IBM's KidSmart Early Learning programme

The KidSmart programme has achieved substantial improvements in teaching and learning with Information and Communications Technologies in just one year in five of the six countries surveyed

The progress from 'inadequate' to 'good' in pedagogic practice with ICT that has been made by so many of the settings in just one year is excellent. While none of the pre-schools achieved 'good' against the ECERS[3] criteria prior to delivery of the KidSmart Early Learning Centres, after just one year all of the schools sampled in Italy, Portugal and the UK achieved this rating, with those in Portugal scoring 'very good' on two of the three elements. France achieved 'good' on two of the three elements. Spain and Germany started from a much lower base but doubled their scores over 18 months and the improvement is continuing. This degree of success surprised even the researchers.

The KidSmart programme has supported significant curriculum development in early education

The early childhood teachers involved in the KidSmart programme have developed a wider and better understanding of the nature of ICT. For the youngest children, ICT is increasingly integrated in their socio-dramatic play and in the most innovative settings children are using the computers creatively for their own productive purposes. In some settings, children are benefiting from the use of a range of peripheral equipment such as digital cameras, scanners and even digital microscopes.[4]

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2   Construct validity for the original ECERS [Early Childhood Environmental Rating Scale : R], Harms, Clifford & Cryer, 1998, has been demonstrated in previous studies through its agreement with professional judgements and its predictive validity through the results of child outcome measures applied to the 'graduates' of higher or lower quality provision pre-schools. Discriminant validity for the ICT sub-scale has been based on the ability of the items to distinguish between classrooms of varying quality which were assessed by trainers/experts.
3   See page 20: ECERS sub-scale. The ICT sub-scale results table is shown on page 9.
4   cf Siraj-Blatchford and Siraj-Blatchford, 2004.

The period of time for which teachers consider that children's use of the Centres is educationally productive has increased significantly across the board

Teachers in the KidSmart programme are making increasing use of the equipment. The amount of time that the Centres are used varies a great deal between settings and between countries, but there is evidence that teachers are making increasing use of the equipment in each country.

Teachers are much more confident and sophisticated in their approach to using computers than comparable teachers in control settings

Over the period of the study, many teachers in the control settings reported modest improvements. However, improvement in the confidence of the KidSmart teachers has been dramatic. In Portugal, the number of teachers reporting feeling 'very comfortable' has increased from 18% to 70% in just six months. This clearly demonstrates the 'user friendliness' of the KidSmart programme.

The KidSmart programme has shown that really outstanding improvements can be made when coherent high quality training is provided

The scale and coherence of the training provided in Portugal has been exceptional and this is reflected in their particularly high achievement in the ECERS ICT sub-scale.

The KidSmart programme has targeted disadvantaged communities effectively, particularly in the UK and Spain[5]

The results in most countries in this study have been encouraging. In the UK, national baseline data shows that the KidSmart programme is meeting the needs of those most disadvantaged and this also applies to Spain. The socio-economic status (SES) of Germany, Italy and France is much more diverse, however, with only half the children coming from lower SES groups. It is possible that this reflects the organisation of pre-schools in these countries, which may set out to admit a cross section of the community.

The KidSmart Early Learning Centres have been very well received in all the evaluation countries.

"Although a big unit, it is quite enclosed and makes a secure and quieter work environment for the children."

"Children are very confident in accessing the pre-installed software – it encourages independence and free choice, with no CDs lying around to be posted in inappropriate places!"

"It is simple to use and it builds the confidence of both the staff and the children."

"Children love it; they have no fear of it as it looks like a toy."

*"Children and parents feel they can use a computer without 'breaking it.'"*

KidSmart's child friendly features are in line with the researchers' own strong views that ICT should be introduced in a sensitive and monitored way than enhances children's awareness of computers and technology as part of daily life.

Suggested recommendations for national policy makers

- Resources for professional training in ICT in early education should be expanded to take account of the need and benefits highlighted by the KidSmart Early Learning programme.

- ICT resources should be made more generally available to the early education sector and fully integrated into pre-school curricula to deliver the established benefits for early childhood development.

- Parents should be helped to support the education of their children through the development of parental partnerships. ICT has the potential to stimulate this involvement.

- There is a need to support knowledge building and co-operation at all levels. Resource should be made available to support active networks of parents and teachers.

These recommendations reflected the outcomes of the European conference "Early Learning in the Knowledge Society".[6]

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5   Note: Data for Portugal is not available at this time.
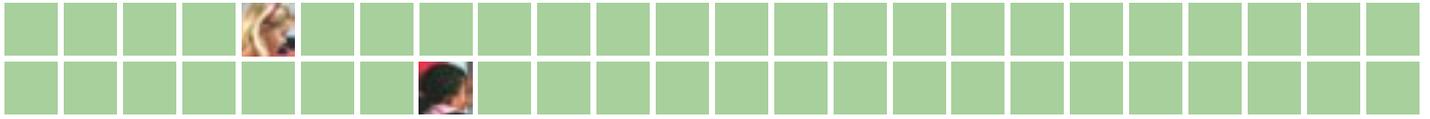
Areas for future development through the KidSmart programme

Ensure the provision of high quality of practitioner training
Examples of the work undertaken in the high quality training programmes in Portugal, Germany, the UK and elsewhere will be made available to KidSmart partner organisations throughout the EMEA region. In addition, IBM is running 'train the trainer' sessions to facilitate the process of sharing best practice and support the planning of effective training programmes at local level. The UK and France should ensure that they make effective training provision for all their KidSmart teachers.

Ensure effective integration of ICT into the curriculum
Best practices will be shared through reports, newsletters and regular practitioner and head teacher meetings. In Germany and Italy, particular attention should also be paid to making increased use of the KidSmart Early Learning Centres as an integrated resource. In Germany a focus on the Young Explorer Software to support the new requirements to develop early literacy, numeracy and science skills more consistently should be encouraged.

Emphasise the importance of adult presence working alongside children at the computer
This is particularly important as the KidSmart Early Learning Centre becomes familiar to children in the pre-school setting. Sustained shared thinking between adults and children has been shown to be particularly valuable to children's development. Head teachers and those leading training sessions will be encouraged to make this explicit to teachers by KidSmart partner organisations.

A wide variety of promising practices is emerging
Structures and processes for disseminating these more widely should be developed further. Some countries are developing strong networks of KidSmart teachers which have regular meetings and newsletters to support the sharing and development of effective practice. Others are beginning to use an online platform to communicate within and even between countries. These examples should be replicated across the region.

Ensure that all possible measures are taken by IBM and its partner organisations in each country to select pre-schools which admit children from areas of significant social and economic disadvantage for the KidSmart programme

Address some elements of the ergonomics of the KidSmart Early Learning Centre
It is anticipated that the Centre will shortly be adapted to incorporate a larger screen size which will be more child friendly. The small sized mice used with the Centres in many countries should be adopted more widely as children find them much easier to use. Children's heights vary widely and pre-schools should make cushions available so that children are sitting in the correct position on the bench and teach children the importance of using them.

The researchers advise the inclusion of microphones for all countries and this will shortly be addressed, along with recommendations for staff monitoring of children's time at the computer and their awareness of health and posture issues.

6   The conference report: 'Early Learning in the Knowledge Society' can be downloaded in English, French, German, Spanish and Italian from: **ibm.com**/ibm/ibmgives/reports

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Supplementary information

Table demonstrating improved quality of teaching and learning with ICT in the KidSmart settings

	Information handling and communication skills		Access and control of ICT tools		Learning about the uses of ICT	
	Visit 1 pre-intervention	Final visit	Visit 1 pre-intervention	Final visit	Visit 1 pre-intervention	Final visit
UK	2.7	4.9	2.1	5.2	2.3	4.8
Spain	1.0	2.4	1.0	2.8	1.0	2.8
Italy	3.0	5.0	2.7	5.0	1.3	4.4
Germany	1.4	3.9	1.0	4.0	2.4	3.4
France	2.0	4.0	2.3	5.5	1.5	5.3
Portugal	3.1	5.9	3.0	6.0	3.1	5.3

Key

1 = inadequate, 3 = minimal, 4 = fair, 5 = good, 6 = very good, 7 = excellent.

2.1 Use of the KidSmart Early Learning Centres

There is no doubt that KidSmart has been extremely well received by early childhood educators, parents and children in each of the evaluation countries. They are highly valued by the sample settings and have been made good use of by staff, parents and children. The percentage of time that teachers consider children's use of the KidSmart Centres to be educationally productive has also increased across the board as a result of their experience of children's use, the outcomes produced and the training they received

Children generally use the KidSmart computers in groups of two to five although in Italy a group of four to six is not unusual. In Spain, France, Italy, and Portugal most teachers reported equal use of the units by boys and girls although it should be noted that these countries have higher adult:child ratios than in the UK and Germany, where the majority of teachers reported boys dominating. Ratios of 1:20 and above are common in Spain (70%) and in Italy (63%) with an approximate adult:child ratio of 1:12 typical in the other countries. Another significant difference in the use of the KidSmart Centres relates to the children's age. While the UK pre-schools cater exclusively for three and four year olds, our parent survey has shown 39% of the French respondents reporting on their five year old children, and 38% of German parents reporting on six year olds. Parents in Portugal, Spain and Italy also reported on significant numbers of five and six year old users. This reflects national differences in the ages at which children are admitted to primary school.

The time periods for which the Centres are actively in use in the settings varies greatly country by country although all reported increased usage by the time of the final visit. In the UK, for example, use had risen to 90%–100% in 90% of the pre-school settings. In most other countries, usage is at around 50% but in Germany and Italy it remains low and it is recommended that this should be addressed by IBM's partner organisations in those countries.[7]

In 70% of the German settings the KidSmart Early Learning Centres are in use for less than 20% of the time. Only 10% of the German settings report use for more than 60% of the time. In Italy the teachers reported that the Centres were initially used for only 17% of the time, and this has only risen to 20%, although this should be compared with the control group teachers reporting their computers only being used for 5% of the time.

Teachers views of the educational value of the Centres has changed significantly over time. In Spain the majority of teachers initially felt that only 21–60% of the time spent on a computer was productive but teachers now consider the children's time at the computer as 100% productive. In the UK 94% of teachers consider 81-100% of the children's time that is spent on the computer to be productive, in Germany the equivalent percentage is 80%, in Italy 84%, and in France 87% of teachers report the same.

The terms in which the educators perceive educational value does, however, differ. The UK has the longest history of ICT curriculum development in early childhood and teachers follow national guidance that suggests an approach that emphasises the value of both educational technology and technology education.[8] In Italy developments are strongly influenced by concerns to improve access to information and the internet and a media perspective also dominates in Portugal. While in Germany there currently appears to be less of a consensus among teachers, in France and Spain the emphasis is more on the use of the KidSmart Early Learning Centres as a tool to support learning across the curriculum.

The following quotes from the French evaluation illustrate the impact that imaginative placement and use of the Centres can have on children's motivation to learn, attendance and achievement as well as on the engagement of parents:

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7   See 'Areas for future development through the KidSmart programme, p8.
8   See the Knowledge and Understanding of the World component of the English Curriculum Guidance for the Foundation Stage: http://www.qca.org.uk/ages3-14/foundation/223.html

Percentage of teachers who feel 81–100% (ie most) of the time spent on the KidSmart Early Learning Centre is productive

	UK	Spain	Italy	Germany	France
First visit	80	0	74	NR	60
First visit	94	100	84	80	87

"some parents had difficulty getting their children to school on time but since the KidSmart Early Learning Centre has been made freely available to use as the children arrive at school, the children have managed to have themselves brought to school early, even as we are opening the doors!"

"…for Mother's Day we made a book on the computer. The children invented a story, painted different illustrations which we photographed with a digital camera. Then we wrote out the text on a word processor, formatted and printed it. The parents were astounded at what their 'little geniuses' had managed to do.[9]"

2.2 Curriculum development and training

The following table shows the mean progress that is being made in developing the ICT curriculum according to the Early Childhood Environment Rating Sub-Scale (ECERS) for ICT.

The progress from 'inadequate' (a rating of 1) to 'good' (a rating of 5) that has been made by so many of the settings in just one year is excellent. The improvements achieved in Portugal have been outstanding. While many of these improvements may not be directly related to the specific introduction of KidSmart Early Learning Centres, it is clear that the KidSmart initiative has supported curriculum development across the full range of ICT curriculum provision. The progress that is being made in the Spanish pre-schools is also creditable. The starting point for many of the Spanish pre-schools was very low and in many classes the introduction of the KidSmart Early Learning Centre has provided the first curriculum area defined specifically for group work. This has had an important impact on many of the teachers and some significant changes have been noted in their more general perceptions of the importance of freedom and exploratory play in the early years. Improvements on the ECERS style ICT sub-scale:

Early Childhood teachers have grown increasingly more comfortable in working with the KidSmart computers in their classrooms:

	Information handling and communication skills		Access and control of ICT tools		Learning about the uses of ICT	
	Visit 1 pre-intervention	Final visit	Visit 1 pre-intervention	Final visit	Visit 1 pre-intervention	Final visit
UK	2.7	4.9	2.1	5.2	2.3	4.8
Spain	1.0	2.4	1.0	2.8	1.0	2.8
Italy	3.0	5.0	2.7	5.0	1.3	4.4
Germany	1.4	3.9	1.0	4.0	2.4	3.4
France	2.0	4.0	2.3	5.5	1.5	5.3
Portugal	3.1	5.9	3.0	6.0	3.1	5.3

9   Scotland the policy framework for ICT in the early years can be found in Early Learning, Forward Thinking: www.ltscotland.org.uk/earlyyears/files/ict_framework.pdf
    (Strayer et Pascal Cazenave-Tapie, 2002).
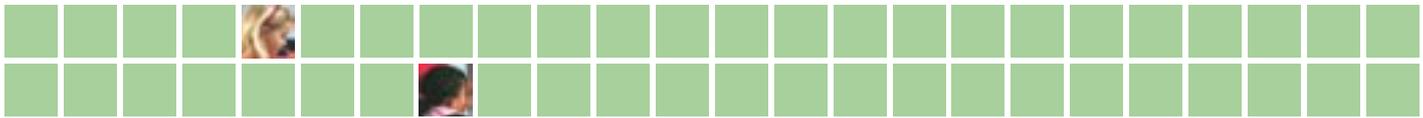
Percentage of teachers who feel VERY comfortable with the computer

	UK	Spain	Italy	Germany	France
First visit	12	26	10	40	40
Final visit	62	83	74	70	75

Over the period of the study many teachers in the control settings reported modest improvements, however improvement in the confidence of the KidSmart teachers has been dramatic. In Portugal the number of teachers reporting feeling very comfortable has increased from 18% to 70% in just six months. This clearly demonstrates the 'user friendliness' of the KidSmart programme.

The early childhood teachers involved in the KidSmart programme have developed a wider and better understanding of the nature of ICT. We asked teachers what they felt children learnt from their use of computers and we also asked: "How is the computer used to assist in the teaching of national or local curriculum requirements (eg the UK Early Learning Goals)?" In our pre-intervention phase a mismatch between practitioner responses to these questions was noted. It seemed that what they observed being learnt at the computer was quite different from what they intended the children to learn. Our findings show some evidence of this gap between observations and intentions narrowing in all the evaluation countries.

Many early years teachers begin with a degree of scepticism about the value of the computers in the pre-school. Their early experiences of the Young Explorer software encouraged a perception of the role of the computer as an educational technology that may be applied in supporting learning, primarily through practice and reinforcement across the curriculum. Early observations of the children's development of hand eye coordination and 'turn taking' with the mouse encourage perceptions of the children's early learning in which the development of basic computer operation and co-operative skills dominate. This notion of the computer as providing education technology also informs many teachers' conception of 'computer integration' across the curriculum. A deeper understanding of the role of ICT is apparent in Italy where their curriculum has encouraged a perception of the role of the computer in supporting democratic practices. In the UK and in Portugal in particular an increasing number of teachers also recognise the part that may be played by the computer presented as a 'tool' in supporting the development of technological literacy.

For the youngest children, ICT is increasingly integrated in their socio-dramatic role play and in the most innovative settings children are using the computers creatively for their own productive purposes. In some settings, children are benefiting from the use of a range of peripheral equipment such as digital cameras, scanners, and even digital microscopes.

The KidSmart Early Learning Centre is being integrated more closely into the curriculum in most countries, although the integration still tends to be mostly in the area of practice and reinforcement of skills rather than as a tool in more creative learning processes. Riverdeep has provided applications that can be used to support a number of activities integrated in this way eg in making greeting cards to be printed and then decorated, or using the Build a Bug in Millie's Math House, as a computer assisted design (CAD) application to design 'Bugs' that may then be constructed using play dough, plasticine or recycled materials.

In Portugal, all KidSmart units had the '2 Simple' software installed and teachers received other software during their training (eg 'Art Gallery'). This software can be used for a range of different activities and purposes, promoting greater integration with other curriculum areas and other teaching and learning media. This is important, as software should be diverse, promoting different uses and offering children a range of experiences.

Surprisingly, since our first visit to the German settings, teachers have reported less potential for curriculum integration. This is disappointing and may have been due to over-expectations or relate to new pressures on staff following a recent international study of school standards. The Young Explorer software does, however, support the teaching of basic literacy, numeracy and science skills and the effective integration of this software for these purposes should now be a focus for the German partner organisations.[10]

A wide range of applications provides a means by which young children can be supported in their manipulation of symbols. Representations on the screen allow them to distance themselves from objects in a way that supports the processes of verbal reflection and abstraction.[11] It is clear that the Riverdeep Young Explorer software provides many contexts for developing these kinds of activity and that the Teacher's Guide provides good resources for curriculum integration. More training may be required before we see wider application of these in Europe, however.[12]

As Valerie Halverson Pace, an IBM Community Relations and Public Affairs Manager in the USA has argued, from the very start of KidSmart the independent evaluations provided by Bank Street College showed that teacher training is critical to success. In the main, however, we found that adequate and appropriate ongoing training was only provided consistently in the German and Portuguese settings. The scale and coherence of the training provided in Portugal has been exceptional and this is reflected in their particularly high achievement in the ECERS ICT sub-scale.

KidSmart agreements with partner organisations stipulate that these organisations provide practitioner training in the integration of the KidSmart Centre to the curriculum. In France, however, teachers reported having only received basic skills courses although 67% reported having received computer training in their initial teacher training.[13] The French research partner has suggested, however, that contact with the researchers themselves, on a one to one basis, undoubtedly

contributed to the evolving trends towards a more integrated and creative approach to the use of ICT in the early years curriculum, that are evident in both the interview and the ECERs data.[13]

In Germany, systematic and ongoing training has been provided and 60% of respondents found this 'very helpful' (30% felt that is was 'somewhat helpful'). In addition to the KidSmart training, the German teachers were provided with basic hardware/software skills training. In Portugal, teachers are being provided with a 38 hours course that is co-funded by the Portuguese Ministry of Education and the European Social Fund. This accredited course focuses on both the development of practitioner practices and the production of pedagogical materials.

While many of the Italian teachers had received basic school based skills training and attended a seminar in Rome at which the integration of ICT into early learning pedagogy was discussed, a surprising number (47%) reported that they had still not received any form of training. In the UK, it was disappointing to note that only one of the four Local Education Authority partners sampled had implemented their promised training package by the end of the first year although they had all received initial training from the UK KidSmart partner organisation.[14] In Spain, the teachers reported on a single training session that they felt was insufficiently practical to suit their current needs.

Over the past year, and particularly since the European Conference, training provided by partner organisations for teachers has become increasingly sophisticated and tightly focused on the effective integration of ICT into the early education curriculum. Two day 'Train the Trainer' sessions have recently been run by IBM in a number of countries in the Middle East to support Ministries in designing high quality training courses which draw on successful models within the existing programme. A further such session is now planned, for example, in France at the specific request of the Ministry of Education, which has recently assumed the role of principle
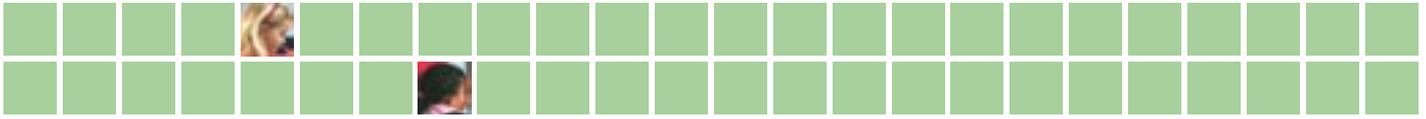
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10   OECD (2001) Knowledge and Skills for Life: First Results from PISA 2000, OECD.
11   Forman, 1984, Siraj-Blatchford and Whitebread, 2003.
12   cf Report recommendations and areas for future development through the KidSmart p7-8

13   Notes: Strayer 2002
14   See 'Areas for future development through the KidSmart programme', p8.

programme partner and is intending to run a series of training sessions for early years teachers in co-operation with their national teacher training colleges. In Spain, a number of high quality training sessions have recently been extremely well received by teachers in the regions.

Teachers generally are calling for more training to be made available and state that they now require more curriculum support in integrating their provision for ICT in the development of practical strategies and with the application of particular exemplary applications.[15] The KidSmart online guide to learning and technology for parents and schools (www.kidsmartearlylearning.org) provides a lot of useful ideas. Guidance is also provided on the Developmentally Appropriate Technology for Early Childhood (DATEC) Web site,[16] (which was developed with European Commission funding and has also been supported by IBM), and provides detailed accounts of exemplary early years practices.

2.3. Adults working with children at the computer

Recent evidence has been provided by the Researching Effective Pedagogy in Early Years (REPEY)[17] project, a study closely related to and building upon the UK Effective Provision of Pre-school Education (EPPE)[18] study. REPEY has shown that adult-child interactions that involve some element of 'sustained shared thinking' are especially valuable in terms of children's early learning. These are sustained verbal interactions that are effectively matched to the child's interest and attention. When children are encouraged to initiate discussion and to ask questions, their capacity to learn increases. It has been found that young children ask more questions when they are involved in practical activities and that ICT provides an excellent context for this:

"Although children work well by themselves on the KidSmart Centres and demonstrate a tremendous capacity to share skills and learn from each other, nothing replaces the active presence of a teacher." (Halverson Pace, 2000)[19]

We asked about the time that adults spent providing children with extension activities or stimulus, providing modelling or demonstration and in reinforcing what the child was learning. While a few (8%) UK and German teachers reported modelling and some reported extension work, it is clear that this kind of support is relatively rare in most settings. Additionally, in each of the countries the percentage of time for which adults are working directly with children at the computer is reported to be lower overall in later than in earlier visits. Ironically, this may be due to the inherent 'child friendliness' of much of the Riverdeep software.[20] We recommend that this aspect of working with children should be made explicit in future practitioner training programmes.[21]

Percentage of time for which an adult sits with children at computer

	0–20%	21–40%	41–60%	61–80%	81–100%
Spain	64	0	0	0	36
Italy	11	11	6	31	42
Germany	10	10	30	20	30
France	75	25	0	0	0
UK	75	19	0	0	6

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15 This is an important policy recommendation arising both out of this report and the report from the European Conference (cf p7).
16 www-datec.educ.cam.ac.uk/datec2.nsf/
17 Siraj-Blatchford et al, 2002.
18 Sammons et al, 2002; 2003.
19 www.mef.org/mcf/forum/ibm.htm

20 Many adults continue to be more comfortable working directly with children using other media than with the computer. Some may also have pre-conceptions about the 'office model' of one person at a machine.
21 See 'Areas for future development through the KidSmart programme', p8.

2.4 Parent partnerships

In some German settings KidSmart has already led to :

"Contact with parents being intensified… There is more communication now. The staff room was used for parents to work with their children at the PC and parents find the PC very useful" (Manager Survey 2003, Germany).

In the first phase of the KidSmart evaluation in the UK,[22] we referred to research that suggests that home-school communication leads to better understanding and more positive attitudes by teachers and parents about each other's roles and also to the improved academic performance of children. Our research suggests that the potential of ICT to support the educational involvement of parents is beginning to be recognised in the UK, Germany and Portugal and this is extremely encouraging.

The importance of the home learning environment has been recognised for many years, with statistical analysis showing the mother's qualification level and family socio-economic (SES) status to be strong predictors of educational outcomes. But major research studies such as Effective Provision of Pre-school Education (EPPE) project are now also showing the importance of the home learning environment to early childhood development and learning. The EPPE research has shown that aspects of self-reported parental involvement in activities (eg reading to their child, teaching songs and nursery rhymes, playing with letters and numbers, visiting the library, painting and drawing, emphasising the alphabet etc) are significant positive influences which account for differences in attainment that are sustained beyond the pre-school period. Most significantly this research also shows that these environmental factors are only moderately correlated with mother's qualification level and family socio-economic status:

"These results suggest that policies for parents in disadvantaged communities which encourage active parenting strategies can help to promote young children's cognitive progress… Many pre-schools already encourage parental participation, and some have developed programmes

that feature parent education. The EPPE results indicate that programmes which directly promote activities for parents and children to engage in together are likely to be most beneficial for young children". (Sammons et al, 2002).

In the USA, the High/Scope Perry Pre-school evaluation[23] and a number of other influential early childhood studies have shown the value of encouraging parents to contribute to the educational process. The value of parents and children reading books together at home has also been well established.[24] Many studies have also shown that when parents, teachers and children collaborate towards the same goals this can lead to improved academic performance across the curriculum.[25] Schools also report that children whose parents contribute to their education in the home show a more positive attitude towards learning and are better behaved in school.[26]

While any detailed analysis of the effects of home ICT use lay beyond the scope of the EPPE research, there are good reasons to suggest that when parents actively support their children at the computer and in other ICT contexts we may expect similar benefits.

A number of researchers have stressed the importance of parental involvement in children's computer use at home.[27] One of the most important findings has been that the level of children's use of computers in school is directly influenced by their out of school experiences.[28] As previously suggested, our data supports another very important finding of these studies: that while the children of higher SES families often use educational software, children in lower SES households use the home computers almost exclusively for playing games. Giacquinta, et al (1993) also found that when children used home computers for educational purposes they were highly dependent upon parental support. When children play games they usually play on their own but Giacquinta et al found that the children who used home computers for educational purposes often had highly involved parents who worked jointly with their children at the keyboard and offered praise as well as practical assistance with the programme.

22 Siraj-Blatchford, J. & I., 2001.
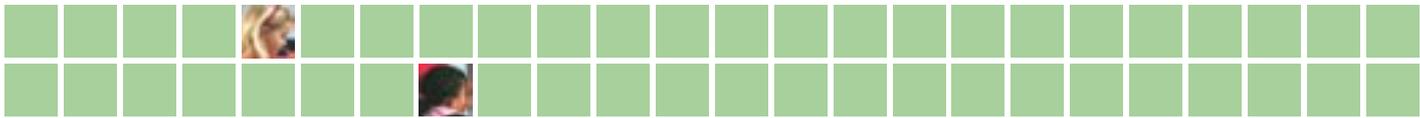23 Schweinhart, Barnes and Weikart, 1993, Schweinhart and Weikart, 1997.
24 Hewison and Tizard, 1980, Hewison, 1988, Topping, 1992.
25 Siraj-Blatchford et al, 2003.

26 Tizard et al, 1982; Hannon, et al 1990; Hewison, 1988.
27 Facer, 2002, Sanger, 1997, Giacquinta, Baucer and Levin, 1993.
28 Facer et al, 2000.

2.5 The digital divide

A question addressed in the evaluation has been the extent to which the KidSmart Early Learning programme is meeting its goal of making a contribution to bridging the 'digital divide' in disadvantaged communities. Our results in most countries in this study are encouraging. In the UK, appropriate national baseline data are available and this shows that parents employed in the lower socio-economic groups are significantly over-represented at the schools where KidSmart Centres have been placed. In conducting the analysis we adopted the PISA (OECD, 2000) protocol of taking the father's employment as a primary indicator, and where the father was unemployed, absent or from a lower socio-economic status classification, we have taken the mother's employment instead. While various international standard classification systems of occupation are available, however, an adequate international index of socio-economic status (SES) has still to be realised.

In the following graphs we have shown the data collected on the socio-economic status of parents in each country. We have used the occupational categories defined in the UK standard National Statistics Socio-Economic Classification (NS-SEC) although national definitions may vary. This classification provides a general indication of the parents' socio-economic status, however, and it can be seen that in the case of the UK and Spain the allocations are strongly skewed towards communities who are unemployed or employed in the technical, routine and manual sectors.

It is therefore absolutely clear that in the UK the KidSmart programme is meeting the needs of those most disadvantaged and this also appears to apply to Spain. The socio-economic status of parents in Germany, Italy and France is much more diverse, however, with only half the children coming from lower SES groups. It is possible that this reflects the organisation of pre-schools in these countries, which may set out to admit a cross section of the community. Investigation into this lies outside the remit of the present study, however.

Percentage of parents of KidSmart recipients from lower SES groups (lower social classes)

%	UK	Spain	Italy	Germany	France
Technical, routine and manual, unemployed	75	77	40	47	38

Considerable caution is, of course, required in interpreting this data. Standardised baseline data for the occupational structure of each country is required if we are to fully judge its significance and this is currently unavailable. It may be that the UK occupational definitions are misleading in these contexts and in any event it is clear that there were wide variations in the reporting of occupational status by parents. In the case of Italy in particular 51% of the sample classified themselves as 'intermediate' on the NS-SEC five point scale, while in Germany 25% of the parents, and in Italy 15% reported themselves members of the 'Managerial and Professional' category.

Comparing percentages of population with access to KidSmart Early Learning Centres and the UK population in three occupational classes

	Influence population	General population
Managerial and professional	12	43
Intermediate	9	19
Routine and manual	58	38

The majority of parents support the introduction of computers in the pre-school and in the home. Although a surprising number (17%) of German parents felt that computers had no place in the preschool (10% were against their use at any stage of education).

Parent views on the age children should be introduced to computers in the pre-school

%	UK	Spain	Italy	Germany	France	Portugal
Under 5 years of age	57	55	50	38	53	62
Over 5 years of age	0	31	27	28	20	34
When they are 'ready'	5	11	16	8	27	4

Parent views on the age children should be introduced to computers in the home

%	UK	Spain	Italy	Germany	France	Portugal
Under 5 years of age	51	50	50	49	58	57
Over 5 years of age	3	47	27	19	20	39
When they are 'ready'	6	3	16	8	22	4

We have found that the proportion of KidSmart parents with computers at home tends to be somewhat higher than the national averages (OECD, 2001, see footnote 10), but this is to be expected given the evidence that families with young children have more home computers than others (eg as reported in the PISA study)[29]. In the UK, 60% of KidSmart parents had a computer at home, in France the figure is 62%, in Germany the figure is even higher at 88% but in Italy it is only 58% and in Spain just 44%. The pattern is complex and there are major regional and urban-rural variations. In Portugal 48% of parents had a computer at home before the evaluation and 62%. In Italy for example, 83% of the families living in the North (Legnago) have a computer at home, in the centre (Benevento) this percentage of families with computers decreases to 43% and in the south (Catania) only 39% of the families have computers at home.

The digital divide concerns not just access to ICT, however, but the quality of the child's experience at the computer. Our data shows that children in lower SES groups are more likely to be playing games on their home computer and for considerably longer periods of time than their middle class counterparts. The children of middle class parents are more likely to be using educational software. This suggests the need for pre-schools to work with parents in developing educational practices in the home.

Computer hardware and software used at home

%	UK	Spain	Italy	Germany	France
Computer at home	60	44	58	88	62
Games software used	39	60	33	48	100
Internet/email used	23	17	20	30	40
Educational software	31	35	12	19	40
Supports employment	32	49	35	48	60

We also asked parents for specific information about the child's use of the computer at home

%	UK	Spain	Italy	Germany	France
Child never uses	3	23	13	18	0
Child operates on his/her own	28	94	43	43	47
Child operates more than 5 hours per week	10	8	11	7	8

29   OECD (2001) Knowledge and Skills for Life: First Results from PISA 2000, OECD, http://oecdpublications.gfi-nb.com/cgi-bin/OECDBookShop.storefront/
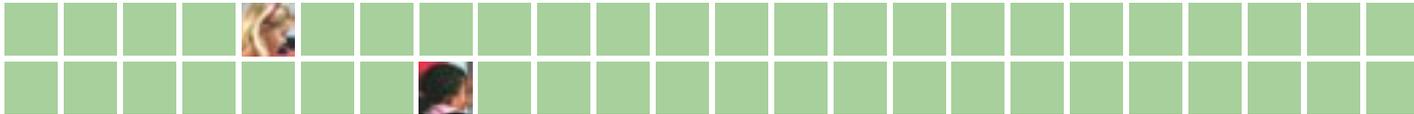
2.6. The KidSmart Early Learning Centre

As indicated, the KidSmart Early Learning Centres have been extremely well received. The robustness of the Centres, their ease of use and the suite of good, accessible programmes has had a positive effect, particularly in respect of access. Some of the strongest features have been found to be the bench seat that encourages children to collaborate and the centred speaker grill. With the speaker fitted behind this grill as originally intended, the wings on each side serve to contain some of the sound which could otherwise be quite distracting to other children.

Flat screen monitors are supplied in some countries but they do not fit the unit as well as the cathode ray tube (CRT) monitors for which it was originally designed. For this reason IBM is now issuing all KidSmart Centres with CRT monitors and has recently agreed with the manufacturer, Little Tikes, that the design of the Centres will be adapted from summer 2004 to accommodate 17 inch monitors. A standard computer keyboard is preferred to the membrane keyboard by most pre-schools and small sized 'mini-mice' are also recommended. Figure 1 shows an adult size mouse being used by a child in a German pre-school. This is widely considered to constitute an ergonomic problem for young children.

It is further recommended that microphones and printers are supplied with all the Centres as they are important for supporting good educational activities. Many pre-schools received these and are making good use of them, but not yet all.

The heights of children in the three to six age group vary widely. In fact charts produced by the US National Centre for Health Statistics (2000) suggests that this may be by as much as 28 centimetres. The ergonomics of the KidSmart bench is therefore a problem and the younger children in particular are often seen straining their necks looking upwards towards the screen. One solution to this would be to provide stacking base inserts and associated footrests. In the absence of this, we believe the problem is best addressed in two ways:

1) By encouraging greater integration of the computer into activities demanding time away from it.

2) Talking to the children themselves about healthy posture (educating them from an early age about computer ergonomics) and encouraging them to use cushions when appropriate.

In most pre-schools children rarely spend a lengthy period of time (eg half an hour) at the KidSmart Centre, however, and if they are well monitored and the sessions effectively planned as part of their wider learning, this should not be a major concern for this age group as long as staff are aware and remain vigilant.

Figure 1

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3. Appendices

APPENDIX A: ECERS sub-scale

Information handling and communication skills

Inadequate		Minimal		Good		Excellent
1	2	3	4	5	6	7
	1.1 There is no or little use made of ICT in the setting.[30]	3.1 ICT is applied by staff to enhance the print and number environment throughout the setting (eg printouts used in emergent literacy/numeracy/labels).		5.1 Staff use the computer during story telling and/or other group activities (eg multimedia, talking books, programmable toys, encyclopaedia).		7.1 Children are encouraged to use ICT to share their ideas and discoveries with peers (eg showing their painting in a display or the centre's web page).
	1.2 Children are not encouraged to operate the ICT themselves (eg any computer, video, television, cassette, telephone etc) that is available.[31]	3.2 Children are encouraged to use only the supplied and pre-installed software on the computer (eg literacy and numeracy programmes).		5.2 Children are encouraged to choose their own (toys or software) applications during free play.		7.2 The children are encouraged to provide initial instruction and to help each other in using new programmes and applications.
				5.3. The Programmes available include open-ended problem solving, adventure games and draw/paint software.[32] 5.3 In applying the ICT the children make their own choices to produce different outcomes.		7.3 Children are encouraged to use generic software[33] and other applications for their own purposes (eg to make a birthday card for a parent).

Access and control of ICT tools

Inadequate		Minimal		Good		Excellent
1	2	3	4	5	6	7
	1.1 Very little pretend or real technology is available for the children's use in the setting.[34]			5.1 The children routinely select and load their own computer software.		7.1 The children are encouraged and supported in information retrieval (eg in accessing a CD-ROM encyclopaedia[35] to help them answer a question).
		3.1 The children occasionally select and load their own computer programmes under adult supervision.		5.2 The children are encouraged to operate ICTs and to appreciate that signals and instructions are required to control them.		
	1.2 The children are rarely or are never given the opportunity to operate ICT (eg TV, cassette, video, computers etc).	3.2 The children have the opportunity to play with computer programmes and programmable toys (eg Pixie).		5.3 Computer software is employed to support learning in a range of subject areas (eg music and science as well as literacy and numeracy).		7.2 The children are encouraged in their play to programme a wide range of real and/or pretend technologies (eg alarms, washing machines, video recorders etc).
		3.3 Children have access to, and operate for themselves, cassette recorders, video, computers.				7.3 Computer software is available to support learning in a wide range of subject areas.[36]

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30 Computers and programmable toys are not available, mostly ignored or inoperative.
31 eg switching equipment on and off.
32 Applications supporting/demanding creativity.
33 Generic software is software designed for a multiplicity of uses eg wordprocessing, graphics, database.

34 ie restricted to telephones, cash registers etc – no programmable toy and no real or pretend computer.
35 Or other CD-Rom or internet (non-fiction) information source.
36 ie supports eg music and knowledge and understanding of the world in addition to literacy and numeracy.

Learning about the uses of ICT

Inadequate		Minimal		Good		Excellent	
1	2	3	4	5	6	7	
1.1 No references are made to the ICT in the children's homes, the early childhood setting or local environment.		3.1 The staff sometimes draw children's attention to the ICT in the setting and in their homes[37].		5.1 The children's attention is specifically drawn to the ICT in their local environment (eg through reading stories about technology, visits to supermarket checkouts etc).		7.1 The children are encouraged to provide narrative accounts[38] of their own and others use of ICT (eg of scanning products through a supermarket checkout, using a cash point, ICT at home).	
1.1 No references are made to the ICT in the children's homes, the early childhood setting or local environment.		3.2 The children sometimes see staff using ICT (eg a school secretary using a wordprocessor).		5.2 The children routinely see staff using ICT in pursuit of the educational aims of the setting eg searching for information on the www, programming a video recorder, making labels for display, using a mobile telephone).		7.2 The staff provide instruction and opportunity in new applications as a direct response to a child or to a group of children's interests or expressed needs.	
1.1 No references are made to the ICT in the children's homes, the early childhood setting or local environment.		3.3 Pretend or real ICT resources are provided for the children to use in socio-dramatic play environments (eg home corner).		5.3 Play with pretend or real ICT is encouraged and often included in socio-dramatic play.		7.3 ICT is integrated into a range of socio-dramatic play environments (eg in 'shop' or 'office' play environments).	
1.2 The children never see the staff using ICT for their own purposes.							

37   If not directly observed, this item must be included in the settings curriculum scheme or statement.
38   eg telling each other about their own or others use of ICT in 'sharing time'.
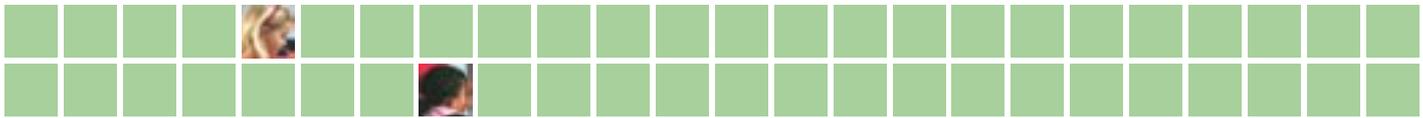
Detailed evaluation results from the countries

APPENDIX B: France

The KidSmart partner organisation in France has been the Association Générale des Instituteurs d'écoles maternelles (AGIEM). In France, the Crèche System covers Infant Daycare (three to 30 months) and the Ecole Maternelle accepts children from two to six years. Parents pay a moderate fee for Crèche services, which are co-financed by local authorities. Nationally, less than half of infants are enrolled. The Ecole Maternelle is integrated within the National Education System and thus involves no supplementary charges for parents. Well over 90% of the population enters school before four years of age.

In France, both levels of care provide high educational standards. In the maternelles, teachers have five years of training and a teaching certificate. Teachers are assisted by one or two care-givers who have at least a high school leaving certificate. In general, enrolments are about 25 to 30 children to each qualified teacher. Counting the assistants, average ratios are about 10 to 15 children per adult. In the disadvantaged ZEP schools,[39] enrolments are reduced to between 18 and 25 children resulting in a reduction in the ratio to 6 to 12 children per adult.

French écoles maternelles have a well elaborated and quite specific national programme that emphasises both early socialisation with peers and individual adjustment to the rules and regulations of collective life. Considerable attention is accorded to the acquisition of basic literacy and numeracy skills.

Although teachers usually have some training in ICT technologies during their time at the IUFM,[40] there are no explicit directives for implementing ICT as part of the pre-school curriculum. Maternelles often have one or two computers available on a time share basis. The exploitation of such resources depends heavily upon teacher initiated projects.

Official policy is, however, definitely supportive of the integration of ICT as early as possible. Limitations relate to a general lack of ICT resources and the lack of any appropriately organised ICT programme for teacher education.

The vast majority of teachers and parents are very satisfied with the access to the KidSmart computers that has been provided. French teachers have suggested that KidSmart has already had a significant effect upon relationships between children and school and even between parents and school:

"*Some parents had difficulty getting their children to school on time but since the KidSmart Early Learning Centre has been made freely available to use as the children arrive at school, the children have managed to have themselves brought to school early, even as we are opening the doors !*" *…or* "*…for Mother's Day we made a book on the computer. The children invented a story, painted different illustrations which we photographed with a digital camera. Then we wrote out the text on a word processor, formatted and printed it. The parents were astounded at what their 'little geniuses' had managed to do!*"[41]

France	Information handling and communication skills		Access and control of ICT tools		Learning about the uses of ICT	
	Visit 1 pre-intervention	Final visit	Visit 1 pre-intervention	Final visit	Visit 1 pre-intervention	Final visit
KidSmart schools	2.0	4	2.3	5.5	1.5	5.3
Control schools	1.5	2.5	2.3	3.3	1.3	2.8

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39 Zone d'Education Prioritaire.
40 Institut Universitaire de Formation des Maîtres (teacher training colleges).
41 certains parents avaient du mal à respecter les horaires d'ouverture de l'école, depuis que l'ordinateur est libre d'accès durant l'accueil, les enfants ont réussi à se faire amener tôt à l'école, dès l'ouverture ! " ou encore " … pour la fête des mères, nous avons réalisé un livre avec l'ordinateur : les enfants ont imaginé une histoire, ont peint les différentes illustrations, nous les avons prises avec un appareil photo numérique, nous avons ensuite écrit l'histoire à l'aide d'un traitement de texte, formater et imprimer le tout : les parents ont été réellement éblouis de ce que leurs petits génies avaient réussi à faire ! ". (Strayer et Pascal Cazenave-Tapie, 2002).

It has even suggested that some parents plan to move so that their children can benefit from this equipment! The manner in which the computer has been integrated into teaching practices has differed widely from one school to another, in particular as regards children's freedom of use.

Comfort

Teachers reported feeling moderately more comfortable with computers even in the control settings in France. However, while 66% of the control group teachers now feel very comfortable, 75% of KidSmart teachers do so. This is especially significant as more of the KidSmart teachers (20%) had expressed initial concerns about the use of computers. All of the KidSmart teachers are now confident or very confident.

The time that teachers spend sitting with children at the computer has declined throughout the period of evaluation in France. The teachers reported spending more of their time in general supervision and less on modelling, demonstration, and in providing software support. Curriculum gains have, however been significant with the settings achieving a 'good' grading in all but Information handling and communication skills.

Productive time

French teachers report only moderate use of the computer throughout the day but the amount of time the KidSmart equipment is in use is increasing. While only 60% of the French teachers initially saw 40% of the children's time on the computer as productive, 87% now report 81–100% of the time to be productive. This compares with 40% of control group teachers reporting maximum computer usage only 10–30% of the time. While a marginal improvement was noted even in the control group, in relation to teachers' perceptions of the value of children's time spent on a computer, the responses of the KidSmart teachers are extremely encouraging. While we found on our first visits that none of the teachers felt that more than 40% of the time was useful, on our final visit 25% reported 41–60% of the children's time of educational value.

The teachers informed us that they were generally impressed with the value of ICT in developing children's social skills. The computer was also seen as especially beneficial in terms of practice, concentration, basic motor skills and organisation of personal activities.

We asked the teachers what they considered children learnt from their use of the computer and there is evidence that the experience of the teachers in the control group has led them to focus upon two areas in particular: 'language and literacy' and 'confidence and self esteem'. The confidence of the KidSmart teachers in the contribution of the computer has improved right across the curriculum with all the teachers citing language and literacy, problem solving/cognition, new knowledge, concentration/perseverance, co-ordination, turn taking/social skills, use of mouse/fine motor skills, and hand-eye coordination. A large minority cited numbers, time and space, creativity, confidence/self esteem as significant learning outcomes as well.

Concepts of ICT and integration

French teachers believe the computer can be integrated into the curriculum and all of our KidSmart respondents said that they believed the computer could be used to assist in the teaching of the National/Local Curriculum. This should be seen in the context of some degree of scepticism regarding the value of computers in the control settings where 60% felt that they would have little value in these terms.

There are some signs that the understanding of ICT education held by all French early childhood teachers is becoming more sophisticated. While fewer of the control group teachers felt that ICT education involved learning about radio and television, more now understand that it includes learning about electronic games and toys and mobile telephones. The concepts of the KidSmart teachers have developed significantly in France with many more citing the full range of applications.
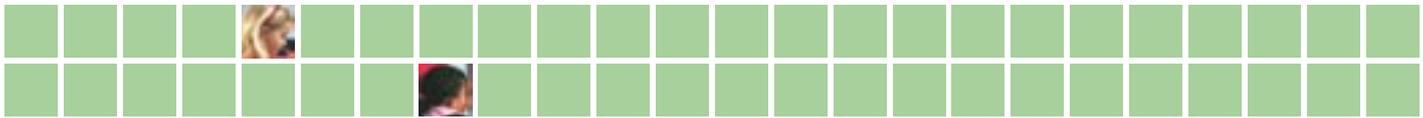
APPENDIX C: Germany

The main form of early years provision in Germany is the Kindergarten, which is for three to six year olds with mixed age grouping. While kindergartens have become widely accepted, the levels of provision vary regionally, with universal coverage in former East Germany being the norm. There has been an extension of places in the western states as well and from the beginning of 1996 every child from age three up to school entry is legally entitled to a place in a Kindergarten (except for Bavaria, but with a few exceptions the supply of places also meets the demand in this State). In east and western Germany, 82-87% percent of the children attend a day care centre for 2–2½ years before entering school.[42]

Germany therefore provides places for approximately 90% of three to six year olds in its Early Childhood Education settings. The typical adult/child ratio for three to six year olds it is 1:11. Most early childhood teachers are trained in further education and less that 4% of them are graduates. In fact as many as 10% may not have any training.[43]

Early childhood education in Germany traditionally focuses on the children's social and emotional development and their motor activity. Cognitive learning in contrast is looked upon sceptically in early childhood settings because it is associated with school and the pressures to perform.

As far as the general provision for ICT is concerned, up to 1996 it was a public conviction of the Youth Ministers of the western States that electronic media were not suitable for use in early childhood settings. In 1987, they decided that computer and video games, TV and video films should not have a place in a Kindergarten (computers were not widely available yet). Essential arguments were that the world of young children became impoverished by the extended use of electronic media and that young children did not yet have the cognitive abilities necessary to make sensible use of them. In addition, a lot of negative effects on the emotional, intellectual, social and physical development were assumed.

There remains an influential, intellectual strand of opinion which maintains that the world of young children may be impoverished by ICT. It is assumed to reduce sensory experiences in the real world and hence that ICT should not be used in early childhood settings. Slowly, however, opinion is changing and many believe that even young children can learn a lot through using ICT, especially computers, and this view is increasingly supported in early childhood settings. It is now clear that ICT and media education will play an important part in the future Bavarian curriculum for children from birth to six.

In 1996 the 16 Youth ministers decided that media education should begin at the Kindergarten stage. The importance of TV, video and computers in a young child's life was recognised. To handle electronic media competently and responsibly became an important objective in early learning, along with the concept of social justice and the importance of helping those children who don't have the opportunity to interact with ICT at home to attain computer literacy.

Curriculum guidance at State level is therefore now under way. The State Institute of Early Childhood Education and Research in Munich has been commissioned by the Bavarian department of social security to develop a detailed curriculum for education from birth to six. Many other federal states will follow or create education programmes of their own.

Germany	Information handling and communication skills		Access and control of ICT tools		Learning about the uses of ICT	
	Visit 1 pre-intervention	Final visit	Visit 1 pre-intervention	Final visit	Visit 1 pre-intervention	Final visit
KidSmart schools	1.4	3.9	1.0	4.0	2.4	3.4
Control schools	1.5	4.5	1.5	4.5	2.5	3.5

42 Sachverständigenrat Bildung bei der Hans-Böckler-Stiftung, 2001.
43 Statistisches Bundesamt, 1998.

In Bavaria the first recommendations for the implementation of the regulatory framework were published in 1997. Media education appears in two chapters. In the first it is presented in a general way as an example of the holistic way of educating children in an early childhood setting. It is argued that the use of media has cognitive, emotional, creative, communicative, technological and socio-educative aspects. In addition the need to co-operate with parents and other institutions is stressed, eg to lend them equipment. In the second chapter, media education is displayed as a special means of fostering creativity and communication and is put in line with music, aesthetic or art education. In the future Bavarian curriculum the focus for ICT and media will lie in the foundation of technological literacy and the setting of specific learning goals, using ICT as a means of attaining those goals.

On 24 April 2002, an all day training session took place at the IFP in Munich. Fifteen centre managers and educators specialising in ICT education took part in the training, which addressed not just technical but educational questions on the use of computers in the Kindergarten. The participants said that this was exactly what they needed.

The participants introduced themselves and talked about their experiences with ICT in their settings and about their motivation to work with computers for teaching and learning. They were encouraged to stay in contact after the briefing and to build a network. Next they were presented with the DATEC curriculum guidance for teachers.[44] Some hand-outs of the presentation were distributed to the participants. In addition they received translations of the "ICT Policy for Centre X" and the "DATEC: ICT Application Review".[45] In the afternoon three small groups were formed, which raised questions on the appropriate use of computers, eg their impact on communication, the amount of control over ICT a child should be given, what kind of software a setting should buy, the amount of time spent on computers and how to make technology an integral part of the curriculum. The groups discussed this for one hour. Afterwards, the outcomes were presented to the other members in the plenary. It seemed that many participants had never reflected so intensively on

these topics before. They found it helpful for their work and felt they would like a second training session soon. Participants investigated some of the computer software installed on a KidSmart Early Learning Centre at the end of the in-service session.

Comfort

Teacher confidence with the computer increased significantly throughout the period of evaluation, from 40% initially feeling comfortable with the equipment at the beginning to 70% at the end. All of the German teachers now feel 'comfortable' or 'very comfortable'. According to one of the setting managers, the teachers felt that the use of computers was:

"...modern, innovative, and obligatory for responsible education in the 21st century. Over and above that they have had good experiences with the computer. Everything works" (Field Notes).

When managers were asked why they thought staff confidence had improved they suggested that:

"Initial apprehensions turned out to be groundless. There is less stress now than at the beginning"

"Parents are very pleased"

"The attitude has become more positive. Children learn very fast and the insight has grown that early childhood is a good age for beginning with ICT and that ICT is especially important for poor children"

Despite these achievements, the ECERS ICT sub-scale shows only modest curriculum improvements compared with other countries. To a certain extent this is due to the fact that the units were delivered without the administration password and for a significant period the settings were unable to install additional software. While the following comparison with the control group may seem surprising, the small size of the control sample is such that their comparative success is entirely attributed to the progress made by one particularly

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44   www.ioe.ac.uk/cdl/datec/curricguide.htm
45   Appendices A and B of the Final Project Report "KidSmart: The Phase 1 UK Evaluation 2000–2001" (Siraj-Blatchford, J. & I., 2001)
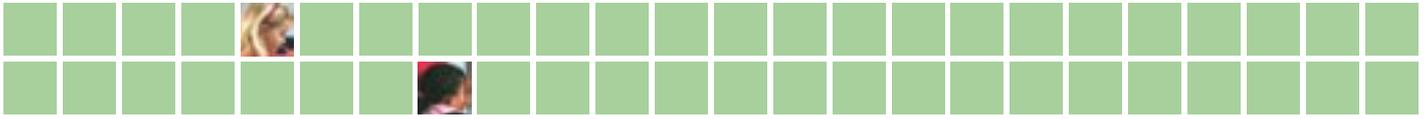
successful control setting. With this setting data removed the superior progress made by the KidSmart settings is unchallenged.

Productive time

70% of the German teachers reported the KidSmart computer in use only 0–20% of the available time and only 10% of the staff felt that it was used more than 60% of the time. However 80% of respondents reported 81–100% of the time was educationally valuable and productive. The amount of time adults sit with the children at the computer appears to vary widely in Germany with 20% of respondents reporting spending 0–20% of the time with the children, 40% spending 41–60% of the time and 40% spending 81–100% of the time. The form of support given by respondents also varied widely. Most respondents felt that the children's use of the computer fostered general abilities such as motivation, social skills, and familiarity with technical devices. They tended not to think of specific learning goals such as letters and numbers without prompting. Despite this, 80% of respondents said that the computer was applied to assist in teaching the curriculum.

When German teachers are asked about learning effects, they usually refer to cognitive abilities and knowledge development. Computers are therefore seen more as a tool for learning at school rather than having an impact on physical and social interaction.

"In the last year before children enter school support is given eg in case of deficits in reading and numbers."

"Games are selected which are suited for certain goals."

"The development of cognitive abilities is supported together with the acquisition of knowledge. This is done by certain games, by use of the computer in general and by researching information on the Internet."

Concepts of ICT and integration

90% of the German respondents were positive about integration and 60% reported that this was extended to socio-dramatic play :

"Installation of a computer corner alongside a construction corner and a doll corner in the classroom, making the plan of a building, drawing pictures."

"Drawing pictures and writing letters with a pen and with the computer, printing out clip-arts and then crayoning in, creating cards by clip-arts and then playing with them."

"Re-playing what has been done or shown on the computer, eg writing a letter with a pen; expression of what has been done with the computer or what has been seen on it by physical movement (eg mouse); producing a CD containing events of everyday life in kindergarten."

"Playing 'McDonald's' with the PC."

"With Easter as a pedagogical topic drawing an Easter bunny on the PC or writing Easter-related words with the keyboard."

"Project work."

"Drawing attention on the difference between real and virtual things practising numbers and calculating also with computer programmes."

Initially, audiovisual and telecommunication media as well as computers were named by all the centre managers with computers and television being the most frequently mentioned. Sometimes print media were also included with ICT.

APPENDIX D: Italy

The KidSmart partner organisation in Italy is the Servizio Scuola Maternal, a department of the Italian Ministry of education. The Italian Ministry of Education is responsible for the curriculum and for quality inspection of the pre-schools (scuola maternal) that cater for over 90% of the three to six year olds. Reforms are currently under way to ensure that in future all scuola maternal teachers will be university graduates. At this point only 26% of the KidSmart teachers in Italy have been trained to degree or post graduate level in education.

In all the settings visited no other ICT equipment (except for hi-fi and TV) was available. We found that the children were given the freedom to use the computer during their free time (about one hour per day). During this period, the teachers support them only if they are asked. In addition, special organised activities are also carried out by teachers.

The role of the Italian pre-school is to support children in reaching clearly defined targets for the development of their identity, autonomy and skills. The choice of curricula is connected to the way that the educational environment has been designed and structured and the infant school assumes responsibility for this while conforming to the following guidelines:

1. Curriculum programme: components and functions

The national programme outlines the aims of the infant school in relation to patterns of childhood development. It indicates learning material which is appropriate for age, cultural context and purpose as well as methodological and didactic criteria for educational activities. The programme is implemented with adaptations to meet the specific educational needs of children and of different communities.

2. Fields of educational experience

These are specific and identifiable areas through which children confer meaning on their many activities, develop their learning capacity and acquire linguistic and procedural tools, as well as pursue educational aims in the context of active experiences which are planned and managed by the school. They are:

a) Body and movement – contributing to the growth and overall development of children, promoting in them an awareness of their body's importance as an expression of personality and as a functional, relational, communicative, cognitive and practical instrument.

b) Speech and words – involving the practice of communicative skills which have to do with oral language and an introduction to written language, developing understanding of language as learnt within a variety of communicative contexts and that it is a system governed by implicit rules which we apply even if we cannot describe them.

c) Space, order and measure – this is concerned with the grouping together, ordering, quantification and measurement of facts and phenomena, as well as developing the ability to interpret and consciously act on them. Mathematical skills are taught primarily through the solution of problems using instruments which themselves may become the object of reflection and analysis.

d) Objects and nature – exploration, discovery and early systematisation of knowledge about the world of natural and artificial reality. Specific aims relate to the formation of a scientific attitude and of scientific skills.

Italy	Information handling and communication skills		Access and control of ICT tools		Learning about the uses of ICT	
	Visit 1 pre-intervention	Final visit	Visit 1 pre-intervention	Final visit	Visit 1 pre-intervention	Final visit
KidSmart schools	3	5	2.7	5	1.3	4.4
Control schools	2.7	2.7	2.7	2.7	1	1

46 UNARETE, 2002 Young children are taught to take a critical view of the media and how to evaluate what they see. It forms a part of education for citizenship.

e) Messages, forms and media – activities which relate to the visual, manipulative, musical, theatrical and audiovisual fields as well as the mass media and the complex relationship between them.

This area has in recent times come to assume even greater importance. It is essential in this multi-media society that we realise the importance of being able to produce and understand messages, translate them and work them out using different codes. Children's desire to communicate and narrate 'visually' could, for example, provide a chance to play 'TV' which might lead to an examination of editing techniques. In this way children will be able to undertake wider forms of discovery with regard to the more common types of technological objects and they will be able to reflect on them and on their cultural significance.

f) The self and others – all those experiences and activities which explicitly aim to encourage the child to understand and accept behavioural norms and the relationships which go towards making human existence meaningful.

The analysis doesn't show any significant differences between the purposes of use. Parents in 75% of the cases affirm that they use the computer mainly for work purposes and only in Legnago do the parents use the computer mainly for entertainment. All the schools identified by the Ministry have been involved in other national projects such as Ascanio, Alice, Reinventing Education, which have introduced curricular and methodological innovations.

IBM organised about ten hours of training for a teacher from each school, which focused on technical aspects of the computer's use. A number of seminars were also organised in Rome to discuss computer integration into teaching and learning. At present computers are located in specific corners of the classrooms. These are created by children and display all the activities already undertaken and in progress.

Comfort
79% of all the Italian teachers (KidSmart and Control) initially reported feeling comfortable with computers, with another 11% feeling very comfortable and only 10% feeling less than comfortable. Matters have improved significantly

in the KidSmart settings with 74% now telling us that they are very comfortable. None of the teachers continue to feel uncomfortable with the technology.

The time that teachers spend sitting with children at the computer has declined slightly throughout the period of the evaluation in Italy. Encouragement and student support seems to be increasing at the expense of software support and teachers using modelling/demonstration.

Productive time
The computer was initially used for just 17% of the weekly time available and this has risen very slightly to 20%, but this should be compared with the control group teachers reporting computers only being used for 5% of the time! The proportion of this time that the teachers feel is productive in educational terms has been fairly stable with 80% of the teachers considering more than 60% of the time well spent. Many teachers say that children learn when they play with the computer. One group referred to the fact that the computer helped to create interesting and enjoyable learning contexts.

There appears to be little change in the Italian KidSmart teachers' understanding of what it is that children learn from their use of the computer. This might in part be explained by the fact that for most, prior training experiences were strongly based upon a popular application of Freirean concept of 'Alfabetization.' which emphasises the use of the internet as a tool for democratic interaction and emancipation.

Teacher responses therefore emphasised collaborative learning, co-operation between pairs and social development. Specific learning experiences related to cognitive abilities, social skills and language and literacy dominated.

Concepts of ICT and integration
All of the Italian teachers agree that computers can be positively integrated with other activities. All of the respondents also share the idea that ICT can be positively integrated with other activities, especially socio-dramatic play. While many of the teachers emphasise the importance of recognising ICT as providing; "Tools that make communication easier", and/or "Tools that help knowledge construction", a more inclusive understanding of the term Information and Communications Technology (ICT) seems to be developing.

APPENDIX E: Portugal

The Portuguese KidSmart programme was developed as a partnership between IBM, the University of Évora and the Associação de Profissionais de Educação do Norte Alentejo (APENA).

In 2001 77% of Portugal's three to five year olds were receiving pre-school education. 47% were enrolled in the state sector and 53% in the private sector, mainly in not for profit pre-school centres. Adult to child ratios in Portugal are typically 1:12, but only 1:18 in terms of qualified staff. In the KidSmart sample a third of the teachers have a three year diploma in Early Childhood Education (ECE) and two thirds have a four year degree in ECE. The use of ICT in Portuguese early childhood education is still at a very early stage of development. Some projects under the initiative of the Ministry of Education and the former Ministry of Science and Technology have implemented the use of ICT in education but they have never seen pre-school education as their priority. Unlike other education sectors, pre-schools have never received ICT resources unless they were integrated into projects with other levels of education. Thus it is difficult to ascertain the percentage of pre-schools that have access to ICT or how they use it.

Recent information, relating to the state sector only, indicates that there is one computer per 100 pre-school children (compared with one to 33 in primary schools) and one computer with Internet access per 442 pre-school children (compared with 59 in primary).[47] Although no information is available for the private sector, we believe the number of computers in these types of pre-school settings to be even lower.

Despite the lack of ICT policies for Early Childhood Education, there are several small ICT development programmes which rank among the most innovative work developed anywhere. Universities have developed these programmes in close collaboration with schools or with teachers' associations.[48]

The "Curriculum Guidelines for Pre-school Education" (1997) is the curriculum document for pre-school education in Portugal. In this document references to ICT are modest but explicit. ICT is referred to within the 'spoken and written language' domain which is included in the area of 'expression and communication', although the link with other curriculum areas (art, music, written and mathematical) is stressed and suggested. In this document, ICT is seen as 'new languages present in children's everyday lives' used to express themselves individually and in groups, to access knowledge and in the transmission of culture. The importance of ICT in supporting learning and its integration as a creative and information tool are also stressed. Media education is also seen as an opportunity to develop a critical attitude towards products such as TV and video programmes, CD-ROMs, etc. Another central idea expressed in this document is that ICT can provide children with the opportunity to learn through a new code which is essential in today's world.

The training model adopted by the Portuguese KidSmart programme included 38 hours of workshops. This form of in-service training[49] places a good deal of emphasis on sharing and reflecting on practices, as well as on the production of new materials and their implementation and evaluation. This approach included the allocation of time between workshop sections for implementation, trials and the collection of children's work products. The training

Portugal	Information handling and communication skills		Access and control of ICT tools		Learning about the uses of ICT	
	Visit 1 pre-intervention	Final visit	Visit 1 pre-intervention	Final visit	Visit 1 pre-intervention	Final visit
KidSmart schools	3.1	5.9	3.0	6.0	3.1	5.3
Control schools	2.0	2.3	1.7	1.7	2.0	2.7

47 DAPP, 2001-2002.
48 One of the most interesting examples is the work developed by APENA in Portalegre.
49 Credited by the CCPFC In-service Training Scheme Scientific Board Funded by Prodep III-EU.
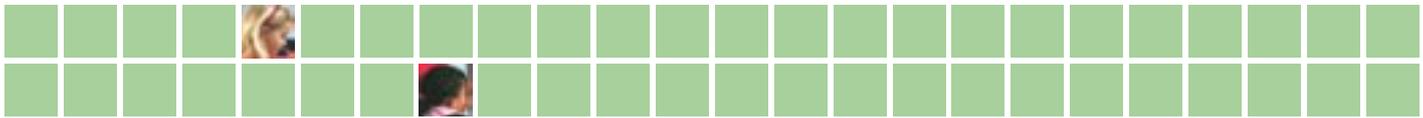
was developed in two groups, one in Évora and another in Portalegre and included two joint sessions of presentation and discussion of experiences (one in the middle and another at the end of training). The content of the training was closely related to the Developmentally Appropriate Technology for Early Childhood (DATEC) rationale and curriculum guidelines for ICT. The Portuguese team for KidSmart also participated in the DATEC project.

The pre-intervention data collection was undertaken during January 2003 and the first post-intervention evaluation in June 2003. The final evaluation took place in March 2004. The Portuguese results are only partially reported as the analysis is still being undertaken.

Teachers in the KidSmart programme have more than five years of working experience, with half of them having taught for more than 16 years. Most of the pre-schools did not have a computer in the classroom before the KidSmart programme. Some had a very basic computer with no CD-ROM or printing facilities and some groups had access to a computer outside the classroom.

All the teachers had a computer at home, which they used mainly for education (70%) and work (82%). Only half of the teachers used the Internet. In the first post-intervention visit, an increase in the uses of computer at home, especially for educational purposes (82.4%), internet (59%) and entertainment (35.3%) was reported.

Concepts of ICT and Integration
Teachers in the KidSmart programme showed a significant change in the way they integrated ICT into every day learning experiences. The computer became a very important learning tool in the context of pre-school classrooms and it was used for a variety of purposes in conjunction with other materials. Computers in the post-intervention evaluation were used on a daily basis and children had access to them as to other areas of the classroom in 'free choice' time.

What was seen as a great evolution in terms of the use of computers in the classroom was less frequently observed in the use of other technological devices. In some classrooms

children are not able to use radios, CD players or telephones as freely as they use the computer. The technological resources available (digital cameras, video cameras, scanners, photocopy machines, programmable toys) to Portuguese KidSmart pre-school classrooms were still limited, which didn't allow teachers to introduce them to children or to develop their wider technological literacy. None of the KidSmart classrooms had Internet connections in the first post-intervention evaluation. Despite these limitations, some teachers developed interesting projects with a local radio station and involved parents in developing a CD-ROM of children's play, using video.

Teachers' concepts of ICT were quite limited before the intervention programme. The computer was the most frequently mentioned technology together with a mean of 2.5 different technologies. In the experimental group, teachers' concepts of ICT grew quite dramatically to a mean of 5.5 different technologies being referred in the first post-intervention evaluation. In the control group, the increase was from 2 to 2.7 mean references. This increase was seen in all kinds of technologies, except for household appliances, which were referred to on both occasions only by 14.3% of teachers.

Despite this change in the concept of ICT, teachers still need to develop their practices in terms of promoting the development of technological literacy in relation to technologies other than computers.

Comfort
Levels of comfort reported by teachers increased slightly after the 6 month intervention, although some teachers' reports of comfort did not relate to their use of technologies in the classroom. Some teachers reported being comfortable using computers but rarely used them with their group of children. In the first post-intervention visit, KidSmart teachers were using the computer with the children on a regular basis and 60% reported being very comfortable (against 36.4% in pre-intervention). On the last visit, we asked the teachers to report how they felt they progressed in terms of comfort when using the computer during the programme. Researchers offered a 5 point scale to record their comfort before and after the programme. Teachers reported an increase of two points (mean) during the programme.

There has been a decrease in the amount of time children spend using a computer with an adult after the intervention. This might be due to the progressive autonomy children gained in using the computer. In some cases, it was due to the location of the computer. Prior to the intervention it was outside the classroom, which required children to always be accompanied by an adult. After the intervention, 45% of the teachers reported between 0 and 20% of time spent with children at computer and the other 45% between 21% and 40% of time spent.

Teachers support children in many different ways; the most frequently mentioned were support with the software (100%), general support (100%), extension work (100%), support with study/project work (90%) and supervision (78%). Encouragement and reinforcement were referred by 44% of the teachers. Mention of basic computer skills decreased immensely. Demonstration and installing software was reported by 11% of the teachers and support with the mouse were not reported by the teachers by the end of the research period. Direct teaching was also not referred to by the teachers.

Productive time

Teachers' perceptions of the learning potential of the computer changed during the intervention period. In the first post-intervention visit teachers showed a greater awareness of the potential of computers to support learning, referring to many more learning areas than in the pre-intervention visit. They see that the experiences with a computer contribute to the learning of maths concepts (number, time-space) (86%), language and literacy (86%), fine motor co-ordination (71%), concentration (71%) and problem solving (50%). Social competence (27%), creativity (27%) and confidence/self-esteem (36%) were the least frequently mentioned learning competencies.

All teachers reported that they used the computer to teach some of the curriculum areas from the Portuguese curriculum guidelines. The most popular were maths, language and literacy. They also reported using the computer in the "Knowledge of the world" curriculum area. In many classrooms, the computer was frequently used as a tool for organising and communicating information about different projects. Selected software was also used as a source of information for these projects.

Although they did not report the use of the computer in art and music, there is evidence that some of the teachers did some projects within these curriculum areas (eg using the computer to record sounds and children's songs, listening to music, and drawing or illustrating stories).

The integration of ICT into socio-dramatic play was an aspect that was beginning to be discussed by teachers (all teachers said that they integrate ICT into socio-dramatic play in the first post-intervention interview) but was not yet developed in terms of classroom practice. Many of the technologies observed in the home corner were 'out of date' and children were not encouraged to develop technologically advanced environments for their own play.

In the final visit, however, some new technologies were beginning to be integrated near pretend play areas (eg payments with magnetic cards, cash-points)

One of the main problems with the KidSmart programme in Portugal was the mobility of teachers between the first and the second year. Although in our sample only two teachers did move to another nursery, in the overall KidSmart programme the number was 8 in 25, despite all the efforts to prevent this. This is due to the allocation system of teachers in Portugal, which is very centralised and complex.
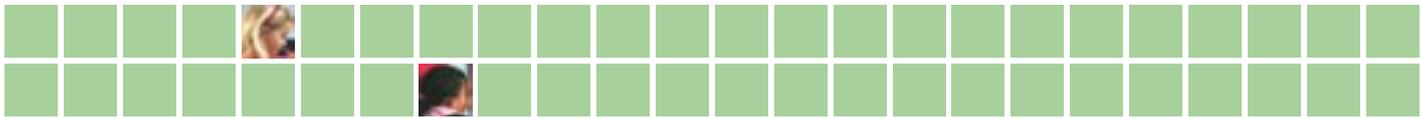
APPENDIX F: Spain

The KidSmart partner organisation in Spain is the Communidad de Madrid (Conserveria de cultura et de education de la CAM) and la Junta de Andalucia (Consejería de Educación de la JA). In Spain the Educational Authorities provide three to six year olds with pre-school education (public and private) that caters for almost 100% of three, four and five year olds. Pre-school education is integrated within the National Education System and is free of charge. From 2005 even private pre-school classes will be funded by the National Government. Pre-school teachers normally have university training for three years. Seventy percent of teachers working with children have an adult/child ratio of 1:20 and above.

Spain has a national curriculum for pre-school education (nought to five years old). This programme was developed under the LOGSE and emphasises the development of children's knowledge of themselves, the context in which they live and their communication skills.

There is currently nothing about ICT education in the curriculum except a general intention to integrate it into educational practices. However, new regulations are coming in soon and all educational authorities in Spain will be introducing ICT into the every day life of schools.

Nevertheless, differences related to the different Spanish Communities are important. In some of them, such as Navarra, or Catalonia, emphasis is on teachers' qualifications and training, whereas in Extremadura and Andalucia, the effort currently is to provide infrastructure as a way of compensating for the digital divide. The plan has already started and the policy is to provide one computer with Internet connection for every two children, using the LINUX® system. The secondary and primary sectors are being equipped first. The expectation is that pre-school education will be included on the same basis as any other sector. Official policy is supportive of the integration of ICT as soon as possible. Children aged three to six are expected to be educated using ICT, for children aged nought to three the situation is still undefined.

One of the biggest problems we have found in this study is the need for digital literacy for teachers. The plan developed by the EU (Europe 2002) was partially developed in Spain and there is a clear need for improved digital literacy, especially in areas of greater social and economic disadvantage. The 30 classes in the Spanish evaluation were drawn from these areas (24 experimental and six control).

Comfort

While the attitudes of teachers in the control group changed very little in the period of the evaluation, the KidSmart teachers became significantly more confident and comfortable with the computer in their classrooms:

Spanish Teachers reporting:	Visit 1 KidSmart	Visit 3 KidSmart
'Very comfortable'	56%	83%
'Comfortable'	25%	11%
'Not too comfortable'	19%	6%

The number of respondents reporting adults spending less than 20% of the time sitting with groups of children at the computer rose during the evaluation from 54% to 72%. The teachers also decreased their supervision of the children at

Spain	Information handling and communication skills		Access and control of ICT tools		Learning about the uses of ICT	
	Visit 1 pre-intervention	Final visit	Visit 1 pre-intervention	Final visit	Visit 1 pre-intervention	Final visit
KidSmart schools	1.0	2.4	1.0	2.8	1.0	2.8
Control schools	1.0	1.0	1.0	1.2	1.0	1.0

the computer. It seems that in some schools the teachers were specifically encouraged to leave the children to use the computer by themselves and to have it available in the class for 'free choice'. As the children were becoming more capable and required less support eg in handling the mouse, direct teaching, modelling/demonstration and student support were all reduced. The dominant activity for most teachers therefore became one of troubleshooting and technical support.

Productive time

While 10% of the Spanish teachers on the second visit reported the computers being used for less than 20% of the available time and only 21% reported it being used for more than 80% of the time, by the end of the evaluation 41% were reporting over 80% usage. All of the teachers considered 100% of the children's time on the computer to be educationally valuable and productive:

"Children have free access to the computer, and it is always in use. Learning is better, more enjoyable, and more fun".

80% of the Spanish teachers saw the computer as valuable in assisting in the teaching of the curriculum and this proportion didn't change throughout the evaluation. When asked what particular areas were supported, mathematics, language/ literacy, letters/alphabet, colours, and size/shape came out strongly.

Spain achieved the lowest ECERS ICT sub-scale scores of all the countries involved in the evaluation. The three main reasons for these low scores were estimated to be:

(1) the training was not long enough
(2) the high turnover of staff in Madrid
(3) the low level of teachers' general knowledge of ICT.

The Spanish teachers initially appeared to show uncertainty regarding the kinds of things children might learn from their use of the computer. In the control group this hadn't changed but by the end of the evaluation period, there was greater agreement among the KidSmart teachers, with use of mouse/ fine motor control, hand-eye coordination, turn taking/social skills and the development of new knowledge all coming out strongly.

Concepts of ICT and integration

Nearly all of the Spanish teachers believe that ICT can be integrated across the curriculum. They consider that this is best achieved by using the computer as another activity area in the class. Teachers then observe that the computer can also be used as a reinforcement activity for the content that they are teaching. An interesting observation was that when teachers tried to use the PC as part of the curriculum they realised that children knew more than they expected, eg they knew all their colours or sizes or numbers. After experiencing this with the KidSmart computers, teachers increased the number of categories mentioned in their definition. In the control group, fewer such changes were observed. Particularly significant was the increase in the number of respondents referring to communication/Internet.

In general the teachers came to feel more comfortable with the computer in their class but their lack of training and familiarity with computers made it more difficult for them to join the children in more productive tasks. While some training had been provided by their local authority and this was found to be helpful, the only KidSmart training given to the teachers consisted of one session. The content of this training was based on the DATEC project and prepared by the UK evaluators. However, this training was considered insufficient and too theoretical. The teachers wanted more basic training on computers and the presentation of specific activities to develop with the children.[50]

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50   Since the period covered by the study, a number of high quality training sessions have recently been extremely well received by KidSmart teachers in the Spanish regions.
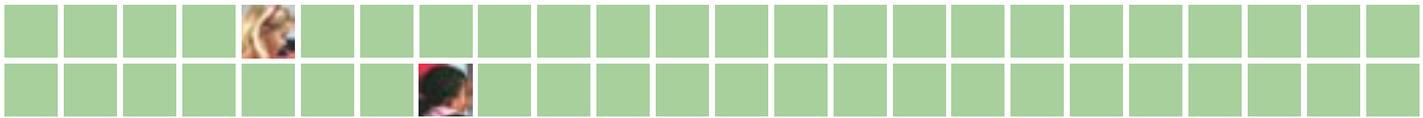
APPENDIX G: United Kingdom

The KidSmart partner organisation in the UK is Early Education (the British Association for Early Childhood Education), which is a national professional organisation for teachers and practitioners in this sector. The UK has currently 90% of three to four year olds enrolled in pre-school settings. About 500 of these are pre-schools with thousands of independent profit and not for profit playgroups. Adult child ratios in UK pre-schools are typically 1:10 or lower.

The UK ICT curriculum consists of three separate strands: The first is related to developing an emergent 'technological literacy' and the second and third to developing information skills and capability in terms of 'communication' and 'control'. The development of technological literacy is an important curriculum entitlement in any broad and balanced curriculum for the 21st century, with technology standing alongside literature, science and music as a major cultural form in its own right. As the Early Learning Goals[51] suggest, before children complete their reception year they should be able to find out about and identify the uses of technology in their everyday lives and use computers and programmable toys to support their learning. Examples from the goals:

- Encourage children to observe and talk about the use of ICT in the environment on local walks, for example traffic lights, telephones, street lights, bar-code scanners to identify prices in shops

- Encourage children to show each other how to use ICT equipment.

Further curriculum and pedagogic guidance has been provided in the Curriculum Guidance for the Foundation Stage[52] 'Stepping Stones'. The first of these is that children should show an interest in ICT and the guidance suggests that this is best achieved by providing opportunities and encouraging the use of progressively more sophisticated technological applications. The stepping stones go on to refer to children learning how to operate technology for themselves. This begins with switching things on and off and progresses towards learning about programmes and programming, ie switching things on and off in sequence.

The third stepping stone is for children to complete programs and use apparatus to perform simple operations for themselves. One aspect of this is to introduce and encourage children to use the language of technology. The stepping stones suggest that teachers should help children to become more aware of the technology that is around them in the pre-school setting, in their homes and in the local environment. These technologies include:

- washing machines that store information to complete the wash, rinse, spin cycles that are appropriate to different fabrics and finishes

- street lights and signals, telephones

- cash registers and burglar alarms.

There is enormous scope for the integration of technology into play environments. Outdoor play vehicles and other toys may be controlled by traffic lights, we can draw attention to the need for home corner washing machines to be programmed for different fabrics and encourage the use of pretend (or functioning) telephones, cash registers, office photocopiers, supermarket bar code scanners, computers etc. in socio-dramatic role play.

UK	Information handling and communication skills		Access and control of ICT tools		Learning about the uses of ICT	
	Visit 1 pre-intervention	Final visit	Visit 1 pre-intervention	Final visit	Visit 1 pre-intervention	Final visit
KidSmart schools	2.7	4.9	2.1	5.2	2.3	4.8
Control schools	2.8	3.3	2.3	3.0	2.5	3.3

51   DfEE, 1999.
52   QCA/DfES, 2000.

The stepping stones also suggest that children might learn more about how things work by taking things apart and putting them back together. ICT applications can be used to support learning right across the curriculum. Programs such as My World have been used for many years to support children in developing their classification and sorting skills. A wide range of software and hardware can also be applied to promote communication between children, and their parent/carers and teachers as well as between teachers and parents. Computer printouts, digital photography, scanners and desktop publishing programmes are already being used and increasingly we will see pre-schools applying Internet technologies such as Web sites and cameras. Programmable toys offer children symbolic objects 'to think with.' Talking books and talking word processors will increasingly be supplemented by programmes offering word recognition to empower children to enter the print world even before they develop the associated literacy skills. While paint programs are already widely in use, more and more pre-schools may benefit from the use of touch screens to support younger children in computer based 'finger painting' and in developing their confidence and capability in using the technology across the curriculum.

Comfort

In the UK, early years teachers have reported dramatic improvements in their levels of confidence with all respondents reporting that they are now comfortable with the KidSmart equipment. While 25% expressed some discomfort with the technology on our previous visit, 62% now report that they are very comfortable with their use of computers. This is up from 22%.

However, the time spent by adults sitting with children at the KidSmart computers remains low, with 93% of teachers reporting this to be under 30% of the time. When they do sit with children, the staff provide a very wide range of support, notably encouragement, general supervision, support with the mouse, modelling and demonstration, direct teaching, reinforcement and extension.

Productive time

In the UK the vast majority of KidSmart computers are now reported to be being used for 90%–100% of the time. While 17% of respondents on our second visits were reporting fewer than 50% of usage, this percentage is now under 7%.

While the UK teachers began with a very wide range of perceptions regarding the learning potential of computers many have now become much more aware of the potential of the computer to support personal and social education in particular. In England, KidSmart computers are now routinely applied in the evaluation settings to support the requirements of the Foundation stage curriculum. Curriculum integration is strongest in early literacy and numeracy, and the units are also commonly used for group story telling.

Concepts of ICT and Curriculum Integration

The message that ICT includes more than desktop computers has really caught the imagination of early years teachers in the UK. KidSmart has played a significant part in this by acting as a catalyst for curriculum development and innovation. Yet despite this, even at the end of the evaluation 71% of respondents were still reporting no integration of the KidSmart computer into socio-dramatic play. One enthusiast reported on an initiative involving the simulation of an office and a shop, and another of a 'Cyber Café'. Others informed us that they would like more training in this area.

Despite the training provided to local authority trainers, this training was only passed on in one of the evaluation authorities over the period. While some of the messages do seem to be getting through, most of our respondents were calling out for more training opportunities as a priority.

Copies of the IBM KidSmart Early Learning programme European
evaluation report can be downloaded in English, French, German,
Italian, Spanish and Portuguese from:

ibm.com/ibm/ibmgives/reports/

Further information about the IBM KidSmart Early Learning programme
can be obtained from:

ibm.com/ibm/ibmgives/grant/education/programs/kidsmart.shtml

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