Literature on Effective Educational Practices in Europe concerning ICT

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1. Introduction

The purpose of the preliminary report is to analyze components from educational practices that are decreasing rates of school failure and the practices that are increasing them. In this report educational practices (by teachers, students, administrators, parents, community members, local stakeholders) that help students succeed in school as well as practices that seem to be negative for school success are studied. The purpose of the report is to connect the literature with the forthcoming fieldwork research.

As Heemskerk, Brink, Volmanw and Dam (2004) observe, there appears to have been relatively little empirical research on the differential impact of the characteristics of ICT as an educational tool on the learning processes and the learning results of different groups of students. The number of theoretical or reflective articles on the issue is larger (Heemskerk, Brink, Volmanw and Dam (2004).

Whilst the content and uses of ICT have been going through rapid changes in the last ten years, the few studies concerning the role of ICT and success in schools are questionable. Even if we had reliable research about the relationship between ICT and school success, we might be misguided. The cultural landscape can change in a couple of years. The change could be in the technology itself, the attitudes towards it, accessibility or the possibilities ICT offers. A reliable study published today compels the reader to question the value of the findings because in the time between data acquisition and report publishing the situation may have changed.

As the role of ICT becomes more pervasive, the impact of it becomes more pervasive. ICT becomes an integral part of the way in which we interact and persons in the information society. It is not possible to separate ICT from other sides of life. ICT is too diverse and all encompassing to be studied wholly. ICT is in the very core of cultural and social interaction. The role of ICT in successful school work is difficult to evaluate, because the technology and its uses is constantly and rapidly changing.

2. Methodology and sources used in the literature review

The searching was conducted in two phases: First the journals that were considered influential in ICT and education were searched. In the second phase the search was expanded to other articles on the topic.

Firstly, the ISI Web of Knowledge is a database that allows researchers in education to search for journals, calculate their impact and rank them according to readership. The first result of the literature review was that the topic, ICT and exclusion (or inclusion), is not a central topic in the current educational research, especially in schools. It seems to be that *ICT & failure in school* is not usually published in the mainstream and influential journals in the field. There were also no specific journals on the subject that are listed in the ISI Web of Knowledge. Thus it was impossible to conduct a search within top journals for relevant information on ICT & school exclusion. The different combinations with keywords such as ICT, exclusion, inclusion, computer(s), segregation, information technology, IT, knowledge society produced very little results.

The second part of the research was done mainly in searching international data bases, the best one for good references was Academic Search Premiere. A general impression was that the topic of ICT has been "trendier" in 1990s and at the turn of the century. The result is alarming: Although information technologies have become more integral part of our educational system, it seems that it is considered and somewhat outdated topic among researchers.

First the lack of major contributions in major journals on the topic is a disappointing one. The topic of *ICT & school success* should be of interest for the community of educational research. Maybe the lack of reliable research on *ICT & school success* describes the difficulty of such a research. Or maybe the researchers are intimidated by the rapid changes in the field, which makes it difficult to make lasting contributions on the topic. On the other hand, *ICT & school success* is in many ways connected to exclusion and must be taken seriously. Even though there seems to be not enough up-to-date contributions on the topic, the importance of the topic remains. ICT is becoming all-embracing for our everyday life and thus a central determinator of exclusion and school success. Although there were more reports on the ICT and school success than school failure, it is not easy to say that this is really the case in everyday school work in Europe. Many times the basic starting point in the reviewed researches towards ICT was positive and it might have an effect of topics researched. If somebody thinks ICT and learning is worth researching they might favour the positive elements of the phenomena. There were no researches available that directly studied the negative impact of ICT. The negative impact usually came through public or organizational

discussion or in negative results while anticipating good ones. Some reported that instead of finding positive impact there was no connection between ICT use and learning.

3. Main results from the literature review

3.1. Educational ICT practices that decrease school failure (or increase school success)

Because the role of ICT in Europe has changed and is constantly changing rapidly, also its role in decreasing school failure has changed along the few decades the computers and information society has been taking shape. Thus, to understand the role of ICT in increasing school success we need to look at the development of ICT practices in education and their relation to school practices.

Shade and Davis (1997) describe the changing role of computers in education. In 1980s it was difficult for children to use computers without teacher's help. The computer programs were often simple, and the main activity for the children was to answer right or wrong (Shade and Davis 1997). Although the computers and the programs were simple and allowed only limited participation, they already had important elements that can increase school success. These programs are good for rote learning. A computer program is an untiring aid in helping children learn for example multiplication tables (cf. Sinnemäki 1998, 210-211), alphabets and get feedback of their learning. They can help children to memorize. They can help in sensomotoric coordination, concentration and to teach children existing knowledge. Programs designed for the training of basic knowledge and skills help the teacher in differentiating their teaching according to children's special need. Pupils with special educational needs (SEN) benefit from these programs, for example mentally handicapped pupils need repetitions to secure their learning. These rote learning programs are often overlooked today but they can help children's learning in many ways.

Special programs developed, cd-roms emerged, colours, movement and voice came for aid to enhance the learning with computers. According to Shade and Davis (1997), in 1990s as the technology and skills advanced, children could use computers more independently. Computer programs were now ready for exploration and creativity. Ojala stated in 1996: "Today's children need such authentic learning experiences, which help them in developing their learning skills and their own awareness of their thinking.- not rote and repetitive learning that was characteristic earlier" (Ojala 1996, 30-31). For example in the city of Helsinki, the project "computer as a learning environment" is an example of educational ict-orientation in 1990s" (cf. Ojala and Siekkinen 1996), where the interest is in good and open programs. In the 1990s the computer and programs themselves generated the learning environment. Important for this phase of development

was the emphasis in the quality and accessibility of the programs and software. When children use open-ended programs, their creative participation and thinking processes can develop (cf. Siekkinen 1996; Räty 1999, 150-151). ICT can increase school success by giving children opportunities for constructive learning and meta-learning abilities. Pupils can create new content with better technology and software.

In the end of 1990s the possibilities of ICT developed further. For example the Finnish ministry of education emphasized the communicative and global tendencies of information society. More possibilities for interaction were opening for pupils, more information became accessible for them and the knowledge services were getting better (cf. A national strategy for 2000-2004, 1999, 21). ICT opened up new possibilities for pupils to succeed. As more and more countries advance in information society, pupils' possibilities in participating fully in the educational, social and economic activities and democratic processes increases (cf. Cullen 2001). Nevertheless, for pupils to succeed in information society, the formal education is not enough. Teachers', parents', friends' and the whole social network's way to regard ICT in everyday life has an impact on children's orientation (cf. Blatcford and MacLeod-Brudnell 1999, 14).

In the beginning of the twenty-first century ICT's role as a cultural reformer and creator of media content started to come forward. According to Suoranta (2001, 18-20), media culture produces new tools, which in turn produce new media culture. As the ICT advances, children produce new ways to work and new meanings, which do not exist without pupils' actions. The pupils come forward as producers of information society, its tools and content. ICT is not anymore in the role of helping children learn but they are in the role of building new reality (cf. Druin 2002). Good skills in ICT and communication is not enough. According to Driscoll (2007) a new breed of web-based technologies often referred to as *Web 2.0* (including blogs, wikis, learning communities, podcasts, audio and video conferencing, and online office applications) helps pupils to engage in not only sending and receiving feedback but working together for creating, building, and editing.

According to Reunamo (2003), pupils need to practice participation and the production of new cultural tools. For the ICT to be really inclusive for pupils, the learning to use ICT must be seen as a by-product in developing new ways to interact with others and in producing content with others. Without participating in the development of the new phenomena the pupils can not practice their skills in creating new tools. In the rapidly changing world the pupils need practice as the agents of change (Reunamo 2003).

Lewis, Trushell and Woods (2005) report of a case using ICT for learning interaction with others. The aim of the study was to ascertain whether collaborative group work on a computer, facilitated by an adult, could provide a means for a primary schoolboy with Asperger's Syndrome

(AS)—moderately-highly affected in all areas of the "triad of impairments"—to develop appropriate task-related interactions with his peers. The results indicate moderate improvements in the child's ability to interact with his peers, both in social and task-related contexts, as well as a raised social profile among his classmates in general (Lewis, Trushell and Woods 2005).

According to Meiring and Norman (2005), Day proposes three important forms of access that constitute a distinctive contribution of ICT to the learning experience of pupils with SEN: physical, cognitive and supportive.:

1. physical access – ' technology at its most dramatic, liberating the pupil from the physical barriers to learning'
2. cognitive access – '[presentation of] the curriculum in different ways, thereby encouraging the pupil, who has difficulty grasping the concepts, skills and knowledge required of him'
3. supportive access – 'the power of technology to support the pupil in particular areas of difficulty'.

In the absence of physical and supportive technology there would be little or no access to the curriculum for some pupils (particularly those with physical difficulties, e.g. the visually impaired). For others, however, physical and supportive technology allows them to progress more rapidly, by removing some of their barriers to learning (e.g. dyslexia) (Meiring and Norman 2005).

Meiring And Norman (2005) give examples of how ICT can contribute special educational needs in foreign languages. The examples can be seen in Table 1.

Table 1: Contribution of ICT to SEN in foreign languages

Contribution of ICT	Features of ICT	Examples of types of SEN	Examples of activities adaptable for foreign languages
Speed and automation (TTA)	produces text more quickly; performs mundane operations quickly; reduces unnecessary tasks; immediacy and visual impact	literacy; dyslexia; learning difficulties	word-processing in FL; matching picture and text, gap-filling; PowerPoint and IWB presentations of language, including sound stimulus
Capacity and range (TTA)	organising and categorising of vast bank of information/material; removing geographical barriers of learning environment; retrieve information at own pace; multi-media	physically impaired; EBD; pupils with limited concentration spans; ADHD	authentic visuals and material; video; range of media (text, visual, sound, motion)
Provisionality (TTA)	trying out ideas to modify learning; immediate feedback	pupils lacking self-esteem and confidence	word-processing: draft/redraft; matching activities; pronunciation; assessment
Interactivity (TTA)	non-threatening interaction; rapid, dynamic feedback	autistic; EBD	word-processing; games; CD-ROM simulations; hyperlinks
Clarity (Kennewell)	appropriate font, layout and colour schemes; use of pictures; removal of extraneous material; three-dimensional presentation	literacy; dyslexia; visually impaired; learning difficulties	display work using word-processing, DTP, Frontpage etc.
Authenticity (Kennewell)	genuine tasks and materials; processing text to numeric data	all	websites; e-mail; project work; databases; spreadsheets,bar charts, graphs
Focusability (Kennewell)	allows learning to be refined to essentials	all	word-processing; use of search engines
Multi-modality (Kennewell)	appeals to different learning styles: sight, hearing; interlinking of senses	physically impaired; EBD; pupils with limited concentration spans; ADHD	IWB and PowerPoint presentations (text, visuals, sound and animation)

It is important that the ICT use is focused on the important things to learn. Heemskerk, Brink, Volmanw and Dam (2004) stress the real life context of learning. According to them, simulations and multimedia programs, for example, offer opportunities to engage students in solving 'real' problems encountered in daily life. The Internet makes it possible to provide problems and assignments that are realistic and up to date, and facilitates communication with the world outside the school. ICT also facilitates differentiation and individualization in education: it makes it possible to tailor both the content and the presentation of the subject matter to the individual backgrounds, experiences and needs of students (Heemskerk, Brink, Volmanw and Dam (2004).

Smeets (2005) describes ICT as a powerful learning environment. In powerful learning environments rich contexts and authentic tasks are presented to pupils, active and autonomous learning is stimulated, co-operative learning is stimulated, and the curriculum is adapted to the needs and capabilities of the individual pupils. The teachers in the highest grade of primary

education seem to apply several strategies to foster optimal learning processes. This especially relates to the presentation of authentic tasks and the fostering of active and autonomous learning.

ICT has many layers of importance for increasing school success. Even though children's role as agents of cultural change is strongly coming forward, all the preceding phases of ICT development described here are still important. ICT still can help students in simple learning and memorization tasks, open ended programs can help children to guide their learning process, it can increase possibilities for knowledge processing and communication. Finally, ICT can help children to get used to be as productive and valued participants in their own communities.

3.2. Educational ICT practices that increase school failure

According to Selwyn (2002) there is no clear indicator that ICT will be a remedy for school success. The inequalities of the past may extend into the future. There is neither empirical nor theoretical evidence to believe this scenario will change for the better. From this perspective, neither academics nor policy-makers can afford to lose sight of fundamental issues of inequality and disempowerment which technology may not be capable of addressing. Despite these concerns, technology will undoubtedly remain an attractive option for policy-makers around the world (Selwyn 2002).

Barzilai-Nahon (2006) claims, that technology is not a neutral artefact in society. Rather, technology and its various facets should be comprehended and explicated within a given context. It is part of daily politics and social life, and as such it should be approached as a social and behavioural phenomenon (Barzilai-Nahon 2006). The deep social and historical tendencies show in the new ICT culture. Taylor (2005) describes the role of gender in education and ICT. Female students were regarded as lesser valued capitals in the first hand. Second, because of the valuing of technical skills in the ICT field, the female students occupied less desirable positions when they obtained ICT internships. And third, the habitus of young women—whether reflected in their heightened awareness of future family responsibilities, more diverse interests, or a valuing of 'soft' skills—worked to dispose them to eliminate themselves from the game.

While ICT is becoming more and more an integral part of our everyday interaction, the cultural and social dimensions of it reach further than mere technology, hardware or software. The social tendencies that increase school failure are reflected in the ICT practices. ICT is not a separate tool in education; it is loaded with cultural meanings, motives and habits. Although ICT is a relatively new way to interact, it encompasses many of the advantages and disadvantages of the past found in the course of finding ways for successful schooling.

Nevertheless, ICT raises some new problems. As Cullen (2001) acknowledges,"digital divide" has been applied to the gap that exists in most countries between those with ready access to the tools of information and communication technologies, and the knowledge that they provide access to and those without such access of skills. This may be because of socio-economic factors, geographical factors, educational, attitudinal and generational factors, or it may be through physical disabilities (Cullen 2001). When ICT is integral part of the society, pupils with no access to it can not take advantage of it. They are also excluded from a major cultural ingredient.

However, to give students unlimited access to internet and computers is not a remedy for school failure. According to Muller, Sancho, Hernádez, Giró and Bosco (2007), ICT does not provide a ready made remedy for real world injustice; rather, ICT tends to reinforce existing social structures and inequalities. Also more ICT does not mean better school success. According to Lei and Zhao (2007), although spending some time on computers may help students increase their learning outcomes, too much time on computers can be harmful. In their study, pupils tended to spend more time using computers in ways not likely to increase their academic achievement. Therefore, when students spent an excessive amount of time on computers every day, they actually were spending most of this time on technology uses that did not directly contribute to academic achievement, so the time spent on technology uses that can have positive impacts and other learning activities was reduced, and hence could decrease their academic achievement. Compared to the quantity of technology use, the quality of technology use is a more critical issue to explore. What is crucial to educational technology integration, therefore, is not so much how many technology innovations have been purchased, introduced, and installed, or how much time is being spent on technologies, but how these technology innovations are used by students. Moreover, not all technology uses are equally useful to student learning. Therefore, more resources and creating supportive environments for technology uses that have positive impacts on students are critically important to schools. Specifically, school administrators, teachers, and parents should pay close attention to how students use technology, and should provide guidance to help students use technology more effectively and efficiently. When quality is not ensured, the time spent on technology should be limited. In addition, new regulations and classroom disciplines may be necessary to help students resist distractions and make better use of available technology and resources. In general, technology uses that had positive impact were not popular; on the contrary, some of these technology uses were the least frequently used (Lei and Zhao 2007).

According to Heemskerk, Brink, Volmanw and Dam (2004), teacher's expectation that his or her students are skilful computer users may disadvantage those who have not had the chance to acquire these skills. Poor and minority-group students are more likely to use computer for drill and

practice activities, while their affluent white peers are more likely to use advanced technology tools and/or the Internet. Certain ICT applications are not equally accessible or attractive to all students, owing to their experiences outside the school, interests, attitudes and learning approaches. The differing appeal of ICT applications to different groups of students has, in particular, been described in the literature on gender and ICT. Gender differences in ICT knowledge and skills, in participation in activities involving computers at school and in computer attitudes, have been explained by pointing out that not only computer games but also educational software is often unintentionally tailored to the interest of boys. The development of gender-inclusive educational software has been advocated for many years now. More recently, similar arguments have been formulated in relation to differences between ethnic or cultural groups, and a plea has been made for increased cultural sensitivity where the use of ICT in education is concerned (Heemskerk, Brink, Volmanw and Dam 2004).

According to Reunamo (2003), in an empirical study concerning kindergarten children, a correlation between exclusion and negative attitude towards ICT was found. Parents that were more concerned about their children's social exclusion considered ICT more negatively. The danger of social exclusion and parents' negative attitude are related. On the other hand, children that used computers skilfully were less socially exclusive and adaptive. Children's activity in social relations is reflected in children's use of ICT. Children's segregate tendency in social interaction is related to children's segregate tendency in not taking part of producing new ways to work with ICT (Reunamo 2003).

To avoid school failure ICT needs to be accessible to all. The content, the interface and the instructional structure needs to such that all kinds of pupils can and are motivated to engage in them. To demonstrate the aspects concerning the inclusive aspects if ICT in learning, Heemskerk, Brink, Volmanw and Dam (2004) have collected an index of inclusiveness of educational tools in ICT, which is presented in Table 2.

Table 2. Index of inclusiveness of educational tools in ICT

1. Content
Perspective
– Presence of different groups Is there a balanced representation of diverse human groups (e.g. male/female; different cultural backgrounds, diversity of ethnicity/race; different social classes; urban/rural; diversity of religions/ beliefs)
– Representation of groups Are the groups presented in ways that are positive, equal and non-stereotypical (e.g. variety of living situations, variety of occupational tasks and other activities, variety in human responses, aggressive as well as sensitive, active as well as inactive)?
– Contributions of groups Are the groups represented in ways that reflect accurately their potential contributions to the subject of the program
Are issues relating to groups routinely included within the content as opposed to being separated out as 'special concerns'?
Does the content avoid assuming that all people are operating from the same group, perspective and/or values?

Is it clear that decisions made in simulations may have different effects for different groups?
Respectful of values Is the content respectful and considerate of the values, manners and taboos of the different cultural groups?
Is the language free of biased terminology?
Real-life context Is the subject matter presented in an authentic context (e.g. by using the experiences of the students, actively involve the students in problem solving, addressing the usefulness of the subject in daily life, presenting a subject using different disciplines)?
Addressing different interests Does the material have the potential to attract the interest of all groups, not just represents a stereotype of the interest of one group?

2. Interface
Visual aspects
– Presence and representation of different groups: Is there a balanced representation of diverse human groups (e.g. male/female;
different cultural backgrounds, diversity of ethnicity/race; different social classes; urban/rural; diversity of religions/beliefs)
Are the groups presented in ways that are positive, equal and non-stereotypical (e.g. variety of living situations, variety of occupational tasks and other activities, variety in human responses, aggressive as well as sensitive, active as well as inactive)?
– Respectful of values Is the visual interface respectful and considerate of the values, manners and taboos of the different cultural groups (e.g. in the use of colour, icons, pictures of animals and other images)?
– Preferences of different groups Are the preferences of different groups taken into account in the visual interface (e.g. bright vs
dark colours, detailed or not, clarity of images)?
– Packaging Do the packaging and/or advertising show a diversity of groups rather than one group to the exclusion of others?
Audio aspects
– Voice Does audio material include narrators from a range of group voices?
– Music and sounds Does the sound track include a variety of styles of music/sounds?

3. Instructional structure
Prior knowledge
– Initial level Is the material designed effectively and explained thoroughly enough so that all users can work with it, regardless of differences in
ICT skills and knowledge
Content knowledge and learning capabilities
– Home language Does the material acknowledge that learners may have a variety of home languages and take that into account (e.g. by using dictionaries, the use of clear language, multilingual)?
Learning strategies Does the material acknowledge that learners may have a variety of learning strategies and take that into account
Learning activities
– Collaboration Does the program accommodate learning together as opposed to competition?
If working in groups is required does the program:
Accommodate multiple roles and tasks
Provide all students with the opportunity to do different tasks and practice different roles
– Communication Does the program accommodate ways of communication with other people, e.g. experts, students?
If communication is required does the program:
Acknowledge that some students may have difficulty with asking (why-) questions, arguing with adults or formulating their ideas?
Acknowledge that differences in communication styles exist between different groups or different languages (e.g. differences may occur in frequency, length or tone of messages)?
– Skills Are different kinds of skills addressed (e.g. writing, drawing)?
Help
– Scaffolding Does the program offer scaffolding support, i.e. an apprenticeship approach helping the student to develop the necessary skills?
– Feedback Is the feedback to the student positive and direct?
– Self-esteem Does the program offer support in a way that promotes the self-esteem of the student?
Does the program offer ways for students to function as teacher or expert to other students?
Students input – Choice Does the program offer possibilities for students to have choice in how to work (e.g. are there different ways to use the program, different solutions to the assignments)
Is the student treated as an active participant with responsibility for their learning process?
– Flexibility Is the program made in such a flexible manner that students can alter parts to their preference?
Can students add their own information and experiences into the material

According to Smeets (2005) the methods employed by teachers to adapt education to the needs and abilities of the individual pupils seemed quite limited. Only a minority of teachers used open-ended ICT applications that can stimulate the pupils' information-processing skills, that support co-operative learning, and that can contribute to bridging the gap between school learning and the ‘real

world'. In addition, with respect to curriculum differentiation, the emphasis in ICT use was on remedial tasks for low-achieving pupils, whilst the potential of stimulating high-achieving pupils by means of ICT was neglected by many teachers. Apart from this, whereas four out of ten teachers felt that ICT provides a fair or a substantial contribution to co-operative learning, the use of ICT for supporting co-operative learning was reported to be quite limited. In conclusion, most teachers do not make use of the potential of ICT to contribute to the power of learning environments. Thus, computers are used mainly to complement rather than change existing pedagogical practice (Smeets 2005).

Political and public opinion can be strongly opposed to ICT and the discussion can be heated. On behalf of the organization"Alliance for Childhood", Cordes & Miller (2000) conclude: A machine-centred approach does not meet the developmental needs of grade-school children. Nor will it pre pare them to muster the human imagination, courage, and will power they will as adults need to tackle the huge social and environmental problems looming before us. Young children are not emotionally, socially, morally, or intellectually prepared to be pinned down to the constraining logical abstractions that computers require. This sedentary approach to learning is also unhealthy for their developing senses and growing bodies. We can not afford the delusion that pushing young children to operate the very latest technological gadgets will somehow inoculate them from economic and cultural uncertainties in the future. Nothing can do that — certainly not soon-to-be obsolete skills in operating machines. In the long term, what will serve them far better is a firm commitment from parents, educators, policymakers, and communities to the remarkably low-tech imperatives of childhood. Those include good nutrition, safe housing, and high-quality health care for every child —especially the one in five now growing up in poverty. They also include consistent love and nurturing for every child; active, imaginative play; a close relationship to the rest of the living world; the arts; handcrafts and hands-on lessons of every kind; and lastly time — plenty of time for children to be children (Cordes & Miller 2000, 95-97).

4. Discussion and conclusion

The role of ICT has come a long way concerning educational outcomes. It first came forward as a specific tool for teaching children specific knowledge and specific skills. In the course of advances in hardware, software and skills pupils became more independent, the interaction with the computers became open ended with the possibility for the children for a creative input. The accessibility has been getting better all the time, although the newest advancements still need new special skills. With the emergence of Web 2.0 the communicative, participative and culture productive possibilities have gained more importance. As it is, ICT has great possibilities for enhancing school success for all pupils and some evidence suggests that ICT really can make a difference. Nevertheless, the relationship between ICT and school success remains unclear and the benefits of ICT questionable. The need for up-to-date and profound research on the subject is paramount. In the same time the challenges of such up-to-date research are strong; A comprehensive study takes time and because of the rapid changes the results are needed now. The value of the findings tend to decrease even before publication.

The obstacles between ICT and school success are double-sided. On the first hand, ICT has presented a whole new set of problems, new skills to be learned and a new orientation for cultural change. On the other hand, ICT has digested also the old problems of education by becoming more and more a central aspect of school work and also pupils' interaction and communication at home.

Another theme altogether is, whether we really want to push children heavily on the information highway and what kind of equipment the child should have on the journey. ICT, virtual environments and media culture are in the phase of rapid changes and interact in many ways. In the middle of this process it is difficult to grasp the full meaning of the process to success in school. But it is worth noting that in the eye of the storm, when we look at the child working on ICT, the situation can be surprisingly stable. The child may be found intensively working on acute problems of today. The child can be in the middle of the new society, confidently producing new ways to interact with the latest tools and he/she may be in no hurry at all. Children can work together constructively, be interested in each others work and help each other. Children negotiate good ways to advance and find new tools to work with. What is the effect of ICT on children? Does it alienate children from being a whole psycho-physic person? Can the children find their place as meaningful and productive participants in the information society?

To grasp the whole picture of ICT and its relation to learning, a model of agentive perception is used (cf. Reunamo, in press a; Reunamo, in press b; Reunamo and Nurmilaakso, in press), which is an adaptation from Vygotsky (cf. Vygotsky 1978, 2004, 2005).

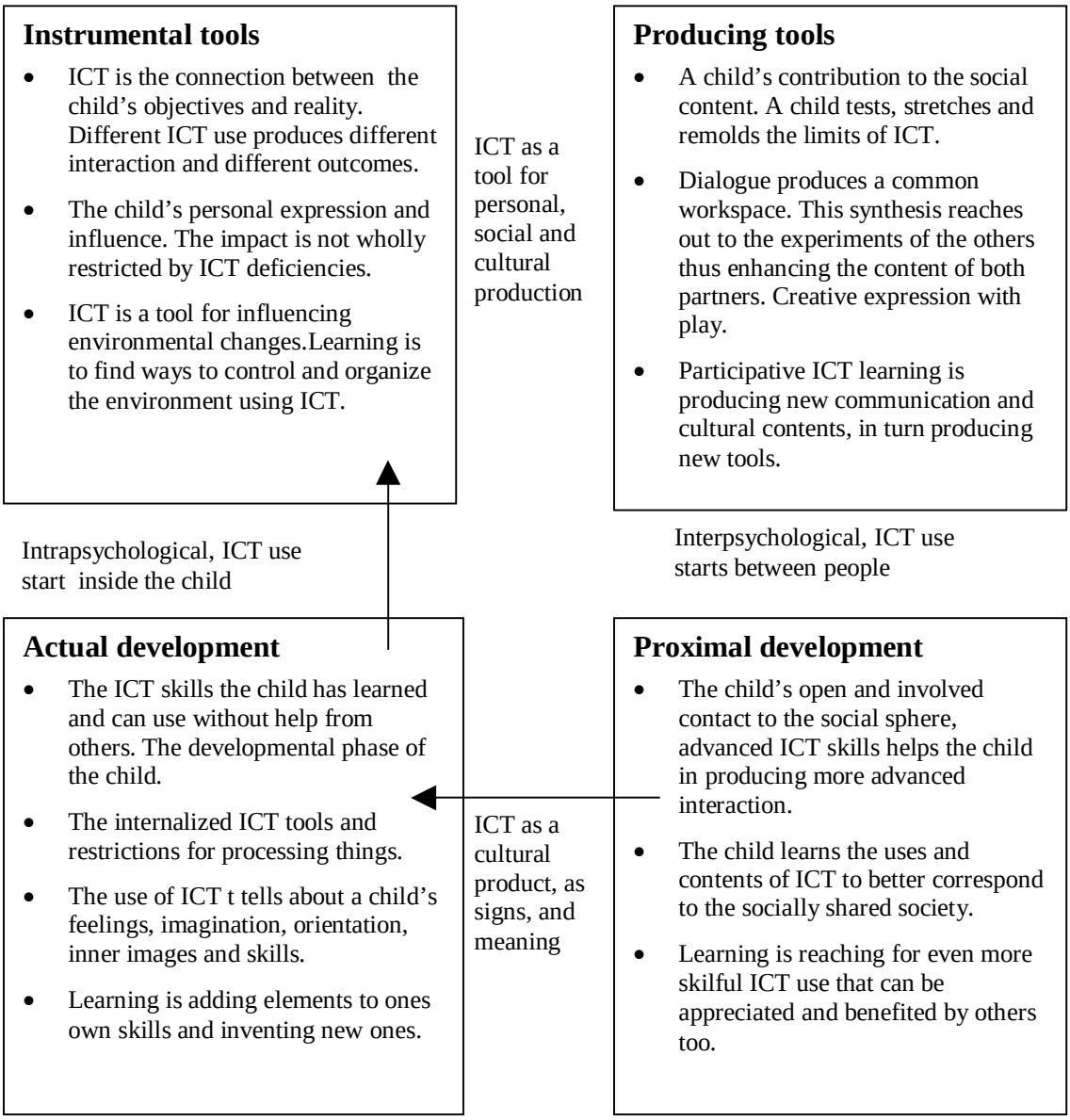

Figure 1. The role of ICT in learning

Figure 1 carries the message that ICT learning is fundamentally a social process. The learning that is connected to ICT is at first interpersonal and it is culture mediated and gradually adapted. Along with the adaptive nature of ICT learning there is the agentive nature of children's learning. Children produce new content and they do it with others too.

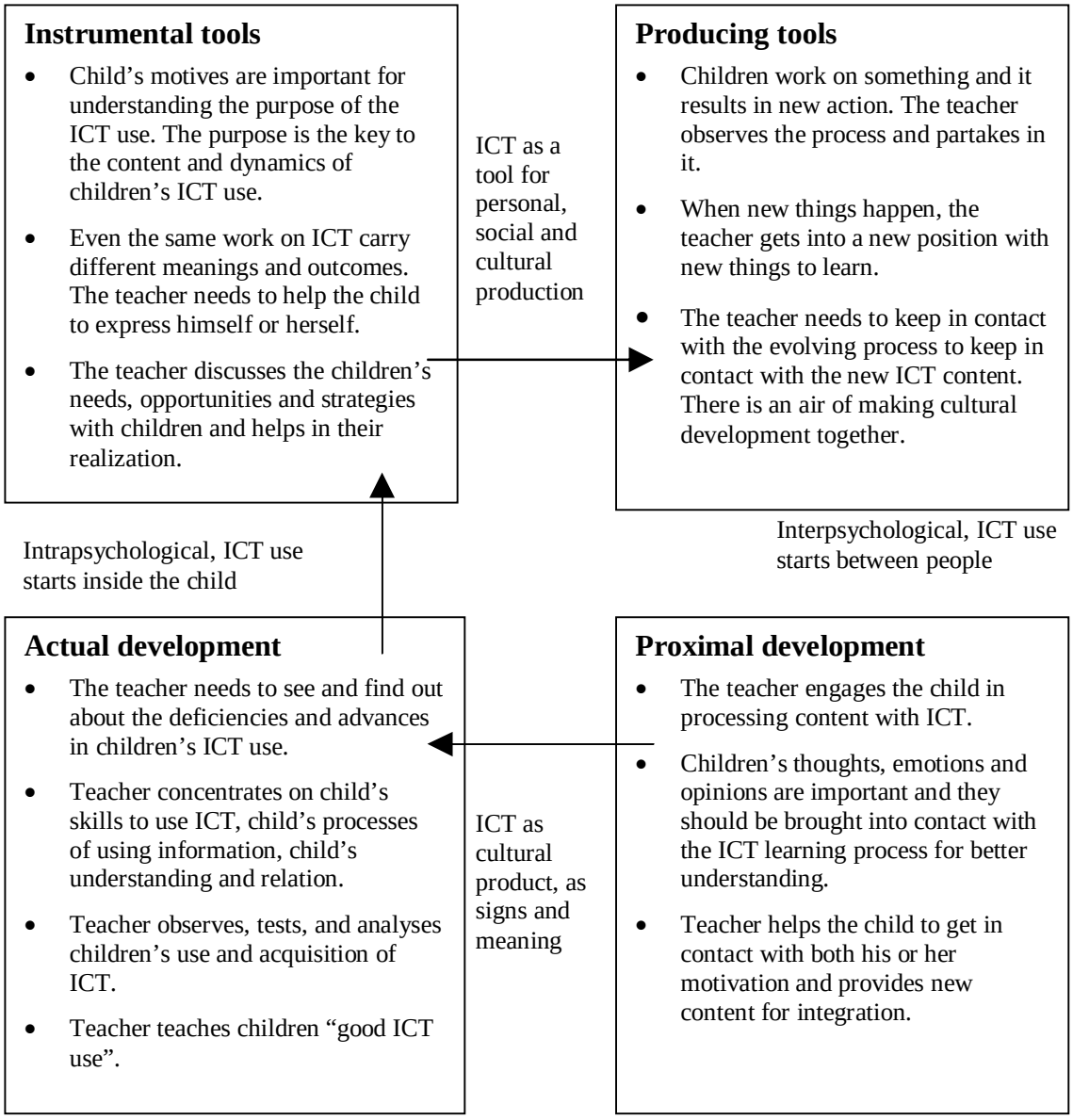

Figure 2. The teacher orientations in ICT learning (cf. Reunamo and Nurmilaakso, in press)

Figure 2 describes the different roles of the teachers when confronted with the phenomena concerning ICT. As learning is culturally mediated process the teacher needs to get in contact with the children's thoughts, motives and feelings to facilitate the learning. Teachers have educational objectives to meet and they need to know the level of children's actual development to help children with their deficiencies. Nevertheless, teachers need to leave room also for children's personal aspirations and content, to help children to become the agents of their life. Eventually, teachers and children work together producing new cultural content and ways to interact with others.

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