DOCUMENT RESUME

ED 464 708 PS 030 307

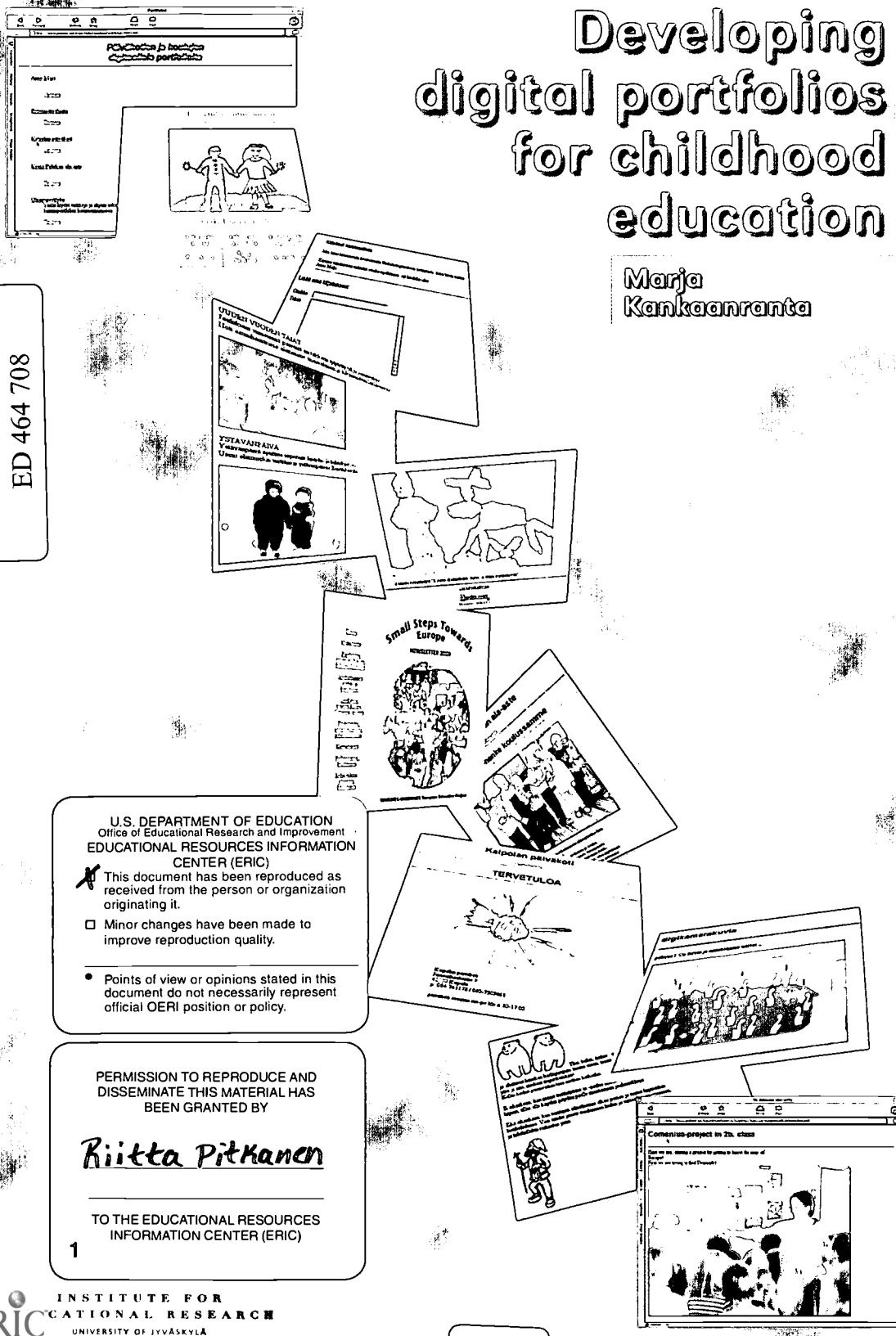
AUTHOR Kankaanranta, Marja
TITLE Developing Digital Portfolios for Childhood Education. Research Reports.
INSTITUTION Jyvaskyla Univ. (Finland). Inst. for Educational Research.
SPONS AGENCY Academy of Finland, Helsinki.
REPORT NO RR-11
ISBN ISBN-951-39-1182-9
ISSN ISSN-1455-447X
PUB DATE 2002-00-00
NOTE 287p.; Photographic images may not reproduce clearly.
AVAILABLE FROM Institute for Educational Research, Customer Services, University of Jyvaskyla, P.O. Box 35, FIN-40351, Jyvaskyla, Finland (28 EUR). Tel: 358-14-260-3220; Fax: 358-14-260-3241; Web site: http://www.jyu.fi/ktl.
PUB TYPE Guides - Non-Classroom (055) -- Reports - Evaluative (142) -- Reports - Research (143)
EDRS PRICE MF01/PC12 Plus Postage.
DESCRIPTORS Action Research; Case Studies; Computer Uses in Education; *Educational Technology; Foreign Countries; *Portfolio Assessment; *Portfolios (Background Materials); *Primary Education; *Student Evaluation; Theories; World Wide Web
IDENTIFIERS Electronic Portfolios; Finland

ABSTRACT

This action research study developed, explored, and analyzed the use of digital portfolios as a multiperspective ecological assessment method in primary education learning environments in Finland. Participating in the study were kindergarten and primary school teachers who were challenged and encouraged to utilize networking and digital portfolios shared on the web to display, assess, and develop pedagogical practices and meaningful experiences in kindergartens and primary schools. A series of action research projects continued the focus on exploring the applicability of portfolio assessment in various learning environments and for the needs of diverse learners. Findings indicated that sufficient access to computers, peripherals, and information networks was necessary for sustainable digital portfolio development. However, it was more essential to have enthusiasm, a need for experimenting with new things, and a genuine desire to learn than to have access to the latest applications in information and communication technologies (ICT). The most central issues for the sustainable use and development of portfolios proved to be the definition of purposes for digital portfolios, consideration of the context and meaning of the institutional culture, provision of support for teachers, development of user-friendly technological tools, collaboration in the portfolio design and implementation, and reflection on ethical issues. Three case studies illuminate the varied ecologies and processes of portfolio development and identify the main content areas in the display of childhood learning environments. Appended are: (1) list of articles previously written on portfolio assessment; (2) content of questionnaires; (3) Web application for digital portfolio development; (4) description of data analysis; and (5) list of portfolio constructors in the study. (Contains 317 references.) (Author/KB)

Developing digital portfolios for childhood education

Marja Kankaanranta



ED 464 708

INSTITUTE FOR EDUCATIONAL RESEARCH
UNIVERSITY OF JYVÄSKYLÄ

Developing digital portfolios for childhood education

Institute for Educational Research
Research Reports 11

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Esitetään Jyväskylän yliopiston kasvatustieteiden tiedekunnan suostumuksella
julkisesti tarkastettavaksi Agoran auditoriossa 2
maaliskuun 23. päivänä 2002 kello 12.

Academic dissertation to be publicly discussed, by permission of
the Faculty of Education of the University of Jyväskylä,
in Agora Auditorium 2, on March 23, 2002 at 12 p.m.

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Research Reports 11

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THIS PUBLICATION
CAN BE OBTAINED FROM:
Institute for Educational Research
Customer services
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P.O. Box 35
FIN-40351 Jyväskylä, Finland
Phone +358 14 260 3220
Fax +358 14 260 3241,
E-mail: asiakaspalvelu@ktl.jyu.fi
www: http://www.jyu.fi/ktl/

Cover and graphic design: Martti Minkkinen
Layout: Kaija Mannström

ISBN 951-39-1182-9
ISSN 1455-447X

Printed by University Printing House
ER-paino Ky (covers)
Jyväskylä 2002

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Abstract

Kankaanranta, Marja
Developing digital portfolios for childhood education
University of Jyväskylä. Institute for Educational Research. Research Reports 11.
2002
ISBN 951-39-1182-9
ISSN 1455-447X

The aim of the study was to develop, explore and analyze the use of digital portfolios as a multiperspective ecological assessment method in childhood learning environments. The study was an action research project, in which kindergarten and primary school teachers were challenged and encouraged to utilize networking and, in particular, digital portfolios shared on the web to display, assess and develop the pedagogical practices and meaningful experiences in kindergartens and primary schools. It continued a series of action research projects, in which the overall focus has been on exploring the applicability of portfolio assessment in various learning environments and for the needs of diverse learners.

The study was based on an ecological approach to technology-enriched childhood environments. The possibilities of the ecological approach as a contextual frame were examined in order to develop an authentic and technology-enriched assessment method for the description and analysis of childhood environments. Ecological framework and systemic thinking were also considered in terms of application for the design and study of virtual environments and for gaining deeper understanding about the interaction between technology and humans in varying contexts.

Digital portfolio development combined two related processes, namely the evolvement of capabilities in information and communication technologies (ICT) and portfolio development. Teachers' ICT capabilities were examined as resulting from the respective factors of access, motivation and competence. It was found out that suffi-

cient access to computers, peripherals and information networks is a necessary prerequisite for sustainable digital portfolio development. The findings confirmed that teachers need to have a sound technological basic competence to be able to utilize ICT in their own work. Nevertheless, it became evident that it is more essential to have enthusiasm and an experienced need for experimenting with new things provided by ICT as well as a genuine desire for learning than to have access to the latest applications.

The proceeding of the five action research cycles revealed that digital portfolio development requires consideration of several design and implementation issues in addition to the factors of ICT capabilities. Most central issues for the sustainable use and development of portfolios proved to be the definition of purposes for digital portfolios, consideration of the context and meaning of institutional culture, provision of support for teachers, development of user-friendly technological tools, collaboration in the portfolio design and implementation, and reflection on ethical issues.

The preliminary cross-case analyses of the digital portfolios constructed during the action research period focus on the meaning of digital portfolios as an assessment method from the teacher perspective, on the ecological approach to the portfolio contents, and on the forms of reflection in digital portfolios. The study also presents three case stories from two kindergartens and one primary school to illuminate the varied ecologies and processes of portfolio development and to identify the main content areas in the display of childhood learning environments.

Keywords: Digital portfolio, childhood education, ecological approach

Acknowledgments

Looking back at the long process leading towards this doctoral dissertation, I am astonished to realize the great number of people who have contributed to its emergence. During this journey into the worlds of childhood I have also encountered numerous learning and working environments, which have equipped me with significant experiences. Now, at the crossroads of searching for new directions for my work, I am delighted to share my feelings of gratitude with all those people who have wandered with me along the diverse routes and who have supported and encouraged me in various ways.

I am especially grateful to Professor Pirjo Linnakylä, for being my adviser and mentor from the beginnings of my research career at the Institute for Educational Research (IER) and for providing me with constant challenges for the evolvement of capabilities as a competent researcher. I would also like to thank her for the many readings of the never-ending flow of manuscripts for this book, and for her enduring patience in guidance. I appreciate the way she has kept pushing me still some steps further and deeper in scientific thinking. Above all, I appreciate her friendship.

The action research study on the development of digital portfolios reached authenticity through the commitment of participants. Especially, the teachers in six kindergartens and two primary schools, one circulating special teacher and the members of the research team constituted a community of enthusiastic developers in the field of childhood education. I want to thank all of them for pleasant collaboration and for the joint building of connections between the daily life of educational settings, research, teacher training and development work. From the research team I would like to mention with warm thanks especially the technical experts Juha Lahti and Kirsi Häkämies from the IER and the student mentors Stina Akola, Tuula Dahlblom and Merja Ikonen from the Department of Early Childhood Education. Also researchers Anne-Mari Jokiranta and Kati Mäkitalo acted as mentors at the time of portfolio development, but they have also co-worked with me in many other research projects.

The Institute for Educational Research has offered me an inspiring working environment. I have belonged to the research group "ICT in learning and working envi-

ronments" and its recent research team on CATO (Collaboration and authenticity in open technology-enriched learning environments). I am indebted to Professor Päivi Häkkinen, for being an innovative and encouraging group leader, an attentive reader of my texts, and a wonderful friend. As a subproject of the CATO scheme, my study was financially supported from the Information Research Programme of the Academy of Finland. The research team emerged from the ideas of Professor Pirjo Linnakylä – thanks to her for the keys into the interesting fields of authentic assessment and technology-enriched learning environments. I have experienced so many great moments among the members of the research team.

Also, I express my thanks to all other colleagues at the IER with whom I have collaborated during past years and with whom I have also had enlightening and enjoyable discussions of a scholarly or more informal nature. There are many people in my mind, but here I can especially mention only a few. I warmly thank the director of the IER, Professor Jouni Välijärvi, for ensuring access to all the research facilities, assistant Seija Haapaviita and department secretary Seija Mannila for their support in various research practices, librarian Riitta Pitkänen for her continuous collaboration, publication secretary Kaija Mannström for her fine work in editing my book, and researchers Hannu Jalkanen and Eija Puhakka for being such sympathetic colleagues.

The preliminary reviewers Dr. Helen Barrett from the University of Alaska, Anchorage and Dr. Eeva Hujala from the University of Oulu gave me valuable insights for revising the manuscript of my dissertation into its final form. Writing my dissertation in English has been a challenge of its own. My sincere thanks to Mr. Tuomo Suontausta for his great work in the expert polishing of my texts. Sometimes it seemed that he could read my thoughts and meanings better than what I did myself.

I am deeply grateful to all my dear friends and siblings for doing their share in helping to take my mind also off the inquiry processes – be it orienteering along trails and terrain or discussions of daily life. I express my thanks to all those children and teachers from whom I have learnt so much about the worlds of childhood. Here, I would like to mention especially the kindergartens Näsipuisto in Tampere and Köpas in Kirkkonummi.

Finally, without the support and encouragement from my parents, Sirkka and Eino Kankaanranta, I would not have had the roots and wings to reach this achievement. I express special thanks to them.

I dedicate this book to Anni, Henna, Johanna, Marie and Miko.

Jyväskylä, on a sunny spring day in March 2002

Marja Kankaanranta

Part I

Framework for the study

CHAPTER 1

Introduction

The world of children has changed drastically over the past decades (see Aldridge & Sexton 1996). The children of today grow up having information and communication technologies as essential and natural part of their daily life starting from a very early age. As they grow, they are expected to become active and self-directed members in their own local communities and also in the information society at large. Furthermore, technology creates ever more versatile possibilities for acquisition and creation of information, self-expression, and for communication and interaction with other people locally, nationally and worldwide.

Technology also creates tremendous challenges. Active participation in the information society presumes novel knowledge, skills and work approaches from children and teachers alike (Ministry of Education 1999). This challenges teachers in terms of utilizing information and communication technology (ICT) in instruction and in guiding children to become its diversified users (e.g. Baker 1999; Bergman 1999). Yet, the aim is not only to help people to use new technology as a medium, but also to encourage them to develop teaching and learning methods that enhance lifelong learning. These challenges concern the teachers of young children as well, although the meaning of ICT in early childhood education is still often questioned and although it is rather invisible in the curricula for early childhood and preprimary education (Finnish National Board of Education 1996, 2000; Kangassalo 1998). Nevertheless, even the youngest children live in a world surrounded by information and communication technologies and they learn to utilize devices and learning tools that did not even exist just a decade ago (Vandevelde 1999).

It is important that teachers find meaningful uses for ICT also in their own work. It has been emphasized that connections through information networks are useful for the improvement of teacher's professional expertise and general school development

(e.g. Bereiter & Scardamalia 1993; Hakkarainen 1998; Linnakylä & Kankaanranta 1999). Information networks can also provide possibilities for expanding the overall visibility and appreciation of early childhood education (Kangassalo 1998). Then technology-enriched networking means above all that teachers make their work visible, share information, and reflect on their experiences, but also exchange feedback with colleagues and interest groups encountered in network communities. At its best this means participation in critical and reflective discussions concerning the current situation and development work in the field.

1.1 Outlooks on early childhood education

During last decades, early childhood education and care have been a subject of constant and often also fairly diversified debate approached from different perspectives (e.g. those of governments, parents, employers, local communities and researchers) and covering a variety of issues. However, according to Dahlberg (et al. 1999), the language used in discussions about early childhood and its institutions has remained amazingly similar through years; the same issues and questions have come over and over again under scrutiny. One of the dominant issues of discussions in the field has been the question about defining and assessing the quality of education and care of young children (e.g. Hujala et al. 1998b; Tietze & Cryer 1999).

A growing interest toward qualitative matters emerged in the beginning of 1980s with questions like: What is quality in early childhood education? How do we measure quality? How do we assure quality? According to Dahlberg (et al. 1999) the essential aims have been to establish criteria for use in the evaluation of the standards or performance of early childhood institutions and to develop measures or rating scales for quality assessment (e.g. the Early childhood environment rating scale by Harms & Clifford 1980, 1998). Research has also generated an interest in developing standards and so-called good practice guidelines (e.g. developmentally appropriate practices) for different forms of provision (see Bredekamp 1987; Bredekamp & Copple 1997).

In the 1990's the concept of quality became thoroughly questioned and problematized (e.g. Moss & Pence 1994; Dahlberg et al. 1999; Pascal & Bertram 1999). One problem was that in many studies single dimensions of quality have been used as tools for measuring and comparing institutions, and often regarding them as independent from each other (Hännikäinen et al. 1997). Despite a seemingly agreement on the different quality criteria used in the evaluations, no definite general understanding of the concept of quality as regards early care and education has been found. Instead, quality has been seen as both a dynamic and relative concept, which depends on one's perspective and selection of variables. It is acknowledged, nevertheless, that holistic

quality thinking involves both dynamic and more static dimensions and also includes a vision for the directions of development. In this view, the static dimension covers the agreed basic elements and quality objectives of early childhood education such as policies, forms of day care services, staff quantity and training (Hujala et al. 1998b).

Generally the quality of early childhood education is described and characterized through outcome, structural, and process criteria or variables (Table 1.1).

Table 1.1 *Criteria for the quality of early childhood education (e.g. Hännikäinen et al. 1997; Hujala et al. 1998b; Cryer 1999; Dahlberg et al. 1999; Tietze & Cryer 1999)*

Criteria	*Content*
Outcome criteria Outcomes of early childhood education.	Certain aspects of child development and learning assumed to be desirable, but also associated to children's later school, social and economic performance sometimes stretching as far as adulthood. Child and parent satisfaction, school aptitude, future school performance.
Structural criteria Frame variables for qualitative early childhood education. Resource and organizational dimensions of institutions.	Often quantitative factors like group size, adult to child ratios. Also such aspects as levels of staff training, suitable day care duration, presence and content of a curriculum.
Process criteria Features of what happens in the institution. Educational processes. Aspects that children actually experience.	The activities of children, the behavior of staff, interactions between children and adults, children's mutual interaction, relationships between the institution and parents, questions about how care routines are handled.

In addition, some indirect guiding factors have been presented as yet another group of quality criteria (Hujala et al. 1998b). The content of the criteria consists of aspects like co-operation, staff training, work community and leadership. In Table 1.1 some of these are included in the structural and process criteria.

Children's developmental outcomes have traditionally been considered the most important indicator for the quality of early childhood education (Niiranen 1995). Thus, the measurement of developmental outcomes has received special interest in the field of day care research. Based on this tradition, the discourse and research on quality issues in early childhood education have examined relationships between var-

ious features of childhood institutions and outcomes reached through childhood education, but too often only from the perspectives of researchers and policy makers (Singer 1996). However, the possibilities to evaluate early childhood education solely with different outcome-centered criteria was questioned already in the 70's (Kärrby 1976).

It is estimated that there is, at least in the European context, a substantial amount of information indicating the structural characteristics of national early childhood education and care systems (Tietze & Cryer 1999). However, the process quality of what is actually happening in institutions has been assessed to a lesser extent. Also the primacy of children's developmental outcomes as an indicator for the quality of day care has been criticized (e.g. Palovaara 1996). These critiques emphasize the intrinsic value of childhood and the existential function of early childhood education. It is argued that the child's activities and experiences should be appraised and assessed also without immediately proportioning them to the subsequent developmental stages and later school performance or without expecting that all activities would seek to yield developmental outcomes (e.g. Strandell 1995; Riihelä 1996; Kankaanranta 1998a). These arguments are in line with the view of McCartney (et al. 1982) that research on the quality of early childhood education should begin from the experiences of the children.

Also the definition of children's needs is becoming more relative. They are examined as socially constructed and filtered through cultural values (Strandell 1995). The emphasis placed on the cultural and social context widens the framework of interpretation from a child's age, sex, developmental stage and social class towards the meaning of time, place, circumstances and social relations. This contextual perspective accentuates that an early childhood institution equips children with characteristics, aims and attitudes typical to a specific context (Prout & James 1990; Strandell 1995; Riihelä 1996).

In many research projects psychological (e.g. developmental stages) and biological descriptions of child development are, indeed, complemented with social and cultural factors. The child's prior experiences and immediate surroundings are seen as closely affecting development and learning in early childhood. (Persson 1991; Strandell 1992; Pramling 1994; Stolpe 1995.) Such quality factors have been explored e.g. by observing children's ongoing activities, involvement and social relations (Sponseller & Fink 1983; Barclay & Benelli 1995; Riihelä 1996; Hännikäinen et al. 1997), and by means of more child-oriented methods like child or child group interviews and discussions (e.g. Lummelahti 1996; Tauriainen 2000; Sheridan 2001), retrospective narratives (Huttunen & Tamminen 1991) and authentic assessment (e.g. Kankaanranta 1998a).

Dahlberg (et al. 1999) proceeds even further towards postmodern thinking and argues that the concept and discourse of quality cannot accommodate contemporary

issues of cultural or other forms of diversity, multiple perspectives, contextual specificity and subjectivity. Thus, they express a need for replacing it with the concept of meaning making. Critical questions to be asked are: How do we construe the young child and early childhood? What are the purposes of early childhood institutions? However, Dahlberg (et al. 1999, 119) emphasizes that the aim is not to prove who is right or wrong but it is crucial that researchers, practitioners and others with different perspectives engage in dialogue and seek mutual understanding and recognition. The discourse of meaning making does not mean rejection of the use of more quantitative features like the supply and use of places or the costs of institutions. The structures and resources are necessary prerequisites for, but not only indicators of early childhood education.

> *There are continuities between the discourse of quality and the discourse of meaning making. In particular, a desire to make sense of what is going on can be said to motivate both the modernist discourse of quality and its postmodern counterpart. We could even say that the different discourses both seek answers to the questions of what is good work in our early childhood institutions, how can it be defined and how can it be carried out. However, the two discourses have very particular and different understandings of what it means to make sense and to enquiry into good work, using very particular and different methods. ... But whereas the discourse of quality speaks of value-free technical choices, the discourse of meaning making calls for explicitly ethical and philosophical choices, judgments of value. (Dahlberg et al. 1999, 106–107.)*

The basis for current discussions is that different perspectives, like those of children, day-care staff, parents, and surrounding communities, are meaningful in the definition but also in the presentation and evaluation of the quality of early childhood education (Moss & Pence 1994; Hujala & Parrila-Haapakoski 1998; Tauriainen 2000; Sheridan 2001). This calls for employing these diverse perspectives on childhood institutions when portraying their pedagogical practices and communicating them to various audiences. Furthermore, different experts in early childhood education need to provide and mediate theoretical knowledge and research experiences to the other actors in the field (Hujala et al. 1998b).

The central goal of evaluation in early childhood education is to develop and maintain the quality of educational activities and practices (Hujala et al. 1998b). Other essential evaluation or assessment functions are reaching of participant perspectives, display of early childhood education and care, clarification of common goals, building linkages between development work and research-based knowledge and finally, the support of equality in quality.

In Finland research-based evaluation on the quality of early childhood education is still at an early stage. Some distinct examples to this effect are a national quality evaluation project on the pedagogical issues of day care (Hujala & Parrila-Haapakoski

1998; see also Chapter 2) and a study about conceptions of quality in day care approached from the perspectives of staff, parents and children (Tauriainen 2000). As for the evaluations on the quality of early childhood education, an evident challenge still remains in finding appropriate methods both for the multi-perspective assessment of educational process and related factors (Hujala et al. 1998b) and for collaborative self-study of childhood learning environments (e.g. Qvortrup 1990).

1.2 Developing collaborative digital assessment for childhood environments

In this study the aim was to develop, explore and analyze the use of digital portfolios as a qualitative and multi-perspective assessment method in childhood environments. The study was an action research project, in which teachers were challenged and encouraged to utilize technology, networking, and in particular, digital portfolios shared on the web to display, assess and develop the pedagogical practices and meaningful experiences gained in kindergartens and primary schools. In the study there was also an emphasis on the design of user-friendly virtual environments for assessment purposes.

This research project produces theoretical, methodological and content information in the area of early childhood education. The research task is divided into the following research questions:

1 What is the digital portfolio development process like in childhood environments? Which design and implementation issues are essential in the development of digital portfolios as an authentic, collaborative and technology-enriched assessment method?
2 What capabilities do teachers need in the construction and use of digital portfolios as an assessment device? How do these capabilities evolve during the process of portfolio construction? What kind of support do teachers need in the digital portfolio development?
3 What is the meaning of digital portfolios as an assessment method in childhood environments? Which assessment purposes do the digital portfolios serve?

The study is based on the ecological approach on early childhood environments. The possibilities of the ecological approach as a contextual frame are examined in order to develop an authentic and technology-enriched assessment method for the description and analysis of early childhood environments (Chapter 2). An ecological framework and systemic thinking are also considered for application in the design and

study of virtual environments and for gaining deeper understanding about the interaction between technology and humans in multiple contexts.

Methodologically, the development and use of digital portfolios is explored as a means for making visible and sharing information about pedagogical practices in childhood institutions. The study continues a series of action research projects carried out in the Institute for Educational Research, the University of Jyväskylä since 1993. The overall focus has been on exploring the possibilities and applications of portfolio assessment in various learning environments (see Linnakylä et al. 1994; Pollari et al. 1996; Linnakylä et al. 1999; Kankaanranta & Linnakylä 1999). In the area of early childhood education the aim has been to establish methods through which it is possible to reach meaningful experiences of children and teachers, to highlight their perspectives and to describe the diversity of learning and teaching in different learning environments (Kankaanranta 1994a, 1996, 1998a, b, 1999).

The notion of digital portfolios has raised interest as a means for describing and assessing teaching and learning at the various levels of education systems. The interest in construction of digital portfolios in this study emerges from the CATO project (Collaboration and authenticity in open technologically enriched and virtual learning contexts), which has been a part of the Information Research Program of the Academy of Finland. This CATO project explores the utilization of ICT, particularly information networks, in technologically enhanced and virtual learning environments. This investigation is targeted especially at the interaction between the information provided and its users as well as the cognitive and social processes involved in real-life settings for teaching, learning and working (Linnakylä et al. 1999).

Digital portfolios can be sources of information for teachers, parents, teacher students and teacher trainers about the daily work, teaching and learning in kindergartens and primary schools. The basic features of portfolio assessment and the use of digital portfolios in early childhood education are examined in more detail in Chapter 3. Digital portfolio development combines two related processes, namely the evolvement of capabilities in information and communication technologies (ICT) and portfolio development. Chapter 4 describes the methodological framework of the study. In Chapter 5 teachers' evolving ICT capabilities are examined in order to determine what it meant for teachers to become sufficiently computer literate to construct and utilize digital web portfolios and to participate in networked collaboration, and also what kind of support teachers needed in the process. In this context, communication capabilities consist of motivation, access and competence in the use of ICT. Chapter 6 presents the proceeding of the portfolio development process during the diverse cycles of action research. The chapter is concluded with a discussion about diverse design and implementation issues in portfolio development.

One of the central methodological concerns in this study is the development of evaluation criteria for digital portfolios in collaboration with the participating childhood institutions. The information obtained through digital portfolios can be used in the analysis of the quality of learning, teaching and collaboration in different settings, since the portfolios include content information about the features of pedagogical practices in the childhood institutions and about the collaborative links between different institutions. Chapter 7 presents preliminary findings of digital portfolio evaluation. The first part of the chapter comprises case stories from two kindergartens and one primary school. The second part of the chapter summarizes specific issues in the portfolio development through a cross-case analysis of all the digital portfolios constructed during the study. Chapters 8 and 9 conclude and discuss the central findings of the study.

CHAPTER 2

Ecological approach to early childhood education

Young children are of and in the world; their lives are constructed through interaction with many forces and in relationship to many people and institutions. (Dahlberg et al. 1999, 10)

As Dahlberg (et al. 1999) points out, children live since their early years in interaction with diverse environments like home, kindergartens, schools and society at large. In the contemporary world young children interact with various technologies, as well. This requires that the meaning of multiple perspectives and multilevel approach is considered and understood in early childhood education and learning environments. Such attention to the multiple perspectives and the recent changes which affect children (see Chapter 1) call for the expansion of theoretical and pedagogical foundations of childhood education and care (e.g. Hujala 1996; Dahlberg et al. 1999). A more comprehensive, coordinated and contextual framework is also accentuated by research pointing to the overwhelming complexity of development and learning in early years, and the need for continuity of experiences for all children in order to support and enhance their development and learning (Aldridge & Sexton 1996; Aldridge et al. 1997).

In this chapter the aim is to explore the possibilities of an ecological approach as a contextual framework to describe and analyze the daily life at early childhood institutions in which technology plays a role, as well. In the ecological approach, the focus is on the multilevel nature of learning environments and the reciprocal relationships of the learner and various environments (e.g. Bronfenbrenner 1979; Salomon 1996; Patry 1997; Kankaanranta 1998a). It is assumed that along with the changes in a learning environment, also the ecology is changing.

The chapter will be opened with a discussion on the history of the ecological approach in order to shed light on its basic ideas and early developments. Then one of the prominent applications of the ecological approach, namely Bronfenbrenner's theory 'Ecology of human development', is examined in more detail, because of its confirmed significance in early childhood education research.

The grounding of the ecological approach is followed with a review on research applying the framework in studies on early childhood education. Then, the applicability of the framework to the study of teacher perspective is examined. For the technological orientation of the study, the ecological framework and systemic thinking are explored for application in the design and study of technology-enriched and virtual environments. The aim is to gain deeper understanding about the interaction between technology and humans in various contexts. It is especially intriguing to find out how the collaboration of complex and multilevel systems can be enhanced, displayed and assessed through the use of information technology. Finally, the chapter is closed with a discussion about the development and use of ecological assessment methods.

2.1 Framing the history of ecological approach

The ecological approach and systemic thinking are grounded in natural sciences (see Figure 2.1). The use of the concept 'ecological' spread from the context of evolutionary biology (Haeckel 1896) first to sociology in the 1920's (e.g. McKenzie 1924; Park 1936; Hawley 1944) and then to psychology in the 1930's (e.g. Lewin 1933; Brunswick 1938). These patterns of thought used in physiological and biological phenomena have been applied to psychology and educational sciences especially in regard to child-environment relationships (Valsiner & Benigni 1986).

Sociologically and psychologically oriented ecological approaches took somewhat different views on the nature of organisms interacting with their environment. In the sociological ecology (synecology) the interest was in the organisms' relationships with the environment as a population or community of individuals. The psychological ecology (autecology), in turn, focused on the individual's relationships with the environment. Interest in real-life phenomena, everyday contexts and the ecological validity of research findings led to applications of ecological ideas in several subdomains of psychology as well as of educational sciences.

Since the 1960s, ecological psychology has been a separate sub-discipline of psychology (see Gibson 1961, Shaw et al. 1982). It conceptualizes a child as an organism embedded in the natural world, and the child's behavior is defined through systematic descriptions. According to Valsiner and Benigni (1986), the Gibsonian research tradi-

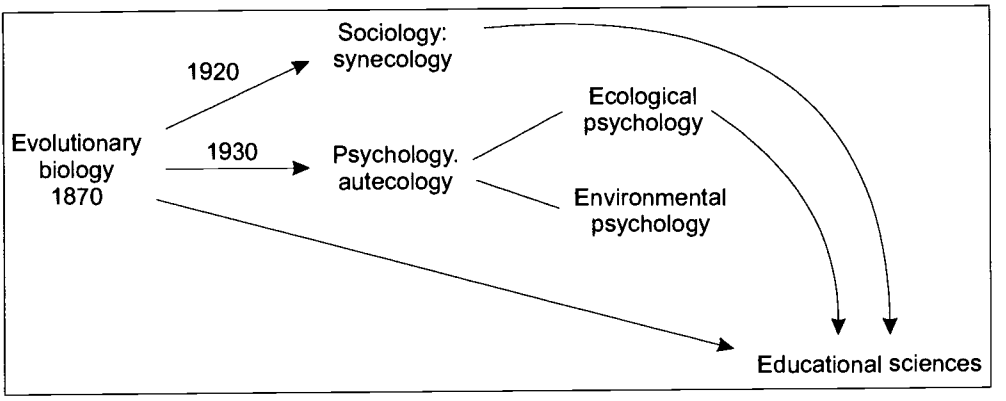


Figure 2.1 *Historical developments of the ecological approach*

tion with an interest in perception and action has, for its part, indicated the need for a more ecological approach. The prevalence of the term 'ecological' was further increased by the advent of the subfield of environmental psychology (Proshansky et al. 1970). Some of the most prominent ecological applications have developed to powerful ecological views as Bronfenbrenner's (1979, 1992) ecology of human development, Gibson's (1979) ecological approach to sensory perception, Eggleston's (1977) ecology of the school organization, and Moos' (1979) social-ecological model for the evaluation of educational environments (see also Jones 1995).

In the 1970's and 1980's a keen international interest towards the ecological approach emerged in the research on child development. It was assumed that an ecological framework would give an extensive basis for the examination of a child's growth and learning environments, heeding the different components related to the child development (Huttunen 1985b). Although the psychological emphasis has characterized strongly the history of the ecological framework, its applicability has been approved also in the educational sciences (e.g. Huttunen 1985a, b; Cochran 1988a, b; Unenge 1994; Van Staden & Loubster 1995). While educational psychology has concentrated on the network of teacher-pupils interactions, the sociologist view on education has typically conceived school as a network of institutional processes. (See Jones 1995; Valsiner and Benigni 1986.)

In recent decades the sociological and psychological orientations have approached each other, although they emerged independently in their respective disciplines. Jones (1995) points out that more recent ecological models in developmental psychology have taken sociological and social-psychological insights by looking at the child as an agent in a social world. Thus, this has given rise to an interest in the subjective viewpoints of children and the meaning of their experiences in the various environments.

Although one of the most popular application areas has been research on early childhood education, the ecological approach has been found significant over the entire life span and in all levels of education. Since the 1990s, the ecological framework has aroused interest also in fields such as higher education (Benjamin 1994; Johnson & Staton 1995), social work and health care (e.g. Carter & Coudrouglou 1994; Germain 1991; Heaney 1998; Teall 2000), youth and adolescence studies (Corcodan 1999; Happonen et al. 1998; Ianni 1998), counseling psychology (e.g. McWhirter 2000), workplace design (Mangum 1999) as well as gerontology (e.g. Svensson 1996). Recently the ecological approach has found its way also in the design and research on technologically supported and virtual learning environments (e.g. Lemke 1998; Nardi & O'Day 1999; Salomon 1996).

The current popularity of the concept 'ecosystemic' indicates the integration of ecological orientation, systemic thinking and phenomenology (e.g. Tyler 1992, 1994, 1996; Featherstone 1996; Cousins & Jackson 1997). It also gives ground for different views and approaches on the interaction of the individual or the group operating in a complex environment. According to Lemke (1998), a total ecosystem is a system of interdependent processes (e.g. human activities, social practices, and biological processes) involving the diverse factors of a complex society. In regard to human activities, the critical processes include the meaning making practices by which humans interpret, evaluate, plan, and cooperate. A child's environment at an early childhood institution can be seen as many-layered and ranging from the aspects of the physical world, structured events, and interpersonal interactions existing independently of the child to the subjective environment or the institution as experienced by the child (Jones 1995). The ecosystemic view has been utilized e.g. in mental health counseling (Amatea & Sherrard 1994; Becvar & Becvar 1994; Coleman 1995), family therapy (Tyler 1992; Featherstone 1996), school-based health services (Cousins & Jackson 1997), and educational and phenomenological psychology (Tyler 1994, 1996).

In systemic thinking the notion of contextuality – events are seen in context – is emphasized. Basically, this was a reaction against laboratory studies. Contextualism with numerous viewpoints and perspectives is appropriate for addressing the complexities of the various ecological systems in which learning and development occur (see Bronfenbrenner 1986; Aldridge & Sexton 1996). In the research of child development this means the context of everyday life and actual life experiences of children in real educational environments (Bronfenbrenner 1991; Jones 1995). Another central feature pertaining to the ecological approach is the holistic perspective, which emphasizes the importance of looking at entire systems and their interaction instead of splitting systems apart (Kääriäinen et al. 1990; Sanders 1996).

2.2 The ecology of human development: Bronfenbrenner's framework

One of the well-known developers of the ecological approach in the area of psychology on human development is an American psychologist, Urie Bronfenbrenner (e.g. 1979, 1992, 1995a, b). In his basic framework 'The ecology of human development' Bronfenbrenner (1979) criticized traditional developmental psychology for being laboratory based and alienated from real life activities. Thus, he called it *"the science of the strange behavior of children in strange situations with strange adults for the briefest possible period of time" (p. 19)*. Earlier several researchers had also considered child's environment fairly narrowly by limiting examination only to people, events and circumstances in the child's immediate environment. Bronfenbrenner (1979) described child's environment as a series of interconnected systems. These nested systems include both the immediate environment (e.g. home, early childhood institution, school or neighborhood) and the various levels of the surrounding environments.

Much credit has been given for Bronfenbrenner's theory especially because of the deepening and expansion of the concept 'environment' and also because the scope of psychology was thus widened to the real life events and environments (e.g. van Staden & Loubster 1995; Aldridge & Sexton 1996). Some of the research-wise strengths of the ecological approach are the exact analysis and examination of the various and widening environments (Kääriäinen et al. 1990, 110–111) and emphasis on the meaning of functional social networks (Cochran 1988b; Niiranen 1995).

On the other hand, the basic framework has also been criticized for even too strong emphasis on environmental issues at the expense of child development and learning and the examination of the characteristics of a developing individual (Kärrby 1986, 88; Niiranen 1995, 41). There has also been criticism concerning the definition of interaction. Kääriäinen (et al. 1990, 110–111) argues that interaction is defined merely as an adjustment of the child and the environment to each other, rather than recognizing individual's own choices, decisions and means of realization.

Environmental overemphasis is not a problem attributable only to Bronfenbrenner's inadequate theoretical thinking. According to Valsiner and Benigni (1986), in various studies applying the ecological approach it is partly evident as a consequence of inadequate conceptual reflection and analysis on the ecological approach in child development research. Many researches using the ecological approach have too often focused on the detailed descriptions and analysis of environments affecting development. At the same time the central contributions of the ecological theory – namely the interactions, relationships, activities and characteristics of a child in different environments – have received less attention (Valsiner & Benigni 1986; Bronfenbrenner 1992).

After becoming aware of the state of affairs in research on human development – changing from 'development out of context' to 'context without development' – but also as a self-criticism to his original framework, Bronfenbrenner has continued to develop and expand further the ideas of the ecological paradigm. The new formulations have aimed at providing and continuously evolving a more complex and dynamic structure for the ecological model of human development (Bronfenbrenner & Morris 1998). The continuum of revisions has focused especially on refining the notion of hierarchical environmental systems of influence, developmentally instigative person characteristics and the concept of ecological niches (Bronfenbrenner 1992), on reflecting the genetic and environmental influences on human development (Bronfenbrenner & Ceci 1994), and on expanding the ecological approach towards a comprehensive bioecological model having significance through space and time (Bronfenbrenner 1995a, b; Bronfenbrenner & Morris 1998). The four principal components of the bioecological model (or PPCT-model) comprise processes, developing persons, environmental contexts, and periods of time.

2.2.1 Developmental perspective

Bronfenbrenner's (1979, 1992) paradigm for the study of development in context is based on Lewin's social-psychological field theory, in which behavior is defined as a function of interplay between the person and the environment. Bronfenbrenner transformed this 'Lewinian' equation by replacing behavior with development, and thus attached it with a temporal dimension. Development was then defined as "*the set of processes through which properties of the person and the environment interact to produce constancy and change in the characteristics of the person over the life course*" (1992, 191). The concept of function in Bronfenbrenner's equation directs scientific interest on the interaction between person-environment dimensions, with particular conditions producing unique developmental consequences (Sontag 1996).

In the core of the bioecological model is the process, or more specifically a number of proximal processes, concerning particular forms of interaction between a person and his/her environment over time. The meaning of proximal processes together with other components of the bioecological approach are reflected in the following proposition:

> *Human development takes place through processes of progressively more complex reciprocal interaction between an active, evolving biophysical human organism and the persons, objects, and symbols in its immediate external environment. To be effective, the interaction must occur on a fairly regular basis over extended periods of time. Such enduring forms of interaction in the immediate environment are referred to as proximal processes. (Bronfenbrenner & Morris 1998, 996.)*

Examples of proximal processes can be found e.g. in association with reading, learning new skills, different child-child activities, performing complex tasks, and group or solitary play. The focus is especially on the evolving content of processes, namely what a child perceives, desires, learns, thinks or acquires as knowledge (Bronfenbrenner 1979). Development is understood as a joint function of the child's personal characteristics and environmental influences. A central aim is to get information about the reciprocal and changing interaction between the child and the learning environments (e.g. daycare, school and home) from multiple perspectives. Bronfenbrenner (1979) emphasizes that the effects of family, day care or school on the child development cannot be estimated through family or school variables only. Real effects come out only in the examination of interaction in the child's whole life sphere. Thus, support for growth and development should bear an influence on the whole system in which the child lives. Also indirect effects (e.g. parental employment) should be taken into account as part of developmental interactions.

The temporal dimension of this approach accentuates continuity over time and space in child development and experiences gained from different environmental levels. Development beginning in childhood is considered to continue through the whole life course and it can be described as continuous changes in ways by which a person perceives and acts in the environment. The importance of the temporal dimension is stressed also in the assumption that interpersonal activities have a lasting impact on developmental outcomes. Bronfenbrenner (1992) utilizes a notion cronosystem model for research frames that consider the stability and change both in persons and in their environment. Bronfenbrenner (1992, 279) defines that "*The degree of stability, continuity and predictability will solve in the longer time period the effectiveness of the system in any subsystem of human development ecology*". Such frames utilize the time dimension as a central factor in theoretical application. The cronosystem model can be directed at short or longer time periods. In a short-term research frame the data is collected from the same research subjects before and after a certain life event, experience or transitional period. Longer-term research projects can explore development on a scale of whole life spans, even.

2.2.2 Hierarchical environmental systems of influence

The way a child perceives the surrounding environment bears great significance for the understanding of behavior and development. From the child's perspective the environment can be described in ecological terms as a series of nested constructions of contexts, which consists of a hierarchy of systems at micro-, meso-, exo-, and macrolevel (Bronfenbrenner 1979, 1992; Jones 1995). The reciprocity of relation-

ships expands from the immediate environment to wider systems, in which the learner has a share, or which influence his/her daily life. The scientific assumption of the relation between human development and environment can be summarized in the following tenets (see Puroila & Karila 2001):

- Development as a process takes place in a particular environment, which is based on micro, meso, exo and macrosystems.
- The function of environmental levels is manifested on the one hand as circumstances for development, and on the other hand, also as the contents of the developmental process.
- The outcomes of a developmental process have transferability over the specific environment.

The most immediate and intimate level is a microsystem consisting of activities, interpersonal relationships and social roles experienced by the developing person in a given situation e.g. at home, in a day-care setting, at school, or at work. Microsystems can be described through physical, material, symbolic and social features. According to Bronfenbrenner (1994), such environmental features can *"invite, permit, or inhibit person's engagement in sustained, progressively more complex interaction with, and activity in, the immediate environment"*. For child's growth and learning, most powerful features of an environment are those perceived most meaningful by the child in the given situation. According to the ecological view, child development is affected by activities and progressively complex reciprocal interaction in which the child participates with other people, but also by the solitary activities with objects and symbols. Bronfenbrenner (1979, 45) conceptualizes developmentally important activity as a molar activity, which is *"an ongoing behavior possessing a momentum of its own and perceived as having meaning or intent by the participants in the setting"*.

Interpersonal relationships have a crucial meaning for the guidance of development and for learning motivation. The quality of interaction and relationships between individuals is determined through the degree of reciprocity, balance or transition of power and affective relation. Also the nature of participation (e.g. positive vs. negative, and constructive vs. disruptive influence) is crucial. The developmentally relevant features of interacting persons or significant others are of crucial importance in supporting child development together with the person characteristics of the child (Bronfenbrenner 1992, 1995b). The research frame should pay attention to these relations according to the principles of the PPCT-model, in which each relation is treated as a context for the processes in other relations.

A child's role consists of activities and relations that are expected from him and persons interacting with him in a given situation. Child development is enhanced through collaboration with persons having different roles. At the same time the child's own role repertoire expands, which contributes to the child's learning and develop-

ment. As regards the analysis of a microsystem Bronfenbrenner (1979, 1992) highlights the importance of a comprehensive examination of the activities, relationships and person characteristics in diverse situations. Above all this means that the social network of relationships should be taken extensively into consideration.

The second level of the nested systems is the *mesosystem* consisting of interaction and relationships among people in two or more settings in which the child actively takes part (e.g. relations among home, kindergarten, school, and peer group). In a way a mesosystem is a system of microsystems, as it gains new structures and components when a child moves to new and wider contexts. There are four general types of interconnections between different settings:

- First-order direct social network: Multi-setting participation presumes child's participation in activities in more than one setting (e.g. home and day care or school).
- Second-order network: Indirect linkage represents multi-setting influences when an intermediary (e.g. parent) establishes the connection between settings (e.g. meetings between parents and teachers).
- Inter-setting communications: The relations are defined in terms of messages from the participant in one setting to the people in another (e.g. school correspondence and newsletters).
- Inter-setting knowledge: Information or experience that participants in one setting have about the other (e.g. what schoolteachers know about kindergarten practices).

Movement through an environmental space is called an ecological transition. Transitions occur whenever a child's position in an ecological environment is altered as a result of changes in the child's role or in the circumstances of the environment (Bronfenbrenner 1979). Ecological transitions are critical events in child development, because every transition is in a way both a result and an impulse of child development. The developmental effects of a transitional period depend on the nature of the connections that emerge between different microsystems. Ecological transitions occur throughout one's life. In childhood, some of the most important transitions for a child are the beginning of day care or school.

In the ecological model the focus is also on environments affecting child development indirectly and events in the immediate environment. This third level of hierarchical systems is the *exosystem*, which includes linkages and processes between two or several settings, but at least one of these environments lies outside the child's active participation. Childhood exosystems can include e.g. a sibling's class, parent's workplace or teachers' discussion network. In kindergarten or school, the exosystem deter-

mines the possibilities of a teacher to act as an educator. In the exo- and mesosystem levels central issues include mutual trust, positive orientation, and goal consensus between the linking persons (e.g. parent) and individuals in the non-home settings (e.g. teachers).

Finally, at its widest a child's balanced growth and learning is affected by the social and cultural environment. Thus, the fourth level, *macrosystem*, determines the functionality, meaning, possibilities and limits of different system levels from the point of view of children, families and teachers. The notion of macrosystem includes the subculture in which a person has been, or is being educated and the subculture in which a person lives. The whole of the interrelated system levels illustrates the ideology and forms of social institutions (e.g. economic, social, educational, legal and political) in a specific culture, subculture or other social context as a so-called societal blueprint. Particular reference is made to the developmentally-instigative belief systems, resources, hazards, life styles, opportunity structures, life course options, and forms of social interchange, which are embedded in the whole hierarchy of systems. Bronfenbrenner (1992) suggests that the belief systems of the significant others in the child's world create a context for the definition of goals, risks, and practices for educating each generation of children. Patterns of beliefs are passed on by culture or community institutions (e.g. family, early childhood institution, school, and workplace).

2.2.3 Person characteristics

The extent of individuals' ability to shape, choose, reconstruct and even create their own environments is always dependent on their possibilities to participate in goal-oriented activities heeding their person characteristics and development environment. The ecological approach emphasizes child's activity and growth which includes that the child is perceived as an active agent influencing and contributing to the environmental context (Bronfenbrenner 1992; Sontag 1996.) The notion of an active agent relates the ecological perspective to the socio-constructivist developmental thinking and learning theory (see Dahlberg et al. 1999; Vygotsky 1962, 1978).

In the ecological approach person characteristics are examined as precursors and producers but also as products of development. Discussion about person characteristics can be centered on the question of what a child brings, or what a child's contribution is, to e.g. a child-kindergarten interface (Jones 1995). The bioecological model distinguishes three types of person characteristics as most influential, namely person forces, resources and demand characteristics (Bronfenbrenner & Morris 1998). Each characteristic is further conceptualized as is shown in Table 2.1.

Table 2.1 *Types of person characteristics in the bioecological model (Bronfenbrenner & Morris 1998)*

Person characteristic	*Description*	*Examples*
Force	Active behavioral dispositions that can set proximal processes in motion, sustain their operation, or interfere with, retard, or prevent their occurrence	*Developmentally generative* Curiosity, tendency to initiate and engage in activities alone or with others, responsiveness to initiatives by others, capacity to conceptualize experience
		Developmentally disruptive Impulsiveness, explosiveness, distractibility, inability to defer gratification, difficulties in maintaining control over emotions
Resource	Constitute biopsychological liabilities and assets that influence the capacity of the organism to engage effectively in proximal processes	*Liabilities* Conditions that limit or disrupt the functional integrity of the organism: genetic defects, low birthweight, physical handicaps, etc.
		Assets Abilities, knowledge, skill, and experience that extend the domains in which proximal processes can do their constructive work.
Demand	The capacity to invite or discourage reactions from the social environment of a kind that can disrupt or foster processes of psychological growth.	E.g. a fussy versus a happy baby, attractive versus unattractive physical appearance, hyperactivity versus passivity.

In a research project applying the ecological model, the assessment and interpretation of person's characteristics is realized from different perspectives like those of the person himself, significant people in his environment, trained observer, and the perspectives of different subcultures affecting the person.

The uniqueness of person-environment interaction and the meaning of the context have been illustrated through the concept of ecological niches (Bronfenbrenner 1992; Sontag 1996). Bronfenbrenner (1992) defined ecological niches as "*particular regions in the environment that are especially favorable or unfavorable to the development of individuals with particular characteristics*" (p. 194). Thus, each child's ecological niche is unique because each will have his/her own way of experiencing the relationships and processes of interaction between home, an early childhood institution and the wider world.

Children also actively influence this ecological niche, a meaning of which is enhanced by contemporary emphasis on individuality and personal learning paths in instruction. According to Sontag (1996) the increasingly complicated childhood requires richly detailed descriptions of the child's environments and unique cultural niches. The child's environment should be described within the broader context of characteristics of e.g. friends, neighborhood, lifestyle, cultural belief system, and family resources. The notion of ecological niches also directs attention to individual attributes and behavioral patterns that interact with unique environmental contexts so as to result in the full realization of human potential.

2.3 Further trends of the ecological framework

The ecological approach derives from the natural sciences at the end of the 19th century. What contribution can this approach, which has been developed further e.g. by Bronfenbrenner, still bring to today's research on young children, their teachers and early childhood education and also to the search for future directions in the information age? I would argue that the constancy of certain fundamental ideas over time is a measure of the value of a good framework. Theoretical frameworks, nevertheless, also need continuous transformations and conceptual refinement.

2.3.1 Conceptual clarification of the term 'ecological'

Valsiner and Benigni (1986) have analyzed the use of the term 'ecological' and the meaning it has received in scientific research. They found two basic conceptual problems: First, the terms 'ecological' and 'naturalistic' are often used as synonyms, and

second, too little attention is paid to the differences between developmental and non-developmental perspectives.

According to Valsiner and Benigni (1986), the conceptual problems derive from the fact that in the analyzed studies the open-system nature of developmental phenomena is not adequately understood. Open-system nature means that an open system, e.g. child development, depends on the exchanges or relations with its environment. In contrast, a closed system exists independently of the environment. However, only open systems – i.e. all biological organisms – are capable of change and development toward more complex states of organization. The future directions of developmental phenomena are unpredictable and dependent upon the relations between the organism and its environment. Thus, Valsiner and Benigni (1986, 211) suggest that the notion of 'ecological approach' be reserved to the studies focusing on "*ongoing exchange processes between the developing organism and its environment*".

The first conceptual problem, the reference of the term 'ecological' to naturalistic research, is related to the issue of ecological validity. Interest toward ecological validity has emerged as a reaction against the more traditional psychological studies conducted in laboratory settings. It is rooted in the criticism Bronfenbrenner (1979, 19) directed towards the traditions of developmental psychology. However, Valsiner and Benigni (1986) claim that the core issues of the ecological approach have largely remained without deeper analyses in its various research applications. Generally, there are exact and extensive descriptions and analysis about environmental features. However, the more complex theoretical question of a child's relations to the diverse environments has remained of minor concern. Also, the descriptive use of the term 'ecological' does not offer adequate possibilities for its further theoretical development.

The general misuse of the term 'ecological' prompted Bronfenbrenner (1986, 28–29) to deepen the definition of ecological validity. This expanded definition includes the traditional validity requirements both for the question under investigation (the extent to which the study measures what it is supposed to measure) and for the environmental context. Thus, to quote Bronfenbrenner (1986, 29) himself:

> *Ecological validity refers to the extent to which the environment experienced by the subjects in a scientific investigation has the properties it is supposed or assumed to have by the investigator.*

In the examination of validity the researcher should be able to assess how the research subjects experience the environment where the research is conducted, and whether the researcher's assumptions about the environment match with the subjects' experiences.

The second conceptual problem – the neglected difference between non-developmental and developmental approaches – leads us to the definition of the ecological

notions of development. The non-developmental approach is static and product-oriented. The focus is on phenomena of tangible and static nature, and analyses target at the results of psychological processes. In the developmental approach, instead, growth and development are taken as dynamic or process-oriented. The focus is now on how children proceed from one phase to another in their development. The theoretical emphasis is transformed from questions of being to those of becoming. In the developmental approach it is essential how the emergence of qualitatively new forms of phenomena in child's action and thinking are explained.

2.3.2 The role of cultural meanings

An interesting further elaboration on the concept of ecology, and the ecological approach in general, is concerned with the role of cultural meanings in child's development. The cultural conceptualization of the context of child development emphasizes *"the role of cultural meanings as the environment with which children are inevitably interrelated during their development"* (Valsiner & Benigni 1986, 215). Cultural meanings compose a development context with which different events in the child's life are related and through which the child's learning environment can be analyzed. They also make up a frame through which parents or teachers perceive their role in child development and learning. Similarly, the frame of cultural meanings directs the interpretation of child development.

The examination of cultural meanings leads to the dualistic view that while being products of their social world (Planel 1996), children are also creators of their own environment and their own worlds of meanings (Berk 1994; Valsiner & Benigni 1986). It is presumed that the child actively constructs and reconstructs the environment in conjunction with making use of it in further development. The emergence and development of relationships can be illustrated as a process in which children develop personal constructions, or a personal sense, based on the objects and events in their environment. Children choose, convert and create circumstances and experiences of their own. The way they do it depends on diverse factors, e.g. age, physical, intellectual and personal characteristics and environmental possibilities (van Staden & Loubster 1995).

The personal sense arises during child development in relation with the social environment. Although the environment influences the emergence of personal sense, it does not determine it. New meanings can emerge when different personal senses or mental constructions encounter each other. The meanings are dynamic: they emerge, develop, and vanish with the changes in the individuals' personal senses. Social and cultural contexts create meaning for pedagogy and enhance the learning experiences to become meaningful for children (Planel 1996).

2.3.3 Towards the perspective of contextual growth

The perspective of this study is closely related to the discussion about the universality of the ecological approach for application on educational issues like early childhood education. It is assumed that the ecological theory can be adapted to the analysis and understanding of the meaning of environmental levels for human development, be the focus on schooling and education or on learning or upbringing (Puroila & Karila 2001).

According to Puroila & Karila (2001) development and education are different perspectives on the process in which both coexist. The goal of education is optimal development. This directs research interests toward the process of educational interaction and to the characteristics of the parties involved. At the different system levels the central educational phenomena under study vary as shown in Table 2.2.

Table 2.2 *Educational phenomena at different system levels (Puroila & Karila 2001)*

System level	*Educational phenomena*
Microsystem	Educational interaction Participant characteristics Educational concepts, conceptual systems Educational cultures
Mesosystem	Confrontation of educational cultures
Exosystem	Educational resources and support
Macrosystem	Guiding values and educational systems

A central challenge in Finnish early childhood education is to develop the pedagogical orientation of day care by anchoring it to relevant theoretical perspectives (Hujala 1996). In this regard Bronfenbrenner's ecological framework has been elaborated towards the perspective of contextual growth, which could further outline theoretical thinking about childhood growth and learning (Hujala 1996; Hujala et al. 1998a, b; Hujala & Parrila-Haapakoski 1998). The contextual approach is based on the concepts and structures of the ecological framework, but it is, thus, widened with pedagogical contents (Hujala et al. 1998b).

The central principles of the pedagogy of early childhood education is culminated in the following citation:

> *Modern early childhood education can be defined as a process, in which a child develops socially, becoming an active agent through spontaneous experiential activities, peer group contacts and with the support of adults' goal-oriented guidance and this way finds a strategy for learning to learn and growth. (Hujala 1996, 496)*

Early childhood education builds essentially on the child perspective and on the adult support of child's growth and learning. Learning is viewed as a result of adult-child or children's mutual collaboration. The child perspective is linked with the pertinent points of childhood learning, namely play, peer group, and activities, and it places child's meaningful experiences in the center of examination of learning. The meaningfulness of experiences means that new things bear relevance in the child's reality and that they integrate into the child's cognitive structure and build on his/her prior meaningful experiences.

Some of the key principles of the contextual approach are as follows (Hujala 1996; Hujala et al. 1998b):

- Child's growth and learning is engaged with the culture, in which the child lives and acts. A child is an inseparable part of his or her social environment.
- A child contributes to the shared everyday life and its shaping, which presumes interaction and co-operation as a basis for all educational activities. Interaction is seen as a common construction of activities.
- Individual education and guidance of learning according to the child's personal learning challenges and curricula are grounded on the educator's awareness of contextual growth.
- The ultimate goal of learning is that a learner acquires metacognitive skills for further learning.
- Reflective assessment from multiple perspectives is a distinct part of the learning process.
- The goal of education is to set the entire system in function.

2.4 Ecological framework in the studies on early childhood education

Bronfenbrenner's ecology of human development has inspired the use of ecological approach especially in the studies on early childhood education. In the following pages I will review a range of studies based on the ecological framework in order to find out how the application of the ecological approach has increased the knowledge about children's learning environments and which areas have thus been covered. For the review the articles were categorized according to their primary research focus. However, many of the studies can be placed in various categories. The following categories are utilized in the review:

- Taking participant's perspective on learning environments
- Child-environment interaction
- Family studies
- Program effectiveness studies
- Multilevel interaction between various environments

2.4.1 Taking participant's perspective on learning environments

Early childhood learning environments have been studied at least from two different directions (see Salomon 1996). Firstly, data have been collected by observing events as an outsider. Secondly, it is possible to use the actual participants as a source of information when describing their experiences and observations concerning the learning environments. For this kind of research, which seeks *participant's perspective in a learning environment,* Salomon (1996) suggests an ecological approach and systemic thinking as a theoretical frame. Daily experiences of infants and toddlers in day care were analyzed from an ecological multilevel perspective by integrating cultural and social policy issues, family and care personnel background and beliefs, the nature of the child care environment, and the child's personal characteristics into the examination (Rosenthal 1994). The experiences of young children were also approached in an international comparative childhood study (IEA preprimary study) when collecting data about children's daily environmental changes. These changes or ecological transitions were described as shifts both in childcare settings and care providers (Ojala 1993). In the comparisons the special focus was on examining macrosystemic effects on different socializing activities in children's daily settings and on the cultural differences or so-called societal blueprints of young children's care and growth environments and daily activities in them (Siekkinen 1995).

Children's experiences and programmatic variables are presumed to be essential also in distinguishing critical features of inclusive early childhood settings that contribute to children's development (Buysse & Bailey 1993; Kontos et al. 1998). The experiences of children with mild to moderate disabilities were examined during free-play activities with respect to the nature of their activities, amount and type of adult involvement, and the social context of their activities within inclusive early childhood programs (Kontos et al. 1998). Also the overall quality of the classroom was assessed. The ecological perspective was chosen to better understand the blended approach to inclusion. A blended approach integrates early childhood special education, regular early childhood education, and therapeutic interventions and presumes a team approach to early intervention. The data was collected through observations, which were conducted via scan sampling during free-play periods in each classroom.

The previous studies focused on participants' experiences, but the methods of data collection (e.g. observations) were adult centered. The children's own voice in describing their experiences was still missing. An ecological and more learner-centered approach was introduced in an action research project, in which portfolio assessment was developed in close collaboration with children and teachers (Kankaanranta 1998a). Children's experiences were followed during the transition stage from day care to primary school. The portfolios displayed children's meaningful experiences, learning paths and own curricula, but they also provided common "meeting places" for different perspectives in the children's learning environments. In a retrospective study Huttunen and Tamminen (1991) examined primary school children's memories of their day-care experiences. In their compositions the children described most frequently their teachers, peer relationships and children's play. The study emphasizes the need to determine children's and parents' expectations and experiences for the evaluation and development of educational practices in day care.

The experienced curriculum of children was revealed also in the analysis of third-grade students' essays on the daily life and learning context of Finnish school (Kankaanranta & Linnakylä 1993). The learning environment was illustrated according to the ecological framework. It was found out that friendship relations between students had a very special and meaningful part in the students' own learning curricula. The examination of student experiences revealed that relationships with other students and with teachers and also different activities considered as school's frame factors (e.g. social interaction, breaks, and lunch) had an unexpectedly powerful position in the school life.

In real life it is impossible to emphasize one perspective over the others, but diversified information is reached by combining different perspectives. Examining the interaction and communication of multiply disabled children in every day activities both at home and at day care, Mäki (1993) aimed at reaching both child and family perspectives. As for her theoretical approach Mäki utilized the so-called ecocultural approach, which is closely related to the ecological framework, especially in the examination of the outermost levels (meso- and macrolevels) of social networks (Mäki 1993).

2.4.2 Child-environment interaction

In the field of special education the ecological approach has contributed to the understanding and interpretation of negative life events and risk factors as a consequence of discordant *child-environment interaction*. Critical life events can have either positive or negative effects on child's further development. Johnson (1994) adapted the ecolog-

ical hierarchy or network of environmental systems to represent educational risks as a consequence of discordant interaction occurring in the classroom, at home, in the community and/or in wider society. The so-called family systems model for interventions supports this idea by requiring treatment and changes both within the family system and the system formed between the family, the school, and other elements of the local community (Tice 1993). Grauerholz (2000) utilizes the ecological approach in exploring the factors related to the sexual revictimization of the victims of childhood sexual abuse. The factors relate to the victim's personal history, the relationship in which revictimization occurs, the community (e.g. the lack of family support), and the larger culture (e.g. the blaming of victim attitudes).

The strengths of the ecological approach are also in its efficiency and holism with respect to inquiries of children's socio-emotional problems (Raivio 1993). Children's behavioral problems are explained to result from a conflict in the interaction between children and their environment, thus not only as a consequence of some specific child characteristics. Widening the focus of preventive or remedial actions to include a child's entire social network of relationships can best support the child's development (Huttunen 1985b, 1990; Raivio 1993). The predictors of behavior problems during early childhood were explored in a study on children of cocaine-using mothers (Eiden 1999). The results indicated that the potential predictors are maternal substance use, maternal psychosocial functioning, maternal and child experiences with violence, and instability or inadequacy of care.

The ecological approach has been utilized also in comparative studies of human-environment interaction in different educational systems. Bronfenbrenner (1970) compared the environmental effects on child development in Soviet and American growth environments, and Fischbein (1986) compared through a twin study the human-environment interaction in a Swedish school and in an Israeli kibbutz-community.

The ecological system theory has also been applied to studies describing and designing children's *life-spaces*. In a multidisciplinary study "Children creating alternative futures" children were supported to act as active creators and participants of the changes affecting their own futures, e.g. in planning a built environment (Baldassari et al. 1987). In their study on children's life space in school, at home and in the surrounding community van Staden and Loubster (1995) developed the use of collaborative (child, teacher, parents) ecological mapping, so-called ecomap, to illustrate children's life space as a visual overall picture. The researchers encourage teachers to combine the principles of environmental education and ecological view of child development both in the teaching of environmental issues and in understanding the child's position in multilevel environments.

2.4.3 Family studies

The ecology of a child's first and closest microsystem, the home environment, has been explored especially in the *family studies*. The family studies applying an ecological framework have focused attention, for example, on the interaction inside families (Huttunen 1985a), on social networks of families (Cochran 1988a), and on developmental tasks of a family with a handicapped child (Virpiranta-Salo 1992). When comparing the methods employed in the development of individualized family service plans (IFSP) for special needs children, Notari and Drinkwater (1991) used a framework that combined the ecological approach and the ecocultural theory. It was realized that the direct and indirect influences of familial, cultural and societal contexts necessitate that all significant people in the child's life participate in the development of individualized family service plans. Therefore, it is essential that parents are involved in a multi-source assessment process, collaborative goal setting and equal sharing of decision-making powers so that the outcomes of the family service plan reflect functional and meaningful activities for the child and the family.

The importance of fathers in child development and gender differences in care giving styles were explored in Meyers' (1993) review about parent education programs. It was found out that in terms of intervention efforts an ecological approach necessitates addressing the psychological determinants of fatherhood (e.g. father's care giving beliefs and relationships with his family of origin) together with their contextual antecedents (e.g. social support or problems stemming from low income). As for effective means for social support, research points out, for example, encouragement of fathers to discuss child-rearing difficulties and fostering of supportive environment within the context of the parent education program (see McBride 1990; Meyers 1993; Steinbach 1990).

Children's portfolios in my study (Kankaanranta 1998a) showed that fathers are rather invisible in the children's constructions of their daily learning experiences at least in the Finnish cultural context. The invisibility of fathers in the children's reflections on learning can partly be explained with the nature of the portfolio activities, which at the time of data gathering did not involve richly reciprocal connections between day care and home. On the other hand, children's learning reflections were not bound to the contents of the portfolios but they discussed their learning more generally. Moreover, these reflections included also mothers and siblings as agents in children's learning.

2.4.4 Program effectiveness studies

In the early childhood *program effectiveness studies* the ecological framework has been utilized in order to explain the effects of day care on children's development, and especially the co-effects of day-care and home (Huttunen 1985a; Niiranen 1995). In a study conducted in inclusive preschool classrooms it was found out that naturalistic, teacher-mediated intervention strategies are effective in increasing the level of active engagement of young children with developmental delays (Malmskog & McDonnell 1999). There have been concerns that adult interactions with special needs children in free play activities might decrease the peer interactions (McCormick et al. 1998). Thus, the aim was to provide an appropriate balance of the peer and adult interaction. Edwards (et al. 1986, 1987) focused attention to the indirect effects of day care, examining the effects that children's day care had on parents' care giving conceptions.

With regard to school research and practices, as well, restructuring efforts and the movement for inclusive education have focused attention on the importance of the child's home and community ecology for the educational process. Sontag (1996) argues that only few studies invoking the ecological paradigm actually treat the approach comprehensively by investigating multiple setting influences such as the joint influence of home and school factors on child development and academic competence. In his own study, Sontag (1996) discovered moderate correlations between selected parent and teacher characteristics in relationship to children's cognitive competence. The effects of a special education program on behaviorally disturbed male adolescents have been described at the classroom level through the interaction of static (e.g. academic classroom materials) and dynamic (e.g. group interactions) features of the classroom environment (DeSouca & Sivewright 1993).

2.4.5 Multilevel interaction between various environments

One fundamental idea of the ecological approach is the emphasis on multilevel interaction between various environments. This emphasis gives also a basis for cooperative or collaborative efforts in education. In developing cooperative learning grounded on the ecological framework, Graves and Graves (1985) wanted highlight particularly the meaning of interconnectedness of students' experiences in the design of cooperative learning environments. The total social and psychological environment is regarded extremely essential in learning, especially in cooperative small-group learning and also in the development of social behavior. A central principle of inclusive education implies that the variety of students in the classroom is recognized and valued and they are incorporated into varying roles in the classroom. However, this principle expands

cooperation also beyond a single classroom and opens the classroom for cooperation within the whole school but also in the surrounding community (Graves & Graves 1985).

Graves and Graves (1985) accentuate following general guidelines for building an educational context for cooperative learning in which both individualistic and competitive behavior is incorporated:

- A holistic viewpoint on cooperation involves creation of temporally and functionally sound environments.
- Cooperation expands from immediate settings to wider entities and systems of which the class is a part.
- Settings within the wider environment are nested, thus people and situations in this wide network affect cooperative processes in the classroom.
- Interpersonal processes of interaction need to be made explicit e.g. through discussions and reflection.
- It is crucial to realize that the change processes will be slow.

The influences of multiple settings have been examined also in the studies on collaboration between both parallel, like day care and home, and successive environments, like day care and school. However, the emphasis is on enhancing continuity in child's development and learning through the multilevel linkages or collaboration among diverse environments. Collaborative links or mesosystemic relations between early childhood settings support both day care and school as well as families, because these links enable them to combine resources for promoting child development.

From the ecological perspective the most effective parent partnership programs have proven to be those evolving as a part of a wider collaboration scheme involving the whole school structure within the entire community. The community context includes its people and resources, demographics across and between groups, interaction, and the interdependencies among all of these factors (Comer and Haynes 1991; Davies 1991). Some studies indicate that positive home-school relationships are especially crucial for children who have socially or economically disadvantaged backgrounds (e.g. Comer & Haynes 1991; Raffaele & Knoff 1999). It is realized, that at its best home-school collaboration is based on improved relationships and multiple levels of involvement of the significant people in the children's lives (Christenson 1995). Also in Finnish early childhood education the ecological approach has provided a firm interpretation frame for the studies on co-operation between day care and families (e.g. Huttunen 1984; Lahikainen & Strandell 1988, see also Puroila & Karila 2001).

It is especially intriguing how continuity in child development can be enhanced through connections between different childhood micro-systems. The consistency and continuity of child-rearing attitudes and beliefs within the same microsystem and between different microsystems was found to be especially important for the well-being of young children who don't yet have adequate metacognitive abilities for putting discontinuities into perspective (Van Ijzendoorn et al. 1998). Discrepancies between parents and professional care providers were diminished through improving their communication in the issues of child rearing.

The perspective of fathers was central in a study on parental participation in a cooperative day-care center (Unenge 1994). Special focus was on examining the effect of fathers on their children's choices of activities, development of relationships and gender socialization. There were differences in parental participation between fathers and mothers, especially in the use of time, ways of interaction and parent-child relationships. The results indicated that fathers operate on a more segregated time basis and they do not try to combine different activities in the same way as mothers do. Fathers also more commonly have diverse interaction styles with regard to involvement in different types of activities. And finally, they seem to cope better in the dual function of their parenthood in the day-care situations.

Although the positive meaning of home-school relationships has been indicated in research, its reciprocal realization in practice is not self-evident and many teachers even feel unprepared for such relationships. The development of a novice early childhood teacher's parent-teacher relationships was examined in a narrative inquiry (Sumsion 1999). During her first two years of teaching the teacher shifted gradually from a focus on self-preservation toward responsiveness and collaboration. According to the results the personal qualities of the teacher, such as tendency to reflect on professional practice, commitment to children, and capacity for empathy, proved to be particularly important in fostering parent-teacher relationships of ecological nature, especially in a professional context, which is not conducive to such relationships. Thus, Sumsion (1999) argues that there is an evident need for pre-service and in-service teacher programs to promote a reflective orientation to professional practice. At its best, also parents are involved in the ongoing reflection and exchange of experiences on relationships and their implications for practice. The results also indicated the importance of the responsiveness of the relationships and the pivotal role of children in shaping teacher-parent relationships.

The effects of collaborative links between diverse successive childhood settings have been a central theme in the studies on *childhood transition* phases, and focusing especially on connections between day care and school (e.g. Gran 1982; Wiechel 1994; Kankaanranta 1998a, b). This kind of life-course or life-span model of human development places particular emphasis on life transitions, life events, and other life devel-

opments as outcomes of person-in-environment process (Germain 1991). Wiechel (1994) analyzed reports and descriptions on the development work done in cooperative projects in order to examine the meaning of adult connections and collaboration between different microsystems in child development. It was realized that even though researchers accentuate the positive effects of collaboration to the child development, there is insufficient evidence so as to determine what kind of effects the collaboration really has and how they show in practice (Wiechel 1994, 42). Thus, more information is needed about the realization of the goals of collaboration.

Wiechel examined collaborative linkages from the adult perspective. Gran (1982), instead, brought forth children's perspective by interviewing them about their opinions regarding cooperation between kindergarten and school. In my action research project "Flexible learning in early childhood environment" the focus was on combining child and teacher perspectives through portfolio assessment in examining collaboration between children's successive learning environments (Kankaanranta 1998a; 1999).

2.5 Teacher perspective on learning environments

Most typically, theoretical discussions adopting the ecological approach have focused on the child development and child perspective on learning environments. The ecological framework is, however, applicable to the study of other perspectives, as well, like that of teacher's. The interest in teacher's perspective has focused, for example, on professional collaboration (Welch 1998), teacher training and expertise (Feiman-Nemser & Buchmann 1989; Wideen et al. 1998), and on leadership (Hujala et al. 1998b).

Welch (1998) discusses the impact of educational collaboration on educational reform, and brings thus forth the teacher perspective. It was found out that the collaboration and partnership between general and higher education is essential in order to create innovative field-based teacher education programs. The role of teacher education is crucial in encouraging prospective teachers to engage in collaboration. Welch (1998) states that the main characteristics of teacher collaboration are interactive exchange of resources as well as shared decision making, problem solving, conflict management, interpersonal communication, and cultural and systemic influences.

However, there is a range of barriers that can prevent professional collaboration, namely conceptual, pragmatic, attitudinal and professional barriers. Conceptual barriers reflect the influence of the microculture within the school e.g. how members of the school community perceive diverse roles. Pragmatic barriers consist especially of systemic factors (e.g. lack of time, competing responsibilities, and scheduling prob-

lems) structuring the school life. The effects of this kind of hindering systemic factors can be best diminished through cultural factors such as the school's belief system favoring collaborative efforts. Attitudinal barriers refer to individual's beliefs and expectations. However, Welch (1998) views professional barriers as the most germane in the discussion of collaboration and teacher education. Engagement in collaboration requires skills of effective communication and conflict management. The ability to fully participate in collaborative partnership with professionals coming from culturally and disciplinarily diverse settings is related to philosophical differences and also to skills and knowledge of problem solving.

At its best, teacher collaboration enhances the range and diversity of expertise but also resources available. Collaboration also increases understanding of different complex situations, because diverse experiences allow broader conceptualization of problems. In a community of teachers, collaboration can extend beyond brainstorming ideas and allocating resources to monitoring, evaluating, and refining educational programs.

Furthermore, the applicability of the ecological approach has been explored in research and development of teacher training and expertise. In the analysis of teacher preparation models Feiman-Nemser and Buchmann (1989) noticed that in typical teacher preparation programs learning to teach is seen merely as an additive process which bypasses person and setting. Features such as the role of prior beliefs or preconceptions in teacher learning, the influence of program features, settings, and interaction are rarely taken into account. Such traditional training models of teacher education as a basis for theory and practice proved to be still evident in almost all the 93 empirical studies (majority published during 1990–1996) on learning to teach reviewed by Wideen (et al. 1998). Reformation efforts in teacher education usually occur in rather isolated niches. Based on the review, it is argued that there is a need for grounding the process of learning to teach on a more ecological approach. The reviewers conclude that at its best the learning-to-teach ecosystem consists of an inseparable and multilevel web of relationships. Some of the most central issues to be addressed in an ecologically competent teacher education research are as follows (Wideen et al. 1998):

- The needs, beliefs and former knowledge of beginning teachers,
- multiple features of larger learning-to-teach ecosystem,
- diverse societal and cultural conditions of settings where beginning teachers will teach,
- the values and influence of teacher educators and university professors,
- the structures, approaches and myths underpinning teacher education programs and practices,

- support of new innovative practices,
- roles of significant persons in a training school (supervising teachers, children, parents), and
- engagement of participants in the process of research.

The tasks of directors, pre-school teachers, and nurses were surveyed and the changes in the tasks during last two decades were analyzed in a study on leadership in day-care centers (Hujala et al. 1998b). In the contextual frame based on ecological thinking, the worker and his actions were viewed as part of the working community and the larger societal and cultural context. The results indicated that co-operation with parents has increased and children have more opportunities for spontaneous activity in day care. However, a task analysis revealed that whole group activities (e.g. circle times) still constitute the basic element in the culture of the day-care center. Also, the daily schedule was notably similar in day-care centers located in different parts of Finland. Respondents reported child-centered principles in the self-reporting forms but the daily routines of the day-care centers indicated that concrete child-centeredness in practical work continues to be problematic. As a conclusion Hujala (et al. 1998b) argue that the changes in the tasks and job descriptions of day-care staff constitute a challenge to decision-makers and those who educate early childhood educators. There is a special need for redirection of basic and supplementary education for day-care center directors.

In a comparison of methods and contents of pre-school education it was discovered that the ecological theory gives an opportunity to understand and explain teachers' efforts to create safe environments and to develop good relationships in a group (Berglund 1994). Some further examples of the application areas of the ecological approach are enhancement of multicultural education (e.g. Bowers & Flinders 1990), promotion of the public dimension and the ecological context of teaching in in-service education and training (Bottery & Wright 1996), value orientation for curricular decision making (Jewett & Ennis 1990), the female educators' concepts on work education (Härkönen 1996), and collaboration between teachers, teacher students and teacher educators (Welch 1998).

2.6 Ecological approach on technology-intensive learning environments

> *We find the ecology metaphor powerful because it includes these local differences, while still capturing the strong interrelationships among the social, economic, and political contexts in which technology is invented and used. When autonomous technology is observed at the systemic level, its effects can seem overwhelming. But in individual local settings, we see a more varied texture of experience than we see from a distant vantage point. From the local perspective, we see paths towards creating reflective and purposeful uses of technology.* (Nardi & O'Day 1999, 47.)

During last years the relevance of an ecological approach has been realized in the theoretical and conceptual discussions on technology-intensive and virtual learning environments (e.g. Bruce & Levin 1997; Lemke 1998; Nardi & O'Day 1999; Ryder & Wilson 1995, 1996; Salomon 1996), but actual research projects and results are still rare. In the ecological approach, the description of technology-intensive or virtual communities and their collaboration expands to include features of the overall environment: technical devices, programs, materials, communicative and thinking tools, different social and emotional processes, functions and contents of activities and also norms and culture of learning (see Lemke 1998). Technology and the technologies of learning are viewed as constituent elements of an ecological system and they can be understood only in relation to larger systems of pedagogical practices (Bruce & Hogan 1998). The totality of a learning environment is always more than a sum of its components and, consequently, it should also be examined as a multilevel entity. (Valsiner & Benigni 1986; Salomon 1996).

2.6.1 The human side of information ecology

Salomon (1996) states that computer use serves as a trigger for transformations and technology-enriched instructional innovations, which involve profound changes and, thus, affect the nature of the whole learning environment. A systemic perspective on the studies of technology-enriched learning environments focuses on overall changes resulting from technology-intensive interventions (Salomon 1996). Systemic change in an ecology means that when one element is changed, effects can be felt throughout the whole system (Nardi & O'Day 1999). Therefore, also individual changes depend on and can be fully understood only in a wider context, in the frame of other changes across the learning environment. On the other hand, changes incompatible with the rest of the system can disappear without a trace (Nardi and O'Day 1999).

Nardi and O'Day (1999, 49) define information ecology as a system of people, practices, values, and technologies in a particular local environment. Attention is drawn to the notion of locality; people's local participation and own activity in making choices about shaping and using technology in their information ecologies. The emphasis is on human activities that are served by technology as well as on relationships involving tools and people and their practices. The key constituents of an information ecology exist in the relations of interdependence.

The dynamic nature of ecology implies continual development and change but also evolution of new information ecologies. The adjustment of people and entire systems to new constraints and possibilities requires co-evolution. In information ecologies, co-evolution relates to tools, the craft of using tools with expertise and creativity, and to the activities pertaining to a process of continuous and dynamic development.

> *Similar dynamics are at work in evolving information ecologies. The pace of new technology development ensures that school, work, and home settings will continue to be offered newer, faster, and different tools and services – not just once, but repeatedly. Information ecologies evolve as new ideas, tools, activities, and forms of expertise arise in them. This means that people must be prepared to participate in the ongoing development of their information ecologies. For example, as schools across the country are wired by enthusiastic volunteers on NetDays, school teachers and administrators should expect to make decisions about how to use the new classroom Internet access not just once, but again and again.* (Nardi & O'Day 1999, 52–53)

In describing the diversity of an information ecology Nardi and O'Day (1999, 51) utilize the term ecological niches familiar from Bronfenbrenner's ecological approach. A healthy information ecology involves niches for diverse roles and functions. Different kinds of people and different kinds of tools complement each other and lend support in continual and sometimes chaotic changes like the ongoing technological change. An interesting constituent of an ecology is certain keystone species whose presence is crucial to the survival of the ecology itself, e.g. technologically skilled people who support the effective use of technology. These keystone species act as mediators and build bridges across institutional boundaries. (Nardi & O'Day 1999.)

Social practices are important elements of diversity in an information ecology. The social matrix of technological usage consists of services, norms, and conventions. Novice users need appropriate practice, core values, support, and a growth path in order to become eventually more competent with technology. Through the patterns of technological usage the local participants construct the identity of their technologies in their respective settings. The identity of the technology varies according to its perceived role, availability, utility and other properties of the machines. Nardi and O'Day (1999) emphasize that, although technology creates possibilities, it also sets

responsibilities for users to establish its status and place in a local environment and for shaping the way technology works in their lives. The more empowered people become in their information ecologies, the more influence they can have in the development of tools and practices (cf. Barrett 1999, 2000).

> *There is a powerful synergy between changing tools and practices. As people become more involved in their own information ecologies, they will be able to articulate more clearly and precisely what works and what doesn't, what they value, and what they need and want. They will be more cognizant of the possibilities in technology and more creative in pushing it forwards to meet their own needs.* (Nardi & O'Day 1999, 14.)

Evolution of information ecologies includes and requires reliance on values, e.g. issues of access equity, critical evaluation of the merit and meaning of a practice or a technology, and exploration of motivations, objectives, and values through strategic questioning. It is essential that human values are applied to the development of the practices and technologies, that people are motivated in the use of technology, that they actively participate in making choices and decisions about technological issues, and that they also influence the directions of technological change (Nardi & O'Day 1999). The values and choices can be seen as the human side of the information ecology.

2.6.2 Technology and affordances

On the other side of the information ecology are the technological affordances. The notion of affordance can be defined as the action potential of a particular object or item in one's environment or as range of uses that a person sees for a specific object (Ryder & Wilson 1996).

> *Technology and media are affordances to the extent that they promise extended human capabilities of seeing, hearing, and uttering. Tools are affordances to the extent they offer extended human capabilities for manipulating things in the environment. Through use, skill is acquired and the object becomes an extension of ourselves. These artifacts are transformed from affordances to effectivities.* (Ryder & Wilson 1996.)

However, according to Gibson (1979) the most richest and elaborate affordances of the environment are social affordances provided by other people. They are created and maintained by the joint action of interacting parties.

According to Nardi and O'Day (1999) virtual learning environments can offer users multiple affordances and they can also enlarge local learning environments by affording ways of connecting with other people. It has been argued that computer-

mediated discussions can provide learning communities with informal and improvised occasions for qualitative collaborative learning (see Crook 2000). The open nature of the Internet transforms interactivity from an affordance of designer control to that of user control. Bridging virtual and local environments is still a great but inevitable challenge, because as Ryder and Wilson (1995) remind "*any attempt to view the two as separate, disconnected entities leaves the virtual unreachable and the local out of touch*". Understanding of the affordances and constraints of Internet usage will help educators in bridging the gap between local and virtual environments. However, Bruce and Levin (1997) also warn that hardware and software design can also disrupt the democratic process, e.g. by uneven access to information and by providing authorities with new means to initiate, direct and silence discussions as needed.

In the broadest sense, the Internet is a network and a set of communication protocols. Four basic applications of Internet communication are to connect people with information, services, goods, and other people (Nardi & O'Day 1999, 188). From the educational point of view, Ryder and Wilson (1996) argue that the Internet itself does not guarantee learning, but it offers multiple affordances in specific contexts involving learning activities. As an infrastructure, it expands the range of human capabilities through bringing together media, tools, people, places and information. Some of the interesting characteristics of the Internet are as follows (Nardi & O'Day 1999, 186):

- It has potential to foster diversity.
- It is global in reach but decentralized in structure.
- It is accessible to individuals and small local groups as well as large organizations.
- Communication and information sharing can take place between one person and another, among limited groups of people, or throughout the whole world of Internet users.
- On the Web, you can produce and distribute information and interactive applications to a broad audience.
- On the Web, you can also find and use what others have created.
- The Web is not a one-way channel for carefully controlled contents, as is the case with mass media or government publications, but an extremely varied tapestry created by millions of people.

Constant and rapid changes in technologies have inspired discussions on the invisibility of technology. In this context, invisibility means that the more technologies are integrated in the social practices of everyday life, the more invisible or transparent they become. When technologies gradually become invisible in social practices, the

focus will shift from technologies, which are used consciously as a tool to do a task, to the task itself (Bruce & Hogan 1998). Also the requirements or ideas concerning individuals' abilities to use different technologies will change: the emphasis shifting from a specific tool being difficult to use towards a person being incapable of using it. Then they alternate individuals status between able and disable. Development toward invisible technologies means a trade-off between user-friendliness and individual control. Rothenberg (2000) debates upon invisibility as one of the thresholds of technologies as follows:

> *Yet technology doesn't just improve, it passes through thresholds as well - the threshold of invisibility, for one. We want to use technology, benefit from it, but not have to think about it. The machine must deliver all that we need with ease. We all know that computers haven't got there yet: they are too visible, too weighty, far too much distraction and work.*

In this connection, Bruce and Hogan (1998) discuss the notion 'disappearance of technology', which means that it is less useful to focus on the technical attributes of the technology than on the examination of how these embedded systems affect and empower their users or how they can either promote or hinder equality. Thus, they look for deeper understanding about the meaning of technology and the interaction of technology and humans. This requires continuing critical analyses on the use of technology in educational settings and the design, interpretations and employment of technology in daily practices (Bruce & Hogan 1998).

2.6.3 Ecological research on technology-enriched and virtual learning environments

Gibsonian concepts and research directions on human perception, and especially the concept 'affordance', have contributed both to the design and the use of technology-enriched and virtual learning environments (e.g. Cognition and Technology Group at Vanderbilt 1992; Ryder & Wilson 1995, 1996), as well as to research on human-machine systems (Hancock et al. 1995; Flach et al. 1995). Gibson's perceptual theory has also been applied for the definition of presence and telepresence both in the design and assessment of real-world and virtual environments (Flach & Holden 1998; Mantovani & Riva 1999; Zahoric & Jenison 1998).

Cognition and Technology Group at Vanderbilt (1992) designed a set of video-based adventures, so-called Jasper series, to create a motivating and realistic context for problem posing, problem solving and reasoning. The design principle of Jasper series consists of a set of features that afford particular types of teaching and learning. The designers emphasize that the mere existence of affordances does not guarantee

that activities will occur, but their occurrence depend on how the person perceives and reacts to the environment, in this case video-based adventures. The realization of the affordances is also dependent on the teaching model adopted in the context of Jasper adventures. The comparison of three models of teaching indicated that the most powerful is the one emphasizing the importance of generative activities on the part of the students. (See Gibson 1979; Cognition and Technology Group at Vanderbilt 1992.) The central affordances of Jasper adventures are activities such as generating sub-goals, identifying relevant information, cooperating with others in order to plan and solve complex problems, discussing the advantages and disadvantages of possible solutions, and comparing perspectives by pointing out and explaining interesting events.

Ryder and Wilson (1995, 1996) use the concept 'affordance' to explain cultural and perceptual processes in people's relationships to the Internet. In their view, important questions to be asked are as follows: How do users see the Internet? What are the potential actions available to a user? How do users see themselves with respect to Internet resources? How does the Internet fit the user's sense of self and community? Above and beyond Gibsonian perspectives, there are only few studies, as yet, applying an ecological framework in research on technological or virtual learning environments.

A fascinating example is Nardi's and O'Day's (1999) research on information ecologies. They investigated the ecological characteristics of diverse local settings, such as a library, an online virtual world 'Pueblo' utilized in an elementary school, the users of software applications like spreadsheets and computer-aided design tools, a digital photography class in a high school, and a teaching hospital. Nardi and O'Day (1999) were interested especially in the interaction among people and advanced information technologies. The focus of the study was on the multiplicity of viewpoints in the settings, the hidden side effects of technology, people's values and agendas as they deployed technology, the resources they used to get their work done, the actual work practices that accomplished the goals of the work, and the social interactions that affected work and technological usage. The results indicated that each of the ecologies was essentially different from the others, and each had unique features as information ecologies. Based on the case studies, Nardi and O'Day (1999) emphasize that different perspectives of various people in information ecologies need to be taken into account when making decisions about new technologies. The process of technological changes calls for active participation and engagement with technology from all of the participants.

2.7 Towards collaborative and technology-enriched ecological assessment

> *Research needs to increase our knowledge about the circumstances in which children live. Based on such knowledge we can build our understanding about growth and learning and evaluate the possibilities of education and teaching. With better understanding about growth and its possibilities we can approach the process of education and support child's own growth.* (Hujala et al. 1998b, 11.)

In this chapter I have explored the theoretical foundations and research applications of the ecological approach or framework. In my study an ecological approach is utilized as a framework for developing multiperspective assessment and analysis of diverse childhood learning environments. In the ecological analyses and assessments the focus is *on the interaction of the whole learning context and the individuals within it* (e.g. Haney & Cavallaro 1996; Salomon 1996). However, there are huge challenges for the methods of data collection in multilevel ecosystems. From the perspective of this study, one of the central questions is how to establish such methods through which we can construct the experiences of the children and teachers, make their perspectives visible, and adequately describe the diversity of learning and expertise in different learning environments (e.g. Qvortrup 1990). It is especially challenging to develop such assessment methods that would effectively serve both the participants and research purposes.

Welch (1994) defines ecological assessment as a collaborative process requiring ongoing dialogue between professionals in order to examine the components and variables within a learning environment that may have an impact on student performance. The information gathered through direct and indirect assessment can be utilized in the design and implementation of instructional interventions. Ecological assessment has also significant possibilities especially in inclusive classrooms for facilitating child-to-child social interactions and the attainment of individualized goals and objectives (Haney & Cavallaro 1996). Yet, in spite of the comprehensive emphasis, the actual research projects have most often been restricted to the evaluation of the quality of the day-care environments.

The social ecological paradigm of evaluation recognizes the existence of multiple actors and viewpoints (Conner 1998). The utility of data is increased along the diversity of aspects of the system that are taken into account. Different viewpoints within the same system are interrelated and complement each other. In the same way, there is no single situation to analyze but multiple situations that form parts of interacting systems. The following issues are central on a social ecological view of evaluation use:

- a comprehensive set of perspectives brought to bear on planning an evaluation,
- involvement of evaluators in the evaluation plan over the course of the study,
- evaluation methods lap different parts of the system,
- the evaluation team reflects the multiple perspectives of the system, and
- the evaluation results reflect multiple aspects of the system.

The prevailing stage of research on the quality of day care is based on the contextual, ecological approach (Hujala et al. 1998b). The aim is to evaluate the outcomes of day care through exploring concurrently the total influence of the quality of care environments, the characteristics of family and children's individual differences. Hujala and Parrila-Haapakoski (1998) claim that the construction of functional and ecologically valid quality indicators for Finnish day care presumes firm interaction between diverse actors in the Finnish day care sector and early childhood research perspectives. The aim of their research is to construct a national quality assurance system based on the Finnish day care system and early childhood research. Its purpose is to serve both individual kindergartens in their quality development work and communities in their responsibility for quality assurance.

Even though the significance of multiple perspectives on learning environments is often emphasized, generally the child has been the focus of assessment rather than an active participant in it. In the above-mentioned study, this is avoided because a central aim is also to activate children among other day-care participants (parents and day-care staff) to such quality discussions that focus on pedagogical issues (Hujala et al. 1998b).

In a series of action research projects, the aim has been to explore the possibilities of learner or participant centered ecological assessment (Kankaanranta 1998b). In the different cycles of the research, portfolio assessment has been applied for the Finnish early childhood context. In the first study, portfolios were developed as a means of making visible and reflecting on children's and teachers' most meaningful events and experiences in diverse learning environments and on enhancing children's continuous learning across different learning environments (Kankaanranta 1998a). In the second study, the multiple perspectives and collaborative nature of assessment was further promoted in the development of so-called kindergarten and school portfolios, which were collaboratively constructed in the whole community of early childhood settings (Kankaanranta 1999).

In the present study the aim is to enhance communication and collaboration between kindergartens, primary schools and diverse interest groups and environments like parents, the surrounding community, international networks of teachers and childhood institutions via computers and digital web portfolios. The aim of the online

construction of collaborative kindergarten and school portfolios is to create possibilities of making the pedagogical practices and every day experiences visible for wider audiences in order to collaboratively evaluate and develop childhood education.

The ecological approach is utilized in this study in two main dimensions. First, it provides a frame for the development of digital portfolios as a technology-supported assessment method. Technology is viewed as an element of information ecology and the use of technology is explored as interaction between technology and teachers in childhood environments. Second, the actual implementation and use of digital portfolios opens another ecological dimension. Some of the central questions are: What kind of interaction does a digital portfolio create in the early childhood environments? How does a digital portfolio fit to the evaluation of childhood ecologies? What is its purpose from the teacher perspective? How do digital portfolios increase our understanding about childhood growth and learning ecologies?

The most important implications from the ecological approach for this study come from the following ecological aspects:

- Emphasis on multiple perspectives on learning environments (e.g. Bronfenbrenner 1979, 1992; Bronfenbrenner & Morris 1998; Conner 1998)
- The reciprocal and collaborative relationships of the learner or teacher and various environments (Bronfenbrenner 1979; Crook 2000; Graves & Graves 1985; Salomon 1996; Welch 1998)
- The role of cultural meanings as a development context (Valsiner & Benigni 1986)
- The multilevel nature of learning environments (Bronfenbrenner 1979)
- Ideas about ecological validity in the analysis and assessment of learning environments and in the development of assessment methods (Bronfenbrenner 1979; Patry 1997)
- Conceptualization of learning environments as childhood information ecologies (Nardi & O'Day 1999)
- The affordances of a learning environment for digital portfolio development (Gibson 1979; Ryder & Wilson 1995, 1996)
- The conceptualization, design and analysis of technology-intensive and virtual learning environment (Salomon 1996; Lemke 1998; Bruce & Hogan 1998)
- The meaning of technology in pedagogical practices, and the interaction of technology and humans (Bruce & Hogan 1998; Nardi & O'Day 1999)

Part II

Digital portfolios in childhood education

CHAPTER 3

Digital portfolios in childhood education

The notion of digital portfolios has recently raised wide interest as a means for describing and assessing teaching and learning at the various levels of education systems all over the world, from early childhood education up to the doctoral level (e.g. Barrett 1999; Bergman 1999, Hartnell-Young & Morriss 1999; Linnakylä et al. 1999). The possibilities of digital portfolios have been broadly recognized also when it comes to specialists of different fields and displaying their competencies, strengths and evolving expertise (Kankaanranta & Linnakylä 1999).

In this chapter I will explore the development of digital portfolios as an authentic means for documenting, displaying and sharing pedagogical practices and meaningful experiences in different childhood environments. The process of digital portfolio development integrates two interrelated issues, namely portfolio assessment and the use of information and communication technology (ICT). In the following I will first discuss the basic characteristics and purposes of portfolio assessment. Then I will address the multiperspective nature of portfolio assessment by describing the different types of portfolios. With the basic characteristics of portfolio assessment in mind, I will then turn to examine the advantages, possibilities, and constraints of constructing a portfolio in a digital form. The chapter is partly based on articles, which I have authored or co-authored earlier on portfolio assessment (Appendix 1).

3.1 Defining portfolio assessment

Although portfolios are still a relatively new means for assessment in childhood education, they have been utilized for long, already, in various professional fields. In the working life portfolios have served as a portrait of the person, of his or her skills,

abilities, interests, and potentials (Linnakylä 1994; Hartnell-Young & Morris 1999). Portfolios have aroused interest especially in occupations requiring creativity, originality and individuality, and in which expertise is acquired through diverse education and work experiences. In such occupations professional competence is varied, as well, and calls for various kinds of knowledge, being typically hard to demonstrate by means of mere education or certificates. For example, artists, photographers, graphics designers, architects and journalists have assorted their best works into portfolios to display the works and achievements themselves but also their techniques, ideas and plans as well as to show the strengths and range of their competencies and creativity (e.g. Adams 1989; Valencia 1990). In many cases they have built these portfolios for years including items from their study periods as well as from a variety of working life contexts. Quite often portfolios or sample works are required also when applying for education in these fields.

3.1.1 Authenticity of assessment

> *The essence of education can be seen in the process of authentic assessment: engaging the students in tasks that are grounded in instruction, that are personally meaningful, that take place in real-life contexts. Logically, authenticity should be the foundation for all classroom assessment systems.* (McLaughling & Kennedy 1993, 7.)

In an educational context, the use of portfolios has proven to be a promising form of authentic assessment. Authentic assessment represents such assessment culture in which the aim is to support child's learning, to connect learning, teaching and assessment to each other and to show child's strengths in real life and real instructional contexts (e.g. Ackers 1994, 65; Paulson et al. 1992; Kankaanranta 1998a). In authentic assessment it is presumed that children are involved in the evaluation of their own achievements and that assessment tasks are real and meaningful for the learners and their education (Linnakylä 1994; Bridgeman et al. 1995). Educational assessment is an integral part of learning and teaching processes and should not be taken out of that context.

It is also essential that information be collected over time, from multiple sources, and using multiple methods and perspectives. Shaklee (et al. 1997) describes portfolio assessment as a practical strategy for organizing this kind of assessment data. Information gained through authentic assessment is supposed to be used for decisions about curriculum and instruction. It is argued that authentic assessment augments quantitative assessment tradition with a qualitative component and brings subjective, personal, and professional elements to the objective measures (Shaklee et al. 1997).

In constructivist literature, authenticity is defined as the ordinary practices of the culture (Brown et al. 1989; Cobb & Yackel 1996). It is generally acknowledged that authenticity refers to relationships and applicability with real life or real world contexts and activities both within and outside of a school (Brown et al. 1989; Honebein et al. 1993; McLaughling & Vogt 1996; Meyer 1992). However, according to Bopry (1999) an activity has authenticity only in relationship to the community of practice in which it occurs. Thus, the centering of a 'community of practice' outside the schoolroom is problematic when the theoretical position supports its grounding within the schoolroom, within the experience of the learner.

> *Authenticity resides in the process of community building in the classroom itself, within schools, and between schools and other institutions. Indeed, it may be best to consider authenticity as something grounded in the community of learners, but acknowledged by a larger community of which the school is a part.* (Bopry 1999, 94.)

Authenticity has been defined through contextuality, the use of tools typical of a culture, the meaning of social interaction, and goal orientation (Linnakylä et al. 2000). The idea of authenticity can, on the other hand, be understood as an orientation towards future and as a possibility to build communities of learners or learning environments. Then authenticity involves also what is possible or what is yet to come (Bopry 1999; Giddens 1979, 1984). Future orientation is in accordance with the idea that educational experience should be a dialogue between the learner and her future (Griffin & Cole 1984). Furthermore, building a community of learners relates authenticity naturally to collaboration and interaction, which presumes that also portfolio development should be seen as a consensual process involving collaboration and social negotiation (Bopry 1999).

3.1.2 Purposes and advantages of portfolios

> *What has emerged is assessment that is authentic in nature, offers multiple indicators of student progress, encourages students to take an active role in their learning, affords teachers new roles in the assessment process, and encourages students to demonstrate what they know in ways that encompass their personal learning styles.* (McLaughlin & Vogt 1996, 9.)

The definition of a portfolio or portfolio assessment is always dependent on the goals of assessment, the purpose and uses of a portfolio and on the perspective of its evaluation. And again, the goals of the assessment and the purpose of portfolio will direct the content, implementation and the concrete form of a portfolio (de Fina 1992, 31; Linnakylä 1994). So far, portfolios have most often been constructed in the form of folders or briefcases. However, the development of information and communication

technologies has brought digital portfolios as a noteworthy alternative for the display of learning experiences.

A portfolio generally refers to a child's or a teacher's own collection of samples of tasks and achievements, which represent the person's growth and learning experiences in a relevant and broadly representative manner (e.g. Kankaanranta 1998a; Kankaanranta & Linnakylä 1999). It is essential that the author of the portfolio is involved in selecting and judging the quality of work (Paulson et al. 1992). Often portfolios include descriptions about the environment and processes associated with learning and working, as well as one's own ideas or philosophy on learning, teaching or working in general. Portfolios can also be collaborative showcases of a specific group's or community's achievements, or they can give a more process-oriented picture of continuous development in the whole school community (e.g. Martin-Kniep 1999). A good portfolio represents a set of work that shows the range, quality and depth of learning and teaching and reflects a person's or a group's actual performance as a visual presentation of accomplishments and capabilities (Herman & Winters 1994; Tillema 1998). Orientation toward future is also important, and therefore portfolios usually contain a section on future goals and challenges.

Practical issues in developing portfolios concern the definition and purpose of a portfolio and reflection on what is important for a person to document through a portfolio, like for a teacher would be documentation of critical teaching tasks (Wolf 1996). Some of the primary purposes of portfolio assessment in educational contexts are definition of learning goals, promotion of learning, display of learning environments, support of self-assessment, development of teaching and strengthening of collaboration (see Table 3.1).

Table 3.1 *Collection of presented purposes and advantages of portfolio approach in instruction (e.g. de Fina 1992; Linnakylä 1994, 2001; Paulson et al. 1992; Stowell & Tierney 1995; Tillema 1998; Pollari 2000; Vavrus 1990; Wheeler 1996)*

Definition of learning goals
• to support children and teachers in defining and setting personal goals
• negotiation and re-negotiation of goals and learning tasks
Promotion of learning
• to support learning to learn and foster further growth and learning
• to increase child's involvement and personal responsibility in the learning process
• to encourage empowerment and enhance ownership of learning
• to relate the work to a larger context
• to direct understanding of process-orientation

Display of learning environments

- to document authentic learning experiences
- to make visible and communicate children's and teachers' activities, daily life and learning or teaching curricula
- to help a person to perceive and document his or her own growth, learning and progress over time
- to allow individuals to display learning and evidence in ways not available, overlooked or undervalued by other assessment means

Support of self-assessment

- to encourage learner or teacher reflection on past experiences as well as in determining future learning goals
- to provide cognitive feedback in a continuous way, thereby promoting reflection on practice
- to give cause for self-regulation in the assessment of progress and future work
- to encourage children and teachers to develop pride in their work and accomplishments

Development and reflection of teaching

- to allow teachers to better know the strengths and weaknesses of children
- to assess and develop curriculum
- to define efficiency of teaching practices
- to give teachers empowerment and enthusiasm for teaching
- to expand the classroom horizon
- to reflect the complexities of teaching and to increase the understanding of the teaching profession
- to encourage professional development
- to open up instruction for other interested parties

Strengthening of collaboration

- to establish a continuum of collaboration between a teacher and a child and also between teachers as portfolios span through grade levels
- to enhance relationships among portfolio creators and mentors
- to encourage a sense of community and collaboration among learners rather than a sense of competition
- to increase involvement in writing, in discussions, and in interactions with other professionals

The portfolio purposes can also be approached through following general evaluation or assessment perspectives (Chelimsky 1997, 10):

- assessment for accountability (e.g. the measurement of results or efficiency)
- assessment for development (e.g. the provision of evaluative help to strengthen institutions)
- assessment for knowledge (e.g. the acquisition of a more profound understanding in some specific area or field)

Further reported goals or advantages are, for instance, that a portfolio-oriented approach raises a sense of ownership (see Berlach 1997), fosters student or teacher empowerment (Pollari 2000), provides a sense of accomplishment, allows for the exhibition of the variety and creativity of tasks, emphasizes the social and human-side of learning, and provides an opportunity for reflection and integration of content (Berlach 1997). The advantages of portfolio assessment reflect both the qualities of good pedagogy and good assessment. In other words, portfolios afford a means for the unfolding of teaching and learning over time and also an opportunity to engage in the analysis of the work done. (See Gellman 1996; Shulman 1988.)

Previous experiences and studies have equipped portfolios with a flow of advantages. Still, there are also substantial disadvantages that have been discovered especially in relation to portfolio implementation and its actual use. Some examples tell about problems with regard to storing and updating materials, access to portfolios, high costs of compiling portfolios in terms of time and resources, poor representativeness of the portfolio items, and the impact of portfolio appearance on evaluation (e.g. Gellman 1996; Wheeler 1996; Wolf 1991). In external evaluation situations like meriting and recruiting, the issues of cheating and plagiarism have been raised, and in student evaluation the reliability and validity of portfolio assessment have raised concerns (e.g. Linn 1994; Messick 1994; Moss 1998). Problems of the latter kind encompass, for example, low inter-rater and task reliability in scoring portfolios, questionable generalizability of portfolio results, inadequacy or irrelevance of information for valid assessment, and incomparability of individual student portfolios and their grades (see Pollari 2000; Linnakylä 2001). However, these problems are not likely to occur in such uses or purposes as the display of pedagogical practices, self-evaluation, or professional development, which are of interest in this study.

Also issues of authenticity and collaboration have been discussed in connection with portfolios. Are portfolios authentic mirrors of school, work or life (Pollari 2000)? Does collaboration with other students or negotiation about criteria with teachers diminish the reliability and comparability of a portfolio in external evaluations for grades or entrance (Linnakylä 2001)? There have been doubts that portfolio items, especially for written statements, may reflect what the author, e.g. a teacher, says he or she is doing rather than what he/she actually does (Wheeler 1996). This problem can

be avoided with a dual emphasis placed on actual teaching and learning artifacts as well as on documented reflections on their meaning (Wolf 1991).

3.1.3 The portfolio process

> *There is no best notion of what goes into a portfolio. Rather, portfolios serve as a metaphor for our continued belief in the idea that children can play a major role in the assessment of their own learning. This perspective, rather than predetermined lists of curriculum samples, should be the guideline for planning particular items into a portfolio. ... The real contents of a portfolio are the child's thoughts and his or her reasons for selecting a particular entry. That selection process reflects the interests and metacognitive maturity of the child and the inspiration and influence offered by the teachers.* (Hebert 1998, 584)

The construction of a portfolio should be seen as a process, which gets different forms and contents along with the growth, learning and reorientation of the author of the portfolio and also along with changes in the learning and working environments. Essential phases in the portfolio process comprise the documentation or collection of tasks, experiences and achievements, the selection of items for display according to specified criteria, and reflection on the basis of the collection (see Table 3.2).

An important benefit of a portfolio is that it provides a means to make learning, experiences, competence, and work visible (Hurst et al. 1998). *Documentation* of activities, learning and working can help illustrate the diversity of learning or working processes involved and also the person's development (Kankaanranta & Linnakylä 1999). From the documented evidence or an archive one can then *select* those items that best demonstrate the quality and achievements in learning or work. The artifacts chosen to a collection represent the achievements and growth opportunities in the everyday learning and teaching (Barrett 1999). The samples may include work specimens, plans or ideas produced individually or in collaboration with others.

Growth and learning becomes visible through the contents or the work selected to portfolios, but even more so in the self-assessments and reflections included in the choice of work (Hansen 1992; Hebert 1998). Once made visible, they become easier to evaluate and reflect on even by the authors themselves. Thus, the selection process is closely connected to *reflective self-assessment*, which helps determine the value and significance of learning or working experiences (Burke 1997; Linnakylä 1994). Self-evaluations are based on the author's own criteria and emphases, though they always reveal something about the values of the learning or expert community, as well (Linnakylä 2001).

Table 3.2 *The portfolio process (e.g. Barrett 1999; Danielson & Abrutyn 1997; Linnakylä 2001; Stowell & Tierney 1995)*

Phase	*Activities*
Documentation or collection	This is the primary activity in the compiling of a working portfolio. The portfolio's purpose, audience and future use of artifacts will determine what is collected.
Selection	The author of the portfolio examines what has been collected to decide what should be moved to a more permanent assessment or display of portfolios. The selection criteria should reflect the learning objectives that the portfolio is demonstrating.
Reflective self-assessment	Portfolio developers articulate their thinking about each piece in their portfolio. Through this process of reflection, it is possible to become increasingly aware of oneself as a learner. Each person brings in his/her own quality criteria showing what he or she values.
Projection and progress	The reflections on learning are reviewed in order to look ahead and set goals for the future. Portfolio developers should see patterns in their work and use these observations to help identify goals for future learning. It is at this stage that the portfolio becomes a powerful tool for continuous development and progress.
Presentation and evaluation	The portfolio is presented to the appropriate audience and discussed in a meaningful conversation about teaching and/or learning. For example, children or teachers share their portfolios with their peers and colleagues. Criteria for evaluation are re-negotiated in discussions between the author and evaluators of the portfolio.

The development of metacognitive self-assessment skills will strengthen the person's awareness of learning and commitment to continuous critical assessment of learning (Hebert 1992; Ringler 1992). Self-assessment and reflection has also a crucial role in the enhancement of self-knowledge and the development of self-regulated learning in which the learner is in charge of the goals and strategies of his/her own learning

(Paulson et al. 1992; Yannarella 1997; Tillema 1998). Through the portfolio process, children or teachers can become reflective practitioners, who evaluate their own growth over time and the achievement of the goals (Barrett 1999).

Two further phases can be distinguished in the portfolio process, namely projection and presentation (Barrett 1999). In the *projection and progress phase* the author of the portfolio reviews the reflections on learning in order to set development challenges and goals for the future. The emphasis is on the continuous follow-up of development, growth and progress over time. Reflective thinking extends and refines experiences into understanding, which at its best generates new insights and visions as well as progress of development.

In the *presentation and evaluation* phase the author shares the evidence collected for a specific audience. Usually a portfolio is already created with a specific audience in mind and thus, the audience is a very important actor in the whole portfolio process (Wyatt & Looper 1999). The opportunity to share information and experiences with others, the received feedback and the common discussions enriches the whole portfolio experience (Fogerty 1996; Martin-Kniep 1999). It can encourage and enhance collaboration with other learners or colleagues but also commitment to continuous learning and school development (Grant & Huebner 1998; Martin 1999). In the portfolio evaluation learner's own values and criteria are renegotiated and agreed on (Stowell & Tierney 1995; Linnakylä 2001). The definition of an audience for a portfolio is closely related to the definition of the purposes for a portfolio. The possible audiences are varied and usually a single portfolio has multiple audiences.

Portfolios are commonly classified according to the *development process*. A portfolio may be just a basic collection of work samples or a process-oriented selection of learning or work experiences based on interaction and reflection with significant collaborators. A portfolio can also be a functional showcase for specific school project, job qualification or career development. Portfolios can be made for personal use in order to document and reflect on one's own development and learning. Then again, a portfolio can be made for the purpose of sharing one's experiences and expertise, establishing a connection for interaction and expanding the area of shared expertise. Alternatively, a portfolio can be made mainly for others, in order to show one's competencies for teachers or prospective employers, for instance, or to inform various interest groups related to studying or work.

Usually, the two-sided feature of a portfolio as *a combination of a process and a product* is valued as an advantage for the assessment method (Berlach 1997). However, there have also been contradictory beliefs about which one of these two is most important. In the literature the developmental, reflective and dialogic process of compiling a portfolio is firmly emphasized (e.g. Graves & Sunstein 1992; Paulson & Paulson 1992; Hartnell-Young & Morriss 1999). Still, the actual use brings commonly

forth the product side of portfolios with a direction towards evaluation of performance or competence and selection purposes (Graves & Sunstein 1992; Tillema 1998). At the same time the opportunities for feedback and change provided by the rich contextual information is overlooked. For example, teaching portfolios have an essential role in the evaluation of teachers' pedagogical competence, but they also significantly contribute to the reshaping of teaching profession. According to Wolf (1991, 136) portfolios "can give teachers a purpose and framework for preserving and sharing their work, provide occasions for mentoring and collegial interactions, and stimulate teachers to reflect on their own work and on the act of teaching".

A significant feature of portfolio assessment is its *dynamic nature*, because the richest portraits of learning and teaching are based upon multiple sources of evidence collected over time in authentic settings (Wolf 1991). The aspect of dynamics shows also as a need for continuous updating, critical review and development. Hansen (1992) has finely underlined the longitudinal nature of portfolios by describing that it is most important to point out from where the portfolio author is coming and to which direction he is going. At its best a portfolio has the ability to link together the past, the present and the future (Tomkinson 1997). Then, it will provide a history of learning, a story of its creator, helping build one's life story further (Graves & Sunstein 1992; Paulson & Paulson 1991; Hebert 1998). Furthermore, learning portfolios make us realize that learning is taking place in different life situations and in diverse environments.

Burgess and Holmes (2000) have explored the phases through which teachers, being novices with portfolio assessment, progress in the implementation of portfolios. These phases (Table 3.3), ranging from initial anxiety to eventual reflective evaluation, also indicate the range of reactions to this assessment method of a new kind. However, it has been found out that there is always personal variety as regards how students or teachers get motivated in portfolio work and how they experience it. Pollari (2000) profiled portfolio students in several groups on the basis of their learner empowerment and affective and volitional experiences. Some were "gainers", who were ready to take the responsibility and an active role in portfolio development. They were almost instantly enthusiastic and engaged in portfolio activities. The "opponents" and the "anxious" were more reluctant toward the portfolio approach. According to the opponents it required too much effort and work from students. The anxious ones were unsure of their own capabilities in self-directed work. There were, of course, also those who liked the portfolio approach in general, but whose portfolio performance was consistent with their normal performance.

Table 3.3 *The phases in portfolio development (Burgess & Holmes 2000)*

Phase	*Description*
Anxiety	Anxiety about the unknowns. Anxious about process, product and outcomes.
Uncertainty	Uncertainty about what to document, how to document, when to document.
Connections	Thoughtful reflection and analysis about the work they do.
Awareness	Heightened awareness of how much has been accomplished as assembled artifacts are reviewed.
Presentation	Professional pride as portfolio takes shape and becomes a finished product. A sense of accomplishment.
Evaluation / reflections	Enabler. Has developed sufficient confidence to assist others through the portfolio process.

3.2 Different types of portfolios

One of the intriguing features of portfolios is that through them it is possible to reach out and combine many different perspectives of learning environments. The same basic principles of portfolio assessment are compatible in the application of portfolios for learners of different ages. It is also a promising possibility to use same kind of approaches both with children and adults in making visible and assessing their growth and learning (Bruner 1996; Kankaanranta 1998a, b; Strandell 1995; Waksler 1986). Of course, there are also differences in the actual application of portfolios as regards the perspective from which learning and the learning environment is examined. Further differences are related to issues such as who has the main responsibility for the portfolio construction and to what extent it is an individual or a collaborative process.

In the following I will explore the features of three different types of portfolios, namely learner, teaching and school portfolios. In a learner portfolio the focus is on individual learning experiences, while a teaching portfolio makes visible the instructional process through which a teacher shares her expertise with students. A school portfolio, in turn, is collaborative in nature and it provides evidence of learning and teaching in a whole school community. Together the evidence selected in these di-

verse portfolios will draw a versatile picture of daily life and learning in an early childhood environment. In a way this will create meeting places for many perspectives and experiences, because no single perspective gains preference over others (Bruner 1996; Kankaanranta 1998a). It is important that different types of portfolios include at some stage also collaborative elements or diverse perspectives of a learning environment. The extent and quality of collaboration do vary. In the development of learner and teaching portfolios this will be realized at least in the presentation stage as feedback from various interested parties.

3.2.1 Learner portfolios

In schools learner portfolios are most typically compiled in specific subject areas (e.g. mother tongue, foreign languages) or they may be used across the curriculum to assess abilities in diverse subject areas (Lankers 1998). Portfolios have also been applied in cross-curricular themes such as culture (e.g. Pollari 1994, 1996, 2000) or projects around nature (e.g. Ikäheimo 1994). In early childhood education the learner portfolio can be defined as a purposeful documentation and selection of a child's work and meaningful experiences. It offers opportunities to exhibit child's growth and learning over time. The selection includes the child's own description of the learning context, his or her personal goals and criteria. Preferably, the portfolio also contains the child's own reflection and assessment of the selected work and the process of learning and development (see Paulson et al. 1992, 60; Linnakylä 1994, 10; Kankaanranta 1998a).

From the children's perspective, it is most promising that they can participate in the construction of their own portfolios, while a teacher guides and helps them in their learning and choices. At its best, the contents of a portfolio reflect the child's most meaningful events and experiences in diverse learning environments (Kankaanranta 1998a). This is in accordance with the basic tenet of authentic assessment in that the work chosen to a portfolio should have significance for the learner (de Fina 1992, 13). The use of portfolios gives children also a possibility to participate in the assessment of their own work. However, Sulzby (1990) emphasizes that portfolios are functional only if the teacher is competent enough to scaffold young children in documenting, selecting and assessing their activities and work, but also in interpreting child's growth and learning. The content construction of a portfolio is, thus, an evolving process shared by a child and a teacher engaged in interaction (Berlach 1997).

The dialogic nature of portfolio-related activities can promote interaction between teachers, children and parents (Ritchie 1991, 19). A shared understanding between the different parties about the purposes and uses of portfolios and about features of good work will lead to a more useful, productive and successful assessment process

(Barrett 1996, 1998). According to Ritchie (1991) it is not enough that parents get information about the progress of their child. The real parental participation includes versatile and at the same time reasonable participation in the activities and assessment. Also Ackers (1994) emphasizes the meaning of portfolio assessment as a means through which both children and parents become involved in assessment. At their best, portfolios entail changes in terms of learner empowerment, i.e. facilitating a process in which the learners adopt an active and responsible role in their studies and learning (Linnakylä 2001; Pollari 2000).

The purpose of a learner portfolio is to show both individual and collaborative learning. It gives different parties an opportunity to extensively follow and assess children's growth and learning in their natural circumstances and through authentic learning tasks (Tierney et al. 1991; Hansen 1994; Linnakylä 1994; Micklo 1997). Especially valuable is the possibility to track the learning progress over a longer period of time and across diverse areas of growth and learning (Yannarella 1997). The growth and learning of children can be perceived and followed by considering the work, efforts and progress of a child. It is essential that a child's achievements are examined positively, emphasizing things that a child already can do rather than what he/she has not yet learned. Ideally, the portfolio follows the child from one learning environment to another, creating thus continuity across the different transitions of childhood, for example from kindergarten to school (Ackers 1994; Bridgeman et al. 1995; Kankaanranta 1998a).

Learner portfolios also open possibilities to assess the realization of curriculum and offer instruments for the continuous collaborative improvement of the quality of instruction (Bergman 1999; Kankaanranta 1998a). From the child's perspective, the primary aim is not, however, to verify the kindergarten or school curricula, but first and foremost to show what children are learning and what they appreciate, or what the children's own curricula is like (de Fina 1992).

3.2.2 Teaching portfolios

> *At the heart of the portfolio as we envision it are samples of teaching performance; not just what teachers say about their practice but artifacts and examples of what they actually do.* (Edgerton et al. 1995)

As Edgerton (et al. 1995) states, the second type of educational portfolios focuses on teaching performance. The use of portfolios has increased in the teaching profession, where the degrees and diplomas, as such, seldom tell anything about the scope of a person's practical expertise. Generally an expert portfolio is assumed to show the person's knowledge and competence in some particular tasks or areas. It is an expert's

collection of evidence consisting in his or her achievements, tasks, skills, knowledge, experiences, and challenges, which in a varied and relevant manner displays the expert's competencies and interests either to him-/herself or to others.

In the field of education a good expert portfolio, or more specifically, a good professional teaching portfolio represents a set of work that shows the range, quality and depth of teaching and learning (Tierney et al 1991). The most common purposes of teaching portfolios are teacher's self-development, sharing of work experience with interested parties, and utilization in a meriting situation. A teacher's basic portfolio can be defined as a container for documenting, storing and displaying evidence of the teacher's philosophy, values, experiences, knowledge and skills in instruction (e.g. Doolittle 1994, Wolf 1991; Hurst et al. 1998). However, a collection of work samples is not enough when a teacher wants to proceed from mere documentation to a reflective demonstration of his or her teaching. Thus, for such purposes the portfolio should be designed as a reflective and discussion-oriented document rather than a list of achievements (Hurst et al. 1998). In teacher education the value of self-reflection through portfolios has been recognized as a means of encouraging students to examine their beliefs about their own teaching practice, and to reflect on and synthesize the practical and theoretical dimensions of teaching (Briscoe 1993; Ketter & Pool 1997).

The real power of teaching portfolios lies in their contribution to the development of the person's didactic and pedagogical expertise. A portfolio highlights, more widely and diversely than a traditional curriculum vitae would do, how the teaching expertise is formed and what the teacher has to offer to students, colleagues and other people (Tierney et al. 1991; Kimeldorf 1994). A teaching portfolio demonstrates the relationships between the teacher's approach to teaching, his/her instructional activities and practices, experiences, and outcomes. At it's best, it shows clearly how teaching encourages high quality learning among students. The portfolio also highlights the teacher's awareness and presentation skills with regard to these matters. While providing a means for reflection, a portfolio offers an opportunity for evaluating one's work and examining the effectiveness of instruction and interaction with students (Doolittle 1994).

In connection with portfolio activities, teachers are encouraged to share experiences and discuss about their portfolios, already in the construction phase, with other teachers or even experts from other disciplines in order to foster continuous dialogue about pedagogical experiences and developments (Boileau 1996; Doolittle 1994; Glatthorn 1996; Seldin 1997; Tillema 1998). The involvement of different parties, e.g. the colleagues or 'superiors', as assessors committed to the same goals as the portfolio designers themselves is likely to advance subsequent collaborative or collegial counseling and guidance at the school (Tillema 1998; Bergman 1999). In this way it can

encourage the creation of a community of shared authority (Ketter & Pool 1997). A teaching portfolio can also become a legacy of a teacher's thinking and experiences for his/her junior colleagues and for the future generations of teachers (Seldin 1997). It also provides a significant means for sharing teaching practices and pedagogical ideas, presenting student work and enhancing interaction with students and parents (Linnakylä 1999).

A more mundane function of expert portfolios is to show one's merits and to market oneself, giving the person certain advantage in the competition (Tierney et al. 1991; Hurst et al. 1998). Also professional teaching portfolios can be compiled as instruments to be used in various competitive situations, as when applying for a job, for instance, or as an asset in a meriting system (Seldin 1997). In such cases the portfolios may contain professional self-portraits or visual presentations of the teachers applying for a teaching position (Hurst et al. 1998). In recruiting situations portfolios have proven to have fairly strong predictive value of successful performance at the workplace (Tillema 1998), although some doubts have also been presented about their comparability (Terwilliger 1997).

Although expert portfolios, on the one hand, seek to portray the person's individuality and 'philosophy' of life and work, on the other hand they do bind the experts to the requirements of their profession. Then again, if a portfolio contains nothing new and creative that would challenge the conventional expectations for expertise, it is not very likely to raise other people's interest (Kankaanranta & Linnakylä 1999). In any case, portfolios seem to support the development of job applicants' reflective self-assessment and self-regulation by helping them match their personal competencies with the requirements of the tasks as well as clarify their plans for further studies or in-service training (Tillema 1998).

3.2.3 Collaborative school portfolios

Collaboration is generally emphasized as an important issue in portfolio assessment. Mainly it is related to peer or collegial mentoring and feedback in the portfolio construction process or presentation situations (Burke 1997; Campbell et al. 2001; Freidus 1998), and also to the possibilities of collaborative negotiation in the assessment (Stowell & Tierney 1995). However, the use of collaborative, collective or institutional portfolios is still a fairly new idea in the display and assessment of learning environments.

To list some literary examples of collaboratively developed portfolios, I could mention a school portfolio describing the development of a school community (Boston pilot schools network 1997; Niguidula 1997), a family portfolio enhancing home-

school connections (Hoffman 1995), and an institutional portfolio documenting the effectiveness of teacher training programs in preparing competent teachers to meet the current and evolving standards of best practice in teacher preparation (Dollase 1998). Martin (1999) extends the idea of family portfolios to the creation of a grade-level or school-wide collaborative portfolios of different 'school families'. A specific course-portfolio has been used as a methodology for self-study about the nature and quality of instruction (e.g. goals, methods and outcomes) of a particular course (Cerbin 1993; Gipe 1998). However, a course-portfolio is usually one teacher's documentation and reflection of teaching practices, whereas a school portfolio is a more collaborative effort.

Whereas a learner portfolio at its best draws a picture of growth and learning experienced by a child, a school portfolio documents and indicates the development and pedagogical practices of the whole school community. In the Boston pilot school network, school portfolios are used as a method for school's self study, which is a process of exploring, documenting and reflecting on a school's vision and goals, practices, results and development (see Boston pilot schools network 1997). The school portfolios are intended to serve as living documents, which would change and grow during the process of self-study. In all, the portfolios are seen as unique representations of the school communities.

A school portfolio contains authentic evidence from the daily life of the school, documenting the course of the school year (Burke et al. 1994). It reflects the school's progress and achievements over time and gives a rich basis for collaborative discussions and reflections contributing to the continuous development of the whole school community. Ideally, the process of constructing a school portfolio involves the entire school community, i.e. teachers, administrators, students, parents and other interested parties (Boston pilot schools network 1997). Due to the open nature of school portfolios, the issues of confidentiality and security are of major concern in the construction and use of school portfolios. Thus, special efforts should be made to protect the rights to confidentiality of the individuals, students and teachers in a school community.

3.3 Shift from a paper to a digital portfolio

The growing interest in the digitally formatted portfolios can be attributed to the realized shortcomings of more traditional paper portfolios. Some of the shortcomings have to do with difficulties in distributing the information; the paper-based form allows only restricted access and circulation, and does not give much opportunity for wider communication (e.g. Niguidula 1993; Lankers 1998; Linnakylä & Kankaanran-

ta 1999). It is also difficult to show the multiple forms of efforts, progress and achievements. Still another concern is associated with the dynamic nature of portfolio i.e. how to store and manage the materials accumulating to the portfolios in the long run, during decades of study and work (e.g. Niguidula 1993; Smith & Tillema 1998). The need for ongoing revision and updating of a portfolio also demonstrates this dynamic nature (Cerbin 1993).

Modern information and communication technologies, however, offer solutions for these problems (e.g. Barrett 1998; Lankers 1998; Linnakylä & Kankaanranta 1999). By means of multimedia one's competencies and achievements can be illustrated more diversely than before (Niguidula 1993), and the hypertext features of digital portfolios make it possible to add in new sections, levels or paths. And of course, they are as easy to rearrange or reduce.

Words like computer-based, electronic, digital and multimedia are used interchangeably when referring to digitally formatted portfolios, which involve the use of electronic technologies. Barrett (2000) distinguishes between electronic and digital portfolios on the basis of the form of artifacts. In an electronic portfolio there is a combination of material both in analog (e.g. videotapes) and in computer-readable form, but in a digital portfolio all artifacts are in computer-readable form. Thus, in the case of web portfolios the notion of a digital portfolio is justified. The basic multimedia elements included in digital portfolios are text, images, sound, video, and hypertext links for the organization of the material.

A digital portfolio contains partly similar pieces of information as the more traditional ones, but the data has been compiled and is stored, maintained and shared electronically by means of information technology (see Wiedmer 1998). The digital format also allows for presenting new kinds of contents. Multimedia technologies make it possible to display one's competencies by means of any combination of texts, images, sounds, and video clips. A digital portfolio may contain anything that can be stored in digital form, e.g. by means of word processors, scanners, video recorders or microphones. The digital form enables easy and fast data transfers and access, facilitating thus more diverse and broad-based sharing of learning experiences and expertise. By technological means, children's or teacher's competencies or the pedagogical practices of a kindergarten can be made visible in a form that is easy to access, even repeatedly if necessary.

For the users of information networks the opportunities of digital portfolios are usually easy to see. In terms of portraying and assessing learning and teaching in early childhood contexts, previous studies have attributed digital portfolios at least with the following advantages (e.g. Ash 2000; Niguidula 1997; Barrett 1998, 1999; Wiedmer 1998; Kankaanranta & Linnakylä 1999):

- More diverse documentation and richer display of children's and teacher's competencies and experiences by the means of multimedia.
- Integrating elements of diverse activities and practices to create a comprehensive, authentic and multi-perspective picture of early childhood environments, their activities and pedagogical practices by engaging users in a rich environment of multimedia (text, graphics, animation, and sounds). Different perspectives can be shared and combined by the means of information technology.
- Ease of accessing, storing, managing and processing the documents displaying both the processes and products of growth and learning.
- Seeing and displaying the longitudinal dimension i.e. the development, progress and change over time. Portfolios created at different points of time can be linked to each other and continuously updated.
- Illustrating relationships and weightings between different components of the expertise in early childhood education by means of various linking systems or multimedia techniques.
- Possibility to combine and show competencies in pedagogy, specific areas of interest and information technology.
- Highlighting various collaborative schemes and partners by hyper-textual features.
- Diverse possibilities for interactivity, communication and collaboration through computer networks both within and outside the early education community.
- Improvement of the quality and timeliness of the feedback process.

Digital portfolios link authentic assessment and the use of technology. The portfolios distributed on the Internet provide a technology-enriched medium for displaying and integrating what happens in the daily life of early childhood institutions. Thus, they increase possibilities for opening up the life and work in the early childhood institutions to several directions locally, nationally and also globally (e.g. Niguidula 1997; Linnakylä & Kankaanranta 1999; Bergman 1999). From teachers' perspective, digital portfolios enable them to make visible a whole range of views and areas of expertise in early childhood education, its development and organization, teacher's education and philosophical thinking, usual learning and work tasks, collaboration and future envisioning.

The accessibility of digital portfolios through computer networks provides also an opportunity for feedback, interaction and mutual communication, debate and problem solving among the experts in the field. Active and sustained communication, in turn, strengthens collaboration and reveals different kinds of early childhood cultures and environments for continuos development. At its best, this interaction is extended

to broader contexts outside the early childhood community, to involve different interest groups such as parents, administrators, novices in the field, as well as teachers and students at other educational levels. In sum, digital portfolios can benefit many different parties and in many respects. A digital portfolio also tells about the author's skills and practices with regard to information technology. Furthermore, it also gives a chance to show aesthetic and creative capabilities, which have traditionally been greatly valued in early childhood settings, especially for visualizing and presenting knowledge as well as for reflecting and self-evaluating the development of expertise and pedagogical practices in early childhood education.

3.4 Design issues in the development of a digital portfolio

> *We can imagine many possibilities for the use of digital portfolios, but as often happens with technology, imagination runs far ahead of reality. Our primary goal, however, is not technological; rather it is to devise a tool that can help schools develop a richer picture of what students are capable of doing.* (Niguidula 1993, 8)

The integration of authentic portfolio assessment and technology determines the digital portfolio development process. This two-fold nature of digital portfolios entails that design issues are complicated and that the aspects of both portfolio assessment and use of technology need to be taken into account. For teachers and children, as well, digital portfolios can be a means for reflecting development in teaching and learning, but also for learning about technology (Hartnell-Young & Morriss 1999). However, the technology should chiefly be seen as a support and reinforcement for the information the author wants to share. The main aim is not to receive a technological version of a set of file folders but to use digital portfolios as a tool for school development (Niguidula 1993, 1997).

3.4.1 Human and technological resources

It has been argued that the most critical component in the adoption and adaptation of a new technological tool like a digital portfolio is the *culture of the educational setting* (Niguidula 1993, 1997). Computer-based technology and portfolios, as such, do not transform education, but schools must renew themselves to best utilize the possibilities provided by so-called portfolio technologies (Cole et al. 1995). There have even been discussions about the need to create a particular portfolio culture for schools applying portfolio assessment (e.g. McLaughling & Vogt 1996). The key elements of a

school's culture in enhancing the use of digital portfolios have been found to reside in the relationships within the school, in regular discussions about student work, and in the openness to discuss the school's work and related visions with others also outside the school (Niguidula 1997). Especially school's willingness or reluctance to change determines how the digital development process proceeds and how the possibilities or constraints of digital portfolios are considered.

However, it must be remembered that creation of a portfolio culture demands new competencies and visions on pedagogical expertise. It is essential to accept self-assessment and collaboration as a part of student, teacher and school-based assessment (e.g. Wolf 1998). In accordance with the principles of authentic assessment, self-evaluation and assessment practices should be rooted in the life of the classroom and the world of the student (McLaughling & Vogt 1996; Tierney et al. 1991). It must be admitted, as well, that the adaptation of digital portfolios into the use of educational institutions will not take place overnight (Bergman 1999).

In addition to the school culture the digital portfolio driven development process is also closely connected with the *human and technological resources* of portfolio developers (Barrett 1998, 1999, 2000). This means that the development of digital portfolios should be preceded by a careful examination of strategic questions about the functions and uses of assessment in general and portfolios in particular, but also about the human and technological resources available in a kindergarten or a school. Resource questions concern especially teachers' or children's access, equality, competence and motivation when it comes to the use of information and communication technologies (Ash 2000; Barrett 2000; Nardi & O'Day 1999; Viherä 1999; Yannarella 1997). Together the general components of access, competence and motivation compose a person's communication capabilities as is hypothesized in the following citation from Viherä (1999, 337).

> *The capabilities can exist only when all three conditions are satisfied. However, communication capabilities are easily confused with skill and ability. A skill requires the ability to do things, and is only attained by experience. The concept 'capability' also includes willingness. Possession of the necessary capabilities means that you have the equipment, the competence and the motivation to use them. The concept 'communication capabilities' describes a dimension, which indicates how well and to what extent the necessary access, motivation and competence have been realized.*

According to Barrett (1999, 2000), effective digital portfolio development combines the processes and elements of portfolio and multimedia development. Based on an analysis of the central features of these processes she has derived five stages of effective digital portfolio development in which both elements (multimedia, portfolio) and their interaction are essential (Table 3.4).

Table 3.4 *Five stages of digital portfolio development (Barrett 1999, 2000)*

Stage	*Content*
1. Defining the portfolio context and goals	Identifying - the assessment context - the purpose of the portfolio - the learner outcome goals - the resources available for electronic portfolio development - the audience for the portfolio
2. The working portfolio	Identifying the content of portfolio items Selecting appropriate software for portfolio design Identifying storage and presentation medium Gathering multimedia materials Interjecting personality into the portfolio design
3. The reflective portfolio	Recording reflective statements on work and achievement of goals Recording feedback on work and achievement of goals Setting learning goals for the future Using appropriate software in the previous tasks like. word processor, html-editor or multimedia authoring program
4. The "linked" portfolio	Organizing the digital artifacts Identifying patterns through the "linking" process Final review of the portfolio and goals Sharing with an appropriate audience Using the portfolio evidence to make instructional or professional development decisions
5. The presentation portfolio	Recording the portfolio to an appropriate presentation and storage medium Presenting before an audience (real or virtual), and celebrating the accomplishments Evaluating effectiveness in light of its purpose and the assessment context

Prospective portfolio authors may encounter true or alleged problems with access to computers, networks or suitable software, and perhaps even more so, with inadequacies in their own *technological competencies* (Barrett 2000; Kankaanranta & Linnakylä 1999). However, along the increased understanding and competence in the use of ICT, teachers will be readier to utilize technologies also with children as a vehicle for learning and to guide children in the use of technologies (Ash 2000; Barrett 1999; Hartnell-Young & Morriss 1999). In the same way teacher's who have compiled digital portfolios of their own are more likely and also more confident in applying the use of portfolios with children (Barrett 1999). Thus, serious attention needs to be given to staff development that demonstrates successful strategies for using digital portfolios as an assessment method. Plans for staff development should also concern the teacher support needed in the digital portfolio development and more generally in the use of ICT (Shaklee et al. 1997).

3.4.2 The choice of a medium for digital portfolios

There are specific software products for making digital portfolios, but a portfolio can also be compiled using some general-purpose multimedia software. When planning for drafting a digital portfolio, one needs to relate user skills and time resources to the features offered by available software applications (Lankers 1998; Barrett 1999, 2000). The idea that "*the medium is the message*" refers to the importance of choosing a suitable software for the portfolio construction, because the software is one of the factors that influence, restrict or enhance the portfolio development and also the quality of the final digital portfolio (Barrett 1999). The specific portfolio design tools have been made as user-friendly and easy-to-use as possible. As a trade-off, however, this has been achieved by restricting the user's possibilities to decide on the structure of the portfolio. Therefore, various general-purpose multimedia tools can prove more flexible and useful in tailoring individually suited and innovatively designed portfolios. Portfolios are often published on discs, CD-ROMs, videotapes, or as paper copies, as well.

An increasingly popular option is to publish the digital portfolio on the Internet, as a web portfolio. When creating these web portfolios the tools and programs are typically the same as when making WWW pages (different Web page editors like Adobe PageMill, Microsoft Front Page, Netscape Composer). The advantages of HTML-based portfolios include web accessibility, cross platform nature and the possibility to integrate multimedia elements. However, there are also major disadvantages related e.g. to the high learning curve in web development skills, to the complex structure of the web, and to certain security issues. (See Barrett 2000.)

A digital web portfolio may be structured so, for instance, that the opening page introduces the author and outlines the contents of the rest of the portfolio. The contents may be organized, e.g. in the case of a teaching portfolio, according to the various areas of competence or by the nature of the expert knowledge concerned in teaching. The opening page may have links leading to various sections along different paths and levels, highlighting the respective issues of work achievements, teaching experiences and authentic work situations with related reflection. The purpose of teacher's basic digital portfolio is, above all, to document the construction of teaching expertise and to display its diversity. From such basic portfolio the author can then select samples for a web portfolio to serve the purposes of communication and interaction which, in turn, contribute to sharing and continuous development of teaching expertise as well as its evaluation. A web portfolio should be compiled according to its specific purpose and expected audience. However, the web portfolio is accessible to a variety of users searching for information to suit their own contexts and interests. It allows for display and sharing of learning experiences, teacher expertise or school's pedagogical practices for wide audiences. This is why the use of web portfolios requires careful consideration of ethical and privacy issues.

CHAPTER 4

Methodological framework of the study

4.1 Action research on digital portfolio development

Schools have become centers not only for learning but also for doing research to develop both learning and teaching. A promising possibility for this kind of educational development work is *action research* realized in close collaboration with teachers and students in different educational cultures (see Walker & Bresler 1993). It has a dual function of generating and displaying information about educational practices and at the same time helping people improve these practices. The most central features of an action research study are involvement of participants, practice orientation, reflection, and change intervention (Carr & Kemmis 1986; Aaltola & Syrjälä 1999). It is central that participants have ownership of their work and are actively involved in the research process. Thus, the results of a collaborative action research always depend on how the research subjects or participants succeed in assessing and reflecting their work critically. The collection of information is a basis on which the participants can build the continuous development work and the assessment and reflection on their practices. (See e.g. Carr & Kemmis 1986; Kemmis 1997; Heikkinen & Jyrkämä 1999.)

Action research provided a methodological approach also for this study on the development of collaborative digital portfolios. The overall aim was to develop digital portfolios as an ecological method for kindergarten and school-based assessment. Special focus was on developing digital portfolios as *a means for making visible and sharing the pedagogical practices and meaningful experiences* in childhood environments. The development work proceeded in close collaboration with the teachers who participat-

ed in the study. It was assumed that this kind of assessment method is valuable both for teaching and research purposes.

In the field of action research there are various approaches differing in their philosophical-epistemological basis, i.e. in terms of their research phenomena, problems and methodology. They also differ according to the diverse historical traditions or the variety of contexts with regard to applying the principles of action research (see e.g. Hollingsworth 1997; Peltonen & Halonen 1998; Rodd 1998; Kemmis & McTaggart 2000). The current study focuses on childhood education and more exactly on the development of a method for technology-supported collaborative self-assessment as a research phenomenon. The use of the assessment method directs the focus also on certain pedagogical practices in early childhood environments. The methodological orientation of the study is primarily based on the ecological approach to childhood education and on the principles of participatory action research.

The ecological approach structures the theoretical view of human nature of the research participants and of the interaction of participants and the various environments involved in the study. In accordance with a phenomenological view, emphasis is laid on how the research participants perceive and experience environmental properties and what kind of meanings the individuals or groups give to various events and circumstances (e.g. Bronfenbrenner 1979, 1992; Sontag 1996; Puroila & Karila 2001; see also Chapter 3). The characteristics of the surrounding reality is determined through the nature of multilevel environments. The framework also provides methodological directions for the development of digital portfolio as an ecologically valid and authentic assessment method. It also constitutes a theoretical and conceptual basis for the analysis of the content of such portfolios.

I have chosen to examine the nature of this action research project from the perspective of the participatory action research (Kemmis & McTaggart 2000), because its ideas have congruity to the ecological framework and the principles of portfolios as a research and assessment method. In this study the practice as a phenomenon is defined according to Kemmis and McTaggart's (2000, 576) taxonomy's reflexive-dialectical view as *"socially and historically constituted, and as reconstituted by human agency and social action"*. This view attempts to understand and make explicit relationships between the two dimensions of individual-social and objective-subjective. Some of the characteristic features of the participatory, collaborative action research approach in the context of this study are:

- The local setting, such as a kindergarten or school class, is seen as connected to wider social and historical conditions.
- The criterion of authenticity involves that things are seen intersubjectively, from one's own point of view and from the point of view of others. This also

means that participants understand that they themselves with others have a crucial role when it comes to making changes.
- Social settings are constituted through social practices, and also 'making changes' is itself a practice.
- Research methods are reflexive and engage participants in a collaborative process of social transformation. The dynamic process of reflection and self-reflection gives human action its dynamic, fluid and reflexive character.

In addition to the differences in research techniques, the research perspectives vary also in their views on the role or location of the researcher and other research participants accordingly. The differences in the researcher location are conceptualized according to Habermas' (1972; see also Linnakylä 2000) theory of knowledge-constitutive interests as technical, practical and critical orientation (Carr & Kemmis 1986; Kemmis & McTaggart 2000). The different cycles of this study have included features of each orientation, but there has been a clear shift towards emancipating and empowering orientations, which together construct the critical orientation. The changes that occurred and emerged during action research cycles in the methodological orientation are further discussed in Chapter 9.

The clear emphasis on methodological development relates the study to the ideas of *development research*. According to Walker and Bresler (1993) development research refers to inquiry conducted for the development of products, programs or developers' capabilities. However, benefits of this kind of inquiry can extend to more general curriculum development and assessment as well as to theoretical advancement.

The study also has certain similarities with *educational design experiments*, which model on experiments in design sciences like aeronautics and artificial intelligence (Brown 1992). First, the study shares with educational design experiments the dual effort of simultaneously designing or developing learning environments and of conducting studies on them. Second, in the educational design experiments learning environments are seen as a systemic whole, which is in accordance with the ecological orientation taken in this study. Systemic thinking involves that the aspects of classroom life are part of a systemic whole, and changes in the system concerning e.g. the role of students and teachers or the place of technology are seen as inputs into the working whole. The third similarity resides in the effort to find and develop appropriate assessment methods. According to Brown (1992), in the design experiments the concern with the outputs from the system has led to look for assessment methods, which address the aspects like problem solving or reflective thinking that a learning environment was set up to foster. And finally, design experiments, similarly to the current study, are targeted on the daily practices of educational settings. This kind of

intervention research aims at dissemination of practical information, seeking to develop procedures or methods transferable to other groups and classrooms. However, Brown (1992) emphasizes that the central goal of an educational design experiment is also the contribution to a theory of learning.

The study is part of two wider research projects. First, it continues a series of action research studies on developing portfolio assessment for the use of early childhood education (e.g. Kankaanranta 1998a, b, 1999). Second, the current study belongs to a larger research scheme known as the CATO project, which explores the utilization of information networks in technologically enhanced and virtual learning environments (Linnakylä et al. 2000). In this chapter, I will present the methodological framework of the study. I will begin by describing the choice of a portfolio as a research method. Then I will present the central focuses and findings of the preceding action research projects and their effects on the current study. This will be followed by the presentation of the participants and the action research cycles in the study.

4.2 The choice of a portfolio as a research method

In the study, the aim was to develop digital portfolios as an ecological assessment method for the following two purposes: first, as a research method for studies seeking for a participant perspective on learning environments and second, as a method for collaborative self-assessment in early childhood environments. This study concentrated on the development work, but digital portfolios were also utilized as data for analysis.

In general, the use of portfolios is an example of authentic, learner-based and contextual assessment methods (Linnakylä 1994; Paulson et al. 1992). Thus, it can be assumed that a portfolio is a suitable method for diverse research topics seeking for a *participant perspective* in the area of early childhood education. The participant perspective is implicit also in the general definition of portfolios as a person's folder of valuable papers, which the learner values and which illustrate growth, development and learning from various perspectives through a selection of learning tasks, events and meaningful experiences (see e.g. Valencia 1990; Tierney et al. 1991). From the ecological perspective, it is also essential that portfolios are defined as means which reflect meaningful events and things in the learning environments experienced by a learner. Through portfolios it is possible to display the *interaction between a research subject and his/her environment,* because they can open kindergarten's or school's learning and teaching cultures, show relationships between children and teachers, and enhance interaction between school and home as well as build connections to the entire community.

It has been discovered that a portfolio can act in various roles in a research project. It can be a tool for development, reflection and self-assessment or even serve all of these at the same time (Kemmis 1995). It can be an independent main method or one of many methods or data sources for an action research study or a design experiment (Brown 1992). A portfolio can also serve as a tool for documenting and assessing the research process in order to open up the qualitative research process also for people outside the actual research project (see Linnakylä 1999). Portfolio can be a research method both for a teacher-as-a-researcher and for researchers coming from outside the early childhood or school community. Through a portfolio a teacher-as-a-researcher gets information about children's growth and learning, but also about the success of his/her own teaching, for a basis of further planning, curriculum decisions or professional development (e.g. Kankaanranta 1998a; Martin-Kniep 1999; McLaughlin & Vogt 1996; Pollari 2000). By means of portfolios a researcher from outside the early childhood or school community can explore teacher's ideas and expertise, but at the same time give the teachers, kindergarten or school a better understanding of their learning and teaching curricula and pedagogical and cultural profiles (Linnakylä 1996, 2001). In this study portfolio acted in the both roles. For teachers' purposes, it was developed as a means for documenting, self-assessing and sharing their work. For research use, it was developed as a means for evaluating the quality of childhood education.

The portfolio approach emphasizes the *holistic data gathering in natural situations and real learning tasks* (Hansen 1994; Linnakylä 1994; Micklo 1997; Tierney et al. 1991). This supports the use of portfolios as a method for qualitative action research and case studies. The portfolio approach favors the inductive process, in which authentic learning situations, experiences and related tasks provide the basis for research. These are examined through a reflective assessment of activities and products, contributing to more comprehensive follow-up and regulation of growth and learning. A portfolio is recommended also as a method for long-term and multi-cycled action research, in which the research subjects participate in the documentation, reflection and assessment of their own work as well as in the identification of new development challenges (Kemmis 1995; McLaughlin & Vogt 1998; Tierney et al. 1991). It is essential that the whole learning community will be engaged in the development of practices.

It is argued that the strength of a research method seeking a participant perspective, i.e. highlighting participants' experiences and thoughts, lies in the extent to which it can tap on *diverse perspectives in the learning environments* (e.g. Waksler 1986; Kankaanranta 1998a; Dahlberg et al. 1999). It is especially promising to use same approaches in displaying and assessing children's and teachers' experiences, growth and learning. The collaborative nature of portfolio assessment presumes that different parties (e.g.

children, kindergarten or school staff, parents) engage in the collection and assessment of portfolios (Hebert 1992; Micklo 1997; Ritchie 1991). The reflection and assessment proceeds as a dialogue or collaborative conversation between different parties e.g. in the event of shared portfolio reviews (Kankaanranta 1998a; McLaughlin & Vogt 1998). In the context of this study, collaborative inquiry means that teachers use portfolios containing a collection of their work in order to explore, reflect and address issues affecting their daily practices (see Martin-Kniep 1999).

4.3 Developing portfolio assessment in the Finnish early childhood education

The current study continues a series of action research projects (Kankaanranta 1998a, b; Kankaanranta 1999), which focused on developing and applying portfolio assessment as an ecological assessment method in the Finnish childhood education. The aim of the development work was to reach and combine different perspectives on learning environments in order to get a wide view of the daily life in childhood institutions. The whole research project "Flexible learning in childhood environments" started as a case study in one kindergarten and school, but proceeded then to a digital network of teachers in various childhood educational settings. The research project consisted of several connected action research studies (Figure 4.1) of which the next three were the most central ones:

1. Portfolio assessment as a child-centered method: Reaching for the child's perspective on childhood learning environments
2. Making visible the collaborative development work in kindergartens and schools by means of school portfolios: Building bridges between educational institutions
3. Digital portfolios as a technology-enriched method for collaborative assessment in childhood education: Enhancing collaboration and communication of teachers in diverse childhood institutions

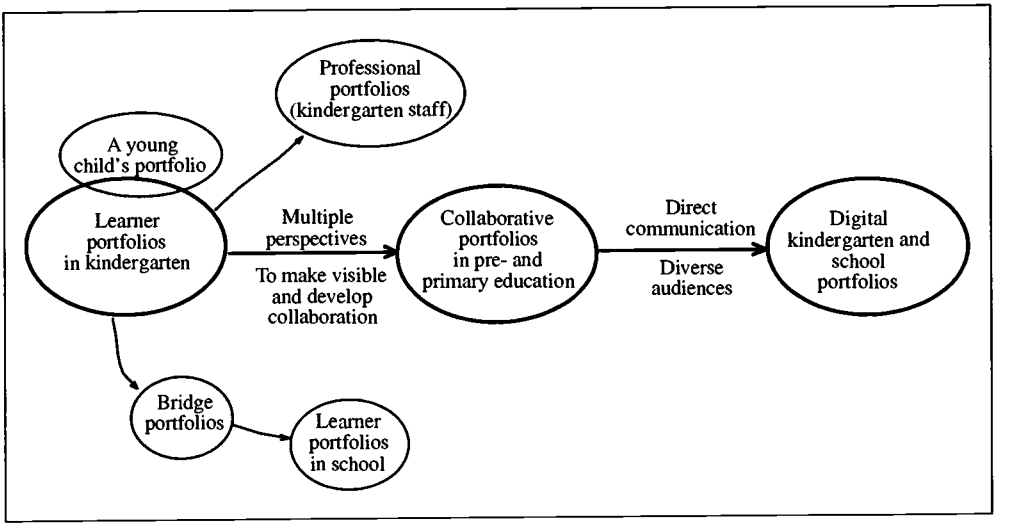


Figure 4.1 *Series of action research studies on the use of portfolios in early childhood education*

In the following I will shortly present the main focuses and the progress of these preceding studies.

4.3.1 Portfolio assessment as a child-centered method

In the first action research study, the use of portfolios was developed as an ecological assessment and research method in close collaboration with one kindergarten and primary school in southern Finland (Kankaanranta 1998a). Portfolio assessment was defined as a child-centered and contextual assessment method, which opens possibilities to combine teaching, learning and assessment (Paulson et al. 1992; Linnakylä 1994; Kankaanranta 1998a). Children's portfolios were called "the albums of growth", because their primary function was to reflect children's growth and learning in different learning environments.

The field phase of the study lasted from the beginning of autumn 1993 to the end of year 1994. In the kindergarten, the portfolios were applied as a method of documentation and assessment for the children of various ages (from 1 year to 6). However, in the study the focus was on the follow-up of one preschool group from kindergarten to the first grade in the primary school. The main goals were to attain children's ideas of their meaningful learning experiences in early childhood learning environ-

ments, to enhance children's self-awareness of their own growth and learning and to support the continuity of learning from preschool to primary school. The emphasis was on the participant perspective or how growth and learning was understood, reflected and made visible in children's portfolios. Children's portfolios were analyzed through a cross-case analysis and personal profiles.

It was found out that portfolios had diverse functions from the perspectives of children, the preschool, homes and children's future school, respectively. Most of all, the albums of growth built bridges between different childhood environments in such a way that children's meaningful experiences and their thoughts of learning were carried across from kindergarten to home and school. In addition to building connections between different learning environments, the albums of growth had a very significant function in the interaction of children and teachers in the kindergarten.

Children participated in varied ways in the portfolio assessment. Their active involvement in the process of documentation, in making choices for portfolio contents, in assessment of their own work and learning, and in the discussions of goals and dreams was found particularly valuable (see Kankaanranta 1998a). Through portfolios, children were able to tell and make visible their experiences and things they had learned so far in their early childhood. It was discovered that children were enthusiastic when their stories, experiences, thoughts and plans were listened to and when they were taken into consideration in the planning and realization of the activities in the kindergarten. The reflection and discussion on children's own work and experiences enhanced their sense of success.

The context of the daily activities and learning was very similar for the children in the study. Children's daily life in the kindergarten included significant shared experiences, which became visible through portfolios. Children were proud of their role as pre-schoolers, which meant for them, most of all, a sense of togetherness within their own kindergarten group. However, children's personal portfolio profiles revealed that from the shared experiences and common activities children also constructed their own and very personal entities. Children's descriptions of their learning histories exposed pictures of freedom of learning and showed their personal learning paths or learning curriculums. During the pre-school year, these personal learning paths were also influenced by the learning objectives (e.g. things to be learned before the school starts) coming from children's different surrounding environments.

The most central outcomes of the study were the opening of children's worlds of experiences and the audibility of children's voices for many audiences in children's growth and learning environments (Kankaanranta 1998a). The communicative and dialogic nature of the portfolio presentations gave extremely promising prospects for the further development of the portfolio assessment and also for the theoretical deepening of the ecological approach. The portfolios of children are, at their best, suitable

vehicles for collaborative reflection and analysis, in which the activities and events become shared and co-built. The most central thing is that the child is present and participates in the situations where his/her strengths and developmental challenges as well as experiences and thoughts on learning are under discussion and consideration.

The teachers in the kindergarten were accustomed to observation and interviews as a means for reaching child's perspective. So far, the main aim of the documentation had been to provide the parents with information about their children's daily life in the kindergarten. Along with the portfolio assessment, the meaning of adult-centered communication became less central, and the child's own role as a narrator and mediator of his/her pre-school experiences from one environment to another was strengthened. Nevertheless, the teachers felt that the portfolio assessment was also an important method regarding their own work. They perceived it as a child-centered means for the assessment of day care activities and for the future planning.

Portfolio assessment also increased parental participation in children's daily life in kindergarten. In the main, parents pointed out that through the portfolio presentations they obtained novel, sometimes even surprising, conceptions of their children's thinking skills. They were stunned about the depth of thinking, which became apparent especially in the children's criteria for choices and in the descriptions and presentations of their work in the portfolios.

When leaving kindergarten, the children took their albums to their homes. During the summer preceding the school beginning, children gathered with their parents a showcase portfolio to be taken to the prospective school. These so-called bridge portfolios were warmly welcomed at school by teachers and new school friends, because they offered a possibility to get to know the newcomers and their prior meaningful experiences and interests. The teachers in the school also appreciated that they could get acquainted with the activities and methods of kindergarten.

The first action research study produced several "sidetracks" during the research process indicating the projectivity of action research (Heikkinen & Jyrkämä 1999; Varto 1992). The basic research task concerned the child's perspective on learning environments and it was discovered that the portfolios or "folders of growth" were valuable as an assessment approach with young children. Along the portfolio development process also directions for further development emerged. Teachers got interested in applying portfolios in the documentation and assessment of their own professional growth. They felt that it was necessary to experience the portfolio process themselves in order to be able to guide children in it. It was especially promising to see a multiperspective scheme applied, using the same methods and approaches in the process of making visible and assessing the growth and learning of all the learners, children and adults alike, in the learning environment.

4.3.2 Making the collaborative development work visible by means of school portfolios

In the second action research project (during 1995–1997) a national network of kindergartens and schools was established in order to make visible and evaluate the collaborative work between successive educational levels (Kankaanranta 1999). The participants consisted of groups of teachers from 24 kindergartens and 20 primary schools. One teacher group came from the same kindergarten that participated in the first action research study. In the study, teachers compiled collaborative portfolios as a means for assessing and sharing information and experiences about the progress of development work in the area of preprimary and primary education. Teachers were guided in portfolio development but the responsibility of collaboration and the sense of ownership in developing their work remained with the teachers.

There were two types of portfolios: a documentation portfolio was a means for documenting the progress of development projects. It was gathered and maintained by teachers and it contained material about collaboration between kindergarten and school. In several kindergartens and schools also children participated in documentation. The most meaningful evidence about work in kindergartens and schools was selected to a so-called showcase portfolio to be displayed for presentation and assessment. In a way the showcase portfolio was a summary about the collaborative activities. The aim was that the portfolios would feature personal stories and analyses of the progress of collaboration and realization of common activities in different local development projects.

Each teacher group chose a specific area or theme of collaboration between preprimary and primary education to be displayed in the portfolio. Collaboration was carried out and developed with structural, educational and functional arrangements. The most usual structural arrangements were as follows:

- Extensive pre-school education in a kindergarten. Links to a school are created, for example, through uniform pedagogy and curriculum.
- Physical integration of a kindergarten and a school to develop uniform practice.
- Preschool classes in a school taught by a kindergarten teacher.
- Preschool education in a school taught jointly by a kindergarten and a classroom teacher (e.g. grade 0 class, non-graded class).
- 6-year-old children are included in non-graded primary levels of a comprehensive school.

The structural arrangements were usually accompanied with educational and functional focuses. Some examples of the focus areas were physical education, environmental education, co-operative learning, enhancement of own choices through workshops, language awareness and continuity in learning of children needing special education. In a portfolio, teachers reflected on the ongoing stages of experimenting, problem solving and feelings of success in the community building process of people who traditionally have been working in their own separate settings. On the portfolio pages it was sometimes also possible to get the feel of shared learning situations and sense of togetherness of children of different ages.

During years 1996–1997 portfolios circulated in the teacher network around Finland to share information and experiences between teachers. Teachers were also asked to give the portfolio authors feedback in terms of the general impression received, the strengths of the portfolio contents and also about areas needing further development. In general, teachers gave each other valuable and sometimes also quite sympathetic feedback for the realization of collaboration. According to the teachers, especially meaningful was feedback in which another teacher gave recognition about the work done (Kankaanranta 1999).

In the feedback on portfolios, teachers reflected both on methodological and content features. In teachers' view, a good portfolio gives an impression that the authors have a serious interest in the development of kindergarten or school practices but also in the documentation and honest assessment of the activities. This kind of portfolio contains carefully collected and logically organized information and materials about kindergarten or school practices. A good portfolio convinces the reader with its personality, interesting evidence and thought-provoking reflections and feelings. Teachers appreciated that pedagogical practices are made clearly visible through experiences and thoughts of teachers and children. In their view, the wealth and depth of reflection, constructive criticism, and presence of feelings raise the quality of a portfolio. Portfolios that were found particularly interesting and useful were those giving fresh ideas for teachers' own work and documentation of activities. Teachers also highlighted the importance of bringing up also the problems encountered in collaborative activities. A sense of togetherness was achieved when teachers realized that often the development areas and problems are similar in different parts of Finland.

When assessing the overall impression of portfolios, teachers brought forth also some problems affecting portfolio's readability. Whereas one portfolio was praised for the amount of material, in another the precise manner of documentation was felt to be even too detailed. In the latter case the authors were advised to concentrate on the essential and to choose the most meaningful material for the showcase portfolio as evidence of the practices and development projects. Some portfolios were found to be accurate, well planned and finely realized, and these same features were desired for

the portfolios which seemed to be confused, superficial, incoherent and difficult to approach.

The collegial assessment of portfolios produced useful information with relevance to the construction of a portfolio. For the further development of portfolios, teachers stressed the meaning of documentation, selection, reflection and the coverage of different perspectives in order to compose an integrated whole. Documentation should show descriptions of everyday life, the realization of goals and plans and the participation of children. Good documentation is diversified, clear and shows originality. Teachers expected information about what is really happening in the daily life of kindergartens and schools and how learning becomes evident in everyday practices. Teachers stated that portfolios constructed in kindergarten and school communities should combine different perspectives as widely as possible. Many portfolios had, indeed, made children's views visible as work samples and as written evidence of their experiences, comments and assessments. According to the teachers, reflection and assessment should be geared towards more personal feelings and thoughts, even to include diary-like reflective texts. The overall summaries and lists of contents in the beginning of a portfolio guide the reader into the framework and help analyze the contents.

4.4 Development of digital portfolios as a technology-enriched method for collaborative assessment in childhood education

In the second action research project, collaborative portfolio development compelled teachers to an ongoing reflection and assessment of the work done in local development projects. However, there was still a lack of direct communication and sharing of portfolio contents between different collaborative groups of teachers in the research network. Instead, usually the researcher acted as the facilitator and organizer of the events for indirect collegial portfolio evaluation. Therefore, in order to enhance and facilitate teachers' mutual communication, the emphasis of the third action research study was placed on direct, technology-enriched collaboration between teachers in diverse early childhood environments. The use of information and communication technologies (ICT) was seen as a possibility for continuous and fast sharing and assessment of information concerning school-level development work. The use of ICT was also presumed to facilitate mutual discussion, feedback and authentic assessment within the whole network of kindergartens and schools. Networking, facilitated by information technology, was expected to help create a community of teachers that encourages and supports ongoing development work and reflection on practices.

In the study, the aim of portfolio development was that digital portfolios would be used as a means for collaborative inquiry on pedagogical practices and meaningful experiences in childhood environments. According to the dual nature of action research, the use of portfolios challenged teachers to participate in the twofold development of the practices in kindergartens or schools on the one hand, and the use of digital portfolios as a method of inquiry on the other hand (see Kemmis & Wilkinson 1998). As a research method, digital kindergarten and school portfolios gave an opportunity to reach a versatile and teacher-selected authentic data about the everyday life and activities in the childhood environments. This data served as a basis for joint online discussions in the teacher network. Digital portfolios were shared on the web environment in order to emphasize direct, technology-enriched communication and collaboration among teachers. The web-based nature of portfolios challenged the portfolio constructor, in this case a teacher, to operate and communicate in the global Internet environment more generally as well.

4.4.1 Participants of the study

The role of the teacher in educational action research is to act as an active participant and a member of the research and expert teams and networks. Through these networks a teacher may receive new views, experiences and knowledge on which to build his or her own educational and teaching expertise as well as children's learning environments. Participation in an action research project does not mean only that teachers are applying the theories and knowledge the researchers are constructing or that they are solely acting as sources of data. Rather, participation means that diverse actors are mutually collaborating in action research endeavors, which seek to develop pedagogical practices and to create new teaching and learning cultures (see Kemmis & MgTaggart 2000). In the study, the participants in the digital portfolio development were teacher groups in several kindergartens and primary schools besides the research group. It was assumed that collaboration with researchers provides teachers with support and knowledge for their work and directs their evolving pedagogical expertise. In the various cycles of action research there was variation in the participant locations from the perspective of knowledge-constitutive interests (see Chapter 9).

Teacher groups

The participating teacher groups in this study were selected through an invitation process. In the end of autumn 1997 the possible teacher groups were approached and informed about the study. The geographical region of participating kindergartens and schools was restricted to Central Finland. The main reason for this restriction was the anticipated need of teacher training in various cycles of portfolio development. It was evident, that the proximity of participants would enable closer contacts between teachers and researchers in the development work. Another reason for the restriction was that the project was supported by a collaborating Pedanet-project, which aimed at advancing educational use of ICT in Central Finland (http:/peda.net).

The teacher groups in the study were from three towns. In the first town, two teacher groups were invited to the research project because they had participated in the earlier study on the use of school portfolios (Kankaanranta 1999). In the second town, one kindergarten was approached because of their known interest on continuous and extensive development of early childhood education. The kindergarten was located in a combined kindergarten and primary school building, and thus, also the teachers in the lower level of primary school were offered a possibility to participate. Teachers in the third town were approached through the Pedanet-project. It was decided in this town that according to the principle of equality all the kindergarten teachers and also teachers in the lower grades of primary schools could participate in the study.

The invitation process resulted in a larger number of kindergartens and schools than was originally planned. However, all voluntary teacher groups were taken to the study because it was presumed that during this kind of intense action research process the number of participants would most likely decrease to some extent. It was anticipated that the large number at the outset would secure that the volume of actively participating settings would remain sufficient for the collaborative evaluation of portfolios and for the building of a functional community of kindergartens and schools.

The number of actively participating teachers varied during the span of the study but the group of participating kindergartens and schools remained almost the same. At the beginning, there were teachers who started in the project only to see in more depth what the project was about. Especially, many schoolteachers had understood that the main aim was teachers' technological training. Some of them withdrew when they learned about the real aims of the study or when they found out that the training offered through the project did not correspond with their needs and current level of technological skills. Some teacher groups continued in the project during several action research cycles but not far enough to publish a digital portfolio for sharing with other groups.

In the study, the definition of participants was examined as a two-level issue, namely teacher and school level, according to the research questions and the length of time a kindergarten or a school was taking part in the action research project. As regards the teacher-level participation, i.e. monitoring teachers' ICT capabilities, there were altogether 24 teachers involved in the action research study during the first two cycles. Correspondingly, as for school-level participation, there were teacher groups in 6 kindergartens and in 2 primary schools that went through all five cycles of the action research and accomplished digital portfolios published on the web. In one of the schools, the collaborative group consisted of one preschool teacher and two schoolteachers. In addition, one circulating special teacher compiled her own digital portfolio.

All the teachers and also other interested staff in the kindergartens or schools were invited to participate in the project. However, from some places there was only one representative in different meetings and training sessions, while from some other kindergartens the whole staff (including teachers and nurses in the kindergartens) was involved to some degree, at least. All the key teachers except for one were females. Teachers did not receive any extra incentive for their participation, for example in the form of extra salary or leave from work. They organized the participation for training sessions and portfolio development by scheduling their daily work.

The research group

The research group consisted of a researcher, five research assistants and some technical experts in the Pedanet project. The research assistants were students from the Department of Early Childhood Education at the University of Jyväskylä and they worked short periods in the study as research trainees. The students acted as mentors for the participating teachers in various phases of digital portfolio development. The technical experts helped teachers with respect to ICT skills and access to computers. One of the technical experts designed the web application for digital portfolios (Lahti 2001).

The study was initiated by a researcher. In this sense, the idea for the development work did not rise directly from the research subjects themselves as is generally presumed in action research literature. For example, Kemmis (1997, 174) defines that "*in action research, teachers (and others) are encouraged to treat their own educational ideas and theories, their own work practices, and their own work settings, as objects for analysis and critique*". However, the earlier studies on the development of portfolio assessment had indicated the need for this kind of collaborative endeavor. On the other hand, the specific aim of digital portfolio development was to find a method for collaborative school-based assessment in which teachers analyze and reflect on their own prac-

tices. The researcher had an active role as an outside guide of digital portfolio development. This meant continuous planning, analysis and revising of the project activities. The role of the researcher and research assistants varied in different cycles. The changes in the researcher's roles are explored further in connection with research results, in the section dealing with teacher support and mentoring in digital portfolio development.

4.4.2 The cycles of the action research project

In accordance with the nature of action research, the development of digital portfolios progressed as *a continuous process of collaboration and dialogue* between teachers in kindergarten and schools, the researcher, and research assistants (Kemmis 1997; Kiviniemi 1999). Prior to the field phase a general outline for the research process was designed. However, the different action research cycles got determined along the progress of the study. The cycles of action research were overlapping with the digital portfolio development process. In the following, a short description of different cycles, their main contents and research methods are given (see Figure 4.2). The construction process of digital portfolios is examined more closely in the results section of the study (Chapter 6).

The field phase of the action research project started in the end of year 1997 and proceeded through five interlinked cycles. In the first cycle *'getting started'* (in November - December 1997) the participants were invited and introduced to the project. Baseline information about teachers' ICT capabilities and assessment practices was collected through a background questionnaire (see Appendix 2). The second cycle *'learning basic skills'* during January - June 1998 consisted of teachers' ICT training and introduction to the portfolio assessment. The technological training was carried out in several meetings or sessions and covered diverse areas of computer use. Some of the training sessions were organized in diverse ICT classes for a large group of teachers, and these group sessions were followed by more individual on-site practice sessions in the kindergartens or schools. Training was organized in such a way that the key persons from every kindergarten and school could participate and then guide those not present in the training sessions. The core contents of the ICT training (e.g. the use of word processing, e-mail, Internet and digital image processing) were issues closely related to the construction of digital portfolios and the networked communication (see Table 4.1).

Content of activities	*Action research cycle*	*Data*
	I	
Inviting and informing participants Gathering background information	Getting started November-December 1997	Research diary Background questionnaire
	II	
ICT training sessions Introduction to portfolio assessment and digital portfolios on the web E-mail discussions	Learning basic skills December 1997 - June 1998	Research diary E-mail messages
	III	
Visits to kindergartens and schools Planning contents of portfolios Documenting, choosing and digitizing material for portfolios E-mail discussions Participation in a discussion forum	Documenting and digitizing materials Autumn 1998	Research diary Follow-up questionnaire Content maps E-mail messages Web discussions
	IV	
Visits to kindergartens and schools Learning www-editing Developing user-friendly applic. Participation in a discussion forum Continuous updating of portfolios Publishing first web portfolios Feedback for portfolios (research group)	Constructing digital portfolios Year 1999	Research diary E-mail messages Web discussions Digital portfolios Reports from portfolio evaluations
	V	
Sharing digital portfolios Assessment of the portfolios: giving and getting feedback in teacher network Updating portfolios Final evaluations	Sharing, reflecting on and assessing pedagogical practices Spring 2000	Digital portfolios Web discussions Teacher interviews Reports from the final portfolio evaluation

Figure 4.2 *The action research cycles in the study*

Table 4.1 *Teacher training sessions in the year 1998*

Time period (year 1998)	*Content of teacher training*
January – February - training sessions	Basic training on e-mail and the Internet Presentation of the project web site Introduction to the digital school portfolios to be published on the web
March – April - training sessions	Digital image processing - introduction to the use of images in a portfolio - digital camera, scanning - basics about digital image processing Introduction to portfolio assessment Planning a digital portfolio
May – June - visits to kindergartens and schools	Practicing technical skills Planning a digital portfolio
Summer	Practicing scanning and image processing
September – November - school visits	Repetition training sessions about scanning and digital image processing Planning the content of a portfolio, documentation Participation in the web-based discussion forum
December	Workshop on digital portfolios - html-editing - feedback on first portfolios

At the same time with the proceeding of technological training, also the planning of the content of a digital portfolio started. Teachers were also introduced to the general principles of portfolio assessment and especially to the construction of digital portfolios.

During May and June 1998, all the participating kindergartens and schools were visited. The main aim was to help teachers start planning their digital portfolios. These visits included consultations with the teachers about possible contents of their portfolios. Teachers also introduced their kindergartens and schools to the researchers. Content mapping was introduced as a method for visualizing the content areas. According to Markham (et al. 1994) content mapping is a powerful research tool for revealing and visualizing practical, theoretical and structural elements of specific contents.

Learning and practicing of ICT skills continued throughout the project, but in the third cycle *'documenting and digitizing portfolio contents'* (autumn 1998) the emphasis was on continuing the planning of the portfolio contents, documenting of daily work, and on choosing and digitizing the materials for portfolios. In the beginning of the autumn, a follow-up on the teachers' ICT capabilities was carried out through a second questionnaire. The teachers were also asked to assess the technological and portfolio training they had received during the second cycle of the action research project. They also reflected on what they had learned so far, and described the central issues for further training and their plans for the content of digital portfolios.

During autumn the first versions of the portfolios were constructed by a technical assistant according to the teachers' directions. Thus, teachers could get an idea of what the planned content would look like on the Internet. In December, a hands-on workshop was organized for teachers about the use of digital portfolios. The main lecturer in the workshop was Helen Barrett, a well-known expert in the field of electronic portfolios. The basics of HTML editing were being taught for teachers, and the first teacher-made documents were prepared. The seminar was the first occasion where the whole teacher group met, and the teachers shared the existing versions of their portfolios with each other.

The fourth cycle during year 1999 was a period of *constructing digital portfolios*. During this cycle, special emphasis was on finding and developing a suitable web application for digital portfolio development (see Appendix 3). Kindergartens and schools were visited frequently in order to assist and mentor their proceedings both in terms of content and technical issues. In the fifth cycle *'sharing, assessing and evaluating pedagogical practices'*, during October 1999 - June 2000, digital portfolios of kindergartens and schools were published on the web so as to enable teachers to share experiences of pedagogical practices and co-constructing expertise in the field. Several workshops were organized for different groups of teachers. In the workshops the teachers were guided in those areas where they needed further practice. The teachers also commented the portfolios of other kindergartens and schools. In the spring 2000 some of the workshops were organized via electronic network.

4.5 Data analysis

The data were gathered combining different interrelated methods. The types of data can be divided into two groups, namely process data and outcome data. The data analysis is described in more detail in Appendix 4. The process data were gathered through two questionnaires, teachers' e-mail messages, messages on the digital portfolio application, field notes, and teacher interviews. The contents of questionnaires

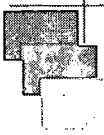
(Appendix 2) were adapted for the Finnish context from Barrett's (1998) resource questions developed for implementation of digital portfolios in Alaskan schools. The field notes or research diaries dealt with training sessions, workshops and school visits but also the general progress of portfolio development. According to Kemmis (1997), it is essential that field notes include "*reflections about the practices being studied and learning about the process of studying them*". The teacher interviews were conducted with two teacher groups about the portfolio development process.

The analysis of the process data started already during data gathering. Characteristically to the action research, fieldwork and data analyses were partly synchronous and complemented each other. The analysis and interpretation of the process data about portfolio development and teachers' ICT capabilities continued during different cycles of action research. The process data was examined by means of content analyses. They indicated further areas e.g. for teacher training, portfolio development and choice of appropriate application for digital portfolio construction.

The outcome data consisted of the digital portfolios constructed during the study. The analysis of digital portfolios was a collaborative effort among the research group and teachers participating in the study (see Stowell & Tierney 1995). In the fifth and last cycle of the study there was a special emphasis on portfolio evaluation. In the beginning of the year 2000 student mentors analyzed all digital school portfolios so as to gain ability to guide and support teachers in the further portfolio development. In the end of spring 2000 the researcher and one research assistant conducted a final analysis of digital portfolios.

Part III

Digital portfolio development



CHAPTER 5

Teachers' evolving capabilities in the use of information and communication technology

In this chapter I will examine teachers' evolving ICT capabilities in the construction and use of digital portfolios. The aim is to explore the technological side of the digital portfolio development process. The most central questions to be discussed here are as follows: What kind of ICT capabilities do teachers need in the construction and use of digital portfolios? How did the teachers' ICT capabilities evolve during the digital portfolio development? What kind of technological support the teachers needed?

The results are organized in three main sections. First, teachers' self-assessments of ICT capabilities in the beginning of the portfolio project are presented. Second, the progress of teachers' ICT skills during the intense training period is followed. And finally, results of self-assessments after nine months of participation in the project are reported. The emphasis is on the follow-up of the two first cycles of the action research project, because during them the focus was on enabling access to ICT and improving teachers' technological competence. However, teachers' ICT capabilities advanced during all the cycles. Their evolving capabilities in the use of ICT are examined through the respective dimensions of access, competence and motivation (see Viherä 1999).

5.1 Teachers' ICT capabilities in the beginning of the portfolio project

5.1.1 Access

Access to information and communication technologies was measured, on the basis of teachers' descriptions, as the amount of the equipment used, plans for future investments, and also as diverse possibilities of using ICT in their daily work (see Table 4.x).

In the beginning of the portfolio project each kindergarten had only one computer, which was mostly in the use of adults, especially for different kinds of administrative office work. Children's access to these computers ranged from non-existent in two kindergartens, through a more common frequency of two to three times a year, up to a weekly working time in two kindergartens. The child-computer ratio varied from one computer per 21 children to one computer per 66 children. The best situation seemed to be in a kindergarten with 21 children, where the computer was reserved for children's use for four hours on a daily basis.

As for the participating schools, access to computers as measured by the number of computers was there much better than in the kindergartens, both for teachers and children. Separate computers were available for teacher's administrative and management work and for instruction. Most schools had at least one computer and the biggest schools also had a separate ICT classroom.

To improve access to ICT all the participating kindergartens had plans, or at least wishes, for purchasing computers to be used solely in instruction. Short-term investment plans concentrated on software products and operating systems, Internet connections to the classrooms, and on the continuous effort to purchase and upgrade equipment. However, it may turn out that the mere existence of a computer does not guarantee its actual use, as was reported by a kindergarten teacher:

> *In our kindergarten there is one computer, and we have allocated turns for its use. The using times are on a paper, but the actual use is minimal. It depends on the eagerness and skills of the adults. I use it a couple of times in a week. If the children want to work with a computer, I'll try to organize it.*

Thus, the actual use is directly affected by the teacher's competence in the area of computers.

Access to the Internet was available in all the schools, but only in two kindergarten groups. In addition, three more kindergartens had a connection to the municipal Intranet. In one town, a network access was provided for all the kindergartens so as to

enable their participation in the project. After this there was only one kindergarten which still did not have any network connections. Other technological devices (e.g. scanners, video or digital cameras) useful for the construction of digital portfolios were rather scarce.

In summary, the access to ICT was on a very basic level in all the kindergartens, whereas in the schools the situation was much better in regard to participation in the development and use of digital portfolios. Also, teachers in the kindergartens were optimistic as regards to the future investments in the ICT-related devices.

5.1.2 Competence

The technological competence of the participants differed a lot. Teachers estimated their own competence both numerically and through written descriptions. Numerical estimates varied from 1 to 3 on the scale 1–5 (Table 5.1).

Table 5.1 *Distribution of teachers' self-ratings about their computer competence in the beginning of the portfolio project (December 1997)*

Scale	*Description*	*n*	*Category*
1	None or very little experience	5	Beginner
1–2		1	
2		3	Advanced beginners
2–3		5	
3	Average	7	Competent
3–4		-	
4		-	Proficient
5	Versatile competence, use with ease	-	Expert
Total		21	

In the first self-assessment seven teachers rated themselves as average users of ICT, and five teachers indicated that they had very limited if any experience in computers. The rest of the teachers placed themselves between these two extremes. A clearer picture of the situation underlying the numerical ratings can be drawn by teachers' narrative descriptions on their current ICT competence and ICT utilization.

User experience in ICT varied from a group of beginners having just some months of usage to three more experienced teachers having used computers for about five

years. It was most typical that a teacher had got altogether less than two years of experience in computers. However, it is not easy to describe experience only by years because even the five-year using time meant occasional and minor usage for two out of the three teachers. Most kindergarten teachers were extremely unsure about their ICT skills and described competence as poor and dependent on the help of others. In general, some of the schoolteachers were more confident ICT users, but also among them were those who still experienced difficulties in computer usage.

My computer usage is in 'a child's shoes'. I have used a computer less than two years. My activity has mainly been word processing (reports, letters, notices), making spreadsheets (excel), and to some degree day care program and Internet experiments.

I'll manage with what I need in my work fairly well, I hope to be better.

My own technological competence is really miserable. Of computer programs I use only word processing and Excel spreadsheets. A computer is not, however, totally strange for me, I've used it now and then for about 5 years.

Teachers indicated that the most common use of a computer was word processing. However, only two teachers used word processing regularly, and fifteen teachers more occasionally. Those four teachers who did not report even word processing can be described as very novice users or beginners with only some basic computer handling skills.

I can "already" switch the computer off, but not on. My "mouse hand" is beginning to be fit for use.

[I'm] in the beginning, "mechanical".

Very low. I need fundamental training in its use. I can do with computer mechanically what someone shows me (e.g. shift tables), but independently I can't use it. I have let children play learning games a little. Occasional usage for about 2 years.

Word processing was used especially for writing down notices, reports and letters, for drafting statements and personal curricula for the children, and also for compiling different lists. For a couple of teachers a word processing program was the only application they could handle to some degree. The other teachers usually mentioned other main uses or programs they had experience of; these were typically various office software including spreadsheets and graphics. In the kindergartens, administrative applications for day care management, e.g. for keeping account of children's care days and nursing fees were of special interest.

Altogether thirteen teachers reported the use of computers with children. For most of them this meant especially general familiarization with a computer, and occasional utilization of various instructional games and other software for children. Only two teachers mentioned also other activities like Internet browsing, use of educational CD-ROM's and writing or drawing applications. The use of computer for communication was still unknown territory or in the phase of practicing and wondering. Seven teachers mentioned the use of e-mail, but four of them limited their competence only to reading of messages. Only five teachers mentioned the use of the Internet, and so far it had mainly meant practicing of browsing and visiting some specific familiar pages.

E-mail. In principle I can go and read the messages, I know how to find the necessary information for use.

I use word processing almost daily. Now and then I take a peek at my e-mail box and the school web sites. Occasionally I play patience and peek at recipes from YLE's (Finnish Broadcasting Company) www-sites.

In summary, according to teachers' self-assessments, most participants had only some basic computer skills and quite a short time of user experience in the beginning of the portfolio project. For most teachers their self-assessments gave an impression of newcomers in the field of technology. Basic programs were familiar for most of the teachers, but more advanced use of a variety of software products for different functions in teaching, learning and daily activities in kindergartens and schools was still just a goal. Also the possibilities of modern communication tools such as e-mail and the Internet were still used narrowly if at all. No one was totally ignorant, but few real users were found and only in the primary schools.

5.1.3 Motivation

Teachers' motivation to use ICT was examined through their plans for further training. Only two teachers stated that they did not have any clear plans for ICT training. Other teachers expressed in their answers a clear desire to learn more and widen their competence in the area of computers. Getting ICT training was seen as essential, but so far it had been almost non-existing for kindergarten teachers. They also felt that the maintenance of acquired ICT skills called for continuous updating. One teacher expressed a fear that she had already totally fallen behind in the development of ICT. Another one doubted her own possibilities to get back to the trails of computerized world after working half a year in a separate building without a computer.

The willingness to participate in a technology-enriched action research project was an indication of teachers' motivation to develop their capabilities in the area of information and communication technologies. However, it must be noticed that the interest to participate was grounded on their eagerness to find possibilities for displaying and sharing with others their work and experiences in childhood education. They were also interested in collaboration by means of information technology between different pedagogical settings and also between the successive learning environments of kindergartens and primary schools.

According to the teachers, one possible answer for the improvement of ICT usage could reside in the training of so-called key persons, who then could support others. Schoolteachers stated that basic training was available for them, and some teachers had complemented it with continuous voluntary studying. Teachers indicated also a clear expectation to receive ICT training through the digital portfolio project. On the basis of teachers' self-assessments, the main aim of the ICT training organized through the portfolio project was outlined so that teachers would acquire the specific skills needed in the construction of digital portfolios (e.g. word processing, scanning, digital image processing) and in the networked communication (the use of e-mail and the Internet). Special emphasis was placed on enhancing teachers' confidence and self-direction in the use of ICT.

5.2 Time for learning

The second cycle of action research was an intense time of ICT training (see Table 4.1) being carefully adjusted to the needs of teachers. After basic e-mail training, teachers were encouraged to practice and get used to this medium by informing and discussing the proceeding of the project via electronic mail. There appeared to be some extremely enthusiastic writers, while many were just responding shortly to questions concerning e.g. the arrangement of training sessions, and some teachers sent messages only rarely. However, gradually most of the teachers became more familiar and confident with this new communication tool.

The contents of messages revealed common themes in the development of teachers' ICT capabilities (Table 5.2). There were also clear personal differences in the user development. The respective issues of access, personal ICT competence and motivation to learn and practice ICT skills were intertwined. The issue of access came out only sporadically during the first six months of the project. Much more crucial aspects in the e-mail messages were continuous self-reflection on teachers' personal competence. Towards the end of the period also issues of context and portfolio development appeared in the messages.

Table 5.2 *Common themes in e-mail messages about development of teachers' ICT capabilities*

Theme	*Content*	*Area of digital portfolio development*
Being uncertain and anxious	Problems with technology	Access
	Worries about own technical skills	Competence, motivation
	Struggling to manage	Competence
Developing competence	Continuous development	Competence
	Use of programs	Competence
Learning e-mail behavior	E-mail etiquette	Competence
	Network ethics	Competence
Becoming a more competent user	Motivation to learn and practice ICT	Motivation
	Helping and guiding others	Motivation, competence
Daily life at schools	Complaining about busy school life	Motivation, context
	Organizing work	Motivation, context
	Describing life at schools	Context
	Assessing portfolio environment	Portfolio development
Discussing the content	Planning and consulting the content of digital portfolios	Portfolio development, context

At the beginning many teachers either suspected problems associated with various technologies or they were worried and uncertain about their own competence. Especially the feelings of anxiety and restrictions in the *ICT competence* came forth. Some teachers felt that the technological challenges of the digital portfolio development exceeded their skills. However, teachers were able to attach also a certain amount of humor and self-irony into their self-examinations.

Hi! Finally we managed to find your message.

We must contact AS (computer coordinator) to see where the problem is. With us? With equipment? ... Remember that with us you need to do everything from the very beginning and in an easy way. ... Welcome!

It's a pity that we are such first-graders in this 'cause registering to the posting list has not yet succeeded in spite of several efforts. There just comes a flood of text in English and always there is some kind of error, although we try to follow the instructions! Is it possible to make the instructions still simpler for us stupidos?

In many instances it was only after a telephone contact that a teacher checked her e-mail. Thus, for some of them a telephone was still an essential parallel communication tool through which the dates for upcoming meetings could be confirmed and also different technical problems solved. It was not yet a customary habit for teachers to check whether someone had tried to contact them through e-mail. In comparison to telephone communication e-mail requires more initiative from the receiver's part, because of the need to check for the incoming mail.

Examples of telephone calls:
What can we do now? The diskette with the e-mail program got stuck in the computer...

Teacher: *I haven't received your message.*
Researcher: *Well, I must check if there is something wrong with it.*
Teacher: *Err... actually I haven't looked my e-mail for a long time.*

In the third month of the portfolio project there was a sudden peak of messages centering on the competence of the participants. Now the e-mail messages revealed that in spite of the difficulties and struggling, teachers somehow managed with the technology and they continued to acquire new challenging skills. Teachers also expressed feelings of gradual development of competence. The most important thing was teachers' willingness to gain experiences and continuously strive for learning in different areas although they were still uncertain of their competencies.

There was often a feeling of a common endeavor towards learning skills needed in networked communication and thus to better connections with colleagues through networks. Especially from the fourth month onwards teachers' learning motivation showed in the amount of messages describing their ever-growing enthusiasm for advancing and widening their ICT competence. The efforts to learn the e-mail etiquette, e.g. the habit to reply to the received messages, could be tracked more indirectly from the flow and contents of messages.

So sorry for the lateness of my reply, I'm not yet really experienced in reading messages from the Internet, but maybe it can be learned with time.

I've glanced through the links on the project pages, and I have found fine pages especially from the States. Is it our aim, that during this year we will try to do something similar in our kindergartens and schools? What could we do to prepare ourselves, if we are able to? Is there already a plan for our next meeting?

Again I'm not sure whether my connection to the world is working, please, tell me whether the time for ICT-training is settled. Do we study before Christmas?

Based on the messages received, the teachers' competence in the use of e-mail could also be examined as an extent of independence in terms of their communication habits. While an increasing number of teachers used their own e-mail addresses in communication, there were some kindergartens in which one contact person was responsible for the communication through the kindergarten's common e-mail address. However, at the same time the other teachers in the setting did not get used to sending and receiving e-mails and in a way gave their voice to the contact person.

I'm informing that also MR is coming to Wednesday training. SH is not coming but she probably wouldn't come in any other day either.

Training suits me well. By the way, do you think that I could manage to enter MR for the posting lists? I promised to try.

In the beginning the *motivation* meant especially the teachers' interest to participate in the construction and use of digital portfolios, but from the fourth month onwards teachers' messages indicated their ever-increasing enthusiasm for advancing and widening their ICT competence.

First day of holidays starting and I'm at once at the computer trying out a mailing list. I found your message where you asked to send messages to the mailing list and I tried to send some mumbo-jumbo. My problem is that I don't find our portfolio project from Pedanet services. After one week this will surely be cleared up in our meeting and we'll again learn new things!

I'm on holiday on 4.3., but 10.3. suits me for training. So, then I'll be there again ready to learn something new. Well, this e-mail thing also stumbles a bit, but I've tried to practice its use as much as possible. Sunny late-winter days!

The paths to competence were diverse. While one kindergarten teacher was too uncertain of her abilities to cope with computers and thus withdrew from the project for half a year, some school teachers were already participating in several training events also outside the portfolio project. A couple of the teachers were proceeding with enthusiasm from novices with very little previous ICT experience to instructors or mentors of their colleagues. Thus, they were enjoying their role as so-called key persons in the field of computer use. Most teachers felt constant need and were eager for more training. While some teachers did not have time, interest or even real possibilities to practice on their own outside the common training sessions, some others immediately overcame the problems of access and wanted to rehearse their new skills also outside working hours at home or at school.

We've had one info about scanning, but one of us was not there, and also for me one time was not enough to leave so much into my mind, that I could teach others. So, if it is possible to get more training in scanning then we will be happy to be instructed.

I would like to ask this kind of permission: Can NR come and give us ICT training at 15th of December? This time suits her.

There was already a mentor guiding us in the use of a scanner, thank you for that. However, repetition would be of no harm. At the same time we could also run through the use of e-mail, please. We have forgotten how to send e.g. pictures and text to you and also to others. Would this be possible?

The descriptions of the *kindergartens and schools as contexts* influencing teachers' participation were constantly visible in the messages. The reality of the busy daily life hindered sometimes participation e.g. in the forms of staff members' sick leaves, vacations or different personnel meetings. Sometimes more seasonal disturbances such as the preparation for Christmas celebrations confused the activities of children and adults alike. In spite of the great haste and pressure the teachers organized their daily work and sometimes also home affairs the best they could in order to be able to participate in the project meetings and training sessions.

We discussed that 14.00 o'clock suits us best 'cause then we don't need to worry about the child group any more. We can stay as long as is needed. We hope that you are able to come to our place still in the afternoon.

Do we study before Christmas? Christmas brownies are already dashing behind windows and also under children's desks... Peaceful advent!

You must already know that this year I'm on a sabbatical leave (lovely!) but still I'll try to stay along with this project. Of course in this economic situation I dare not to use so much our home computer, I mean solely. And I've heard that the school use of the Internet has exceeded all agreed limits and politicians are going to limit the use!

Along with the proceeding of the project and teacher training the focus of the e-mail messages shifted from technical issues to discussions about portfolio development and use. Thus, the content of daily work in the kindergartens and schools came to the fore. Teachers were eager to learn and to move ahead to the new areas of ICT needed in the construction of digital portfolios. They had begun to document their work and to digitize materials chosen to portfolios. They had also begun to find innovative ways of making visible the various dimensions of teachers' and children's work.

We think that the planning of our portfolio is in good shape. Could we borrow the digital camera, so that we could get better and more current photos from the environment of our

kindergarten, park and teaching and play situations? We have updated our material slowly but carefully. I also tried to call you and ask about the camera. Could you, please, send a message or call, whether it is OK to borrow the camera, thanks.

I'll quickly register for the Saturday training – it's interesting. Can we put in our portfolio e.g. children's drawing wall? After the parents' evening the children were interested in how on earth photos had been put in the computer and then I explained scanning to them. Now I dream of going with those interested to scan their own drawings. That's why it would be nice to have a place in a portfolio where we could watch them. We don't have an image processing program in our computer, with which we could edit pictures we have already scanned (they are on a diskette). Who was it we should ask for help? Who taught it to us? Sorry about this innate slow grasp! Otherwise very bright -J-

As the above example shows, portfolio presentations evoked naturally also children's interest in computers. Children acted as initiators of learning by asking questions about things they wondered, e.g. how it is possible to get children's own drawings and photos visible on a computer screen.

5.3 ICT capabilities after nine months

5.3.1 Access

The second self-assessment of ICT capabilities was carried out in the beginning of the third cycle after about nine months since the starting of the project. This was after several ICT training sessions. Self-assessments did not show any essential changes in the standard of technological equipment available. There had been only some investments on computers and in the area of digital image processing, e.g. purchases of scanners, video or digital cameras. In one town all the kindergartens had been offered an enthusiastically used possibility of scanning in one of the participating schools.

The idea of using computers in instruction was already self-evident in the participating schools, although there were much variation in the quality and content of actual utilization. In regard to the schools the decision-makers had already approved the continuous investment in computers. However, kindergartens were still fighting for approval of their increasing need of computers and peripherals also for the instruction of younger children. Fortunately, along with the growth of teachers' technological competence, they gained ground to demand technological investments.

We need 2-3 more computers, one to child groups, another to our third group, which is placed in another building and still without a computer. These are coming next year if our budget proposal is accepted.

Again, the question of access to computers in the daily life of kindergartens and schools was a much wider issue than just the existence of computers and peripherals. In their plan for technological investment a group of teachers brought out especially the problem of finding time to concentrate on the use of computers.

> *Problems: there is not enough time to go into the matter! These things ought to be very clear for one before one really uses ICT in the daily work. It is important to strengthen own competence – but then again there is no time.*

5.3.2 Competence

The second self-rating (Table 5.3) compared to the first one indicated a clear upward movement in teachers' self-rated competence. Now there were only two teachers who characterized their competence with the lowest points on the scale. Both of these teachers were among the three newcomers to the portfolio project in autumn 1998. The number of average users was already 12, and two teachers even felt having advanced above average. Again, the written narratives specified the quality of competence.

Table 5.3 *Distribution of teachers' self-ratings about their computer competence after 9 months (September 1998)*

Scale	*Description*	*Rating*	*Category*
1	None or very little experience	1	Beginner
1–2		1	
2		4	Advanced beginners
2–3		4	
3	Average	12	Competent
3–4		1	
4		1	Proficient
5	Versatile competence, use with ease	-	Expert
Total		24	

Generally, teachers' descriptions gave now an impression of more self-confident and optimistic users with more diversified skills and uses. Teachers were still careful in assessing their competence and also brought out several areas that needed further practice. However, instead of strong feelings of uncertainty and impossibility, ICT was

now for most of them something to be learned and mastered with time. Still, some stated that they were good only in the basic handling of computers and in different routine activities.

It is difficult to say what I can do best, a little bit of everything and I'm good at reading directions. Windows 95 is familiar to me.

To switch on and shut down the computer, to guide others aside... I remember to check my e-mail, if I only get near the computer!

I am a beginner with some courage for experimenting. I use computer only at work and also then there is very little time for using it. Most often I use e-mail, and statements, minutes... I write in the same way than before with a typewriter. Just a little bit of spreadsheets and I've started a library file. I've already forgotten how to attach a photo to children's memos.

Quite a few teachers modestly described themselves to be somewhere between poor and passably good in several different basic computer activities needed in the daily work of kindergarten or school. Some teachers were courageous experimenters who were ready to invest time in practicing and who advanced quickly in various areas of computer usage. In contrast, there were also those who did not actively seek their own ways to work with computers.

Word processing proved again the best-mastered and most frequently used activity. It was often listed with different basic ICT skills. Teachers' estimates about their word processing skills varied from unsure and basic level of some teachers to those for whom word processing was already almost like a routine skill used with ease in diverse tasks.

To use word processing programs, but even this it is nothing to write home about. Starting up a computer goes well, but progressing from there causes a lot of insecurity.

I enjoy wandering about in computer programs and I see the computer as one of the vehicles for work. At home I have a computer of my own (old 3.11).

I'll manage basic things: word processing + transferring picture into the text. I read e-mail and send messages to others. To the children I teach games + drawing programs + teaching programs. I use computer always whenever I find time. I forget easily, if I can't practice at once. I would like to learn much more, if I only had time.

The everyday use: writing with beautiful fonts, producing the week program to be displayed on the hall wall (pictures, frames, and programs). I can do some tables (e.g. parents' names and addresses etc.) Games + a drawing program (Paintbrush).

Also the use of e-mail was now a common practice for almost all of the teachers. Half of the teachers defined themselves as skillful and frequent e-mail users. While e-mail had become a familiar communication tool for most of the teachers, the Internet seemed still to be amazingly distant for them with only few mentioning web browsing. However, there were some who experienced difficulties even with reading of messages and who rarely used e-mail. In the assessment of the technological training, teachers mentioned that they had learned the basics of digital image processing, but in their self-assessments these skills were still missing. This could mean that they did not yet feel themselves competent and independent enough in this area.

I have learned how to use e-mail. I have not had time to concentrate on the Internet-pages + its use. I think I can take digital photos. I understand what a portfolio means and what its purpose is. The training has been easy enough and proceeded just right for me. I have been satisfied.

Digital camera and scanning are familiar to me in principle. I only should use them more often, so that I would remember all the ins and outs.

Moreover, the teachers emphasized that the most essential challenges in the use of ICT were specifically in the area of digital image processing, in the active utilization of the Internet as well as in the use of ICT for instructional purposes and for their own continuous learning and practicing.

5.3.3 Motivation

Teachers' self-assessments revealed very positive attitudes towards participation in the technological training and, thus, towards learning of diverse ICT skills. Many teachers described themselves as being now more motivated in using computers and having more courage to experiment with different things. However, they complained that they did not have enough time or computers in the daily work to practice the skills taught in the meetings and workshops. For some the lack of practice gave a feeling that they had already forgotten a lot of the things. Thus, continuous training was called for in the forthcoming training sessions.

There have been many things to learn and indeed, I have learned a lot, but I suppose I have forgotten most of the learned things because not practicing them. Repetition is the mother of studies – I have seen that true also in this case.

Training has to some degree inspired me to use computers, I've also gained courage to try different things. I could have learned more, but this is because I haven't practiced enough in my own time, at work we don't really have the time or access (one computer).

Teachers' descriptions indicated that there was a direct connection between the current needs of daily ICT use and the experienced competence in different activities. Teachers were first and foremost motivated to practice the skills currently necessary in their daily work, including electronic documentation needed in the construction of digital portfolios and in the communication with colleagues. They were interested in further training in the active utilization of e-mail and the Internet. Also digital image processing, including scanning and the use of digital camera and image processing software, was often referred to as a challenging skill.

Training has been versatile, interesting and given me a lot of new information. I have at least learned to take interest in what a digital portfolio is; also the use of a digital camera is interesting.

I have got basic knowledge about the above-mentioned things, but mastery requires lots of practicing. Training has been good and no-nonsense, but when you start from the zero level even small progress brings satisfaction. My attitude towards computers in general is, however, sensible and I don't experience it as an end itself. Rather it is a means to make my own work easier and to keep contact with other people in the same field. I would like to learn different uses better.

For some teachers it was enough to become a basic everyday user because of the experienced time constraints. However, many teachers aimed at developing themselves from novices to more advanced users by broadening and deepening their basic operating skills to a more versatile utilization of various programs and equipment and also by obtaining more information about different possibilities of ICT. Along with the improved competence and awareness of ICT, teachers also became more engaged in developing and reflecting the use of ICT in the instruction of young children.

... I'll learn little by little, but there ought to be time for practicing. I suppose that I'm becoming a basic everyday user, I don't have time for anything else.

Everything... it is difficult to name anything specific, because I don't really have an idea of all the possibilities one can do with a computer, because of my short experience. At least these things I would like to learn better which I have already practiced a bit.

All the concepts are not yet completely clear. It is challenging to learn all the time more and then also to remember those things that are more rarely in use.

To reflect all the time on how to utilize computers in teaching, how much to put time and effort to it and how much to other things. I'm personally interested in continuous development and want to be conscious of proceedings in the computer area in general.

Among the teachers there were still some who were in the phase of uncertainty, because they had entered the group of participants only recently. Thus, because of the continuous changes in teaching staff, the heterogeneity of teacher competence was evident during different cycles of the project. Conveniently, some of the teachers had now also started to share their ICT knowledge with others, especially with the newcomers to the portfolio project. Two teachers, who had just started in the project, told that other teachers had guided them in the areas dealt with in the earlier training sessions.

I am a new one, have just come to the kindergartenà I've been trained into the secrets of e-mail and the Internet!

At the moment my computer competence is weak. Years ago I felt that I mastered the use of a computer fairly well but because I haven't even touched a computer for several years I've forgotten everything.

At the same time with the training organized in the portfolio project, teachers in one school had been participating in ICT training organized through a national "Information society" teacher-training project. One of them felt that some of the contents in the training organized in the portfolio project were overlapping, although she added that repetition is always worthwhile. Another teacher thought that technological training had supported the "Information society" training, but she wanted to learn more about the basic ideas and aims of the whole portfolio project. Thus, again it came out as a challenge for the project to satisfy teachers' different needs and varying competence. And it also showed that the focus needed on ICT capabilities so far had left portfolio development in a minor role.

Training has been overlapping with the Information society -training. On the other hand, repetition is the mother of studies!

Training has supported the Information society -training in many things. The portfolio project is still unclear for me. What are we going to do? Why? How?

5.4 Conclusion: Taking steps to the digital world

It is not easy to step into the digital world. Construction of digital web portfolios and technology-supported communication requires from individual teachers a complex set of skills in modern information technology. According to the ecological approach and systemic view, implementation of a novel technology-enriched assessment method and related use of computers inevitably affect the nature of the whole learning

environment (Salomon 1996). Changes, even if they are individual, in one element of an ecology means that their effects can be felt in the whole system (Nardi & O'Day 1999). It has been stated that the use of computers serves as a trigger for transformations and technology-enriched instructional innovations (Salomon 1996). In this study, however, it was the other way round; it was the implementation of a technology-enriched instructional innovation, namely digital school portfolios that triggered diversified computer use in childhood education environments.

In this chapter, I have explored teachers' capabilities to participate in the construction and use of digital web portfolios, and more generally, to enter in the digital worlds of information society. I was interested in examining the meaning of technology in digital portfolio development as well as the interaction between teachers and technology during the development process (see Bruce & Hogan 1998). Teachers' evolving ICT capabilities were examined as resulting from the respective factors of access, competence and motivation (Viherä 1999). These factors intertwined during the first two cycles of the action research project on digital portfolios. This time period was chosen for closer examination because during it a special focus was on teacher training and support in the use of ICT.

Access to computers and peripherals was at a very modest level in all the participating kindergartens and it remained almost unchanged, especially in regard to the number of computers in kindergartens. In the very beginning also the quality of Internet connections varied. The participation of a few interested teachers was even hindered and delayed by the lack of Internet connections. Limitations of access did not affect in the same extent the participation of teachers in primary schools, where the use of ICT has a longer tradition. Still, it became evident that the most crucial thing was not to have the latest applications but to have enthusiasm and urge for experimenting with new things provided by information and communication technologies and a true desire for learning. However, sufficient access is a necessary prerequisite for the continuous development of the pedagogical use of ICT.

During the examined time period the most distinct changes in ICT capabilities occurred in teacher's competence and motivation. In the beginning of the portfolio project, *teachers' motivation* was primarily based on the purpose of the research project. They felt encouraged and willing to participate in the construction and use of digital portfolios, because they shared the need for collaboration with their colleagues in order to enhance the quality of instruction in early childhood and primary education. In particular, the teachers wanted to make visible and present their own work for diverse audiences and to take a closer view on work of others, as well. However, they did not yet possess the ICT capabilities required in the construction of portfolios in digital form in the networked context, or more widely, the capabilities needed for active participation in information society (Viherä 1999). It was presumed that essen-

tial capabilities for the digital portfolio development were ICT-related skills like operating a computer, word processing, scanning and processing of images, use of digital camera, the communicative use of e-mail and the Internet and related technological devices. And more specifically, teachers needed skills for web page editing.

At the beginning most teachers had only some basic computer skills and quite a short time of user experience. This was verified by their self-assessments giving an impression of newcomers in the field of technology. Some teachers were extremely unsure about their ICT skills describing *competence* as miserable or dependent on the help of others. Nevertheless, no one was totally ignorant of computers, but the few real users were found only in the schools. Basic programs were familiar to most of the teachers, but more advanced use of a variety of software products for different functions in instruction and daily activities in kindergartens and schools was still just a goal. Also the possibilities of modern communication tools such as e-mail and the Internet were still in the end of fall 1997 used narrowly if at all.

The findings strengthened the meaning of *motivation* as an important factor in the use of ICT. Most teachers did their best to balance with the issues of access and time constraints caused by the busy daily life in the kindergartens and schools in order to carry on with the continuing but often rather slow development in ICT competence. Often the user development both in terms of motivation and competence had individual features. There were teachers who advanced quickly from non-users to a courageous explorers and mentors of others. And then again, there were those struggling with a technophobia so overwhelming that they either withdrew from the project for a period of time before gaining enough courage to start with the basics of ICT or did their best to avoid any personal contact with computers. Nevertheless, all the teachers were advancing at their own pace and with a varying need for support.

Along with the improved competence teachers became more empowered and able to demand investments in hardware, software and also different equipment needed in the digital documentation of their work. The teachers also found *new functions and meanings for the use of computers* in their daily work. They proceeded from mere routine administrative and typist-like ICT users towards more communicative and diversified utilization. While adopting a broader view of the uses of ICT in their own work, the teachers also became interested in the possibilities of computers in early childhood education. Most promising were the shared experiences of teachers and children having a common interest in learning various skills needed in everyday activities.

The results, as discussed from the technological point of view, indicated three further interrelated issues as significant for the teacher's opportunities to participate in digital portfolio development. All these issues underlined the need of an ecological perspective in the study of technology-supported learning environments. Firstly, teach-

ers displayed *the significance of their working context* by describing how the daily life at kindergartens and schools framed their participation. However, they did their best to organize their work in a way that the care and learning of children was not affected. The sense of belonging to a community of learners, who share a striving for making various aspects of early childhood education visible, gave in many instances a further incentive of investing time and effort in the development of one's ICT competence.

Secondly, there appeared to be an enormous need for *continuous teacher support* in the use of information and communication technology. Thus, teacher support and mentoring were set as central aims for digital portfolio development in the following cycles of the action research project. In addition to in-service training sessions, there appeared a need of more informal support, which was organized flexibly as on-site tutoring and advising. Thirdly, it became evident that a special challenge for the progress of digital portfolio development comes from the *choice of an appropriate application* for portfolio construction. The properties of the application need to be proportioned to the technological competence of the authors (Barrett 1999, 2000). The choice of application is also strongly determined by issues of access and motivation as factors of teachers' ICT capabilities and the ecological affordances like approval, time and support kindergartens and schools as contexts provide for this kind of assessment activity.

At least in early childhood education ICT has still to reach the same unquestionable status as it already has in the education of older students (e.g. Baker 1999). The provision of in-service ICT training for teachers is still negligible in the field. Yet, it is acknowledged that the basis for a purposeful use of technological tools is laid in the learning experiences gained in early childhood (Sinko & Lehtinen 1999; Vandevelde 1999). Also the Finnish National Board of Education (1996) has defined as a goal that there will be equal opportunities for young children to familiarize themselves with the use of computers. In order to realize this goal to such extent that these early experiences would have an influence on later habits, sufficient access to computers and information networks need to be available in early childhood environments. More important, however, is teachers' adequate technological competence and motivation to use ICT in the instruction of young children and to continuously keep track of the developments in the field.

CHAPTER 6

Portfolio development process

In this study, portfolio development was grounded on the phases varying from documentation to presentation and evaluation, which are commonly described as characteristic to the portfolio process. However, while the portfolio process served as a general framework, its particular stages did not follow each other in a linear and strict order. For teachers it was presented as a continuous and collaborative work, which would combine different perspectives in a learning environment. In this chapter, I will describe the development process of digital portfolios from the perspective of portfolio assessment. The study was based on a general research schedule (see Chapter 4), but the cycles of portfolio development were further elaborated and got their eventual shape in the course of the action research process (Carr & Kemmis 1986). The main cycles of the portfolio development in the study were:

- Grounding portfolio development
- Planning portfolio content and documenting daily practices
- Digitizing the selected materials
- Compiling a digital portfolio
- Sharing and evaluating portfolios in a networked community

The cycles are further examined in this chapter in order to determine central design and implementation issues in the digital portfolio development. It is essential to notice that these cycles are closely linked to the evolvement of teachers' ICT capabilities.

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6.1 Grounding portfolio development

The aim of the first cycle was to lay the foundations of portfolio development. It included two stages. First, relevant background information about teachers' prior knowledge and experiences of assessment and portfolios was gathered through 'strategic questioning' in the beginning of the study (see Appendix 2). Teachers reflected on the following issues (see Barrett 2000):

- What is the role and functions of assessment in childhood education?
- What kind of prior knowledge does the teacher have about portfolios?
- What kind of prior experience does the teacher have with portfolios?

Reflection on these issues was seen important in order to draw a picture of assessment cultures in the participating kindergartens and schools. The aim of this strategic questioning was also to inspire teachers to reflect on the assessment issues. Second, based on this information the teachers were introduced more deeply to the principles and development of digital portfolios.

6.1.1 Strategic questions about assessment and portfolios

The role and functions of assessment

Teachers reported that their assessment practices aimed at increasing teachers' child knowledge, at gaining process information about implemented activities and attained objectives, and at enhancing children's self-knowledge of their own development and learning. Especially kindergarten teachers emphasized the importance of acquiring in-depth *information about* individual children's *development and learning.* Careful assessment and follow-up of children's development was most typically carried out through continuous child observation and teacher diaries. Assessment in these terms was basically a very teacher-oriented activity. The information acquired was seen to support teachers in the planning of activities. According to the teachers, this information would also be of interest for parents and the children's future schools. As for important features of assessment the teachers named regularity, integration to learning and teaching, and comprehensiveness.

> *[I see] assessment as part of learning. Regular assessment develops both learning and teaching. When it comes to children, assessment ought to be directed towards all different fields. Regular assessment secures as wide learning and development as possible.*

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We follow children's development and how they learn things. We keep some kind of diary as a memory help.

The purpose of assessment is to get to know a child and his needs better in order to take into consideration each child's important things.

Observation [is carried out] in small and whole group. How they do tasks, motor activities, participate in social situations and activities, solve problems etc.

Another important purpose of assessment was monitoring of how the *aims, objectives and activities* in the kindergarten had been implemented. Teachers recognized its meaning in directing future work and objectives. Assessment was usually carried out through teacher's individual self-assessments and joint discussions between the members of the staff. Different perspectives were combined also through discussions with children and their parents. In one kindergarten even children's role as evaluators of teachers' work was appreciated. One schoolteacher underlined the importance of assessment in giving information about the effectiveness of teaching.

Gives feedback about the direction and methods of teaching, materials and course of practices for the improvement of objectives and for setting of new aims.

All in all, teachers' definitions about assessment varied. It became apparent that assessment, its purposes and methods in kindergartens were not clearly defined or reflected on. In general, it seemed that assessment as a practice still meant for kindergarten teachers something that is primarily teacher's responsibility. And some of them did not see assessment as a crucial part of work in a kindergarten but rather as something that belongs more naturally to a school culture. An example of the uncertainty and ambiguity in the definitions is that many mentioned the use of child observation but did not reckon it as an assessment method. It seemed also somewhat contradictory that one kindergarten teacher first told that assessment is not emphasized in the pre-school group, but continued then by defining that the purpose of assessment is to encourage children to pay attention to and appreciate their own work and achievements.

The role of assessment is not stressed in the preschool group. I think the purpose of assessment is to encourage children in observing and appreciating their own work and achievements.

In spite of the overall teacher-directed assessment practices, some teachers brought forth also the child's perspective by emphasizing *children's opinions and self-knowledge of their own development and learning.* Still, these were not mentioned as often as teacher observation. The importance of a personal curriculum was emphasized especially in

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the instruction of special education children. According to the teachers, assessment was utilized as a base for planning a child's personal curriculum but also in the follow-up of its implementation and the child's progress. It was pointed out that the purpose of assessment is to find appropriate activities for all children in a group. In this connection also the meaning of assessing whole learning environments was introduced.

In addition to the most commonly described assessment practices, also some other forms were mentioned by a couple of teachers. One schoolteacher appreciated the possibility to get and give feedback, which meant especially continuous oral or written feedback about children's schoolwork.

> *Continuous oral and written feedback about students schoolwork. Written reports, in which student's behavior, working habits, knowledge and skills are assessed verbally.*

More formal assessment methods were presented by three kindergarten teachers when they told about the use of different kinds of tests as a means of following child's learning aptitude, strengths and weaknesses. The most common tests were Breuer-Weuffen Discrimination Test, controlled drawing observation, motor tests and questionnaires about the child's self-concept.

Teachers' prior knowledge about portfolios

In their answers, teachers described and defined their prior knowledge about portfolios. A portfolio was most often defined by teachers as a *process-oriented folder of growth*, through which a child's development and learning can be described and followed. The emphasis on child's development was in accordance with the main purpose that the same teachers assigned to assessment practices in early childhood environments. Especially for younger children, a portfolio was seen as a combination of child's work and teacher's observations. Its purpose was to make child's development truthfully visible.

According to the teachers, truthfulness can be achieved through careful documentation and collection of data about child's activities, experiences and meaningful events. Other essential features of portfolios were mentioned to be effectiveness, systematicness and continuity in assessment and documentation. Teachers estimated that ideally the collection of a portfolio should start when a child enters kindergarten and ought to be continued during the subsequent years in kindergarten and also in school. For teachers and parents a folder of growth was seen as a means to follow child's development, and for children as a possibility to observe their own learning.

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Purpose: to record flashes of learning process, to build a curve of growth, to make a child's growth visible and to help a child to observe what she has learnt. A portfolio is a folder of growth. (A schoolteacher)

I think it means examining a child's development based on the collected data. Purpose: to see the progress of child's development. (A kindergarten teacher)

It means more effective assessment by making it more systematic and intensifying documentation. Portfolio is a means for intensifying learning and developing teacher's own work. (A kindergarten teacher)

Some teachers described a portfolio as *a story or a history of a child's life* in kindergarten or in school. To achieve this, documentation of a child's life should be sustained, systematic and made in different forms. Again according to the teachers, it is important that a child's life is followed from one learning environment to another. Teachers also emphasized that portfolios can naturally be used in discussions with parents.

In my view, a portfolio is a 'history' of a child's life, years in the kindergarten and in school. It is material about products, things, events and others important to a child. The goals are self-assessment, self-knowledge and strengthening of self-knowledge. (A kindergarten teacher)

Although, a child's role was seen central in the collection of a portfolio or a folder of growth, there was still somehow an adult-centered emphasis in the answers. Only three teachers underlined the meaning of child's self-assessment and self-knowledge, unfolding of child's perspective and providing an opportunity for independent follow-up of child's own learning and goal-directed activities.

Portfolios have brought with them feelings and students' own thoughts about what was nice, difficult etc. in the learning process. (A schoolteacher)

Most teachers described portfolios as a means for assessing a child. It was more rare to define it as *a method for developing teacher's work*. Only two teachers shortly described the utilization of portfolios in showing and strengthening teacher collaboration in the area of preprimary and primary education.

Collaborative portfolio – it is an excellent means for seeing the increased collaboration! For a newcomer it is a good way to learn what has been before and where we are now. (A schoolteacher.)

In teachers' view, assessment and documentation through portfolios can give a teacher directions for professional development and also show the needs of further training.

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Also children's portfolios can support teacher's work and future planning by showing results, assessing the past and giving evidence of the meaning of different events.

The respondents considered that there are several distinct strengths in the use of portfolios in the instruction of young children (see Table 6.1). However, teachers claimed that there are also obvious problems especially in the construction of portfolios. The most typical problems have to do with lack of time, laborious documentation and collaboration between teachers. Teacher collaboration was called for in order to establish a shared conception of the portfolio method but also to enhance continuity across different educational levels and grades. Teachers were also concerned about how they could get parents more involved in the portfolio process and about issues of privacy. Most of the problems were such that need to be solved before taking portfolios in use.

Table 6.1 *Strengths and problems of portfolio assessment*

Strengths	*Problems and difficulties*

It is possible to follow child's development in the long run.
Portfolio provides a means to collect and combine information and materials
Portfolio assessment is a useful way to get, utilize and pass on information.
Child's active role is emphasized in the assessment.
It develops self-assessment and self-knowledge.
It is a systematic and progressive assessment method.
It is possible to learn new methods of documentation and assessment.
	Lack of time
	Portfolio assessment is laborious.
	It is difficult and challenging
	• to document diverse work and activities
	• to define and make choices
	• to determine roles and responsibilities
	• to work collaboratively and find a common language
	• to guarantee continuity in the use of portfolios
	  • from kindergarten to school
	  • between grades
	• to involve parents
	• to protect privacy

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Teachers' prior experience with portfolios

Teachers' prior experience in using portfolios varied from non-existing up to three years of collecting a portfolio during teacher training studies. Two teachers stated that they had not utilized portfolios in their work at all. Other teachers' experience can be divided into three groups according to the types of portfolios, namely learner portfolios, student teacher portfolios, and collaborative school portfolios.

The use of learner portfolios varied on a continuum from teacher-centered to a more child-centered approach. The most teacher-centered approach meant collecting written information about children through observation. Six teachers described child's personal curriculum as a form of assessment comparable to a portfolio. Varied data were collected on children with special educational needs in order to follow the development of their skills and developmental tasks. This information had been utilized especially in the planning of future activities and in discussions with parents.

> *Personal curriculum of a special-needs child can be thought as some kind of portfolio. These we had to draw up for several children every year.*

In kindergartens so-called pre-school folders were collections of different materials children had produced during the pre-school year. Altogether seven teachers mentioned this kind of preschool folder, which was mostly a very teacher-directed way of collecting e.g. drawings, photos, stories and different preschool exercises of children. However, some teachers had also given space for children's choices of the contents and so children's ideas and descriptions about the daily life of the kindergarten were included in the folders. The pre-school folders were no longer just collections of works but had moved toward more child-centered 'folders of growth'. The main function was to reflect child's day care memories. Still, the answers indicated teacher's central role in collecting the contents and directing the use of portfolios. As one teacher described, the aim was that through portfolios teachers could check and ensure that each child got versatile learning experiences.

> *I have collected works of pre-school aged children to folders during one year. We don't have much time to study them, but if one of the children need to be observed it is very fruitful to examine works. In that way you can also control that every child does at least some new tasks, and not only 'escapes' to familiar and safe.*

> *I have been carrying out a portfolio during one year in a day care child group. We did a folder about each child. For it we collected photos of a child, child's works (paintings, handicraft etc.), tales narrated by children, snapshots from excursions, stories from events, skills and knowledge, 'developmental milestones', learning of the phoneme 'r' etc. etc.*

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Related to assessment, we utilize in our kindergarten a form for personal curricula. This is drawn up together by persons responsible for a child's care, upbringing and teaching, i.e. a personal aid, parents and experts working with a child. We also have preschool folders, exercise binders and parents' discussion forms. Folders are showcase folders, in which children can collect the works they prefer. These folders are collected together with children in order to develop a child's self-assessment. A teacher can of course collect a portfolio and then she will choose works to be kept and information about a child and her development.

In light of the answers there was some, even if still rather modest, continuity in the usage of portfolios. One schoolteacher told that she had continued with her students the construction of their portfolios, which had begun as pre-school folders in the preschool group.

In the grades 1–2 we have collected to a folder students' thoughts, assessments, tests, works they have selected, parents' opinions, photos. I have given quite exact directions about what to collect into the folder, but students have themselves chosen the works and told why they chose them.

One teacher had compiled a portfolio during her teacher training studies. However, she claimed that along three years of studies it had gradually become merely a collection of grades. Four teachers had prior experience in using a portfolio as a means for professional development. These teachers had participated in the action research project in which a school portfolio served as a tool for highlighting the collaboration between preprimary and primary education. After the project, they had kept on using collaborative school portfolios in their daily work.

6.1.2 Introduction to portfolio assessment

The analysis of strategic questions indicated that teachers had rather teacher-centered view of assessment. The main aim has been to gather information about child's development. The most common assessment method for this has been child observation at least in kindergartens. A portfolio was defined as a process-oriented means for documenting child's development and describing child's life over the kindergarten years. Also portfolio's function in enhancing continuity between different educational levels was underlined. Still, a portfolio appeared as a rather teacher-directed method for collecting information about children. The more self-directed and self-assessing aspects of portfolio assessment were less emphasized.

In their answers, teachers addressed both the strengths and problems of portfolio assessment. They indicated some basic issues, like parental involvement and privacy protection, that need to be considered in portfolio development. Most of the teachers

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had some prior experience with a certain form of portfolios. Only few teachers indicated the purpose and use of portfolio as a method for teacher self-assessment or for collaborative display of kindergarten activities.

The portrait of strategic questions directed the content and proceeding of teacher training in the area of portfolio assessment. Alongside the proceeding of technological training during spring 1998, teachers were introduced more deeply to the general principles of portfolio assessment and digital portfolios, particularly. Central issues dealt with in training sessions included the stages of portfolio process, the collaborative nature of portfolio construction, and the meaning of multiple perspectives in portfolio assessment. Teachers also familiarized themselves with and assessed digital portfolios already existing on the web.

In the training sessions, the aims and principles of digital portfolio development were specified and discussed with teachers. Digital portfolio development was determined to have multiple functions, which were closely related to the principles of action research (see Kemmis 1997). First, digital portfolios were seen as a means for *making childhood education visible* through case studies about kindergartens and schools. The aim was to inform people outside childhood settings about the objectives, contents, and methods of these settings, but also about the general value and meaning of childhood education. Teachers were asked to act as researchers of their own pedagogical practices and to consider questions like: What things would we like to tell about our kindergarten or school to other people? How are we going to present our daily life? How can we document our work?

Second, it was presumed that the process of digital portfolio development would also help teachers in the *ongoing kindergarten and school development.* Through their own portfolio development, teachers would become reflective practitioners who could utilize the collected portfolio evidence as a basis for self-assessment, further planning and development. By sharing their portfolios with other teacher groups, they would get an outside perspective for the work done. They would become critical friends for other teacher groups through giving feedback for their portfolios. Third, digital portfolio development would offer teachers a possibility for widening their professional expertise in *the use of information and communication technology* as well.

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6.2 Planning portfolio contents and documenting daily practices

We had a meeting about the continuation of the project for our part and we came to the following conclusion. The contents and structure of the portfolio: 'Traditional' folder of growth has been in use with each child for only one year in our kindergarten. It has become familiar to parents and children only recently and that is why we can't move directly to an electronic one. These folders contain so much 'feelings'. We will get a scanner to our kindergarten with which all groups can produce material to the folders. So, in the transition stage the equipment will be used in the production of portfolio materials. When the staff has learnt to use the equipment, we can better move on to digital versions. Example about the first digital portfolio could be:

- *Creation of a file for the child group 'Small bears'*
- *A file for adult use: in the file, there will be collected observations, assessments etc. about individual children, summaries every half year*
- *Children's works will be kept in their own folders*
- *In one file, there could also be children's personal curriculums*

Excerpt 6.1 *A preliminary portfolio plan of Pupuhuhta day care center*

During the second cycle in spring and summer 1998, the focus was on planning the portfolio contents and documenting the pedagogical practices. The aim was that teachers would reflect on issues to be made visible about their daily work. Planning took place within collaborative groups, but in the joint training sessions the plans were shared with the whole group of teachers as well. In early summer all participating kindergartens and schools were visited in order to help and guide teachers in portfolio design. Teacher groups were asked to contemplate their first ideas for portfolio contents.

The above excerpt (6.1) represents a day care center which had already utilized portfolios as a means for child-centered assessment. After joining the digital portfolio project they had started to debate upon the role of digital portfolios in their assessment practices. In the preliminary portfolio plan, they stated their interest in using computers as vehicles for documentation. However, they wanted to concentrate on developing teachers' computer use before starting the construction of digital portfolios. They also aimed at continuing with child portfolios in a traditional folder format in order to get accustomed into their use.

More generally, teachers' preliminary ideas for contents were rather incoherent and unspecified in nature and often without stated functions or focus areas (Table 6.2). Teacher groups listed loose combinations of possible contents, documentation

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Table 6.2 *Examples of preliminary ideas for portfolio contents*

Setting	*Content areas*	*Methods of documentation or specific documents*
Kindergarten 1	Group and staff presentations, development projects, collaborative partners, contact information	Rising sun as a picture for the first page A photo of the kindergarten Photos about activities
Kindergarten 2	Curricula for different areas of emphasis	Photos of staff and two child groups Other photos taken with a digital camera Kindergarten's ground plan
Kindergarten 3	Child groups Kindergarten history Emphasis areas in 1997–1998 Events: garden party, harvest feast, night event, spring trip to the Ähtäri Zoo, workshop week	Staff presentation (photo) A child's drawing of kindergarten Photos of daily activities
Kindergarten 4	The contents will follow the structure of our previous collaborative school portfolio.	
School 1		Group photos Photos about different activities e.g. children skiing, first graders with fancy clothes
School 2	Not yet specific material in mind and not yet plans either. The continuation of collaboration between kindergarten and school is unclear, because the teacher for the preschool group has not yet been chosen.	
School 3	No exact plans so far. General presentation about school activities.	

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methods and even specific documents like photos or pictures that they wanted to include in the portfolio. Usually the content of a kindergarten portfolio was drafted as consisting of child group and staff presentations, goal and emphasis area descriptions, and display of projects, events and activities. At this point, they did not yet reveal any personalized aspects of the childhood settings involved in the study.

There were also differences in the extent of the content ideas. Some teacher groups had instantly clear ideas about things to be displayed in a digital portfolio. For some, it was more difficult to find things that would be worth sharing with others. These teachers thought that in their kindergarten there was nothing special or different from others. Sometimes special areas came out in the joint portfolio sessions when colleagues from other kindergartens indicated things they had already heard of or knew about regarding the work of others. Also the possibility to present the daily activities and discuss them with other teachers and an outside visitor, in this case a researcher, opened new dimensions of work for the teachers themselves, as well.

During visits teachers were encouraged to have deeper discussion with their colleagues concerning the basic things of their work and pedagogical practices. Teachers were asked to discuss the following questions concerning e.g. pedagogical goals, possible portfolio contents, documentation methods, and available technology (see Barrett 1998; Boston Pilot Schools Network 1997; Kankaanranta 1999):

- What are the central goals of your kindergarten or school?
- What are the areas of emphasis or specific features or activities?
- What things and meaningful experiences would you like to present and describe in your digital portfolio for interested audiences (like parents, other teachers)? What could your digital portfolio include?
- How are you going to document these things?
- What will be the structure of your portfolio?

The discussions were summarized in written portfolio plans, which later on were sent to the research group for closer examination (see example in Table 6.3). In the planning, content mapping was utilized as a tool for revealing and visualizing the content areas and structure of digital portfolios.

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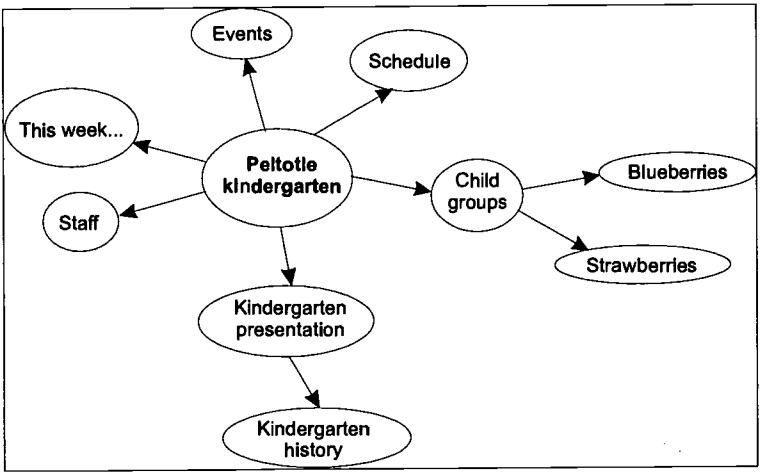
Table 6.3 *An example of a written portfolio plan (Peltotie kindergarten)*

What are the central goals of your kindergarten or school?
[Our aim is] to plan good and versatile activities according to children's age and development. In activities we will pay attention also to children's wishes (one week is planned by children). We'll remember basic things and the basic task, in addition we'll have something new and extra every year. We'll discuss and try to maintain good relations and collaboration with parents, take families into account, and support them.
What are the areas of emphasis or specific features or activities?
Music; mother tongue: nursery rhymes, phonetic exercises, theatre, sign language; preschool education in a specific group; division of children to small groups.
What things would you like to present and describe in your digital portfolio for interested audiences (like parents, other teachers)? What could your digital portfolio include?
Child groups: age of children, what kind of yearly plans we have for them, group size.
Staff: titles and joint planning. Planning framework for a preschool group, a plan for the younger group. Areas of emphasis. The + and - of an old kindergarten (facilities, homeliness). With photos we will describe our kindergarten (outdoors environments, inside photos). We will inform about our events before and then afterwards we will reflect on how everything went and what it was like. Celebrations and other traditions, our daily schedule. If we were really active, we could put every week our weekly program there.
How are you going to document these things?
Photographing, weekly plans, drawings, craft works, a video, to write stories, to interview children and adults, to ask a newspaper reporter to come for a visit.
What will be the structure of your portfolio?
See the concept map.



What kind of technology do you have for digital portfolio development?
[We have] one computer, a printer and a scanner.

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The documentation of daily life in kindergartens and schools was started at an early stage as a significant part of the portfolio development process. In documentation teachers concentrated on those areas they had outlined in written plans. However, the plans were also revised several times during portfolio development. Documentation was integrated as closely as possible with technical training and self-directed practicing. For example, the kindergarten teachers practiced their newly acquired ICT skills in image processing by scanning photos and other materials for their portfolios. In addition to the joint training sessions, teachers were provided with on-site mentoring in small groups or individually in areas where they felt a need for further support, e.g. in image processing. This was seen as essential for enabling teachers to transfer and apply their skills into their own technological environment, i.e. to work with the equipment and software in their use.

Most of the kindergarten teachers told that during summer months they would have more time for portfolio activities because of a more flexible daily timetable with children and because there would be fewer children at kindergartens. But again, this could not be generalized, because in some kindergartens the summer vacations tied the rest of the staff to work in child groups. In one town, summer time meant better access to computers because one primary school offered their computer lab for use. This possibility was welcomed and utilized with satisfaction especially for image scanning.

6.3 Digitizing the selected materials

The main aim of the third cycle in autumn 1998 was to start digital documentation of planned content areas, digitization of the selected materials and construction of the first version of a digital portfolio. The results of the second self-assessment showed that in this phase the teachers' ICT capabilities were not advanced enough to tackle the technical issues of web page editing (see Chapter 5). However, it was considered essential that teachers could get an idea of how the plans and ideas for a digital portfolio would look like on the Internet. Thus, it was decided that technical experts in the research group would edit the first versions of digital portfolios based on teacher-selected materials. For the time being, teachers' main responsibility rested on content design. During this cycle teachers' technical training was continued especially in the area of web page editing and the choice of appropriate digital portfolio applications was examined.

Teachers sent their written plans with included portfolio materials to the research group. In the first portfolios it was most important to outline the structure of the portfolio. In most cases the materials included a draft for the front page (see Excerpt 6.2) and some basic information about the daily activities and more structural things

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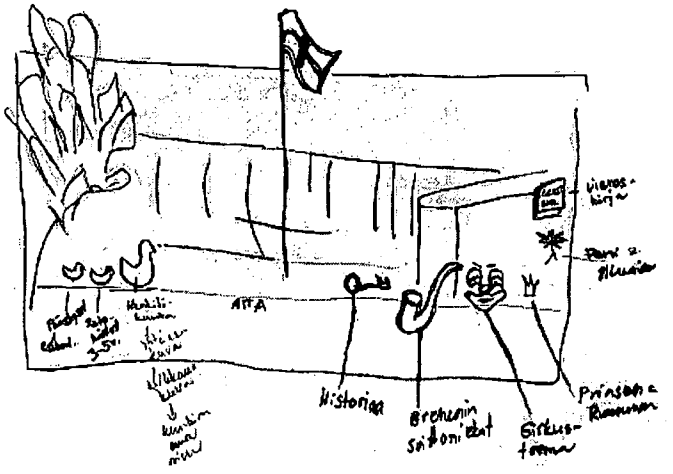
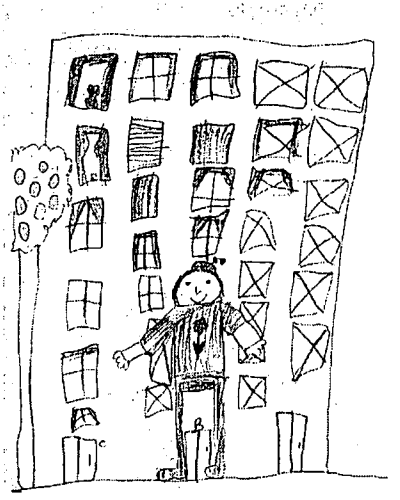


For the front page a drawing of the kindergarten, featuring the front yard and building, a flag waving on the pole. Clickable icons for history, projects, staff, child groups etc. (Viiskulma kindergarten)



In the front-page [we will have] a drawing made by a child. In it, a child is in front of an apartment building. The door is a clickable link into the kindergarten pages. Some information for parents. Names of the child groups, which lead to the pages of 'Strawberries' and 'Blueberries'. Inside: history, areas of emphasis, staff information. Also events will be presented e.g. harvest festival in autumn, parents' garden-night (parents collected cones), spring trip to a zoo, preschoolers' night event. The children in 'Strawberry' group planned activities for one week: indoor gymnastics, trips, preschool tasks, crafts, and playing. They chose the activities in which they would like to participate. (Palomäki kindergarten)

Excerpt 6.2 *Two drafts for the front page with short explanations*

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about the kindergarten or school organization. In the beginning of autumn each teacher group was provided with access to their portfolio. They were requested to examine its current situation, comment on it via e-mail and to continue on its content design.

> E-mail for teachers 25.8.1998
> *We have worked on your kindergarten's digital portfolio according to the material you gave. These www-pages are not yet generally available on the Internet but we'll give each of you the address to your pages. We hope you will soon tell us how you like the pages. We hope you would consider to what direction you would like to build your portfolio. Our purpose is to continue working on the portfolios together with you. We will organize some web training in autumn. In the training you can either start a new page or develop further something which has been already started. We hope you plan the materials and ideas beforehand. However, you can still also send us such material that you would like to attach to your portfolio.*

Teachers' responses implied that the possibility to see one's own ideas of content, although still modest in quantity, visualized on web pages gave them an impulse to continue with portfolio planning and editing. In a way this was the first instant for portfolio presentation. They could look at their own work as readers of a portfolio. Content mapping as a device for portfolio planning made teachers to ponder about central concepts in outlining things they wanted to include in a portfolio. There was also already a need for revising the materials teachers had given for the first version.

> *We read your message and started to consider the content of our web page. The page looked great! Thank you! (A message from a kindergarten)*

> *The photo-section is good. More: curriculum, staff photo, description of activities, third child group. I would like to learn to do scanning with children. (An e-mail message from a kindergarten)*

> *We have seen our pages. They look just nice, but some corrections need to be done in the contents. Those things are from last year and thus old.*

> *In our view the planning of our portfolio is in good shape. Could we please borrow a digital camera, so that we could get better and timely photos of the kindergarten environment, park and about teaching and play situations. We have updated our material slowly but surely.*

The aim was that now the teacher groups would continue in a more individual rhythm with their portfolio construction. There was, though, difference in the level of activity and independence. While some wanted to take more responsibility over digital portfolio development and contacted the research group for support and negotiation, some others continued sending their materials for page editing. But there were also some whose activity depended on constant urging and reminding by the research group.

I would like to discuss our home page face-to-face with you. Does someone of you have time to meet me here in kindergarten or at someone's computer?

While the emphasis was mostly on documentation and digitizing the materials, teachers made also some effort on actual web page editing with the help of a technical assistant visiting on the spot. However, generally the progress of skills in HTML editing was slow.

The portfolio project and the first versions of the digital portfolios of kindergartens or schools were presented also to parents. Some parents immediately got interested in this new form of communication through e-mail and the Internet, which could be utilized also in the collaboration between childhood educational settings and homes. In one kindergarten the parents participated in the planning of day care activities. Their proposals were attached to the portfolio, as well.

We shortly presented the portfolio project to parents, and also our home page to those interested. At once one parent proposed something we hadn't thought about before: our kindergarten has an e-mail address. Thus parents can well communicate through it and even network with other parents.

We had our parents' night and parents presented this kind of expectations and proposals for our work. We hope this to be included in our kindergarten's portfolio. What could be a title for it in the mind map? We thought to relate it to the practice, but because the data is so ample, parents could be as an own title - or how? Parents' proposals have also been divided into bundles according to the themes of happenings, in addition to child grouping.

Teachers' e-mail messages revealed that in some kindergartens the web portfolios aroused concerned discussions about the ethics of Internet publishing, especially about the use of photos including children. In one kindergarten this led few parents to forbid the use of such photos that portrayed their own children. Ethical issues had already been discussed in the training sessions and teachers were guided to present the project to parents and ask their permissions and opinions especially for the use of photos. Parents' reaction was a good reminder of the importance of ethical considerations.

Unfortunately in the photo of our Independence Day anniversary there were children whose parents forbid the use of photos. This forbidding started from a mother, who encounters in her work many troublesome things happening in the world around us. And then some other families joined the prohibition.

One family gave a negative decision for publishing their child's photos on the web. Thus, we need to check one of our photos. We had a problem with the photo in which there are five children in front of the Melukylä scale model. The photo needs to be edited so that the boy on the right with black shirt will be cut off. He is the child who must not appear on our web pages. Otherwise we would like to use this photo.

In December a hands-on workshop was organized for teachers about the use of digital portfolios. The main instructor in the workshop was Helen Barrett from the University of Alaska Anchorage, who is an expert in computer programs used in electronic portfolio development. Most of the teachers were eager to participate in the workshop, but there were also some who were not able to take part. Main reasons preventing participation were unsuitable time of the workshop, problems with daily work or experienced difficulties in the use of ICT.

Here are three enthusiastic participants for the 12th of December training about digital portfolios...

We are very busy and we have had many kinds of difficult things at school this week, some of them pretty bothersome. Now it feels like my planned participation in the portfolio workshop must be left aside. Because of these other hurries I have not had much time to concentrate on this thing and I haven't collected any material. Also my strength is low and I must rest now, so that I can live through all Christmas hassle next week. If my cancellation causes problems there, please let me know. Let's see what I can do for my participation then - because the seminar is interesting.

In principle this interests me, but because we don't have any equipment in our use, so that I could use them by myself somewhere, learning would be in vain for me in this phase. So, I won't participate.

Before the workshop the choice of appropriate applications was carefully examined with the instructor (see Barrett 2000). It was decided that different applications would be shortly presented for teachers but that the main emphasis would rest on trying out basic HTML editing with a user-friendly web-editing program. In the seminar the whole participant group met each other and teachers shared with others the current versions of their digital portfolios.

In the one-day-long workshop teachers did not make much progress with their portfolios but they got an idea of what HTML based web-page editing is like. The following message from one teacher group summarizes the general feelings.

Thank you for the Saturday training. It was interesting and nice, though also heavy. The trainers were nice! Thank you for everything. Page making did not proceed for us, but we got photos scanned. We thought with M that we will still plan our pages and text for them, and we could send them to you, so that you can put them in the right place, and better and quicker than we could. We feel that his thing was too difficult and quick for us and that this is why the pages didn't get finished. I have so rarely time to sit at this computer, and things get forgotten. Also, we don't have anyone, whom to ask for guidance at difficulties. In spite of all this, let's continue practicing, plan pages and new photos and let's have a relaxing Christmas. (An e-mail message from a kindergarten)

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Teachers were pleased to learn about different portfolio applications and to see actual portfolios either on the CDs or on the web. The possibility to meet and share ideas with other participants gave them a further sense of a common endeavor. With the hands-on experience on HTML editing teachers could better estimate their own possibilities for this kind of editing work. The reality of their daily work with restricted time resources for web page editing made them doubt their possibilities to learn and utilize HTML editing. They rather preferred reliance on outside technical support in the technical construction of the portfolio. Yet, they did state their willingness to continue with practicing.

6.4 Compiling a digital portfolio

The fourth cycle during January - September 1999 was a main period for the construction of digital web portfolios. The aim was that teacher groups would become more independent in their portfolio work. The previous cycle indicated that this would require as user-friendly an application as possible for the technical construction of portfolios. During this cycle, teacher training was organized according to teacher-specified needs, but the emphasis gradually shifted towards content issues. In addition to the shared workshops, on-site mentoring was continued and the possibility of student mentoring was explored in one kindergarten.

In the on-site meetings during spring 1999 the current situation of portfolios was discussed and portfolio plans and content maps were revisited and revised. In many cases there was seemingly progress regarding the depth of content mapping. For example, in the first content map drawn in summer 1998 one teacher group had only a rough framework for the portfolio contents. The second, revised map drawn in spring 1999 displayed more structured ideas for it. The teachers described the contents as follows:

> *Projects "Fairy tales" and "Circus" from last spring are such which could be documented in a portfolio. There are some photos about them although we did not remember to take a lot of photos. In children's folders there are photos but child photos and works can not be used without permission. A description about the fairy tale project: when and how it was realized, children's stories. History: newspaper articles and photos about the kindergarten's history. In one book there is something written about our kindergarten. From year 1983 until now there are photos and texts about the kindergarten's history. Teachers could choose one from each year. The kindergarten has been popular in local newspapers because it was the first one, which was build specifically as kindergarten.*

Excerpt 6.3 *A description of the planned content in Viiskulma kindergarten*

In the meetings actual portfolio work was continued and mentored. A research assistant acting as a mentor in on-site meetings described the portfolio progress in her research diary as follows:

> *Visit to Kaipola kindergarten*
> *Teachers had realized the meaning of portfolios as a means for assessment. They have figured out that by clicking a specific aim a reader can look how the aims had been achieved and what kind of problems there had been ... They thought that when they evaluate afterwards the whole year they can revisit the portfolio for the aims and activities. And they can use them as a base for planning aims and activities for the following year.*
> *The head of social 'affairs' had asked the kindergarten to present in some event their portfolio for others. This had inspired teachers in investing time and effort for portfolio development. Teachers wanted to continue trying with html editing by themselves and on their own time. In this meeting they edited aims in html-language. In this way a teacher who did not participate in the workshop got an idea about html editing. The most problematic things are navigation between programs, and some basic things like saving a file need still further practicing. Both of the teachers are sill cautious with computers, although one teacher had even installed some software from a CD to their computer system.*

In general, the digital portfolio had started to gain a firmer foothold as a natural part of kindergartens' and schools' assessment practices. Teachers had spread information about portfolio work to people outside their settings. Web page editing was continued courageously and related skills were introduced also to those teachers who had not participated in the workshop. Portfolio construction was understood to be a continuous process of editing and revising as is expressed in the following excerpt from the research diary:

> *Visit to Keski-Palokka school*
> *Teachers had again considered the outline and they did have a proposal for a new front page. The heading for the front page would be 'Collaboration between preprimary and primary education in the school'. The front page would be linked to the school's web page and vice versa.*
> *One of the teachers argued that their reflection should be deeper. By this she meant that they should bring forth the things in which they succeeded and which things need further improvement. The teachers considered a possibility that single aims would have links to the pages on which they reflect on the positive 'results' and possible problems in regard to these aims.*
> *However, the situation in the school is unclear with regard to teachers. Primary school teachers don't yet know which grades they will teach the following year, and it may happen that the preschool teacher will start a parental leave in the autumn. All the teachers are enthusiastic to continue in the project, but stated that intensive continuity with portfolio activities may change to a more occasional web adventuring.*

In the previous school there was constant uncertainty about teaching staff. This was especially difficult because the basic idea of their digital portfolio was to show and

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develop collaboration between preprimary and primary grades. Thus, they felt it important to have good and steadier relations between teachers so as to concentrate on portfolio work. One of the teachers was concerned about the level of reflection in their portfolio. They planned to make reflection more visible through linking the aims with the reflective statements about results and problems in terms of attaining the goals.

The search for an appropriate portfolio application led to a positive result and all the kindergartens and schools were offered a possibility to experiment with a web application, which was originally designed as a shared network magazine for schools participating in the EU Comenius project (http://cce.peda.net). The application was deployed for portfolio construction. All teacher groups were interested in getting an introduction to the application and after this they could freely decide whether or not to take it into use. At the time, all the participants decided to continue portfolio development with this application, because they realized its user-friendliness in comparison to HTML editing. Kindergartens and schools were visited frequently in order to assist and mentor their proceeding with both the technical and content issues. Most of the teachers also actively utilized e-mail to ask for guidance:

> *We would like to create a new section into our portfolio and for it three subsections. We don't anymore remember how it can be done. Could we get help? The section would be 'Children's pages' and its subheadings would be 'Children saying', 'Children's work' and 'Photo album'.*

Later on, one kindergarten decided to return to the use of HTML based editing, because they found it a more suitable means for technical construction matching their needs and goals. The male teacher in the teacher group was interested in learning about web page editing. At first he combined the use of portfolio application with HTML editing. He got help from a young boy who had become interested in web page design after participating with his mother in the portfolio workshop organized in the previous December. He became such enthusiastic a web page designer after the seminar that the kindergarten got a special technical assistant of him, and soon he held the main responsibility for portfolio editing in this kindergarten. After that their digital portfolio has been continuously technically reconstructed and updated by him according to the plans and directions of teachers. This arrangement proved convenient for the kindergarten because they wanted to concentrate on the content planning, documentation and assessment of activities and events.

The compositions of teacher groups varied during the portfolio development process. This was mostly due to the constant changes in the teaching staffs, in general. In few cases teachers withdrew for a period of time from portfolio development because of feelings of anxiety or non-competence. There were also individual periodical changes in the amount of intensity or investment in portfolio development. This was usually directly related to the staff situation and different leaves from work.

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Although I'm currently on an alternation leave I would like to continue in the project. From the project pages I'll follow the situation and availability of training sessions. I'll participate if I can. (A school teacher)

I have returned from an alternation leave. We have discussed whether I could continue in this project from the part of our kindergarten. The other teacher is so overloaded that she is ready to shift the main responsibility over to me. What is the situation now and are all the kindergartens from our town still participating? I missed also the training organized in March because I was not at work yet. Have I lost the threads or is it still worthwhile to continue? I would like to continue in the project, even though sometimes I have difficulties with time and sometimes I feel that I don't have enough brains, either, but I would surely have effort! (A kindergarten teacher)

The progress of the study showed that teachers needed support in the diverse stages of digital portfolio development. The amount and form of support varied from one setting to another. In order to satisfy the emerging needs, student mentoring was examined as one form of teacher support. The experiences in a previous study about development of school portfolios had indicated that students could have a significant role in guiding teachers in portfolio work (Kankaanranta 1999). This encouraged and inspired in contacting students in the field. As a result two students from the Department of Early Childhood Education at the University of Jyväskylä participated in the digital portfolio project during spring and summer 1999 in order to do their research practice involved in the studies.

From the student perspective, the aim was to introduce them to the mentoring of teachers and on the idea of the use of digital portfolios in early childhood education. After familiarizing themselves with the digital kindergarten portfolios, the students chose one kindergarten to focus upon. They were especially interested in the intercultural education implemented in the kindergarten. In this way this kindergarten was provided additional mentoring in the digital portfolio development. The students participated in the content planning and they also gave feedback to the teachers. Their collaboration with the kindergarten was highlighted in a joint conference presentation. In this way both the students and the teachers got an opportunity to share their experiences and ideas about intercultural education and digital portfolio assessment in an international forum of experts in intercultural education.

After the practice period, students reflected on its progress, i.e. on the things they had learned or experienced and on the meaning of mentoring for the development of their expertise in early childhood education. In their practice report (Excerpt 6.4), they described that the most challenging things for them had been to explore the use of a novel assessment method, namely digital portfolio, together with the teachers and to have an English presentation in the congress.

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Common reflection

The project emphasized the development of early childhood education. A digital portfolio is a new method, which includes many elements to be learned and developed. We believe that also our ideas and thoughts have advanced the development work. We have utilized and passed on our expertise both in Pupuhuhta and through the congress on Intercultural education. We have acted as independent researchers searching information and forming new insights for us about information networks, and we have acted in active interaction with each other, Marja and also with staff in Pupuhuhta center. The framework for the project is an ecological approach. This has been an essential part of our research project in which the interaction between various educational contexts is central. We, as students in early childhood education, acted in many contexts, of which the most important were the educational field or Pupuhuhta center, the research institute and surrounding society. Interaction with society was in our case realized widely through the Congress on Intercultural education. This kind of collaborative network is a new thing in early childhood education and the central aim of our research practice was to develop it.

Student 1

In Pupuhuhta we had a role of an expert and a consult along with the role of a researcher. In the beginning I was hesitant about the adequacy of my expertise in mentoring in this area. Then I noticed that even small things have a meaning in the proceeding of things. At the same time expertise developed for all of us in the project. [...] A digital portfolio is at its best interest arousing and easy to use. One page should not include too much and it must be clear and illustrative. The first page should give a general idea about the contents and it should guide the reader to look at interesting content areas more closely. I realized that the choice of things to be included requires a lot of reflection - how to shortly describe things which I could easily write about in several pages. It is not enough to think what seems good to us, the portfolio writers. We must try to take a perspective of an outsider who does not know anything about our kindergarten beforehand. [...] Encounters with every child and family are also encounters with another culture. Each child and family has its own history, traditions, living environment, educational background, and values - a cultural living environment.

Student 2

[...] The most important issue for me in the research practice was that I did participate in the development of novel methods for collaboration between research, studies and practice in the area of early childhood education. This is valuable in itself. I think that collaboration was realized splendidly. All actors supported each other and interaction was natural. Collaboration does not carry far without a common important aim. We had two aims: to create a digital portfolio and a congress presentation. The realizations of these aims exceeded our expectations. Collaborative working was for me, but I think that also for others, very rewarding. All actors brought their own contribution and strengths to it. [...]

Now I have noticed that in the beginning my view of the research practice was narrow. I saw only two separate contexts in which we would act. Now I perceive the whole collaborative network that was created between different contexts. There are lots of relationships and what we are doing now affects wider issues and even in ways we can't see now. Our collaborative efforts affect Pupuhuhta day care center and me as an expert. In addition there is e.g. the collaboration between school and kindergarten and of course a

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single child. The creation of new collaborative links takes a long time, but we have now participated in the development of such a tool that surely has a future. Even though a digital portfolio is only in the development stage it already builds bridges between educational contexts.

Excerpt 6.4 *Students' self-reflection on the practice period (Dahlblom & Ikonen 1999)*

They felt empowered and content with the success their presentation received in the audience. In their report they also reflected on the appropriateness of an ecological approach in this kind of multilevel collaboration between the respective fields of early childhood education, teacher education, and research. The students felt that also their own role had been significant in the overall development of the use of digital portfolios, but that they had also themselves gained new expertise in this field during the practice period.

6.5 Sharing and evaluating portfolios in the networked community

In the fifth cycle during October 1999 - June 2000 the digital portfolios of kindergartens and schools were published on the web, which started a collaborative process of sharing experiences of pedagogical practices and co-constructing expertise in the field. Some parts of the portfolios had already been published earlier, but in this cycle the process of sharing and collegial feedback was especially enforced. Teachers had been complementing and updating the contents of their digital portfolios either according to their own plans or in response to the feedback received from other teachers, students working in the project or from the researcher.

In the end of autumn 1999 all teacher groups were contacted and asked about their current situation and willingness for continuing digital portfolio development. In their answers teachers stated that they still were interested in portfolio work but that they needed further mentoring in technical issues like scanning and the use of the portfolio application.

Of course I am interested and I will gladly have guidance. I have really not had time to think about this and also the address was missing for a while. However, I think that it would again be time to address the matter. I have ordered scanners for kindergartens and myself, but we have not received them yet, but hopefully soon. (A special teacher)

We are still wondering the same thing; where we can find 'Letters to the Editor'. And another thing then is the portfolio, which we are supposed to comment. We have not been able to access other portfolios. Do you already have the timetable for our meeting? (A schoolteacher)

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Teachers described in their e-mail messages that it was essential that forthcoming workshops and portfolio design needed to be timed according to the limits of their daily work. It was important that they would suit as well as possible to the experienced needs of teachers.

> *We would prefer that you could come here to our kindergarten because it would serve our needs better. And then more people could participate in the 'learning event'. It is impossible for us that several staff members could come to an outside event. (A kindergarten)*

> *It is really hard to organize meetings in mornings. I think it is difficult to detach anyone because in the mornings we work intensively with children. Also one of our staff will be absent that morning. (A kindergarten)*

Teacher support was offered through diverse modes of mentoring in several on-site and on-line workshops. The previous cycle had provided good experiences of students acting as mentors and this encouraged extending student involvement in the portfolio work. The exploration of student-driven mentoring was continued when another pair of students from the Department of Early Childhood Education did their research practice in the project. It was especially interesting to find out how this kind of mentoring relationship between young students and expert teachers would work out.

At the beginning of their mentoring period the students constructed their own portfolio pages in the web portfolio application environment. This was their way of introducing themselves to the teachers and also of familiarizing themselves with the use of the portfolio application.

> *Hello!*
> *We are students from the University of Jyväskylä, Department of Early Childhood Education.*
> *...*
> *Our aim is to familiarize ourselves with the portfolio project and the development of portfolios together with kindergartens and schools in the project. This kind of portfolio is new idea for us. It is really interesting to examine existing portfolios and to learn to develop our own portfolios. During our research practice we will work more intensively with some kindergartens, but we are going to familiarize ourselves with all the portfolios. We also hope that with our comments we can give you new ideas for portfolio contents.*
> *At the moment we are practicing with our own digital portfolios. Soon you will be able to take a look at them. We are looking forward to your comments and greetings!*

Students also analyzed all the existing digital portfolios to get a closer view on their content so as to be able to mentor teachers and give them feedback about their work.

Teachers welcomed the student mentors to work with them and visit them both virtually through the portfolios and physically in real meetings in the kindergartens

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and schools. Discussions and e-mail communications with teachers revealed that they had taken more ownership over their digital portfolios. They had identified areas in which they needed further guidance, invented imaginative survival strategies or 'strategic plans' for enriching their ICT capabilities, got fresh ideas for portfolio contents and distributed the portfolio address to various parties.

> *At the moment we don't get help for scanning from our town because our ICT coordinator is leaving. However, we have our own small strategic plan, which we can realize only in the evenings. We'll try to find some common evening time to realize our plan, so don't worry.*

One of the day care centers had even given the portfolio address to their foreign collaborators and presented their portfolio for visitors. Their portfolio had become a means of introducing day care activities to interested parties. They had also made a great effort in designing pages both in Finnish and English.

> *... We have 'proudly' distributed our portfolio page address to our French and English partner schools. We have presented it also to others who have visited us or have shown interest towards our work.*
> *Presently, we are in the middle of a time similar to what shops have during Christmas time. But we have planned the following for our portfolio development. Our technical assistant will come to work for us during summer. He will update our portfolio to correspond the situation in next August. In other words to correspond the beginning of the new kindergarten year. He will finish the incomplete pages e.g. the Newsletter page and add one 'travel diary'.*

In spring 2000 there were several on-site and on-line workshops, in which the students acted as mentors. In the workshops teachers were guided in the areas where they needed further practice. They also continued with their portfolio construction and commented on the portfolios of other kindergartens and schools. In early spring two workshops were arranged concentrating on the issue of feedback. Teachers had already been encouraged to explore and give feedback on the portfolios of other teacher groups. However, so far, there had been only some occasional comments in the feedback sections of portfolios. In order to enhance and structure the sharing process, a 'critical friend' system was built up. The idea was that each teacher group would function as a critical friend for another group. They were supposed to follow the progress of each other's school portfolio and give feedback on it. The content and quality of portfolio feedback is discussed in more detail in Chapter 7.

In the first workshop on feedback, the teachers were given a set of questions to support them in the collegial portfolio evaluation. The aim was to guide teachers to focus on the pedagogical content, authenticity and further development of the evaluated portfolio. They were asked to reflect at least on the following matters:

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- What was your first impression about the digital portfolio? * What did you like the most?
- What things were such that you would like to get more information about? * Did you get new ideas for your own work?
- What questions did the portfolio evoke?
- How was the daily life shown in the portfolio?
- How could the portfolio be developed further? Give some ideas.

The first workshop inspired the teachers on reading and commenting other portfolios. Still, according to the mentors most of the comments were rather superficial in quality and did not focus on the portfolio contents. They were typically more general comments on the layout and structure of portfolios.

> *One essential part of our work was to comment on portfolios in the feedback sections. We wrote our own comments and developed then a 'critical friend' system. Every kindergarten and school is a critical friend to another teacher group and they are supposed to comment on its portfolio. There were hardly any comments in the feedback sections before a common workshop, but then people started writing them. This could be further developed and there could be, for example, a meeting in which the feedback giving would be practiced. Now the comments are superficial and don't tell much. The aim is to go deeper and to give feedback especially about the portfolio contents. I think, though, that we have taken the first steps in this feedback giving. [...]*

It seemed that the idea of critical friends was not yet internalized. On the other hand, the general nature of feedback could be an indication of the fact that teachers did not dare to assess each other's work very critically because they were unsure of the effects of their feedback. It was discovered that the meaning, content and nature of feedback should be further discussed with teachers. There were, however, some teachers who already commented actively on other portfolios. One teacher even managed to comment almost on all the portfolios. She did not restrict her portfolio reading and evaluation to workshops or to working time but continued the reviews also on her own time. Her comments included also questions and ideas for further development.

In the second workshop on portfolio feedback, the teachers were given another set of questions directing their feedback. These questions focused on the realized and desired progress of portfolios.

- What new things did you find that attracted you?
- What progress had taken place since the last time?
- What things could be further developed?
- What could be done next?

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In addition to the workshops on portfolio feedback, there were several on-line workshops organized via a specific mentoring portfolio and more informal e-mail contacts, which concentrated on portfolio design issues. The student mentors created the mentoring portfolio into the portfolio environment in order to give guidance in different design issues. The 'letters to the editor' or feedback section of the mentoring portfolio was utilized in on-line workshops as a communicative device for questions, guidance and discussions.

> *Welcome to our web-based workshop!*
> *This time our aim is to reflect on and write the portfolio introduction page. You can find guidelines from the mentoring portfolio under the title 'portfolio introduction pages'. If you have anything to ask, enter your message in the feedback section of the mentoring portfolio. I will follow the discussion and place my answers there. So, please, don't use e-mail during this workshop. I hope you also will place a message to the mentoring portfolio about the participants in this workshop.*

In the first on-line workshop the main theme was the creation of a portfolio introduction page. The aim of this page was that teachers would present their portfolio to the readers and also shed light on the various issues concerning portfolio development, e.g. its intended purpose, audience, current stage and forthcoming developments (see e.g. Barrett 2000). This page was also intended to be a place for self-assessment about portfolio development and its contents. The student mentors attached guidelines for the introduction page into the mentoring portfolio (see Table 6.4).

Table 6.4 *The guidelines for the contents of the portfolio introduction page*

Portfolio introduction page
The aim is that you will describe and present your portfolio. • The purpose of the portfolio • Intended audience • What is your portfolio like at the moment? • Self-assessment on the portfolio and activities Reflection on portfolio development • What is best at the moment in your portfolio? • What has been most difficult in portfolio development? Have you found solutions for problems? • What is most important to you in your portfolio at the moment? • What are your interest areas? • What have you learned during portfolio development? • What kind of feedback would you like to receive from others? • How much time have you invested on portfolio development?

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Collaboration
- Who has participated in portfolio development? In which ways? Who has the main responsibility?
- How could you get others to participate?
- How are parents involved in portfolio development?
- How are children involved?

Portfolio utilization
- How could you present your portfolio to others?
- How could you utilize your portfolio?
- How are you going to develop your digital portfolio in the future?

From on-line discussions (Excerpt 6.5) it could be detected that already the first on-line workshop conveyed a certain sense of togetherness when the participants were interconnected and interacting through the web environment. Some teachers utilized the opportunity to ask help for page editing and some described their portfolio work. On the other hand, some teachers were frustrated because they could not detach themselves from work as well as had been the case in the face-to-face workshops organized outside the kindergarten setting. They were physically too close to the daily activities and were therefore unable to concentrate entirely on the portfolio work. Amidst their normal daily schedule it required the individuals a great deal of personal effort to find a few moments off the work so as to concentrate upon this kind of evaluation practice.

21.3.2000 workshop

Kindergarten 1: Here is M from Peltotie. S is also nearby; I'll ask her advice now and then. I sent A (mentor) a message also via e-mail, because I did have problems with this. But then I managed to enter this message.

Kindergarten 2: Wasn't it our aim to do the introduction page by creating a new column? I have tried to elaborate something, which is not yet suitable for publishing. I need encouragement in this!

Kindergarten 3: That was it. I couldn't do anything, only the heading. It doesn't work this way. I can't concentrate on this here. I'd need some privacy to do this. I already had to attend a meeting. So, I'll try to continue some other time.

Kindergarten 4: Also I need to go to a meeting. A question: could our portfolio introduction consist of those things we have now written. (Of course the text must be more accurate before publishing it.)

School 1: On the web?
We just noticed that there is a workshop. We have not checked our e-mail recently. We are just starting some pottery work with the first grade and P. has a meeting. Thus, our participation is superficial. However, we try to follow the proceeding of the workshop. Headings are OK! I'm now alone at the computer. So, I have placed the headings. We must reflect on the contents together. We'll continue.

Excerpt 6.5 *Discussions on the first on-line workshop*

The analysis of the portfolio feedback sections showed that there still was a need for inspiring and guiding teachers in acting as critical friend i.e. giving comments and assessment for others. Thus, this became a main theme for the second on-line workshop organized one month after the first one. The degree and content of teacher participation varied. Some teachers were still unable to completely release themselves from their daily kindergarten duties for the whole workshop time. These teachers did hastily the basic things, in this case acted as a critical friend for one teacher group commenting their portfolio. Some others succeeded better in concentrating upon the portfolio work. They had enough time both for commenting on other portfolios and for constructing further their own portfolio contents.

One teacher group followed the guidance offered on the mentoring pages and worked on their own for some hours. They managed to combine portfolio work finely with the child group activities. However, during that time period they did not participate in the on-line discussions at all, because the unfamiliarity of the application had caused them to think that there were no others present. After sending one message they realized that on the screen new messages appeared above the older ones, and that there were in fact many other participants attending the on-line workshop.

17.4.2000
Mentors: Welcome again to a web workshop. This time our aim is to act as critical friends for a teacher group and read and comment on their portfolio and also on another portfolio. Of course you can comment also on several portfolios. You'll find further guidelines from the mentoring portfolio.

A teacher from a kindergarten: M. is participating from kindergarten P. I hope there will be others, too. I don't have much time to be around, but in this short time I'll try to do everything that is needed.

A teacher from a school: When I comment on a portfolio, do I place the comments here in the feedback section or where?

A mentor: Enter your comments in the feedback section of the portfolio you are commenting.

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A teacher from a kindergarten: I have now given my comments onto the portfolio and now I will leave the workshop. See you and let's e-mail.

Teachers from a kindergarten: ...We have commented on the portfolio of kindergarten P. and we found it engrossing. A question for you: We would like to move the heading 'club project' from the list of contents under to 'water project' in the head column 'projects'. Now it is in the end of the list of contents. How can we change this? Do we go to the 'edit' in workshop, or how? Last time we talked in the workshop about links from child groups to the projects. You promised to consult Marja on this thing, how is it? Well, we don't yet have texts ready for child groups, but we are thinking about them just now.

Teachers from a school: We have participated for some hours as much as we have had time in the middle of making Easter birds. I don't know whether there are others around, but so far I have not seen any feedback on the pages.
... Well, I learn all the time new things. After sending my message I noticed that new messages appear above older ones. And then I also noticed that there are a lot of people here. Unfortunately, I don't know everyone by name and I don't know either from which kindergartens the writers come. Thus, I hope everyone adds her workplace in a message. Is there anyone from Kindergarten P?

Mentors: Kindergarten P. was not able to join this time. I agree that it would be a good thing to add in the workplace. And, please, could you add in also the date when you enter feedback in other people's portfolios! (A mentor)

Excerpt 6.6 *Discussions on the second on-line workshop*

According to the student mentors, teachers were in general satisfied with the diverse workshops. Teachers argued that common meetings or workshops were for them the best moments of portfolio development. In the workshops they could concentrate on working in a way that was not possible during normal working days, and time was utilized efficiently and enthusiastically. The student mentors estimated that the teachers had become rather independent in the portfolio work even though they still needed some support, too. The teachers hoped that workshops would be organized on a regular basis. Nevertheless, portfolio work was also finding its place among the work practices, as is confirmed by the following excerpt from a student mentor's field note.

Mentor 22.2.2000
I think that the teachers in the workshop worked fairly independently. From time to time they still need some help. Their comments about portfolio development are positive. The only thing that is experienced as restricted is time resource. That is why teachers consider workshops a good idea. In my view they now use also more time in portfolio development and planning outside workshops (e.g. in the workplace). For the next workshop the teachers wished that we would practice image transferring from a diskette to a server.

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I also asked how parents had reacted to our letter. According to the teachers there had been but few comments. Some teachers said that they had commented as parents on the portfolios of the kindergartens in which their child is.

The *portfolio application* was constantly developed and this meant that teachers also needed constant support in its utilization. During autumn 1999 the second version of the web-based portfolio application was taken into use. This version included some new features like the possibility to create multilevel sections, which meant that the portfolio contents could be better structured. The portfolio application included a specific editor section and its use was restricted for those who knew the password for it. The teachers could decide themselves when they wanted to publish their pages.

When the mentors followed and guided page editing, they noticed that there were differences in the publishing process among the teacher groups. While some teachers were ready to publish their outputs or stories right away, some others were very diffident in publishing anything they had produced. These teachers continued to polish their portfolio pages for a long time. In the editor section it could be observed that they did have many stories in good shape but still unpublished. The mentors tried to encourage teachers to share the work done. They advised teachers that the portfolio pages did not need to be totally complete and final before publishing, because it was possible to make revisions also to the published content. The student mentors also acted as an audience for portfolios and they commented on their progress both through e-mail and the portfolio feedback section.

Mentor 11.4.2000

I visited your portfolio and I remembered that you did already have something in store for your portfolio introduction pages and also some 'club project' things. I suppose they are still incomplete, but wouldn't it still be worthwhile to publish them? If you want, you can write on your portfolio introduction pages that your pages are still incomplete or under construction. I also remember that you also had some nice photos. You should go ahead and publish and share your pages with others, because you have so much material.

Mentor 18.5.2000

I visited your portfolio and I found that there was a new story 'Black cat's secret adventures'. I liked it a lot. It is always nice to see and read children's work. ...

Reply from Viiskulma:

That 'Black cat...' is our 'final story'. At first we planned to ask children about what they like in the kindergarten etc... but their answers were so 'conventional' that we decided to put in this story. We did this even though there is nothing else about this project on our pages.

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In the end of the fifth cycle, the researcher and one student mentor evaluated and analyzed comprehensively all the digital school portfolios. Each teacher group was given a written feedback report, in which issues of design and implementation were discussed. The findings of the evaluation are explored in Chapter 7. The final evaluation was a formal end for the field phase of the study. However, contacts with the teacher groups have continued also after this. The main goal has been to find out possibilities for the sustainability and transferability of digital portfolio work in the kindergarten and school cultures.

6.6 Conclusion: Design and implementation issues in the digital portfolio development

In this chapter, digital portfolio development has been examined from the perspective of portfolio process. During the action research study five cycles of portfolio development were distinguished (Table 6.5). The specific phases of portfolio process, and the contents and scheduling of the cycles were formed during the progress of portfolio development. In each cycle the focus was on certain design and implementation issues and also on the evolvement of teachers' ICT capabilities in order to provide a structure for and guide the teachers in the proceeding of digital portfolio construction. It was found out that it is impossible to distinguish any separate and sequential periods of documentation, selection and reflection. In portfolio work these phases are always intertwined and linked together, as contents are continuously revised and updated. For example, documentation of the daily life and pedagogical practices in kindergartens and schools was integrated with technical training and self-directed practicing.

The results of examinations revealed issues of design and implementation that should be considered in the process of digital portfolio development. In the three first cycles, issues of design were on the center of portfolio activities. After that the actual implementation became more topical. On the other hand, it is hard if not impossible to separate these two from each other, because, as noted above, portfolio development is always a continuous process in which design and implementation intertwine in continuous updating, revising and complementing of contents. According to Shaklee (et al. 1997, 64) a third crucial issue in portfolio development is the management of a portfolio assessment system:

> *Three issues are raised time and time again: design, implementation, and management. How do you design a portfolio assessment system? How do you find the time to implement a portfolio assessment system? How do you manage it once you do?*

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The exploration of management issues exceeds the scope of this study, which primarily concerns five cycles of digital portfolio development during an action research study and does not reach out to the evaluation of sustainability and continuity of portfolio work in the participant groups. This does not, however, diminish the significance of management issues as part of portfolio utilization. In fact, some of the design and implementation issues overlap with the management of digital portfolios, because all three are linked with each other. In addition, a fourth central issue is the evaluation of portfolios, which is the theme of Chapter 7.

Table 6.5 *The realized cycles of digital portfolio development in the study*

Cycle of portfolio development	*The phases of portfolio process*	*The role of ICT*	*Time*
I Grounding portfolio development	Reflection on strategic questions about assessment and portfolios Introduction to portfolio assessment	Self-assessment of teachers' ICT capabilities Basic teacher training in the use of ICT	November-December 1997 Spring 1998 -
II Planning portfolio contents and documenting daily practices	Documentation, reflection	Basic teacher training in the use of ICT Technology-supported documentation	Summer /autumn 1998 -
III Digitizing the selected materials	Selection, reflection	Follow-up self-assessment of ICT capabilities Technology-supported documentation	Autumn 1998 -
IV Compiling a digital portfolio	Selection, description, reflection	HTML editing of portfolio pages Design and introduction of the digital portfolio application	Spring 1999 -
V Sharing and evaluating portfolios in networked community	Publishing portfolios for presentation on the web, presentation Projection, exchanging feedback Final portfolio evaluation	The use of digital portfolio application On-line workshops	Autumn 1999 – Spring 2000 -

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Already the examination of teachers' evolving ICT capabilities revealed that crucial issues for portfolio development are the meaning of kindergartens and schools as contexts for portfolio development, teacher support, and careful choice of an appropriate application for the construction of a digital web portfolio. Different cycles of portfolio development verified the meaning of these issues, as the most prominent problems encountered were the lack of time and resources for portfolio work and insufficient teacher training and support in the area of ICT or assessment practices. In the course of the study, solutions for these problems were searched for through providing support and mentoring based on the needs of teachers and developing a user-friendly portfolio application. The progress of digital portfolio development triggered also ethical considerations about web publishing. The study indicated that some further design and implementation issues comprise the collaborative nature of portfolio work, evolvement of teachers' ICT capabilities, and creation of such a portfolio culture that values reflective practice. The meaning of these issues is further explored in chapter 8.

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In their portfolio evaluation report, student mentors reflected on the prevailing situation of digital kindergarten and school portfolios in spring 2000. This analysis was made a few months before the evaluation of portfolios in the end of the fifth cycle. The students' report conveyed teachers' positive attitudes towards digital portfolios and their construction. It indicated that there were wide differences in the implementation of portfolio contents but all teacher groups were enthusiastic about ongoing portfolio development. They were eager to receive support and guidance. There were differences in the extent to which portfolio development was a collaborative effort of a whole kindergarten or a personal striving of one person. The changes of staff constitution had affected especially one kindergarten: the whole staff had changed during the action research project. Still, the portfolio idea had proved its sustainability and lived through changes because the current staff wanted to continue its construction. All in all, it was evident that this kind of a novel idea sustains over years by the ones who have internalized the idea and meaning of it and who are ready to 'fight' for it.

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The portfolios are in different stages. The portfolio of Pupuhuhta center is what I think a digital portfolio should be. On the other hand, a more modest one is also enough. Puukila staff took seriously the feedback they received and now they are revising the description of their content areas. It is fine to realize how feedback affects and how people reacted to it. In Peltotie kindergarten there is one teacher who is fighting for the portfolio. She is active and really enthusiastic about it. From her also we have received encouragement and positive feedback. She uses her own time for the portfolio work. Staff in Viiskulma kindergarten has got lots of good plans ready - now they need to implement them. They wish more kindergarten visits. Palomäki portfolio is in good beginning. The staff of this kindergarten has changed almost totally from what it was when the portfolio project started. They are excited but they need more guidance, support and familiarization. Special teacher's portfolio is developing and also she is participating with a positive attitude. In Kaipola kindergarten the portfolio scheme is seen positively and they have plans. They need support and encouragement for the implementation of ideas. Vitikkala school is 'out' until spring, because the teacher responsible for this is abroad. In spring it is good to contact them.

Excerpt 6.7 *Student mentor's reflection on the portfolio development*

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CHAPTER 7

Portfolio cases and cross-case overview

The main aim of this research report is to examine the process of digital portfolio development for assessing and supporting early childhood education and teachers ICT capabilities. During action research cycles actual products or digital school portfolios were evaluated several times as part of a collaborative negotiation process. The active field phase of the study was concluded with a comprehensive portfolio evaluation in the end of spring 2000. In the evaluation the aim was to get a broad general understanding of the portfolios, including their design, implementation and content. The teacher groups were informed about the upcoming evaluation and asked to prepare their digital portfolio in such a form in which they wanted them to be evaluated and commented. In general, teachers were eager to receive feedback of their work. Some asked for further working time so that they still could complete some sections.

Examinations and evaluations showed that there were certain similarities but also clear differences in digital portfolio design and implementation. For the completion of the portfolio process, I consider it essential to present a few preliminary findings about this evaluation. I will start with three case descriptions, in which the development and contents of portfolios are analyzed. After the case descriptions specific issues of implementation are further discussed based on a cross-case analysis. Special attention is paid to the functions and main content areas of all the portfolios.

7.1 Three cases

Case descriptions were made of all the digital school portfolios that were evaluated in spring 2000. The following three cases were chosen to be included in this chapter because they represented diverse approaches in the digital portfolio development process.

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The first case introduces a group of schoolteachers, whose aim is to showcase and develop collaborative activities in bridging different levels of preprimary and primary education.

The second case draws a profile of an active teacher community in a versatile day-care center. In both of these cases, digital portfolios emerged as a tool for continuous self-study and development of teachers' pedagogical practices. This is featured in their portfolios as a process structure, as continuous updating and revising of contents and sometimes almost real-time authoring. These teacher groups were also active to participate in general development of portfolio methodology e.g. through speculating the features or restrictions of portfolio applications and constantly considering their own application choices.

The third case takes us to a kindergarten in a town from which all the kindergartens participated in the digital portfolio project. This kind of pedagogical technology-enriched practice was determined as a common endeavor for teachers in early childhood education. In this third portfolio the teachers aimed at introducing common day-care activities for diverse interested audiences.

The three case portfolios differ from each other in the extent to which the people in the ecology of a kindergarten or school participated in portfolio construction. In the first case the portfolio was implemented at the classroom level and the authors were the teachers of one preschool group and two primary school classrooms, respectively. The teachers documented their collaborative activities in the portfolio. In the second and third case, the aim was to present the activities of the whole kindergartens. In the other kindergarten the portfolio was constructed at the kindergarten level. The ecology of portfolio development was even wider in the second kindergarten, because this kindergarten represented the town's all kindergartens aiming at presenting their work through digital portfolios. In this case the portfolio development can be determined to have taken place at the town or community level.

In the following, case descriptions begin with a short introduction of the setting to illuminate the ecology of portfolio development and with teachers' own statement of the portfolio's purpose as an assessment device. Then the process of digital portfolio development is described and finally the main content areas are identified. In the descriptions each digital portfolio is determined as the case of the analysis. The aim was to analyze what the portfolio communicates to its readers about the kindergartens and schools.

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7.1.1 Keski-Palokka school: Displaying and self-assessing collaboration and developing teachers' expertise

The first case portfolio presents three classrooms in a primary school with about 500 students in grades K to 6, 28 teachers and 12 other staff members. In the school there are 18 classes including a preschool class. A kindergarten group of 25 children moved to the wooden school building from the nearby kindergarten in autumn 1996. Two years later the Ministry of Education granted preschool education permission for 15 children in the school. This permission transferred the preschool group under school administration.

Portfolio emphasized collaboration

The teacher group has determined on the portfolio's introduction page two main purposes for their digital school portfolio (Table 7.1). First, the teachers aim at displaying and developing collaboration between teachers and children at different grade levels and also across preprimary and primary education. Second, the construction of a digital portfolio is considered to support teachers' professional self-assessment.

Table 7.1 *The purpose and audiences of Keski-Palokka digital portfolio*

Purpose: *To develop collaboration, to make collaboration visible, also for parents and interested others. At the same time to assess one's own work, the smoothness of collaboration as well as possible problems.*
Audience: *Our own school community and other interested schools and kindergartens and parents.*
Who will benefit: *We believe that people acting in kindergarten and school world would be interested to follow what is happening in other places and there will surely be also hints for different projects. Those parents who have access to the Internet at home or at work will have a possibility to see what is happening at school and kindergarten, because things that children tell don't always correspond with reality and all children are not even willing to describe school things. Also municipal decision-makers can follow the everyday life at school and kindergarten and will get information about areas of emphasis.*

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In addition to the two aims, the teachers mention several subobjectives that indicate the possibilities and advantages of a digital school portfolio for different audiences. The teachers believe that their portfolio could provide other teachers with ideas and guidance about projects and serve as a forum for following the daily life in the school. Also parents with access to the Internet have a possibility to get information about the school life. The teachers also recognize the meaning of a digital school portfolio as a worthwhile channel through which community's decision-makers can get information concerning schoolwork.

Portfolio development

The main authors of the digital portfolio were three teachers at the Keski-Palokka school. Their roles varied during the portfolio project. At the beginning a team of two teachers, one teacher from the preschool and one from the primary level, were in a more active role. However, already during the early stages of the portfolio process a third teacher came along to work with them. The two teachers had already collaborated with each other for some years. The notion of a school portfolio was familiar to them because they had participated in an earlier research project in which school portfolios were used as a means for making visible the collaborative practices of successive childhood education institutions (see Chapter 4). Thus, they had already been involved in the process of documenting and self-assessing their own work. In the section 'Background for collaboration' the teachers analyze the progress of their collaboration and the role of a portfolio in their work. This background analysis is complemented with a description of the current situation in their teacher collaboration.

> *In our case, the first impulse for collaboration between preprimary and primary education was the active participation in the local curriculum group in autumn 1995. At that time we got to know each other and discovered that we were interested in the same things. The planning and realization of collaboration was facilitated when the preschool group moved from the nearby kindergarten to a separate building in the schoolyard in autumn 1996. We discussed what our realistic time and energy resources are and what kind of problems we could encounter.*
> *At the same time we drifted into the action research project 'Flexibility in school beginning' and we began to collect material for a documentation portfolio. We learned different kinds of documentation methods, assessed our own practices and the school portfolios by others in the research network. That work was rewarding but also demanding. Time resources caused problems. Slowly, a self-portraying portfolio, in the form of a folder, began to emerge. Through it we have been able to tell about our collaboration to interested parties.*
> *Now our aim is to build a digital portfolio, which again offers new challenges for our collaboration.*

Excerpt 7.1 *Background for collaboration*

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Some of the basic ideas and also materials for the digital portfolio came from the previous paper-based school portfolio. Thus, at first, their digital portfolio displayed collaborative practices between a preschool group and a school class. However, needs for broadening the purposes and contents of the digital portfolio did emerge, as the third teacher wanted to join the team. She had not been involved in the collaborative work earlier, but she was interested in participating in the digital portfolio project. In the beginning she participated in technical training sessions, but took a more passive role in the design of portfolio contents. In autumn 1999, the idea of collaboration between child groups was widened and so-called god student system was taken into use. Children in the first grade became god students for third graders. This change gave more active and well-defined roles for all three teachers, because the new common goal tied them to work together.

During portfolio development, one of the teachers was more active in the contacts between the teachers and the research group. Otherwise, all teachers participated with their own contribution either alone, in pairs or all three together in the cycles of portfolio design and implementation. Sometimes they worked together at school; sometimes each teacher proceeded on her own at home. Technical assistance from part of the school's ICT teacher was available especially during the school year 1999 - 2000. The process nature of portfolio development and the need for continuous updating is nicely brought out in different places, e.g. in the section on common activities where the teachers write as follows:

> *We surely must interview students about how they have experienced the god student activities. We try to get their opinions onto this page after holidays.*

This teacher group continued longer than others with the HTML editing of the web pages. They decided to take the portfolio application into use after having realized that it was more suitable for their needs and circumstances. However, the existence of different applications for portfolio construction and several portfolio versions caused confusion among the teachers as can be seen from the series of messages in Table 7.2. Fortunately these teachers were active in seeking guidance through e-mail both in this issue and also in other matters, like image transferring, concerning portfolio work.

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Table 7.2 *Messages reflecting the portfolio development process in Keski-Palokka school during spring 2000*

Could you, please, tell us which portfolio parents should look into? As we already told you, we don't have anything yet in the portfolio application. And we surely need a specific meeting before we can get our portfolio installed to the same address with others. (24.1.00)
I just presented another teacher our portfolio application and I gladly noticed that from our address there is a link to our portfolio pages. I think parents could already comment it although the pages are uncompleted. (25.1.2000)
Now, when it seems that computers are working again, could we try to consider together how to continue our portfolio? We need to delete some text and images from wrong places and to add stories. We don't know how to use the web school system - well, we don't know much about other things either. (9.2.2000)
Now we are wrestling with image transferring. We did try to transfer some winter photos we have taken with a digital camera but with no success. There were some problems but we'll try again tomorrow. If we still don't succeed we'll contact you. (13.3.2000)
I looked at your feedback, thank you for it. When editing the pages I thought the same, I mean that there should be headings under which things could be put. Otherwise it is mishmash. The headings could be e.g. class picture, artwork and handwork, projects, events, international collaboration. Are there too many headings? They can be reduced. (18.5.2000)
All of us have access to the Internet also during summer. Next week I am travelling and resting, but surely we will continue web page editing in summer. We have photos and stories about our trips, and also the class page needs to be done. I'm still no good at scanning things, but I hope I will get help from P. Thank you for collaboration, enjoy the summer! (30.5.2000)

At the time of portfolio evaluation in spring 2000, the teachers were satisfied with the situation of their digital portfolio. They were especially proud of the extent to which they had already made their practices visible. The most central problems at that time were insufficient time resources, some shortcomings of the portfolio application and deficiencies in user skills. Teachers assessed that the application had limitations especially in terms of its capacity to enable an author to define the order of contents. On the other hand, the teachers admitted that they still had insufficient ICT skills in some areas e.g. in linking specific web sites with the portfolio. All in all,

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the teachers stated that the application had offered them a user-friendly possibility to design web pages.

> *The portfolio construction has taught us to make these pages at least in some way. The program offers this possibility even for the clumsiest users.*

The teachers presumed that in future they would continue with portfolio work according to a looser time schedule and put more emphasis on encouraging students and parents to participate in this form of assessment. The teachers had informed other school staff in common meetings about the existence of the digital school portfolio, and it had shortly been presented for others. Still, the teachers argued that, for the time being, there had not been any wider interest in the issue. They thought that this was partly due to the fact that they had not felt comfortable enough in advertising their work for others. An indication of an emerging interest was, however, that there were promises that in the following school year some new teachers would join the portfolio team. One of these teachers was going to work with a first-grade class into which some children were coming from the school's own preschool group. For her the digital portfolio could be a valuable means for familiarizing herself with the earlier activities of the children.

Parents had been informed about the digital school portfolio already in the early stages of portfolio construction. Actual parent participation had, so far, been rather limited. The teachers regretted that they had not remembered to ask parents' permission for photo publishing early enough. In spring term 2000 one parent raised concerns about the use of child photos on web pages. Yet, none of the parents forbade the use of photos. However, this gave impetus to discussions about ethical issues with parents in future parental meetings. The teachers also started to reflect on what possibilities there could be for photo abuse.

Portfolio contents

In the contents (Figure 7.1), both the aims and realization of collaboration were made visible. Central issues included continuous planning, realization, progress and experimentation of different collaborative practices. It seemed that appropriate forms for collaboration had been found, but new ideas were also continuously searched for. The descriptions indicated that the teachers had apparently been enthusiastic and ready to invest in the development of their work.

The teachers have adopted the digital portfolio as a vehicle for continuous display and self-assessment of their own work and the daily life at school. Through it readers

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can take a look at the various collaborative activities, events and also with the moments of celebration. It is possible to find many ideas for the implementation of collaboration between teachers and also between children of different ages. In the portfolio both the processes and products of activities are made visible.

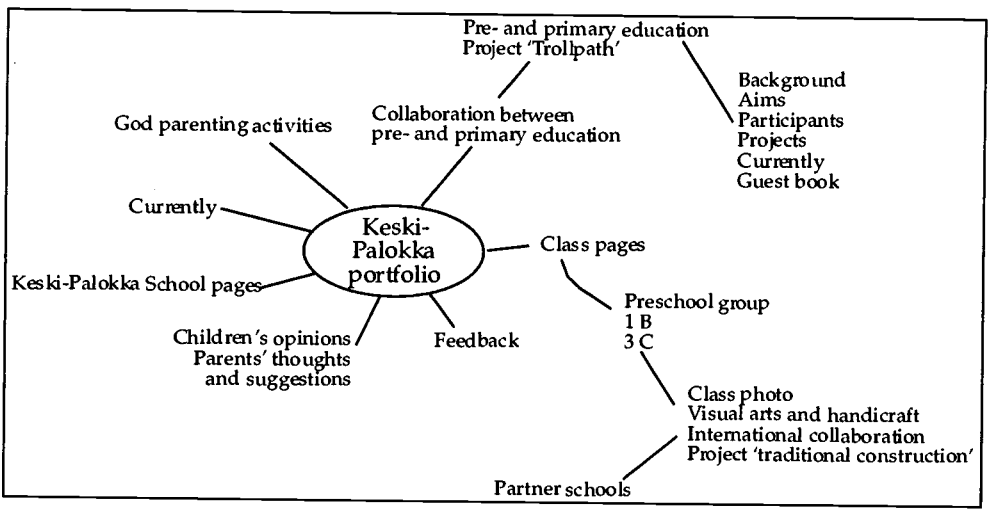

Figure 7.1 *A content map of the Keski-Palokka digital portfolio*

The Keski-Palokka portfolio is composed of two different parts or nested portfolios. The main part has several subsections and one of these subsections is linked to a separate portfolio, which concerns the collaboration between preprimary and primary education. This latter mentioned portfolio is of older origin and serves now in a way as a historical review to the beginnings of the collaborative practices.

The portfolio on preprimary and primary education includes information about the background, aims, and participants of the collaborative practices in that setting. Typically these practices include visits, common activities in subjects like music, physical education or arts and crafts, different seasonal celebrations, teacher exchanges and diverse projects. Two collaborative projects, namely "Sea adventure" and "God studenting" are described in more detail with texts and images.

The project "Sea adventure" was a spring performance presented to parents. Children participated actively in the different phases like planning, gathering various props, and preparing the scenery (Excerpt 7.2). The process of setting up the whole performance was documented in the portfolio in words and images. Children's activities var-

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ied from story writing, reading and listening to singing of songs on the sea theme, finding accompaniments, and to drawing of pictures.

The phases of the process

1) *We familiarized ourselves with the stories of Lasse the Shipdog, an old sea dog. Beside you'll see a photo about Lasse and ships.*
2) *We learnt songs on the sea theme: about sailors, pirates etc. We found songs that inspire children from the songbook. We also invented accompaniments for the songs with rhythm instruments.*
3) *Children wrote stories and drew pictures inspired by the theme. Based on the stories we planned a tale hosted by Lasse (the teacher and a hand puppet)*
4) *We rehearsed plays for the songs (a drawing about girls' scarf-dance). In each group there were both first-graders and preschool children.*

...

Excerpt 7.2 *Some of the phases in the project "Sea adventure"*

The frame story was collaboratively planned and built upon children's stories and drawings, games were rehearsed, costumes made and rehearsals took place on a regular basis. The documentation of the project is complemented with teachers' and one parent's reflections. One mother emphasized that a significant advantage of collaboration comes from its social aspect, which helps children get to know each other.

> *Collaboration is nice, because children get to know each other, and thus, got new friends. The program in the spring "end-of-term celebration" was really great. You had had lots of effort in practicing. The event gave a pleasant feeling. (Antti's mother)*

This project was an example of integration of different subjects and activities along the "Sea" theme. Its documentation gives an impression that the most important thing for the participants was not the end product, as such, but the collaborative and social learning experiences gained during the whole project.

The second project displayed in this portfolio on preprimary and primary education deals with god student activities, which were first started between preschoolers and second graders. The basic aim of the god student project was to lessen children's anxiety towards school beginning but also to help the teacher and the new students to get to know each other. There was again a clear emphasis on providing situations for collaborative and social learning. Later on, the project was widened to make links also between first and third graders. In assessing the implementation of the god student activities the teachers brought forward especially the children's active role in familiar-

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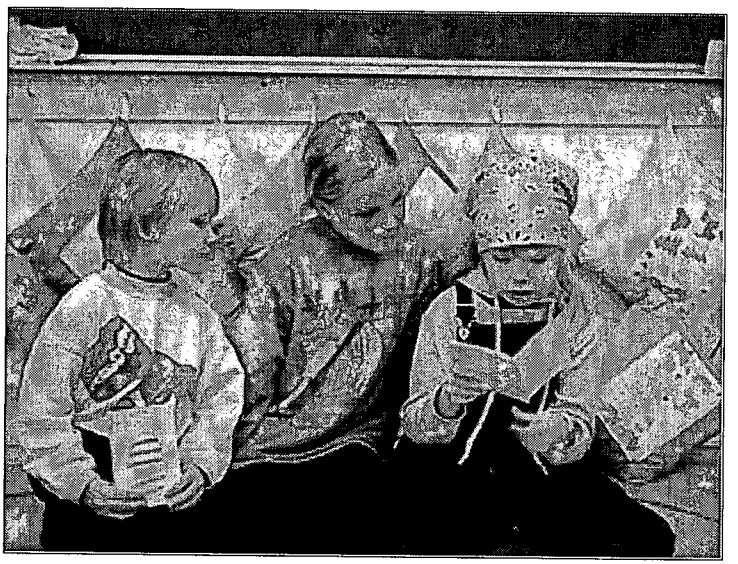
izing themselves with the school. In more traditional introductory school visits the newcomers have had a passive role. Another advantage has been that older students, who act as godparents, have felt to have an important mission in guiding the younger children (Excerpt 7.3).



Right after Easter, on the World Book Day students handed small fine self-made booklets over to their godstudents. The booklets were then read and examined in the cozy corners of the school. First graders were really excited about their books, and still after a common meeting in their own classroom they were allowed to read also the booklets of other children in their groups.

Excerpt 7.3 *An example from the section "Common activities"*

The project enhanced interaction between grades. In the portfolio, different forms of god student activities are presented, including preschoolers' activities at school, second graders' activities in the kindergarten, and the preparation of a common spring musical. The documentation of this project also includes participant's assessments. The teacher perspective is widened with a student's opinion about the project. A second-grader describes her positive feelings about having a younger child as a god student.

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I like to have interaction with preschoolers. ... Godstudents are nice. Preschoolers are very skillful for their age. I like dogs and that's why I would like to do a dog work with preschoolers. My god students are Henna and Maija. They are nice girls. It is fun to work with them at school and in their kindergarten. It would also be nice to write letters with them. We have had fun together.
Henna, 2nd grade

Later descriptions about collaboration between preprimary and primary education are attached to the main portfolio. For example, the preparation of a spring musical has become a yearly tradition. The progress of the musical "Troll path" in spring 2000 was described and analyzed almost weekly in a diary.

Week 14
Today we gathered in the preschool group's classroom. The preschoolers had rehearsed a mouse play for the performance and they presented it to us. They had also made paintings about Pekkolo-troll and described their work for us. Then we worked in smaller groups and the first graders read their troll stories and showed the drawings they had made. The reading rehearsals for the first act are also going on, roles have been assigned without argument.

Excerpt 7.4 *A section in a diary about the musical "Troll Path"*

In the diary the moments of success but also the arduous moments of practicing and anxiety at the different stages of the project are well documented.

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In addition to the display of collaboration, diverse activities of classes are described. The web pages of a 3rd grade class are most advanced. Through them a reader can virtually examine children's artwork but also their international collaboration. The project on "Traditional construction" seemed to be a successful way of combining internationalism and students' own cultural heritage. In the photos, young skillful constructors look seemingly content with their work products. In the section of work presentation, it would be interesting to read also children's thoughts and assessments about them. Other teachers could be interested in reading more detailed descriptions about the work processes and materials.

The photos complement the texts. Sometimes they reveal even more than the words about the collective participation, contents and quality of work but also about the physical environment. Authentic atmospheres are caught in photos - it seems that snapshots have become a natural part of daily activities. Occasionally, it is possible almost to hear also the audio world of the school: a hum of voices, whoops of delight, the reading of own stories to a godparent. Through the photos, especially the work products and results, children's interaction and physical environment are displayed. The photos or even videos could perhaps display more broadly also the work processes and everyday activities.

The perspectives of children and parents are included to some degree in the portfolio. Children's comments on god student activities tell about delight in guidance and finding the task important. Children's thoughts lighten the contents and bring the daily life closer to a reader. Parents emphasize in their feedback the meaning of collaboration and they appreciate the efforts made toward the large projects like the "Troll path". They feel that the actual event was successful and a clear indication of teacher expertise. A specific remark was given also about the meaning that all children had an equal possibility to participate in the diverse activities. The descriptions about the progress of activities, children's thoughts and teacher reflections are smoothly combined. In some sections, especially in the continuously updated project pages, it is possible to get a feeling of almost on-line connection to the school.

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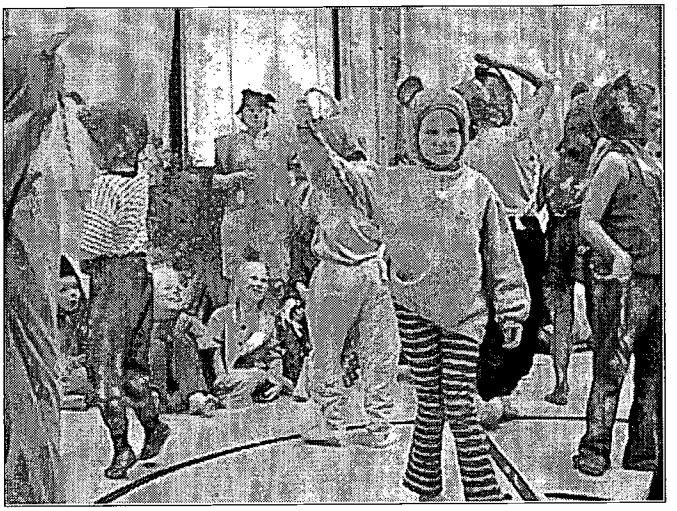
Week 21
The zero hour is coming just too soon, namely tomorrow!
Wednesday 24.5.



We, the teachers, worried unnecessarily. Like a preschool boy, Petteri, stated just before the performance: "It will SURELY go well". And it did. Children's sincere pleasure of performing and empathy struck also the mother and father trolls and we even got inspired to perform our play still on the following day the third time to the second graders and Outi's 3rd grade. Even our principal honored our performance with his presence. We believe that everybody was satisfied (even moved, at least the parents) with the performance. At least some small second-grade spectators stated after the performance: A wonderful play, the little mice were so sweet!

Excerpt 7.5 *A diary text about the progress of the spring musical "Troll path"*

A useful option for making different perspectives even more visible would be to give the children and parents access to the so-called reporter level in the portfolio application. Then, children could design their own pages and parents could write feedback also directly into the section of 'Parents' thoughts and suggestions'.

In the feedback section of the portfolio, readers gave special credit for the quality of descriptions about collaborative practices. Also project presentations, e.g. about the project 'Troll path', were appraised as engaging. In readers' view, the specific preschool pages presented widely both aims and activities. In general, texts were evaluated as clear and easy to read. Also areas of further development were proposed in the feedback. Even more information was desired about the school, its teachers and students.

We visited your pages in the end of January. The photos nicely enliven the text. Your collaboration is interesting and it must be rewarding. It would be interesting to know more about your school; the size of the school, group sizes, and whether there is wider collaboration between preprimary and primary education. (Two kindergarten teachers)

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The authors solved the lack of background information practically enough, namely with a link to the school's home pages. Some readers praised that the portfolio pages indicated that children had been taken finely into account in the activities. Teachers were asked to add the child perspective also to the portfolio even more widely in the future. Constant updating for diverse parts of the portfolio was wanted.

The feedback section in this portfolio already functions as a forum for mutual discussions with interested parties. The sense of reciprocal communication has been achieved because teachers have responded to the feedback they had received.

> *Thank you all for greetings. We got yesterday some expert guidance and after it we have again tried to continue our portfolio work. As our front page we have, so far, kept the page we planned and designed with Tuomas last year, but yesterday we changed it. Now after holidays we'll edit out overlaps and try to make a link to our school's web site. From there you can find a history and description about our whole school. These pages are also under construction, but we think that we should not present twice the same things that are already on the Net??? We have done lots of things with our god students, but we'll discuss it later on.*

As the following excerpt shows, the feedback section was utilized also as a place for teacher self-reflection. This teacher discussed there her problems and progress with digital portfolio work.

> *You live and learn!*
> *I'm writing for myself! When I had again a moment for sitting down at the computer, I noticed after careful examination that it is easy to delete the needless texts. But it is still impossible to change the order of texts in the list of contents, or is it?*

The teacher group in the Keski-Palokka school chose a specific theme, namely collaboration, for their digital portfolio. The dual aim was to make visible and develop the collaborative practices between teachers and students at various grade levels. The Keski-Palokka school portfolio combines the history of collaborative practices, descriptions of topical activities and prospects for future. Due to the theme or the purpose of the portfolio, the focus was on those pedagogical practices or school activities that included collaboration, which was usually planned beforehand. Thus, in general the portfolio elicits more powerfully the special events, celebrations and good feelings than everyday activities and the moments of disappointment.

The process of portfolio development in the school revealed several design and implementation issues for further discussion. In the process, the ethical considerations came forth. It also became evident that the teachers' own motivation to take a new kind of assessment method into use is crucial, and this requires their engagement in constant challenges for pedagogical development work and the development of their own capabilities in ICT, for instance.

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7.1.2 Pupuhuhta day-care center: Becoming conscious of pedagogical practices

The second case portfolio gives an outlook on the many-sided ecology of Pupuhuhta day-care center. The center represents an extensive view of early childhood education in which common day care is combined with varied forms of services for families, like family day care and a family park. Day care is offered for about 100 children in five different age groups. The multi-professional staff consists of one special education teacher, 11 kindergarten teachers, 7 day care workers, 3 childminders and one kindergarten assistant, added with a number of language assistants, special assistants, apprentices, and students of this field. The whole day-care center is lead by a principal. The day-care center is specialized in offering multicultural education, since in the neighborhood there are many immigrant families.

Image 7.1 *Staff in the child group 'Bear guards'*

Portfolio informs and strengthens pedagogy

The main purpose of the Pupuhuhta digital portfolio has been defined as twofold; first to inform others about the activities and work in the day-care center and second, to make staff members themselves more conscious of their own work. The teacher group emphasizes the meaning of the portfolio process for the continuous development of teacher expertise. The digital portfolio has provided them with a suitable means and impulse for documenting and self-assessing their work and pedagogical practices. The teachers think that reflections included in the self-assessments help them in making themselves more conscious of their own work. Through portfolio pages information is shared with parents, students, foreign partners, and a wide range of visitors. One teacher described this as follows in an interview:

It is fine that we can tell about our own work, because it is a fact with our line of work that very few people actually know what we are doing. This is just great that you can really show on a wide forum what we are doing.

The portfolio does not include explicit statements of purposes but the teachers have described them in the discussions with the research group. However, the purpose of showcasing and reflecting on the development projects of the day-care center from a teacher perspective can be traced down already from the front page of the digital portfolio. The front page consists of a staff photo and a figure about development projects in the day-care center (Image 7.2). In the figure, each development project is placed in a box, which functions as a hyperlink to further web sites. Also the aim to showcase and reflect on development projects can be understood from the structure of the front page. One teacher stated in the interview that the most important thing for her is the mere existence of the digital portfolio. It is a means for illuminating and appreciating for their work.

For us, for me... the most important thing is that it exists. It is part of our history. It is part of the fantastic work we have done. It is a way of making it valuable by putting it in the portfolio.

According to the teachers, the most common use of the digital portfolio is that teachers in different kindergartens visit each other's digital portfolios. In their own view, more varied utilization with diverse audiences will take from two to five years. One future function will be more intense use of the portfolio in the collaboration with foreign partner schools, which the day-care center had at that time in England and in France. In view of this goal, the portfolio also features an English version. Currently, communication takes place through mail and visits. The web pages have also been shown to partner teachers visiting Finland. They have been enthusiastic for seeing documentation on the web about their collaborative efforts. However, the partner schools did not yet have enough ICT facilities and access to the Internet to enable mutual electronic communication.

Portfolio development

Almost the whole staff had participated in the portfolio development. The staff was divided in small groups, which were responsible for the planning of specific content areas like "Family activities". However, a team of three teachers had an overall responsibility over the portfolio work and they also guided and inspired others in this effort. This teacher team gathered the contents and participated in technical training sessions organized through the research project.

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Pupuhuhdan toimintakeskuksen kehittämishankkeet

Interkulttuurinen opetus- ja kasvatustyö

Small steps towards Europe Comenius-projekti

Lasten havainnointi ja kasvunkansiot

Perhetoiminnan kehittäminen

Leikin ja leikin ohjauksen kehittäminen

Pienryhmätoiminta lapsen oppimisen ja kehityksen tukeminen ja seuranta

Image 7.2 *The front page of Pupuhuhta digital portfolio*

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At first the teachers started their digital portfolio work with HTML-editing. Later on they experimented with the portfolio application and one of the teachers, a male teacher, prepared some pages with it. After some experimentation they decided to find such a solution for the portfolio work that would enable them to concentrate on its content development for the time being. Fortunately for them, a son of one of the teachers participated in the digital portfolio seminar organized in autumn 1999 and got extremely interested in web page editing. After the seminar he began to help the teachers in various technical issues. Quite soon it was decided that the boy would become their technical assistant and take care of web page editing. The teachers did not want, at least at this stage, to be involved in the actual technical construction - even though this had been made easy enough with the application.

The teachers justified their choice with restrictions of the portfolio application and limited time resources. In their view, the application did not give enough possibilities and freedom for design. They criticized that the application was too elementary, allowing just the use of texts and images. On the other hand, many teachers felt uncomfortable and unsure of their ICT skills and they could not imagine themselves becoming any better in this area. The teachers also brought out that the time spent at the computer was always away from the work with children, and meanwhile inflicted extra load on other teachers.

It is just that when you know that you now have two hours, for instance, it then takes quite a while before you can get going. Even though you have the things in your mind then comes the technique. How did it go and which keys and buttons you ought to push, because you still do it so rarely that it means always searching.

Still, they wanted to develop a digital portfolio because they saw the possibilities of ICT in communicating their work. They were so content over their own organization of portfolio work that they were not interested in trying out other alternatives, e.g. doing some parts such as diaries with the portfolio application and leaving the most technical parts like diagrams for the technical assistant.

Yes, we have had two earlier versions and we have been taught to use it. But then we have discovered that we are involved in so many things that we needed to invent another means for coping and its personification is Mikko. This is how the circle gets widened. If we had really made ourselves to do it, we would have known how to.

It is a conscious choice.
... It is not part of my work, but I can consider different ways which to use and maybe it is not intention that I learn to do what Mikko does.

I find it interesting to write those stories, but I can't put them there. So, if we did not have someone to put them there, they would stay somewhere. I am not going to learn it, and my

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working time and my capacity is not enough for learning to do it. But I find it very cool to look at them there and I am very proud to see my own text there and photos I have taken, and I find it really nice to show them to others. But there is a conflict here. I am not going to learn it and I don't have, in a way, any possibility to do it.

Even though this digital portfolio is teacher-centered, children have been introduced to it as well. They have been especially interested in seeing photos about the activities and people they know. The documentation and assessment of children's work is still, however, done in the form of paper folders. The aim has been to get also parents' comments to the digital portfolio. The teachers estimated that so far very few parents had had possibilities for viewing the portfolio. They assume that it would take some years to achieve this.

Teachers claim that the most typical feature of digital portfolio development is constant change. The contents are changing and developing. The variability of development projects has been due to ongoing changes in the emphases of early childhood education as a consequence of new challenges and expectations imposed by the surrounding community and national decisions. By continuous updates, the portfolio seeks to display the changes regarding the contents of early childhood education.

Portfolio contents

The main content of the Pupuhuhta digital portfolio is structured according to six development projects (Figure 7.2). In addition, there is a page for staff presentation, an English version of the portfolio and a link to the center's home pages. The staff is presented as being active, and the expertise of different people is made visible. The photo in the front page also functions as a link to the staff pages. These pages could be a good place for teacher profiles concerning their ideas, thoughts etc. It would be interesting to learn how the day-care staff succeeds in maintaining the sense of togetherness and enthusiasm through which the continuous development work is carried out.

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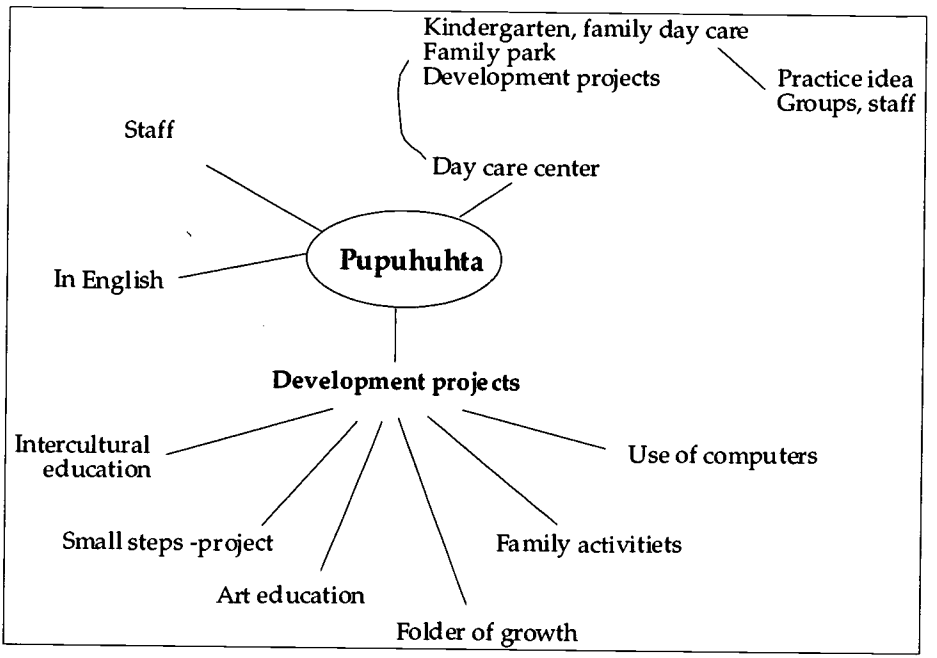

Figure 7.2 *A content map of the Pupuhuhta day-care center portfolio*

The development projects are presented extensively in the portfolio. In year 1999-2000, their respective themes comprised intercultural education, an international preschool network "'Small steps toward Europe", art integration, children's portfolios, family involvement, and the use of computers. In the digital portfolio, only the content for the section on computer use was still missing. According to the teachers, the themes rise from the needs of the daily life, where they occur as interconnected.

> *So, they are not any forced issues, like let's say we are a physical education kindergarten... we are not a computer kindergarten or a music kindergarten. Instead, they rise from the normal day although they are fine words like intercultural teaching. But they are not anything more than that by coincidence every third child is an immigrant child. It has just been said with these words... a word has been found for them. Or the Comenius project, which was given to us, or that for a specific reason we use folders of growth with children in order to follow their development. But they have really risen from the work we actually do. They are not some curious things, which are left hanging somewhere up in the air - so that now we have invented fine projects.*

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The teachers emphasized that the themes for development projects change or expand continuously. Also the contents of projects change and especially their idea and implementation become deeper and clearer for teachers as well. The themes concern issues of diversified expertise in the field of early childhood education. The presentation of development projects could be further complemented with a description of their origins and a follow-up of their implementation.

The content of this portfolio is vast. Aims, principles for practice, and realization of activities are comprehensively described and presented. The structural hierarchy offers readers a possibility to choose the depth of exploration into different things and areas. An overview of the center and its activities can be gained quickly owing to clear diagrams outlining the contents in different levels. Still, a deeper browsing carries a reader into descriptions of aims and activities and also into experiences highlighted in five diaries about international meetings in the Comenius project "Small steps toward Europe". The diaries provide personal and open insights to the experiences and feelings of participants. In the diaries also factual information about the care and education of young children in other countries is provided.

> *The green moors of Gloucestershire and blooming gardens welcomed us, when we arrvied from Jyväskylä which was covered with first snow. The slushy weather of November was forgotten in the middle of English friendliness when we started our working day in Coney Hill Family Center. The staff starts work at about eight am, when they gather around morning coffee and for the preparations of the day. The morning time is utilized for varied discussions about children, families and the forthcoming day. The first child groups come at 9.00 am and all thirty children gather in a morning circle, which is lead in weekly turn by each adult. In the morning the latest news are discussed with children and the theme for the day is described.*

Narration through diary texts is combined with photos, which enlighten, authenticate but also deepen the descriptions. Other parts of the portfolio are more text-based.

The portfolio presents a day-care center, which is continuously striving for developing its activities, widening pedagogical expertise and keeping up with the spirit of the times. A central characteristic of the center displayed in the portfolio is collaboration between people of varied ages. Collaboration is extended from interaction in a child group or partnership between day care and home towards friendship across cultural and national borders. Partnership with parents is obvious already from the center's aim of developing diverse family activities like the Family Park, a project called "Hand in hand" and parental visits to the day-care center. One parent reflected on her visit as follows:

> *This kind of day is very important experience for a child. She notices that her mother and father are really interested in her activities. It is also meaningful for parents, and it really*

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contributes to child-parent relationship. Of course, it is only one day, but still it has meaning for a child. It also improves relationships between kindergarten and home. It gave a good opportunity to discuss with teachers. It was also an opportunity to learn about their principles and how they act in different situations. I was also able to observe the child's contacts with other adults.

...

It was a rewarding and happy day. I think that every parent should see and experience something like this in order that they would see the world of their child more widely outside home circles. Childhood is unique and it is supported by safe and caring adults around the child.

Collaboration in the form of intercultural learning is present as part of the everyday life and learning in the center's multicultural environment. In the Pupuhuhta day-care center up to 30% of children come from immigrant families. The digital portfolio serves as a wide information source about the pedagogical practices involved in their instruction. The teacher perspective is brought out in a piece of reflection on the change process required in intercultural education.

The staff has gone through a change process, during which we have acquired information about different cultures, the encountering of cultures and about immigrants' adaptation process. We have been forced to become conscious of own prejudices and to recognize how we are part of the Finnish culture, which directs our way of perceiving life and education. We have learnt to utilize interpreters, ethnic assistants and other multiprofessional network as a support for our work. It has been rewarding to participate in the development of intercultural work practices for the intercultural day-care life. It is important to remember that interculturalism and tolerance will mature and develop all the time. We hope that it will become visible as a controlled and conscious change of work practices and methods.

The collaboration with different expert groups like ethnic language assistants and therapists is active. However, personal thoughts and views of diverse actors are still missing from the portfolio pages.

On the other hand, intercultural learning culminates in the European partner school activities, in which exchange of experiences, information and ideas between the different school cultures is essential. The portfolio reveals that the staff has courageously and open-mindedly entered into this international collaboration. Collaborative efforts towards different directions tell about a desire to learn new things and to sustain professional development with other pedagogues in the field. The partnership activities have also given new insights to the work. Novel ideas for daily practices and intercultural communication and education have been developed. One example of such practice is so-called "Reindeer-book", which circulates among the partner countries. It is a growing collection of drawings and thoughts from Finnish, English and French children. One aim is to explore and compare the features of children's thinking through the book.

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In accordance with the portfolio's purpose, the teacher perspective is central, but also children's and parents' perspectives have been given space to some extent. Children's thinking can be found at least in the presentation of portfolio activities. Child group presentations can be found on the center's home pages. Some other forms of bringing forward the child perspective could be e.g. insights on what children prefer doing, what their daily activities are like, what kind of activities are available for them and how children perceive them, and what children do on a normal day.

Feedback for the digital portfolio is still slight including comments only from student mentors and the project leader. These comments were positive and addressed on diverse good properties of the portfolio. It was stated that especially the width of the material and the versatility of texts have helped to compose a good entity. The readers mentioned diaries and child portfolios as promising ideas for documentation of life in a day-care center. In its current status, the portfolio primarily conveys the teachers' picture of the day-care activities, and it is wished that children's comments would soon be added to the portfolio. Comments in more technical line concerned the layout of texts, and the use of different font sizes, column breaks, and colors were suggested.

The portfolio development process indicated that the staff was active and courageous in making their own decisions about the design issues, such as the choice of an appropriate technical method for the portfolio construction and the form of engaging the whole staff in the content planning. However, for the time being they chose not to start developing their own ICT competence to any larger extent but relied on the help of an outside expert. The explicit strength of the Pupuhuhta day-care center portfolio lies in the descriptions of active and versatile collaboration of diverse actors and the pedagogical development of the teachers. The teacher group has understood and adopted the digital portfolio as a method for documentation and self-assessment. They also highlighted its possibilities to display the ongoing changes in the field of early childhood education and especially to show how the day-care center is responding to the expectations laid on them. The aims and implementation of pedagogical practices are widely described. On the other hand, the children's experiences of the daily life and the learning process remain rather invisible.

7.1.3 Viiskulma kindergarten: Providing versatile day care

The third case portfolio draws a profile of Viiskulma kindergarten. In the kindergarten there are two child groups: the Nightingales and the Swallows. The staff consists of four kindergarten teachers and two day-care workers. The Viiskulma kindergarten is situated in the near vicinity of a small town's center. It was the first kindergarten in

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the town to be housed in a specific kindergarten building. That is why its history has been followed with interest also in local newspapers and it used to be a favorite place for outside visitors in the town.

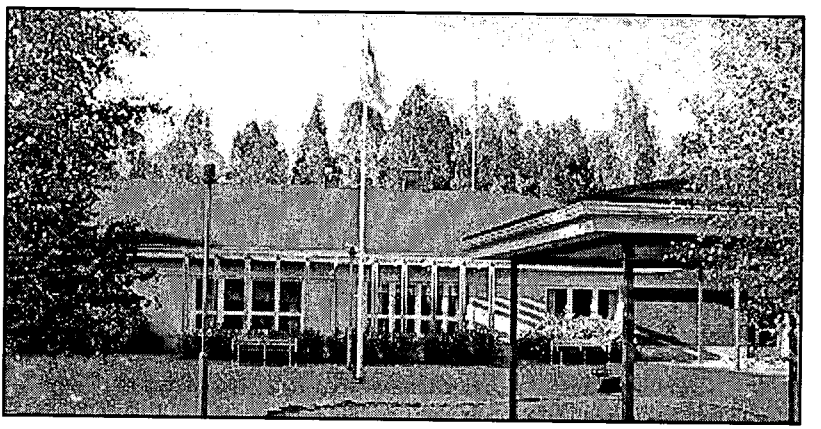

Image 7.3 *Viiskulma kindergarten*

Portfolio shares information and builds bridges

On the presentation pages the teachers state that the main aim of their digital portfolio is to provide information for diverse audiences. It is principally directed to children's families as an information source but the teachers wish to reach also other audiences through it. Especially different collaborative partners like other kindergartens, schools, parish, and possible future customer families are mentioned as information receivers. Portfolio is seen also as a means for building bridges between different actors in the field of early childhood education.

A fresh idea is to direct the portfolio to the students in the field. The idea is that students, who are planning to do e.g. teacher practice periods in the kindergarten, could get acquainted with the kindergarten and its daily practices already in advance.

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Our portfolio is above all directed to client families. We hope that our collaborative partners (like other kindergartens, schools, parish) and families who are planing to enter their child for our kindergarten would familiarize themselves with our pages. Students coming from different educational institutes have a possibility to get information beforehand about our kindergarten. We are going to update our pages yearly by introducing our newest projects in text and images. It is challenging and interesting to construct the pages, but it is difficult to find time for this work because, still, our primary function is to work with the child group.

Excerpt 7.6. *Portfolio presentation*

Portfolio development

In Viiskulma kindergarten two teachers have shared the main responsibility for the portfolio development. They have also been responsible for the web editing of the pages. Content planning has mainly taken place during working hours, but occasionally at home as well. The contents have been discussed and planned in some meetings with the whole staff and in smaller gatherings of staff in single child groups. Teachers argue that it is difficult to estimate precisely the time invested in the portfolio work, because it is often interrupted by other activities. According to them the most concentrated working periods have taken place immediately before and after organized workshops and after getting some inspiring ideas.

The whole staff is aware about the existence of the digital portfolio and they have also familiarized themselves with it either independently or with the guidance of responsible teachers. Not every member of the staff, however, has taken interest in the use of ICT. Some people do not have the opportunity to use computers at home, and during working days there is not enough time for practicing. The teachers have felt that their own skills are too limited and thus they have too many technical problems.

> *The clarification of the problems takes too much time and effort and finally you get stuck so badly that you must call 'home troops' in order to proceed. And when you have been fretting long enough in front of the computer you'll get a bad conscience, because you feel you would have been needed elsewhere and your colleague is freezing out there in the cold.*

The teachers have found the construction of a digital portfolio as challenging work. They stated that the aim is to update the contents on an annual basis through presenting the newest projects in writing and photos. However, it has been difficult to find time for the work because their principal function is to work in child groups. The occasional lack of motivation has come from the feeling that the audience for the digital portfolio is still scanty. Thus, in those moments the teachers had experienced it

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hard to find any burning zest to working. Otherwise they consider the actual portfolio work as enjoyable and are themselves well aware that by marketing and informing more strongly the portfolio for e.g. parents they would get more readers. So far, they have not had enough time or effort for this kind of marketing, however.

Portfolio contents

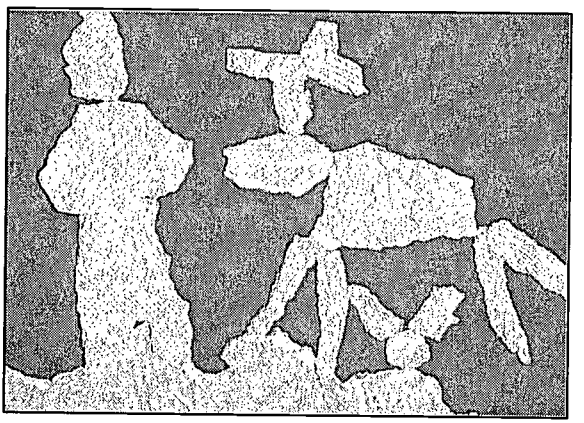

Image 7.4 *Sanni's artwork: "A boy taking an evening walk, a moose and a rabbit are watching"*

The digital portfolio is opened with the above piece of a child's artwork and a poem reflecting human growth. This personal and inviting opening gives the impression that the kindergarten is child-centered and seeks to provide the children with constructive experiences about the surrounding world.

The outline of the contents gives a clear view about things that are considered important in the work and activities of this kindergarten (Figure 7.3). The main sections feature the child groups, projects, children's pages and a presentation of the kindergarten. As for the layout, the use of columns outlines the contents clearly. The basis of the portfolio was in good shape in spring 2000 with a versatile range of stories and other contents. Some topics, like a presentation of one child group, are mentioned in the list of contents, but at the moment they are still missing. Thus, further construction means especially completion and updating of the existing content. However, already in its current stage Viiskulma's portfolio is a clear and logical entity.

In the portfolio there are lots of images which guide readers into the kindergarten environment with its everyday activities and moments of celebration. Most images

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are full of action. The narration through images could be complemented and expanded with a deeper narration through texts, as well.

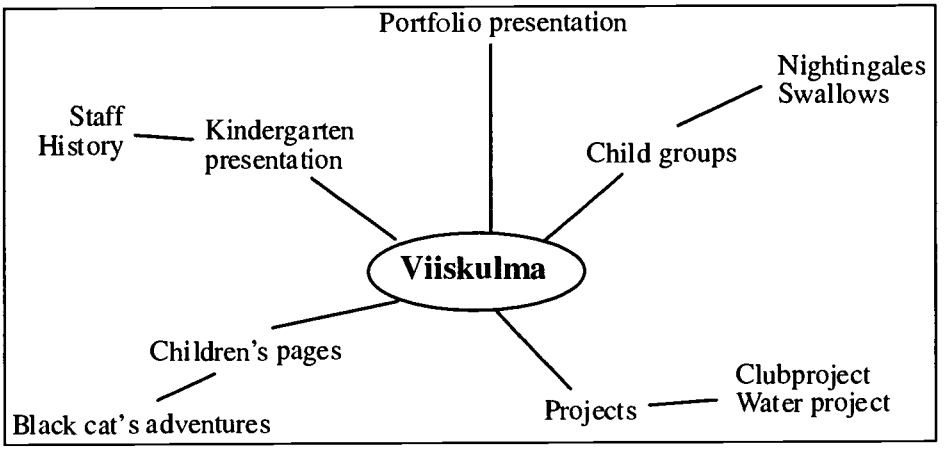

Figure 7.3 *The content map of Viiskulma portfolio*

Sometimes the choice of photos communicate unspoken messages. For example in the section "Club project" the traditional sex roles have been overcome when girls are working with a computer in an ICT-club, while boys concentrate on baking oatmeal cookies in a chef club.

The general aims and principles of upbringing and pedagogy are finely expressed in the poems and quotations in the different parts of the portfolio (e.g. Excerpt 7.6). More explicit goal descriptions are placed in the child group pages. As a common endeavor for the whole kindergarten emphasis is placed on learning good manners for interaction with other people. The stated appreciation of the child perspective means that the themes of the activities are discussed with children, and sufficient time is secured for their playing and peaceful growing. Also parents are welcomed to collaboratively participate in the planning of activities.

The aims for the "Nightingales", the group of 3-5-year-old children are determined at a general level but in a way which warmly takes the reader in the middle of the daily life of young children. The main issues brought forward as emphasis areas in the beginning of a new kindergarten year are as follows: practicing of such social skills that are necessary in a child group, familiarization with the day-care practices and the daily schedule, and the creation of basic trust among young children. The aim descriptions

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are shortly complemented with ideas for their realization in everyday situations. Aims for winter activities center around physical exercise and especially on the learning of basic skills in skiing and skating.

We learn skills for interaction by playing, through physical excercise and doing some handicraft work in a safe day-care environment. In addition to these we make trips in the vicinity of the kindergarten. The adoption of the kindergarten practices and the daily schedule is highlighted in the group of young children. ...

Our aim is to get ideas of themes from children and parents as much as possible. In our activities there is space for children's own wishes and play, because...

"We need silence,
we need peace.
We need time for growth,
we can't assume,
that anything could grow in a field,
that is incessantly ploughed."
(Huttunen: Päivähoidon toimiva arki)

Excerpt 7.7 The page about the preschool group "Swallows"

The page of the "Swallows", the preschool group, tells that their curriculum is based on the town's preschool curriculum. It is divided into six areas, but the teachers stressed that preschool education is performed as holistic instruction through different themes and projects. They consider it essential that everyday situations are utilized as natural learning events.

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The child-centered ideas are realized especially in the three projects titled 'Water', 'Club' and 'Story'. These projects also outline and present interestingly the daily work in the kindergarten. The "club project" indicates that children are allowed to decide and choose the content of activities according to their own interests. In the two other projects the child-centered approach means that children are encouraged to combine their ideas and imagination in the collaborative group activities.

The story project "A learning adventure in a secret land" is displayed on the children's pages. At the moment its documentation means that one story "Black cat's secret trips", which was made in collaboration of three children, is found on the pages. It is desirable that this could be accompanied with more documentation and reflections on the whole project.

Black cat's secret adventures

In this spring the group "Swallows" engaged in a project called "A Learning Adventure in Secret Land" and it produced e.g. the following fairy tale. The project was based on the learning materials "Secret land" (by Wäre, Huovi et al.).

Black Cat's secret adventures

The parents of Black Cat had left for a great, long cruise. It ran totally out of food and it decided to go to some Secret Land. Then it met a huge monster on the bridge, and the monster said to it: "What are you doing on my bridge?" Then it decided to stay overnight in a trunk and built a hut of its branches. And then came morning and it woke up and went to the shore to drink and it noticed that water had got muddy.
Then it left by boat on the water and then it fished, and when it had eaten all the fish it took a nap. When it woke up the boat had bumped into land and it got off the boat and saw ahead an awfully huge castle. Then this cat could read and it knew what was written in it. And it was written "Secret Land".
Then it opened the gate and saw some fellows. Then it decided to go to play. The fellows asked it to play hopscotch. Then it played hopscotch very well according to all the fellows. And then it decided to find a house, in which there was a horseshoe as a mark and decided to stay there overnight. Then came morning and he started to kick a ball with the fellows, skipping rope with the fellows and it was fun for him.

Other stories created in our group can be read in the municipal main library

Excerpt 7.8 *A story displayed on the 'Children's pages'*

Similarly, the other project presentations are worth deepening by describing their aims and by documenting and assessing their realization in more detail. Currently they are described in a declaratory manner. For example, the following themes could be handled in more detail when presenting the club project: which clubs the children found most interesting, what did children do in them and what things did they like, what did different parties learn from them? On the pages dealing with the water project a reference is made to the incompleteness of the pages and, thus, a reader is left waiting for a follow-up. On the portfolio's introduction page there are signs of deeper reflection as regards the description of the challenges and problems of portfolio construction.

The staff is presented as a youthful and flexible team. So far, there is little detailed information about the staff members e.g. concerning their ideas and reflections on work and different projects, and about collaboration with different parties. On the other hand, already now the photos succeed in displaying moments of collaboration and interaction: children are playing and working together, an adult and a child are making a patchwork together etc. In the text about the kindergarten's history the meaning of varied parental participation in the kindergarten's daily life is underlined. Mainly, this has meant parents' activity in improving the kindergarten's facilities, for example through participation in bees and bazaars, and excursions as well as by donations for a playhouse.

The short history of the kindergarten is interesting to read and it stores the landmarks from different years for current and future people in the kindergarten. Recording the history is always worthwhile. In addition to parental participation the landmarks or milestones mentioned in the portfolio include founding the kindergarten, an airplane received as a gift from the Air Force, organization of the kindergarten's food service, various festive traditions and the improvement of the kindergarten's yard.

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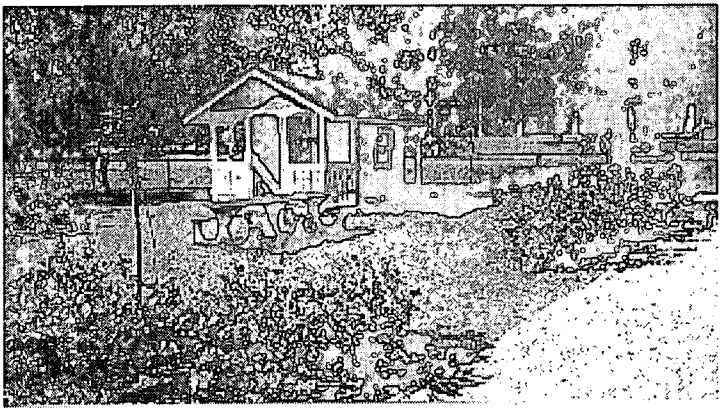
The kindergarten was established in year 1983 and then it was the first kindergarten built as its own building in the town (the facilities of other kindergartens were in apartment buildings). In the first years we were often featured in the local papers.



In year 1991 we got an airplane as a toy in our courtyard. It was a donation from the Air Force Technical School. After that we were named 'Airplane kindergarten' for a long time, at least among children.
Parents have actively taken part e.g. in bees, bazaars and trips. A remarkable evidence of parent activity was that they donated a playhouse to the kindergarten courtyard as a farewell present from the families of children going to school.

Excerpt 7.9 *A part of the section 'Kindergarten's history'*

The Viiskulma kindergarten portfolio illuminates an early childhood environment, in which everyday learning experiences and the child perspective are appreciated. The contents are still rather condensed but already in its current status the portfolio succeeds in assuring the readers that the kindergarten's invests in providing versatile and inspiring activities for children.

7.2 Portfolio implementation issues

As a summary of case descriptions a cross-case analysis was conducted on all nine digital school portfolios. In the cross-case analysis the focus was on the following portfolio implementation issues:

- The meaning of a digital portfolio as an assessment method in childhood environments
  - What did the teacher groups determine as the main purposes and audiences for their digital portfolios?
  - Which were the main ecological focus areas in the digital portfolios?
- The content of actual digital portfolios
  - What was the relevance of constructing a portfolio in a digital form?
  - Which (ecological) focus areas were displayed in the actual digital portfolios?
- What forms of reflection were utilized in the digital portfolios?

7.2.1 The meaning of digital portfolios as an assessment method

The meaning of digital portfolios as an assessment method is examined according to the teachers' statements of the purposes and audiences of their portfolios. In general, a portfolio is supposed to be a collection of information chosen and displayed with a specific purpose in mind (see e.g. Wolf 1986). The purpose was explicitly stated in six of the evaluated nine portfolios, but it could be implicitly traced down also from the rest of the portfolios. Some teacher groups described the meaning of their own digital portfolio also in the discussions with researchers.

Usually teachers reflected on the purpose and audience on a specific portfolio introduction page. However, in many portfolios these were prominently or at least perceivably present already on the front or welcoming page. The front page also had another function, namely to give a first impression for the readers of the portfolio. First impression has, indeed, proven essential in arousing readers' interest to visit and examine in more detail specific www sites, in this case digital web portfolios (Hankala 1999; Linnakylä 1999). Amidst the overwhelming flood of web pages available to web users especially visual elements draw attention quite effectively. Seven portfolios did have a specific front page and two portfolios started straight from the contents page.

The cross-case analysis of the teachers' statements revealed eight main purposes for the digital portfolios. In Table 7.3 the purposes are compared with the most typi-

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cally reported instructional advantages of the portfolio approach (see Chapter 3). The last column of the table indicates the ecological focus and system level that the stated purpose implies.

Table 7.3 *Portfolio purposes and ecological focus*

Purpose	*Advantages of the portfolio approach*	*Ecological focus*
Illuminating kindergarten or school work	Display of learning environments	*Microsystem* People, goals, activities and features of a kindergarten or school ecology
Following work done in the kindergartens or schools	Display of learning environments	*Microsystem* Kindergarten or school ecology in a longitudinal dimension
Self-assessment of work	Support of self-assessment	*Microsystem* Participant's perspective on working or on the learning environment
Displaying and developing collaboration	Strengthening of collaboration	*Microsystem* Interaction and collaboration among children and teachers inside a kindergarten or school
Involving parents in the kindergarten or school work	Strengthening of collaboration	*Mesosystem* Second-order network Inter-setting knowledge
Enhancing continuity between childhood environments	Strengthening of collaboration	*Mesosystem* Childhood transition phase
Showing collaborative links	Display of collaboration	*Meso and exosystem* Collaboration between interested parties
Online discussion about themes in the field Guiding and consulting others	Strengthening of collaboration Development and reflection of teaching	*Meso and exosystem* Communication and knowledge sharing between diverse parties in the field

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From the ecological perspective, four out of the eight main purposes focused on the microsystem level. The most common purpose for digital portfolio assessment was *illumination of day-care or school work*. This was referred to in all nine portfolios. Teachers aimed at displaying learning environments and opening their work for interested parties. They wanted to introduce their goals, activities, development projects, and in general to describe and showcase the life, work and overall ecology of kindergartens and schools. Usually a portfolio was intended to describe the daily work of those teachers who had constructed the portfolio. The special educator's portfolio was an exception. Through her digital portfolio she wanted to present the contents, methods and diverse practitioners of early childhood special education in the whole town. She planned the digital portfolio to become a lively data bank in the field of special education.

A digital portfolio was also seen as a vehicle for *follow-up of work and activities*. This added a longitudinal dimension for the description of the ecology. This process orientation came up explicitly only in school portfolios. One school portfolio promised to provide the readers with an opportunity to follow the daily life at school together with two classrooms. The class photos were attached to present the subjects of school stories.

> *On the pages of the portfolio you can follow the activities of our classes during the school year. We are altogether 46 students and two teachers in the second grade. In addition to the normal school work we have e.g. partner classes in Portugal and the 2b class is starting partnership work towards Denmark. About international collaboration and other things you can read from our portfolio...*

In two portfolios teachers highlighted that the main idea had been to construct the portfolio for themselves. They described digital portfolio as a means for *teachers' self-assessment* and for making themselves more conscious of their own work. From a portfolio with a staff photo on the front page, a reader can sense a feeling of togetherness between members of the staff but also perceive that the purpose of the portfolio is to showcase kindergarten from the perspective of teachers and to display teachers' work. One of the teachers described this in a discussion as follows:

> *Well, it is informing... about what we do, what are important things for us. Another thing is, at least for me, that I make my own work more conscious in this way or the work we are doing, not my work but our work. Because you document it seldom... so this is one way. If we did not participate in this, we would not have done anything like this. We would have just sporadic information.*

On the other hand, a portfolio starting with photos of children seemed to emphasize the perspective of children. A very personal and interesting front page featured a poem about childhood and a photo attached to it.

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Several teacher groups emphasized that strengthening of collaboration between diverse actors is an advantage to be gained through the portfolio approach. This referred to the collaborative linkages in the micro-, meso- and exosystem levels. For some, the foremost purpose was to *display, assess and develop collaboration within a kindergarten or a school.* Especially in one school portfolio this was the major theme:

> *To develop collaboration, to make collaboration visible, also for parents and interested others. At the same time to assess our own work and the smoothness of collaboration as well as possible problems.*

This teacher group aimed at collaboration in order to enhance interaction among children of different ages and their teachers. Already the front page featuring a photo and text welcomes the reader to get acquainted with the collaboration in the school. In the photo there are second-grade children together with their god students. This instantly underlined and verified the stated purpose of the portfolio. Beside collaboration this school named also more typical functions, like passing of information and following of activities, as aims of their digital portfolio.

Image 7.5 *Welcome to take a look at our collaboration in K-P school*

In the strengthening of mesosystemic collaboration, digital portfolio was considered as one way of *increasing parental involvement* through a novel media for communication and information sharing. From the ecological perspective this refers to the second-order network as a type of interconnection between different settings. In this

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case the digital portfolio serves as an indirect linkage through which a teacher establishes a connection between home and school. Furthermore, the portfolio also provides a means for revealing inter-setting knowledge, because through it parents will receive information about their child's activities in a kindergarten or school. In one kindergarten it was desired that the contents of their digital portfolio would encourage parents to visit also the real kindergarten after getting acquainted with the virtual one.

> *Those parents with network connection either at home or at work have a possibility to see what is happening at school and kindergarten, because things that children tell don't always fit with the reality and all children don't even like to tell news from school. Also it is possible for the municipal decision-makers to follow the daily life at school and kindergarten and to get information about different areas of emphasis.*

A digital kindergarten portfolio was also seen as a bridge between successive educational levels in order *to enhance continuity in child's development and learning.* The ecological focus was on childhood transition from kindergarten to school. A digital portfolio can serve as a collaborative link between different settings and tell schoolteachers what kind of learning environments and experiences their forthcoming students have had in a kindergarten.

> *[To give] information about activities and principles in kindergartens. Information about alternatives to guide the choice of the form of day care. For schoolteachers: information about future students' preschool year and experiences. Godparents: information about children's day-care activities. Grandparents: information about children's day-care settings, activities, and things to learn.*

Teachers aimed also at showing *collaborative links outward of the school world* in their portfolios. This meant especially diverse partnership projects with foreign schools. Finally, a more communicative role for collaboration was given in portfolios with a weight on *mutual guidance and on-line discussion* on the significant themes in childhood education. The ecological focus was on creating technology-supported collaborative links among people in this field. The aim was on the mutual development and sharing of instruction and pedagogical practices.

> *Our aim is to give ideas and hints to other kindergartens.*
>
> *Other kindergartens get ideas about daily activities for their own daily life.*
>
> *We believe that those working in kindergartens and schools would be interested in following what is happening in other places and there will be also ideas for different projects.*

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The audiences were defined broadly and concerned all ecological system levels. It was very common to address the portfolio to all those who are generally interested in childhood education. At the microsystem level, a digital portfolio was determined as a means for teachers' own self-assessment and information processes. At the meso- and exosystem level, different audiences were most often described as receivers of information concerning the life and developments in kindergartens and schools. The more specific descriptions identified parents, other kindergartens and schools as the most central audiences. Other typical examples of various information receivers were godparents, grandparents and possible future client parents but also municipal decision-makers at the macrosystem level were referred to. Also different collaborative partners like the local parish were mentioned. One kindergarten suggested a very promising possibility to use a digital portfolio as an information source for students coming from different educational institutions to practice in the kindergarten.

...Students coming from different educational institutes have a possibility to get information beforehand about our kindergarten.

7.2.2 The portfolio contents

The actual content and form of a portfolio is in general determined along its stated purpose. In the study, a portfolio was intended to show evidence of pedagogical practices and meaningful experiences in a whole kindergarten or school ecology. Teacher groups were asked to complement this general aim with their own specified purposes as was described in the previous chapter. The goal about school-wide portfolio implementation was achieved in the kindergartens, but in the schools the content was mainly restricted to the particular classrooms taught by the portfolio authors themselves.

The portfolios drew respective profiles for six kindergartens, two primary schools and one special teacher. In quantitative terms the contents of portfolios ranged from condensed in four cases, and average in three cases, up to extensive in two portfolios. The two wider portfolios were also the most often updated ones. The most condensed portfolios were still in their early stages, but their basic structure and focus areas were already visible. However, also a very condensed content could be enriched by personal design. For example, one kindergarten portfolio succeeded in arousing interest through the balanced use of text and photos. It was characteristic to all the portfolios that they were under constant construction. Many authors aimed at updating specific parts of a portfolio regularly, while some basic information would remain the same for a longer time.

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In the following, the portfolio contents are considered in two dimensions. First, the ecological foci of the contents are described. Second, the relevance or added value of constructing a portfolio in a digital form is discussed.

The kindergarten or school ecology displayed in the portfolios

The contents of the portfolios displayed most widely the microsystem of kindergartens or schools, but also elements of meso and exosystem were visible to some degree (Table 7.4). At the microsystem level, the portfolios most typically gave a general presentation of the kindergarten or school ecology through describing its people, goals, activities and physical environment. Portfolios also provided more quantitative structural information like group sizes and staff composition. Some teacher groups added a longitudinal dimension to the portfolio by telling about special occasions in a kindergarten's history.

Table 7.4 *The ecological system levels of portfolio contents*

Ecological focus	*Specified content*
Microsystem The ecology of a kindergarten or a school Promotion of learning	People Goals for education, areas of emphasis, development projects Activities, events, learning and work processes Outcomes e.g. work products Physical environment Structural information e.g. group size, staff Description of history
Microsystem, mesosystem Interaction among people within a kindergarten or school First-order direct social network	Roles and relationships of people Collaborative activities among children and teachers in a child group or between different child groups
Mesosystem Second-order network	Interaction between home and kindergarten or school
Exosystem Linkages and processes between two or several settings	Partnership with foreign schools Virtual interaction between portfolio authors and audiences

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The description of people, their roles and relationships concerned children, day-care staff and schoolteachers. Commonly, *information about children* was available in child group presentations, which were found in all kindergarten portfolios. The child group presentations were very general in nature and stated e.g. group sizes, goals and content of activities. A couple of portfolios had specific children's pages in order to add also a child perspective to the contents. So far, such pages included children's stories, self-presentations, opinions and ideas for future activities

The majority of photographs portrayed children or child groups. For example, in one school portfolio children's own presentations or stories were accompanied with their photos. Other photos with single children or small groups of children were most often included in the child group presentations. A more thematic child photo was found in the album page of a kindergarten portfolio. The interaction of children is presented with a portrait of two young children and a poem about friendship.

Friends together,
Sitting and wondering:
"What could one do,
To bring good mood?"

Excerpt 7.10 *Display of children's interaction in the section 'Album'*

One school portfolio illustrated clearly its collaborative purpose by the use of photos portraying older students together with their junior peers.

As the portfolio development process indicated, especially the use of child photos aroused ethical considerations among teachers and parents. For some teacher groups the use of photos was a self-evident means of documentation, but for others it caused a continuous and difficult dilemma. Some parents forbid the use of photos displaying their children and also some teachers were very suspicious in this respect. One teacher group decided that they would not use child nor teacher staff photos at all. To

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clarify and demystify this issue the choice of images should always be discussed together with the parties concerned and especially with those shown in the photos. A basis for the discussion can be a simple question raised by one schoolteacher:

> *We informed parents [about the digital portfolio], but we forgot to ask their permission e.g. for photo publishing and one of the mothers expressed her doubts about photo abuse on the net. What kinds of possibilities for abuse the unnamed photos can cause in your mind? We must return to this subject with parents in autumn.*

The teacher perspective was naturally strong in all the portfolios according to teachers' prime role as portfolio authors. *Teachers and other staff* were presented particularly on specific 'staff pages' in all but one portfolio, where staff information was included in the section 'kindergarten history'. Most often the information about staff included its composition, but sometimes also names and photos of single teachers or teacher teams. The widest personal teacher self-portraits were found in the portfolio of a special needs teacher and in one school portfolio. The first one was a reflective story about the beginning phases in new work. In the latter case, one of the schoolteachers had written her own teaching pages shedding light on her career and personal life. In both cases the authors gave also insights into their own professional development.

One kindergarten portfolio had a great number of teacher photos, which was in accordance with and accentuated the purpose of their portfolio to present and self-analyze the work of teachers. Already on the first page the reader meets the whole staff in a group photo, which communicates a feeling of togetherness among the staff. Most of the other teacher photos in this portfolio were attached to numerous diaries describing the kindergarten's collaborative work with foreign partner schools. Teacher interaction was also visualized in another school portfolio with photos introducing teacher partners, and the background and current situation of their collaboration.

Pedagogical practices and learning were presented especially through their goals, daily activities, and collaborative efforts. Often the goals were determined under specific headings such as objectives, areas of emphasis, or mission statement. Some authors described their goals in a formal, accurate and strict manner, while some others were more informal and utilized also poems, short literary quotations or drawings with a child theme in explaining the objectives and areas of emphasis. One drawing elegantly underlined the emphasis on enhancing friendship and collaboration: A child was having a swing alone and the drawing was accompanied by a poem.

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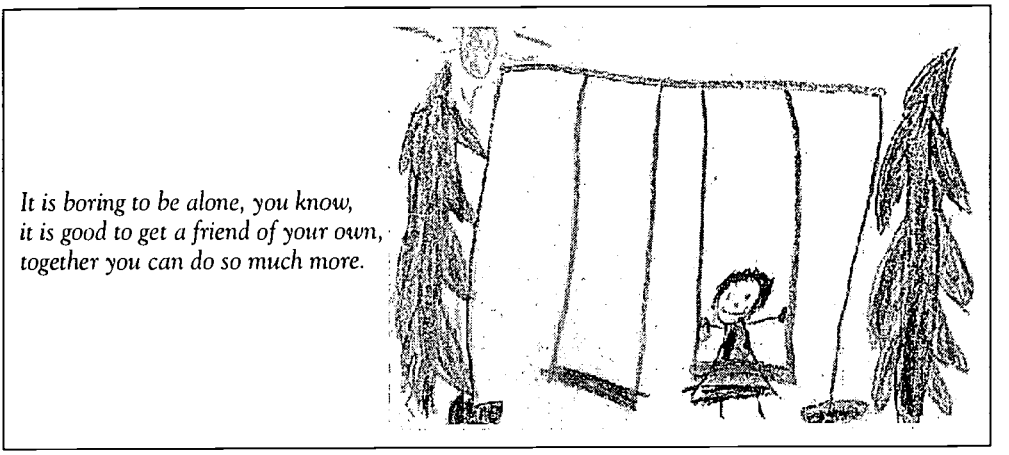

Image 7.6 *A drawing with a girl in a swing*

Typically, the daily life and activities in kindergartens and schools were described through various projects, events, work products and descriptions of history. Most commonly they were displayed in diaries, on project pages and visually also in photo albums. Some descriptive passages were found also on the pages defining objectives or areas of emphasis. Projects were usually realized during longer time periods under specific themes. One kindergarten aimed at being close to nature in their daily activities. They had found so called 'adventure education' to have such elements which correspond with their goals of environmental education.

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In a way, adventure education has been a new field for us. Already its name awakened our interest. After familiarizing with the theme more deeply, we discovered that in a way, we had all the time applied adventure education without consciously knowing it.

Image text: Culmination of the 'Mouse adventure': We did find a coffin and from it a packed lunch

Excerpt 7.11 *Documentation about the project 'Mouse adventure'*

The teachers had utilized photos to represent different activities or working and learning processes, children's work or products and various events in kindergartens or schools. Thus, both the processes and products were presented through them. One school portfolio finely described in a diary-like way the progress of their yearly collaborative project, namely planning and practicing of a performance for the school's spring fete. Different phases of the process and also the final product, the actual performance, were documented with photos, children's drawings and reflective texts.

In one kindergarten portfolio the main contents were outlined according to six development projects. The basic information about the kindergarten was provided through a link to the kindergarten's home pages. This portfolio had several levels, which were creatively linked together through different figures, photos, and texts. The portfolio browsing was made easier by the use of a frame through which the whole structure could be followed. The structure enabled the reader to choose the depth of exploration into different development projects.

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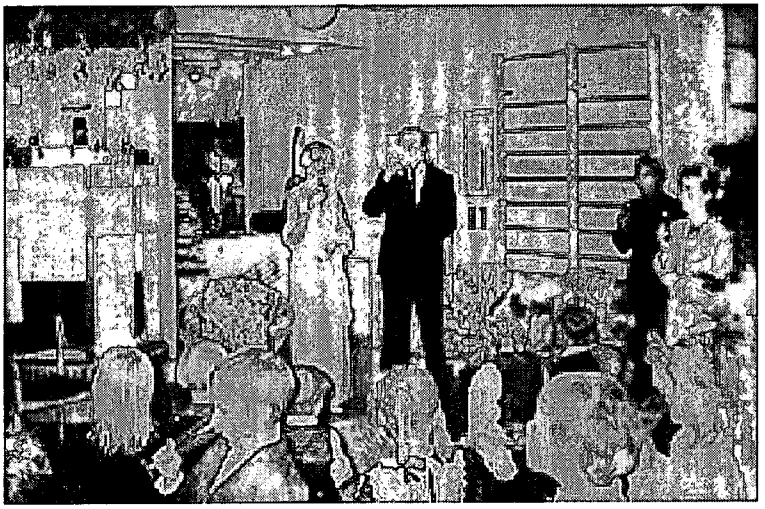
In many kindergartens different events paced the year. The documentation of events showed people in the middle of activities and depicted moments of celebrations as well as excitement in trips or in sporting games.



Celebration of independence
We celebrate Finland's independence with a fancy 'Presidential Reception' also in the kindergarten. We dress up and come then to greet the presidential couple with the accompaniment of Finlandia. The role of the presidential couple is usually played by the parents of some child from the kindergarten. The President gives a short speech and proposes a toast, and then children present Finnish folk songs and dances. The presidential couple starts a waltz in which guests join. The common festival lunch is served in the hall.

Excerpt 7.12 *Event depiction 'Celebrating the Independence Day in a kindergarten' in a photo album*

In another kindergarten portfolio a Christmas fete was documented in a form of a story. Elaborate drawings deepened the story by creating an atmosphere of a fairy tale. In general, it seems that portfolios bring out fetes and other events more strongly than the daily activities and everyday life. Teachers try to draw a positive picture of their setting and it is more rare to see daily routines or moments of disappointment.

The documentation of children's work, hand-made products or performances organized in a kindergarten or a school presents the creative side of daily activities. Some photos illustrated specific exhibitions of children's works, while others present-

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ed the proud creators alongside their products. In one school, children had created old-fashion courtyards and model houses in a project about traditional construction. This project was a collaborative enterprise with some European partner schools. Two boys described their work as follows:

First we planned the courtyard area and its buildings on paper. It was fun to design the courtyard. It was difficult to make the fence in the courtyard. I, Riku, made the fence and houses. I, Niko, made the big houses. Other group members were Tomi and Juhani.

Excerpt 7.13 *Young constructors present their work*

Too often, however, the photos were supposed to tell the whole story. In the above example the boys are portrayed with the completed end product and not in the middle of working. It would be, indeed, interesting also to read about work processes, including children's interaction and materials used in the production. This would give a better understanding about learning in such context. The works presented in the photos were typically related to specific projects or themes. Only in one case there was a product of free creative activities; two children and one adult were standing by a huge Lego tower.

In many portfolios, an album was utilized as a form of illustrating everyday activities. The most compelling way of utilizing an album was the combination of photos

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with poems or descriptive texts. However, there were still some albums that were merely collection places for photos with only very short texts or sometimes without texts at all.

One kindergarten portfolio stood out with very creative ways of representing their work. Although the content of the portfolio was still quite slight, it already gave promises of innovative means of displaying virtually the daily life of a kindergarten. The personal use of language created an authentic sense of the content. On the contents page a personal touch was added simply by using short introductory sentences under the headings, like *'Our first Christmas outdoors – This happened in 1998'*, or *'Come and take a look at our activities through photos'*. Another example of creativeness was 'the album', which was a collection of self-made poems and photos attached to them. The poems described the real-life situations and feelings in the kindergarten. Writing a poem about such an ordinary thing as dungarees indicated finely a sense of humor but also revealed a dislike for the grinding fight with them. Also other photos and poems illustrated kindergarten's daily life and they covered issues like friendship, fantasy worlds represented through children's art works, time of first snow, and use of computers.

Dungarees, ever so muddy overall,
What a trouble and ghastly appall!
Dust is flying, making you cough,
Fingernails breaking, ain't that tough!
Wishing a machine could wash them clean,
Just take them home, that's what I mean!

Excerpt 7.14 *Elements of daily life featured through 'Dungarees'*

One portfolio was outlined in a process-oriented way. This portfolio of a special needs teacher was still in its early stages. However, she succeeded in conveying and communicating feelings, meaningful experiences and plans of a newcomer in the field. Especially delightful was the lively and honest description of atmospheres and experiences, positive and negative alike, in a way that brought the situations close to the reader.

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And so the practical preparations began. A leave from the kindergarten principal's position, finding a substitute teacher, finding an office, furniture, phones etc. When I entered my office the first day, I was faced with the messy marks of renovation, a table with unsteady legs. The first thing was to get the phone line connected, which I had to wait for a week...

The different sections of the portfolio comprised a job description and descriptions of the beginning and the progress of the work. On the portfolio introduction page the author presents plenty of ideas for future contents:

I would like to add to the portfolio e.g. a weekly program, therapies and other support activities (images, signs) of an individual child. I hope to find some images among the text, e.g. children's drawings. I can e.g. make a list of books, which have been useful for me. It will consist of books, which I have been able to borrow from the local library. I would like to share with others what kind of special knowledge there is available in our town day care, or which kind of further education the staff participates in and how they apply their skills. There are bundles of ideas, but this will take rather much time, especially, when doing it by myself. ...

The physical environment or facilities were made visible mostly through photos. Only one kindergarten portfolio had a specific section 'Physical environment and history' in which the building and facilities were shortly described. However, the environment was also visible in many photos depicting various activities in or outside kindergartens and schools. The photos displayed group rooms with their furnishings, playgrounds and different facilities such as the playhouse donated to a kindergarten by parents. In one portfolio also the building and courtyard of a foreign friendship school was displayed in a diary about a visit to that school.

At the *mesosystem level* the portfolios showed interaction and relationships among people in diverse settings. Two general types of interconnections between different settings were made visible, namely the first- and second-order networks. First-order direct social networks meant collaborative activities between child groups. The display of collaboration was most widely realized in one school portfolio. In the beginning the documentation was directed toward collaborative activities between preschool and primary school education. Later on, the idea was broadened to develop and display also the interaction among children at different grade levels. The portfolio follows the progress of so-called god student practices. The second-order network concerned interaction between homes and kindergarten or school. Most portfolios at least mentioned parents in goal setting or description of events. In some portfolios parents' perspective was more explicitly visible as their opinions and experiences about specific events or projects. In one kindergarten portfolio the aims, contents and progress of a specific development project 'Family activities' was broadly described.

At the exosystem level, portfolios indicated linkages and processes between two or several settings. These collaborative links widened the ecology of kindergartens or

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schools. Partnership activities with foreign schools were described, for example, in diaries and on project pages. Some portfolios contained links to the web pages of collaborative partners e.g. homepages of other kindergartens or schools. The comparably small number of outside links could be explained with the authors' unfamiliarity of the contents of the Internet especially for kindergarten teachers. So far, they had also concentrated chiefly on documenting and digitizing the contents for their own pages. Virtual interaction and communication within the teacher network and between various portfolio authors and diverse audiences became visible mainly in the feedback sections of the portfolios.

The relevance of constructing a portfolio in a digital form

An essential advantage of a digital portfolio is argued to be that it enables a more diverse documentation and display of children's and teacher's competencies and experiences by the means of multimedia. The digital form offers a wide range of multimedia options for the combined use of text, images, sound, video, and animation.

The digital portfolios developed during the study included only basic multimedia elements, namely texts, images, hyperlinks and multilevel sections. This was due to the facts that teachers were rather novice users of ICT and the portfolio application enabled just the use of the basic elements. Therefore, the main added value of constructing a portfolio in a digital form came from the web-based possibilities of making visible and sharing the ecology of kindergartens and schools for wider audiences and from being able to give and get feedback to the work done. The portfolio application provided also a means for virtual teacher support. Other advantages were the possibility to structure the contents into multilevel entities by using hyperlinks and sections, and the ease of storing documents, and revising or updating the portfolio.

Eight portfolios were constructed with the specific portfolio application and one portfolio was prepared mainly with a web page editor program. In the latter case the teachers accounted mostly for the contents of their portfolio, while a young technical assistant took care of the technical construction. One school portfolio included a parallel portfolio, which had been constructed earlier with a web page editor program. The earlier portfolio was completed in the beginning of the project and it presented collaboration between preprimary and primary education. The teacher group was responsible for planning and documenting the contents of that portfolio, but a technical assistant from the research team had done the actual technical page editing. The use of HTML features was still modest in all portfolios constructed with the portfolio application. In most of them HTML was utilized only slightly and sticking to the basics, e.g. use of different colors, fonts and bullets.

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In one primary school portfolio, the content was extensive and teachers were already in need of more hierarchical levels in order to outline it properly. Thus, further development was expected from the portfolio application. The application was discovered to have limitations also in terms of the possibilities offered to an author to reorganize the contents. In general, it can be stated that the more varied and extensive a portfolio became, the more need there was for structuring its contents.

The most reader-friendly pages typically featured e.g. clear division into paragraphs, well-balanced combination of text and images, and rational utilization of fonts and colors. The portfolios varied in the extent to which texts and images were utilized. While one portfolio was wholly text-based, and two portfolios utilized photos only in some parts, the rest of them showed a balance between texts and images. However, also the author of the text-based portfolio was going to add in images later on.

Images proved to be an essential visual element in the digital portfolios of kindergartens and schools. In general, the use of images supported and deepened the text in which they were embedded and added significantly to the authenticity of textual narration. However, some photographs were provided without explanation and a few served only as window dressing. The images also broadened the vision of childhood learning settings by portraying the actual persons involved, highlighting the moments of action and collaboration, and depicting surrounding environments. Sometimes the choice of images revealed the emphasis, purpose or nature of the portfolio. While an aerial photo on the front page gave a bit formal impression of the kindergarten, a colorful flower drawn by a child dazzled with its warmth.

Many teacher groups found photos as a natural way of documenting the daily activities, and in general, the images were compatible with the texts. However, in some portfolios the photos presented mainly exceptional or untypical events, preplanned occasions and activities such as celebrations and trips. The amount of images ranged from non-existing in one portfolio up to 54 photos or drawings in another. Drawings were still quite rare in the portfolios, especially in comparison to photos. Three drawings - a portrait of a kindergarten, a flower, and two children standing hand in hand - could be found on the front pages. These created a child-centered feeling of the content. Only one painting could be found in all the portfolios. It was presented as an example about the use of portfolios, or folders of growth, with young children. In the painting there was a text written by a teacher explaining the young painter's interest areas. Other visual means of documentation were rare. An exception was the use of different figures in structuring the overall content of one kindergarten portfolio. The figures also served as hyperlinks to the different sub-sections.

7.2.3 Forms of reflection in digital portfolios

In this study the construction of a kindergarten or school portfolio was defined as a collaborative process of collecting or documenting evidence during a length of time, selection of documents using specific criteria and reflection on the selected collection. A distinct difference between institutional portfolios and student or teaching portfolios lies in the nature of their primary contents. Usually, the latter ones are composed of selected pieces of course work or diverse evidence of personal teaching expertise selected from a variety of material and linked with the criteria and reflection indicating the reasons for its selection. Instead, the portfolio evaluation indicated that the aim of a digital kindergarten or school portfolio was to build up a coherent and comprehensive picture of the activities, events and pedagogical practices taking place in these childhood settings.

The development process of such portfolios, however, included stages of documentation, selection, reflection and feedback similar to those pertaining to students' or teachers' working or showcase portfolios. Reflective practice was essential in the diverse cycles of portfolio development as was indicated in Chapter 6. Reflection or reflective assessment was emphasized to constitute also a crucial element for portfolio contents. The cross-case analysis of digital portfolios showed that most teacher groups had utilized various forms of portfolio reflection. In general, their texts were honest and indicated that the teachers had carefully attended both to the daily work and to portfolio compilation.

All portfolios included narratives through which teacher groups *made visible and provided* background information about the kindergarten and school ecology, describing the daily life and implementation of activities in kindergartens and primary schools. In some portfolios facts were presented in a straightforward way and event descriptions were rather superficial. The authors did not make any explicit statements about the value or meaning of the selected evidence, nor were there any clear attempts at self-assessment or discussions of school development. These teachers were mostly telling what is happening in the classrooms or child groups. The main aim seemed to be to introduce the variety of day-care activities and contexts for interested audiences.

However, in many cases descriptions were fine combinations of general introductions, matter-of-fact or more informal presentations of principles, stories of activities or events, historical reviews, and discussions on the aims of teaching. Often the event descriptions were short narratives with attached photos, like in the following quotation about the yearly event "Autumn athletics".

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Autumn athletics
In several years, already, we have organized in August an athletics event in a nearby Paunu sports field. This is a common event of our whole kindergarten. The most popular sports have been e.g. hurdles, turbojavelin, long jump, and throwing the hammer. At the end of the event adults have competed in a relay race, while children have been cheering as spectators. And finally, to top off the day, there has been a feast for gourmets in the form of a pancake party, for instance.

Excerpt 7.15 *The quotation about the event 'Autumn athletics'*

It was quite common to give a more personal touch for a portfolio through descriptions, which more richly brought authentic experiences and true-to life feelings into display. Expressions of such feelings and experiences were found in almost all portfolios. Feelings were present e.g. in project and event presentations or even in child group portrayals.

Intercultural fetes and events
Over the years the kindergarten and the school have organized, together or separately, many kinds of festival weeks and events around the themes of internationalism and Finnish culture. A beautiful memory in our minds is the dance which Kurd girls performed in Finland's Independence Celebration. The dance was based on a Kurdish birthday song, which the girls wanted to dance for their new homeland.

The group "Forget-me-nots" started its activities with a hasty schedule. Even some tools were received only after a couple of weeks since the beginning. Despite this fact, it was a pleasure to notice how well the surrounding environment received the new group. Old people living in the same house rejoiced over the life that small children brought to the yard. ...

It is positive that both feelings of success and concerns about things that had not gone so well were reflected on in the portfolios. In this way teachers showed that they

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aimed at learning from their own experiences. In one kindergarten portfolio the section of events shows the way to everyday experiences. For example, the story about 'Spring expedition' combined the everyday reality with worlds of fantasy. This kind of description could be complemented with reflections on what has been learnt, how things went, and what was achieved through the trip etc.

> *Spring trip to Piispala, Kannonkoski*
> *In Tuesday morning, May 16, at 7.45 a.m. there was a lot of excitement in our kindergarten, as the clock was showing 'the starting time' but we could not see the bus anywhere. Waiting, getting nervous, calming down, some phone calls... understanding, sweating, cold shivers and ... finally the bus came, some twenty minutes late, but after all we could start our trip. A beautiful, sunny spring weather, soft green sceneries and a cheerful hum of voices embraced our journey; nobody felt sick and our travel was enjoyable in every respect, also for the adults.*
>
> *At Piispala, Queen Vellamo from the empire of waters, the wife of King Ahti, was waiting for us. She told us how dwarfs, demons, trolls etc. had got angry about the noise coming from the construction works in Piispala and now we could help to calm down the brownies. After "toileting" we started off with the lead of Vellamo. The route snaked in a heather-growing forest and on our way we made some tasks and tricks to appease the brownies. ...*

Excerpt 7.16 *Event description about 'Spring expedition'*

Some project or event presentations included assessments of a simple declaratory manner. For example, the realization of one kindergarten's club project was shortly characterized: *"the participants enjoyed in Outi's guidance"*, or from the event diary about the kindergarten's anniversary: *"We were happily surprised that we got so many guests"*. In general, more assessment and critical evaluation is needed to make digital school portfolios deeper in their reflection. This can be attained e.g. through reflections on what teachers have learned from the diverse activities and practices described in the portfolios.

Goal setting was, at its simplest form, just references to jointly agreed aims and areas of emphasis. Mostly these references dealt with feelings and experiences about different activities, but in some parts also with assessments of realization of plans.

> *The week "Life in the old days" went nicely. We had asked parents and children to bring old things to the kindergarten. Only few children brought things, but still we got quite a lot and they were fine. We made button propellers with children, but these toys did not really work too well. We failed to get them hum. On February the 24th Granny Airi came to visit us and also she had old things with her, e.g. old books and candy boxes, which interested children, and also postcards. Maybe the most interesting thing was, that she brought also coffee beans she had roasted herself and a coffee grinder which children could try out. It smelled wonderful...*

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A more sophisticated and promising way was to parallel the aim description with examples of the practical implementation. In some portfolio the sections of events included in-depth descriptions about realized activities. Integration of child and parent perspectives complemented excellently the narration of staff. Only a few teacher groups reflected more extensively on their teaching aims. An example of this is found in the section of development project 'Intercultural education and teaching' in one kindergarten portfolio. In several places descriptive and evaluative texts were combined when authors reflected both on the origins and the realization of the goals. Practical examples from the daily life help the reader understand the reality of day care. This also ensures that ideas and pedagogical practices are discussed together. A reader becomes convinced of their developmental perspective, and of the realistic and true-to-life thinking involved in these practices.

Ethnic assistants are necessary in a multicultural kindergarten for child development, education, and teaching and for the collaboration with parents. A remarkable thing related to education for tolerance is, for example, to hear our Russian language assistant to sing Russian songs along her chores.

The goal of the language club is to enhance skills in the Finnish language. ...For example, during an autumn trip it is cognitively different for our staff to teach the berries to an immigrant child from what it is to teach the berries to a child speaking Finnish as her mother tongue. Finnish language teaching and observation of language development is an important step towards intercultural pedagogy.

Two teacher groups utilized web diaries as forums for shared writing of experiences. Teachers in one kindergarten narrated through their travel diaries about visits with foreign partner schools. Teachers reflected on what they had learnt during the visits and what meaning and effects the international partnership have had on their own work and on the general quality of early childhood education in their kindergarten. For example, they described how teachers have applied in their own child group the things they have seen and experienced elsewhere. Another teacher group followed the weekly and sometimes even daily progress of their projects. In both cases teachers communicated true-to-life experiences and feelings of their work but also insights for further development of pedagogical practices.

Sometimes the presentations of activities also included signs of *emerging self-assessment and evaluative stance*. For example, the development project 'Small steps towards Europe' was basically presented in a descriptive manner, but also signs of self-assessment are found.

"Small steps towards Europe" has so far been an interesting and rewarding project. It has supported in a splendid way our day care to become more international and to give education for tolerance. Through the project we have received new friends and we believe that our collaboration does not end on the last day of our project. (31.7.2001)

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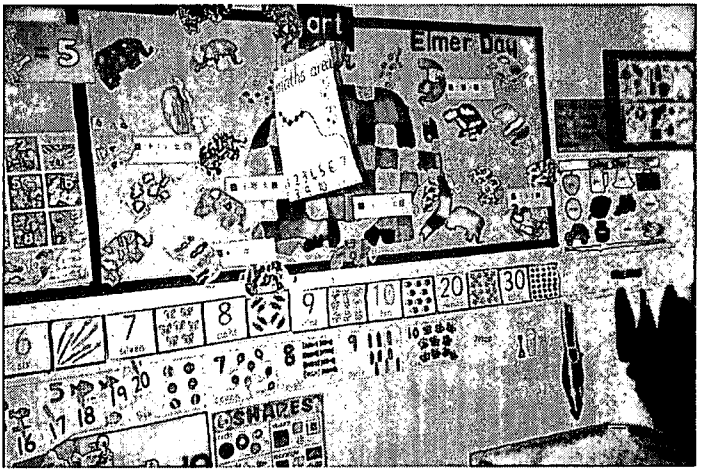
1) A travel diary

Family Center carried out a project in mathematics, for which they had got the idea on their visit to Finland. Children (and parents) studied mathematics in nature through play and they learnt to observe numbers in their surrounding environment e.g. on car register plates and walls of houses. ... Morning activities included a short break in the fenced yard, where cycling was the most popular form of physical activity. The rather narrow, asphalt yard did not really create opportunities for other things.



2) A project diary

Week 18
Let's see whether we will have time to practice enough. All the roles have been assigned, reading and playing practices are on the go whenever there is time, but that is hard to find! There are also all the other things pressing now when the end of school year is imminent. But our expectations are high. Adult memory just tends to be less reliable than children's. Maybe we need to rehearse our lines also when walking the dog!
Week 19
The first joint practice in the hall was quite chaotic. The mother and father trolls (teachers) couldn't remember much of their lines. The Wolf had been sneaking one week in the fells of Lapland, but it knew its lines brilliantly! Those who did not yet have roles were standing pretty much as question marks. Role clothes have been gathered from here and there. Still a lot needs to be done. But we have the enthusiasm to pull this through, and choirs are practicing songs in every while and then. The task of the fairy is to make up her own line. Whole entity is shaping little by little when the lines, songs and rhymes of the troll path inhabitants have been agreed on.

Excerpt 7.17 *Diary pages from two kindergartens*

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Although all teacher groups did their best to appeal readers outside the kindergarten or school community, there were also those for whom the main aim was to make themselves more conscious of their own work. Such *analyses of one's own work and definitions of competence or expertise* were found in four portfolios. One teacher had created a page of her own, in which she narrated the history of her teaching career and revealed meaningful experiences, which have affected her life and work. Also the life outside schoolwork (e.g. family, hobbies) had contributed significantly to her overall teaching philosophy. The text was finished with a short philosophy in which the teacher emphasized the meaning of lifelong learning and positive thinking. This reflective piece or self-study resembled a teaching portfolio.

The circulatory special teacher used successfully versatile forms of reflection. The portfolio included four texts, three of which combined description and reflection in a smooth manner. They were written in the first person and they were honest, warm and lively narratives about the work of a circulatory teacher. The fourth passage was a more formal guideline text about the circulatory teacher's official job description. In the job description she disclosed the aims and levels of her work. She also shortly touched upon her own qualifications for the job as follows:

> *After many years of persistent work and persuasion (different statistics etc.) the post of circulatory special teacher was established in our town in the beginning of November 1998. ... Even though I have worked for the city of Jämsä for almost 20 years, I felt like a butterfingers in my new position. The good thing was that I knew all my collaborators beforehand.*

Some portfolios also contained analyses *of the meaning of one's own work and its development*. Some teacher groups even had courage to take pride in their work.

> *We tried to ponder realistically what our time and energy resources are and what kind of problems we might encounter.*

> *We are now working, for the second term already, on the theme 'learning through adventure' and this theme has taught us all very very much, adults and children alike. Our 'adventure projects' have succeeded well for the most part. However, in retrospect we have noticed things that we could have done otherwise, but also things that could not have been realized better! And we have been proud for that, believe me!*

On portfolio presentation pages there were signs of more reflective writing habits when teachers described the challenges, meanings and problems encountered in the course of *portfolio development*. These pages also contained statements of portfolio purposes, and often challenges were defined for the portfolio's further development, as well. For some teachers, documentation of work into a portfolio had already become an undisputed part of their pedagogical practices and they wished for comments and feedback from readers.

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To conclude, the examination of actual portfolio contents indicated that teachers have adopted digital portfolios as a means for making visible the ecology of kindergartens or schools. They emphasized especially the display of interaction and collaboration between various actors in the field. The portfolios also included various forms of reflective assessment. However, in general, most parts of the portfolios operated at the level of description and presentation of activities. Deeper forms of reflection were found, as well, but they were still relatively rare. Nevertheless, already this kind of documentation and description, which seeks to highlight the various people concerned as well as their interaction, activities, events and work products, is an important form of assessment.

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CHAPTER 8

Conclusions

The findings of the study suggested that digital portfolio development requires consideration of several design and implementation issues. This is in accordance with Barrett's (1998) argument that digital portfolio development should be preceded by a careful examination of strategic questions about the functions and uses of assessment in general and portfolio in particular, but also about the human and technological resources available. The following issues proved to be central for sustainable use and development of portfolios:

- Definition of purposes for digital portfolios
- Consideration of the meaning of kindergarten or school culture for digital portfolio development
- Exploration of the role of ICT in the childhood environment
- Provision of diverse support for teachers
- Development of user-friendly technological tools
- Collaboration in the portfolio design and implementation
- Reflection on ethical issues

The meaning of these issues in this study is discussed more closely in the subsequent sections.

8.1 The purposes of digital portfolios

The findings indicated that teacher groups had clearly acknowledged the advantages of digital portfolios for their work. Teachers emphasized the meaning of portfolios especially in the display and sharing of information concerning kindergarten or school

environments. Portfolio was also determined distinctly as a means for making visible and strengthening collaboration. As for other purposes of a digital portfolio, also support for self-assessment and the development and reflection of teaching were mentioned, but less emphatically than the previous ones. When compared with the most typical advantages of the portfolio approach (see Table 3.1), it was found out that 'promotion of learning' and 'definition of learning goals' were not explicitly stated by the teachers. However, these advantages could be interpreted as implicit through various purposes mentioned as the prime aim. For example, the plans for display of learning environments in the portfolios included also descriptions and definitions of instructional goals and learning tasks. In addition, it is evident that the ultimate aim of collaboration between parents or teachers at successive educational levels is the promotion of children's growth and learning.

Chelimsky (1997) proposes that different evaluation or assessment purposes could be further characterized through three general perspectives, namely assessment for knowledge, development, and accountability. However, these perspectives are not exhaustive nor mutually exclusive. These assessment perspectives are applied here to examine how teachers defined portfolio audiences and purposes in more detail (Table 8.1).

The knowledge perspective of portfolio assessment proved to be dominant at all system levels. At the micro level teachers constructed the digital portfolio for themselves to get a better and deeper understanding of their own work through documentation and self-assessment. A digital portfolio could function finely as a forum for new staff members to familiarize themselves with goals, people and activities. Somewhat surprisingly, children were not mentioned as an audience for portfolios, or the purposes of portfolios did not directly concern them. The seemingly invisibility of children in this regard can be related to the general goal of attaining multiple perspectives on childhood learning environments. Teacher groups aimed at including children's and parents' perspective to the portfolios, and in many portfolios these were already visible as descriptions or feedback of activities. Yet, during the monitored cycles of portfolio development the main focus was on the collaborative teacher perspective and, thus, the portfolios were chiefly authored by, and addressed to, teachers in the kindergartens and primary schools.

Also a developmental perspective appeared at the micro level. From this perspective portfolio assessment provides evaluative help to strengthen kindergartens and schools as institutions. More specifically, teachers regarded digital portfolios as a means to develop pedagogical practices and collaboration with relevant parties.

Table 8.1 *Comparison of portfolio audiences and purposes with related assessment perspectives*

Audience	*Purpose*	*Assessment perspective*
Microsystem Teachers themselves	Understanding own work Enhancing community consciousness Base for development of pedagogical practices and collaboration	Knowledge Developmental
Mesosystem Parents Children's future schoolteachers	Information sharing Visibility of work Increasing parental participation	Knowledge Developmental
Exosystem Teachers in other kindergartens and schools Local settings like parish Foreign partner schools Future 'client' families Future students	Information sharing Visibility of work Increasing collaboration Collegial guidance and consulting	Knowledge Developmental
Macrosystem Decision-makers	Information sharing Visibility of work	Knowledge

At the other levels, the knowledge perspective concerned teachers' efforts to share information about the daily work, teaching and learning in kindergartens and primary schools and to add to the overall visibility of childhood education. Teachers saw that digital portfolios could be sources of varied information. The possible audiences at the mesosystem level were parents and children's future schoolteachers, who could this way learn about children's daycare experiences. At the exosystem level, portfolios were directed to other teachers, teacher students, foreign partner schools, and local institutions like parish.

Also at the macrosystem level the knowledge perspective was prevailing, because one of the stated aims was information sharing for decision-makers. In this case, a digital portfolio could have also an accountability function in showing the value for funds invested in childhood education. However, in the teacher groups' purpose statements the accountability perspective as a measurement of results or efficiency was not explicitly expressed. One of the central results at the wider ecological levels is that the connections and relationships between growth and learning environments can get

more diversified, both between parallel learning environments like kindergarten and home and between successive environments like kindergarten and school. Such connections between various parties are essential for the comprehensiveness and continuity of children's growth and learning.

The developmental perspective of portfolio assessment was still minor at other than the microsystem level. At the mesosystem level it referred to the desire of attracting parents for increased participation inspired by the multimedia presentation of the kindergarten. At the exosystem level teachers had realized that a digital portfolio could be a means for collegial development of childhood education because it encourages teachers for ICT-enhanced collaboration, guidance and consulting. This is enabled through the availability of portfolios in information networks and through the built-in possibility for feedback and discussion. In this study, also teacher training was indirectly included in the portfolio development as teacher students acted as mentors in the portfolio process. In future, digital portfolio could be one promising method for increasing developmental collaboration between teachers in the field, teacher training and educational research.

Teacher groups had already marketed their portfolios also for diverse audiences like parents, visitors, and partner schools. Yet, during this study interaction through digital portfolios occurred primarily within the network of research participants in online workshops and through teachers acting as critical friends for each other. In this way, the portfolio becomes an interactive means for development and collaborative reflection as discussions are based on documented evidence. For other audiences portfolios still functioned solely as information forums and responses through portfolios were rather scarce. Teachers recognized the possibilities and worth of this kind of computerized communication, but they assumed that its fulfillment would take some years. It would require greater activity from them so as to advertise their portfolio sites. More varied use also calls for development of interactive systems of mentoring and guidance.

To conclude, digital web portfolios enable presentation of self-reflections and thoughts to a wider audience. A virtual audience offers a forum for sharing and discussing issues of childhood education and also a possibility for collegial guidance. On the other hand, the virtual forum enables teachers to see the work, thoughts and self-reflections of other teachers. The possibilities to look at other school portfolios and to give feedback on them also guide teachers in their own portfolio work and give insights for the continuous development of their work.

Even a preliminary evaluation indicated that digital portfolios could give valuable content information about different features of expertise in successive childhood settings and about the collaborative links between different levels of childhood ecosystems. This information can be used in further analyses on the quality of learning,

teaching and collaboration in childhood environments. Continuously updated content information could be valuable for teacher training as well.

8.2 The meaning of kindergarten and school culture

It has been argued that the culture of an educational institution is the most critical component in adoption and adaptation of a new technological tool like digital portfolios (Niguidula 1997). In this study it was found out that the issue of school culture concerns:

- kindergartens and schools as contexts for portfolio development,
- provision of teacher support within a kindergarten or school, and
- creation of so-called portfolio culture

The progress of the study revealed that the context of kindergarten or school is a critical component in determining the possibilities and constraints for the design and implementation of digital portfolios. The teachers in the study participated in the digital portfolio development on a voluntary basis, alongside their normal teaching work. The aim was to investigate how portfolio development could become a natural part of the daily practices. The teachers were themselves responsible in organizing their participation in such ways that would suit their whole kindergarten or school community and yield sustainable forms of portfolio activities. The initiative for digital portfolio development came from the researcher. However, teachers had such prior knowledge and experience about portfolio assessment that they could readily see the possibilities of digital portfolios in their work. This encouraged and attracted them to active participation.

Teachers displayed their working context by describing how the daily life at kindergartens and schools framed their participation. This was in accordance with the contextual thinking emphasized in the ecological approach (e.g. Bronfenbrenner 1991; Nardi & O'Day 1999). However, they did their best to organize their work in such a way that the care and learning of children was not affected. There were several organizational issues that needed to be solved in order to ensure the teachers' possibilities for portfolio work. It was especially crucial that the timetable for meetings and workshops was always negotiated with the teachers so as to find the best possible time and enable as wide participation as possible. It was also essential to start and proceed with reasonably small efforts.

It became clear that without *provision of support within the kindergarten or school community* no portfolio development process can proceed effectively. This study proved

that important characteristics of internal support include a general approval and valuation of reflective practices as an inherent part of the school culture, a whole-school approach emphasizing collaboration in assessment practices, and more practical issues of ensuring sufficient access to computers and ICT training for teachers. One important form of school community's support in the use of digital portfolios is collaboration or collegial mentoring between teachers within a school but also across different schools and even across different educational levels. Collegial mentoring and collaboration is a great asset when constructing a portfolio and in the general development of teachers' ICT capabilities, but perhaps even more so when it comes to sharing feedback more widely.

Along the process teachers gained more and more independence and ownership over the portfolio scheme. Especially, once sharing the first versions of their digital portfolios on the web, the teachers begun to find different meanings and purposes for the portfolios. After this they took wider responsibility for the portfolio work, but they were also more empowered to request for appropriate mentoring and better access to equipment needed in digital portfolio compilation. Still, most teacher groups needed constant encouragement and support for continuing to compile their portfolios.

Restricted time resources is probably the most common argument against participation in various development activities, particularly if these activities do not seem to have any instant or direct benefits for the daily work and practices. Also in this study, time constraints were most often referred to as hindering participation and active portfolio development. This discussion, however, has always two sides, at least (see Shaklee et al. 1997). It has the side of school culture indicating which things and practices are valued as essential parts of the daily work and which are the main aims of education. It also has the side of actual work conditions in kindergartens and schools. In this study it soon became evident that during working hours it was often almost impossible for teachers to withdraw from the child group activities and concentrate on reflective assessment of their work, or practice and improve their skills in ICT and portfolio development. Also constant changes in the staff hindered the consistency of development work.

The problem of insufficient time resources loses some of its meaning when reflective practice has a role of its own in daily activities. The school culture is also self-created and it can be further developed. The creation of a culture of co-construction and reflection implies that pedagogical practices are examined critically. According to Dahlberg (et al. 1999, 143) this entails prioritizing and sometimes just simple decisions about work organizations:

> *... It is important to look at the use of time to ensure work such as documentation gets done. The key is to prioritize (for example, we have found that time can be found for staff to work on documentation by not expecting all the pedagogues to be with the children or to be eating meals*

with the children). Given this priority, documentation can both develop in-service training and the formation of public forums for participation, dialogue and confrontation – documentation becomes the focus for both.

This can be transferred to examination of what a *portfolio culture* would be like (Wolf 1998; McLaughlin & Vogt 1998). What kind of portfolio culture would best support and contribute sustainable portfolio activities and also include serious discussion on the ethical issues involved in digital publishing of portfolios? In the study it was found out that the crucial features of a good portfolio culture include at least valuation of reflective practices, active collaboration between diverse actors within and outside the kindergarten or school community, and interest in the work of others. It is fundamental that experts in such portfolio culture have motivation for continuous learning and development and a desire for sharing one's expertise and renegotiating pedagogical practices (Freidus 1998).

In this regard, it is essential that the portfolio approach is valued as an essential part of pedagogical practices. The portfolio approach includes especially documentation of work, selection and reflective assessment of the most meaningful practices and experiences, and the process of making them visible and sharing them with others. In this way, this kind of reflective practice opens the daily life for diverse audiences. According to Shaklee (et al. 1997, 138) reflective practitioners are individuals "*who can transcend their own personal teaching experiences and view their teaching (and all this involves) from multiple perspectives and through the current knowledge derived from theory and research*". In this way it links early childhood education to other educational levels, helps teachers become conscious of their own work for pedagogic development, and empowers teachers both pedagogically and technologically. Smith and Tillema (2001) have found out that professionals considered systematic reflection as the main long-term effect in portfolio approach:

An additional influence of the portfolio experience is the need for respondents to discuss their work with colleagues and reflect on it themselves. It is related to the counseling role of the portfolio. When compiling a portfolio in an instructional setting there is an ongoing dialogue with the tutor. This legitimizes the need professionals have to discuss their work with others.

The question of becoming a reflective practitioner (Schön 1987) takes us back to the issue of mentoring or scaffolding. The portfolio development process in this study confirmed Lyons's (1998) finding that reflection on practice requires the use of diverse methods of scaffolding in order to aid teachers in making connections between meaningful experiences and pedagogical practices. It also supported Shaklee's (et al. 1997) argument that the primary issue has to do with how to encourage educators to become reflective. Yet, as was described earlier, one of the constraints in this study was

that during the cycles of portfolio development the need, and thus also provision of technical support exceeded the amount of guidance in portfolio work including reflective practice.

In this study reflective practice and re-construction were sought for through collaborative development and use of digital portfolios. The teachers themselves already had in mind clear purposes and audiences for their digital portfolios (see Chapter 7). For example, they underlined the possibility of opening and indicating the value of early childhood education for diverse audiences and for making also teachers themselves more conscious of their work through making it visible and reflecting on it.

The latter purpose brings us to yet another form of mentoring that emerged as part of the portfolio process. Through the process of self-reflection and collaborative portfolio construction the teachers wanted to become more conscious of their own work. Thus, they acted as mentors of their own work and its development, but at the same time also as mentors for other teachers in the development of digital portfolios. Portfolio contents and self-reflections were constantly discussed within teacher groups. According to Freidus (1998) this kind of self-mentoring or metacognitive awareness aids teachers in personal or professional thinking that guides their practices. In this study, such metacognitive awareness developed along with teachers' portfolio process.

8.3 The role of ICT in the childhood environments

The use of ICT in digital portfolio development required that its role in the overall environment be carefully explored (e.g. Salomon 1996; Nardi & O'Day 1999). The ecological approach and systemic thinking provided a contextual framework for gaining deeper understanding about the meaning of technology and the interaction of technology and teachers in the daily life (Bruce & Hogan 1998). The focus of analysis was on *the role of technology in enabling teachers to participate in digital portfolio construction.*

Especially the ecological notion 'disappearance of technology' (e.g. Bruce & Hogan 1998; Rothenberg 2000) did get verified during various cycles of the action research study. The notion refers to development where the role and uses of technologies are gradually adopted as natural elements of childhood learning environments (see Bruce & Hogan 1998). In this study, examination focused on how embedded technological systems affect and empower teachers as their users and how they either promote or hinder digital portfolio development. In the context of this study this meant foremost such technologies that concern digital portfolio construction. Two interlinked issues emerged as essential; first, the evolvement of teachers' ICT capabilities and second, the development of appropriate technological tools.

The evolvement of teacher's ICT capabilities was examined as resulting from respective issues of access, motivation and competence (see Viherä 1999). It was found out that sufficient access to computers, peripherals, information networks and appropriate software is a necessary prerequisite for sustainable digital portfolio development. The study also strengthened the meaning of motivation and competence as important factors of teachers' ICT capabilities. Teachers need to understand why to use technology in their own work. In this study, the portfolio approach provided teachers with the primary purpose and motivation for the advancement of their own ICT capabilities.

Technological changes set teachers face to face with constant challenges for teaching but also with feelings of uncertainty regarding their own competence and novel aspects of professional expertise. The findings confirmed the argument that teachers need to have a sound technological basic competence to be able to utilize ICT in their own work (see Koivisto et al. 1999). It is important that the teachers are offered new learning challenges, as well. It became evident that it is more essential to have enthusiasm and experienced need for experimenting with new things provided by information and communication technologies and genuine desire for learning than to have the latest applications. During the process of digital portfolio development and along with their improving ICT capabilities teachers also engaged in the pedagogical use of ICT in early childhood education (see Salomon 1996). Therefore, it can be assumed that in general, the use of ICT can open up new dimensions of pedagogical expertise for teachers.

Already the first cycles of portfolio development indicated that teachers needed extensive support in the development of their ICT capabilities. At the same time there was a need to develop user-friendly tools for digital portfolio construction. The latter need indicates that also the technical attributes of the technology had to be taken into consideration (cf. Bruce & Hogan 1998).

8.4 Diversity of teacher support

The need for teacher training and support proved to be extensive and constant in the diverse cycles of portfolio development, but its nature, forms and content varied. In all, the teachers' need for technical support, and accordingly its provision, exceeded the need and guidance given in portfolio assessment. This was clearly a consequence of the fact that the use of ICT was for almost all of the kindergarten teachers an entirely novel area of expertise, while they regarded assessment and also portfolio assessment more closely related to their prevailing pedagogical practices.

Especially in the first two cycles of portfolio development teachers needed constant *support in technical skills and content matters* as was described in Chapter 5. Teachers also needed continuous support and technological coordination with issues regarding access to computers and information networks. Training and support that were adapted to the developing skills and needs of the teachers, but also to the daily timetables of kindergartens and schools, proved to be a successful way of introducing ICT for teachers. One solution was to train so-called key teachers, who could mentor their colleagues in various areas of learning technologies. Also the effect that teachers' participation in an ICT-related research and development project had on the investments in appropriate technical devices in their kindergartens and primary schools can be regarded as a special form of support.

Earlier studies have shown that teachers' possibilities to get support and training in the use of ICT have a fundamental effect on how courageous the teachers are in applying new teaching methods and how they cope amidst technological changes (see e.g. Kankaanranta et al. 2000; Koivisto et al. 1999; Sinko & Lehtinen 1999; Rahikainen et al. 1998). A survey on Finnish primary and secondary school teachers' ICT competence indicated that teachers already experienced stronger need for pedagogical than technical support (Rahikainen et al. 1998). However, in early childhood education the use of ICT is still in its beginnings and in need of basic investments as for ensuring teachers' access and competence (e.g. Kangassalo 1998; Pekkarinen 2001). Investments are crucial in order that teachers become computer literate enough to share and construct expertise collaboratively in virtual groups and to guide also young children to become active and independent explorers of information (Sinko & Lehtinen 1999; Vandevelde 1999). It has been realized, indeed, that the basis for purposeful usage of technology is created already in pre-school and the first stages of primary education (Sinko & Lehtinen 1999).

Portfolio development was started simultaneously with teachers' technological training. This was seen essential to ensure that teachers would have a clear purpose and motivation for the advancement of their ICT capabilities. The content of portfolio training and support was proportioned to *the prior knowledge and experiences of the teachers* in terms of portfolio assessment and especially in the use of digital portfolios. Teachers needed outside encouragement and support in various areas related to technology-enriched portfolio development, but especially for the analyses and collegial reviews of digital portfolios. The main forms of outside support for portfolio development were mentoring in the portfolio process, collaborative choice and design of the web portfolio application, and training and guidance in the use of the application. It was not self-evident for the teachers to give feedback to others, and often the feedback given was very general and superficial in quality (see Chapter 7). They were not yet accustomed to independent sharing and evaluation of digital portfolios. This is

why it proved necessary to organize specific joint sessions for portfolio sharing. A distinct future challenge will be to diversify the forms of reflection and to develop reflective tools for portfolios.

The nature of interaction with regard to teacher support changed according to the ecological idea of reciprocal, mutually dependent roles of participants (e.g. Bronfenbrenner 1979; Nystrand et al. 2001). At the beginning the main difference in the participant roles appeared between the research group and teacher groups. The research group acted in a role of a guide or an expert in the portfolio work and use of ICT. The teachers were portfolio authors, who needed constant support in various portfolio activities. At that stage, the support was more about formal training for teachers in portfolio development. Along with the evolvement of teachers' capabilities both in the use of ICT and portfolio assessment, the role pattern gradually transformed towards guidance, mutual development and collaborative mentoring. Improved capabilities empowered and engaged the teachers to take more responsibility for their portfolio design and implementation and also for the guidance of their colleagues.

The forms of teacher support were forged during the cycles of portfolio development according to experienced needs. It was seen essential that teachers receive support both from outside and inside their kindergarten and school communities. Outside support and stimulation was often a prerequisite for teachers' continuing efforts with the portfolio development in spite of the experienced lack of time and resources. In this study outside support was provided by the research group consisting of a researcher, a number of student mentors and technical experts, and also by a regional ICT-related development project called Pedanet. Nevertheless, without internal support within the kindergarten or school community, no portfolio development process can proceed effectively. The issues of inside support are examined more closely in conjunction with discussion about school culture.

This study provided promising experiences about *collaboration between educational research, teacher education and teachers in the field.* The ecology of one kindergarten or school was widened to a network of diverse actors and experts in early childhood education. The collaboration with teacher education meant that five students from the Department of Early Childhood Education at the University of Jyväskylä worked as research assistants in the study, covering thus their research-training period. They acted as student mentors at various stages of portfolio development.

For these students, the action research project and collaboration with teachers provided a forum to advance their consultative expertise in early childhood education, to familiarize themselves with technology-enriched communication and assessment, and to participate in the methodological development work in close collaboration with teachers. The student mentors acted in varying roles according to the nature of experienced needs. The teacher groups finely welcomed the students as men-

tors and outside critical friends to support and guide their work both in portfolio development and in the use of ICT. In this collaboration, it was especially intriguing to discover the reciprocal nature of relationships between the student mentors with open-minded attitudes towards technology and the experienced teachers with wide pedagogical expertise.

External support for portfolio development was provided in several joint face-to-face workshops, as individual or small-group on-site mentoring in kindergartens or schools, and through electronic communication devices in online situations. In general, the teachers found the joint workshops organized outside their own settings valuable, because then they could better rid themselves of the daily work and concentrate upon the portfolio construction. Otherwise, amidst daily tasks and duties it was difficult to devote oneself to it. Also the student mentors emphasized the meaning of teacher training and consultation e.g. in the form of workshops as an essential factor for ensuring the continuance and sustainability of digital portfolio development.

> *The meetings are the only moments when the staff can concentrate on portfolio work. A common workshop for all might be a better idea than visiting every kindergarten separately. In these common meetings teachers have achieved more [as regards portfolio development], whereas in kindergarten visits more time goes in general discussions. I think that a precondition for the continuation of this project is that workshops are organized more frequently. Without meetings the portfolio construction process will slowly fade away. (An excerpt from a student mentor's research diary.)*

On the other hand, some teachers preferred frequent on-site meetings in their own kindergartens or schools as a solution for the scarce time resources. On-site meetings also enabled teachers to transfer and apply their skills in their own technological environment.

The whole group of teachers met only once in a face-to-face situation and this happened in the common portfolio seminar. This meeting was considered valuable for building a community of teachers engaged in sharing their daily work through digital portfolios (see Freidus 1998). The rest of the face-to-face meetings were organized locally in smaller groups consisting of teachers in a specific area like one town. After the teacher groups had published their digital portfolios on the web, some of the workshops were organized through a web-based portfolio application as well. These on-line workshops were open for all the teachers. In these on-line sessions teachers continued with their portfolio development, asked for guidance as needed and shared feedback with other teachers.

8.5 Development of user-friendly and progressive technological tools for digital portfolios

It was found out that successful portfolio construction involves at least two different kinds of technological tools:

- a user-friendly and progressive application for portfolio construction
- collaborative and reflective tools embedded in the portfolio application

Along the proceeding of the portfolio process the choice of an appropriate application for web portfolios was carefully examined and different technical possibilities for web page editing were tried out. The first versions of portfolios had been created using HTML editors with the support of technical assistants. However, teachers needed extensive support with the work and still many of them found the effort too difficult and time-consuming.

The exploration and monitoring of teachers' ICT capabilities during the first two action research cycles had also indicated that although their ICT skills were improving all the time, more advanced and specialist ICT use like web page editing needed still a lot of time and effort. It could be estimated that with constant and long-term support and teacher training the required skills would be acquired. Then again, slow progress would delay the development of portfolios, which the teachers had already got well underway with planning, documentation and selection of materials. At that stage they were more and more eager to see the results of their portfolio work on the web. Discussions and e-mail contacts with teachers indicated that there was a clear shift of focus so that *the concrete task of portfolio construction was gaining emphasis over the desire of just learning to use technological tools.* If technology gets a too central role, the content and purpose of work will fade out to the background, which may lead to a decline of motivation and take capacity from pedagogical thinking. (See Bruce & Hogan 1998.)

Another fact to be taken into account was *the future of digital portfolio development in kindergartens and schools.* How could teachers continue the development work through digital portfolios after the project with related mentoring and support would cease? How could other teachers, still novice with advanced technology, start to construct their digital portfolios? It was therefore topical to consider the choice of an application for portfolio construction. It was recognized that the development of a user-friendly and dynamic application was crucial for the progress of digital portfolios. Again, from the ecological perspective this required that key constituents of the overall environments affecting the digital portfolio development would be taken into account.

The findings and experiences from prior cycles of digital portfolio development suggested that the properties of the application needed to be proportioned especially to the teachers' ICT capabilities, namely competence, access and motivation in the use of information and communication technologies (Barrett 1999, 2000; Viherä 1999). Also the affordances of kindergartens and schools as assessment contexts determined the application choices. It had become clear that while the teachers wanted to learn HTML editing, they did not have enough time or competence for its independent use. The application needed to be as user-friendly as possible providing a platform for web publishing with basic skills but at the same time giving a possibility for more varied use along with increasing competence in web page editing.

The web portfolio application was developed in the collaborating Pedanet project (Lahti 2001). The design and introduction of the portfolio application was related to the ecological discussion about disappearance or invisibility of technology (Bruce & Hogan 1998). It led to the twofold goal of developing invisible technology and visible childhood pedagogy (see Duffy 1999). The aim was to develop user-friendly solutions for web editing in order that technological tools would become more invisible in daily practices (Bruce & Hogan 1997). The application needed to be flexible enough to correspond with the evolvement of teachers' capabilities. From this perspective user-friendliness means that the application is suitable for people with different skills and demands. It leads to intertwine of skills and tools. The application, in a way, grows with the advancement of user skills and provides constantly new challenges and increasingly versatile means for portfolio implementation.

The features of the web portfolio application determined the basic structure and technical realization of portfolios. It offered a convenient and user-friendly method for real-time processing of web portfolio materials. As a trade-off, this meant that the possibilities for versatile multimedia utilization and page layout design had to be restricted to some extent. Teachers could create and publish web pages, write basic text, transfer images to a server, add images and links to the pages and also create two-level sections for the contents. They were thus able to edit digital portfolios without any knowledge of HTML or of FTP transfers to a server. The basic properties of the application could be extended, however, by the use of HTML editing according to the evolving skills of the teachers or by establishing links to pages prepared with more advanced web editing programs. In other words, it provided tools for web publishing with basic skills but at the same time featured a possibility for more varied use along with continuous learning of web page editing.

The analysis of portfolio contents showed the need for further development as regards the design and use of collaborative and reflective tools. In its typical form the portfolio application included a simple tool for feedback. For the purpose of teacher support and guidance in portfolio construction also a specific mentoring portfolio was

constructed. It was utilized especially in online workshops, but teachers were encouraged to utilize it as an aid in independent portfolio authoring, as well. In future it would also be interesting to learn more about the portfolio authors – their thoughts, reflections and assessments as well. Another challenge is to introduce the portfolio application for wider use and display of multiple perspectives. The portfolio application provides two different authoring levels. The teachers can act as main authors who are entitled to publish or delete portfolio pages. The rights of co-authoring can be offered for children and their parents, for instance.

8.6 Collaboration in the portfolio design and implementation

Portfolio development was presented to teachers as a collaborative process, which would bring forth multiple perspectives of the daily life in kindergartens and primary schools. However, during this action research study the primary focus was on the teacher perspective and teachers' mutual collaboration in the design and implementation of digital portfolios as a new assessment method. It was up to the teachers to combine it with other perspectives like those of children or parents.

The amount and forms of *teacher collaboration in the construction process* varied from one kindergarten or school to another. They varied also within a single teacher group during the various cycles of portfolio development. Eight portfolios were more or less collaborative efforts of teacher groups, but one portfolio was authored entirely by a single circulating special teacher. It presented early childhood special education in one town. Usually, in kindergartens the aim was to display the whole kindergarten ecology in a digital portfolio. In schools, teachers concentrated on making the activities of their own classes visible.

It was presumed that digital portfolios would be constructed in collaborative groups composed of teachers in a same setting. However, there were differences in the degree to which the whole kindergarten or school community was informed about or involved in the portfolio development. In most settings there were one to three teachers sharing the main responsibility for the portfolio development. Some teacher groups maintained all the time a shared authority over the digital portfolios. Still, there were also a couple of kindergartens in which the main responsibility gradually shifted to the shoulders of individual teachers. This happened especially in small kindergartens where there was a need to divide the daily tasks. Generally, collaboration was at its best in the design phase when teachers were planning the content areas together. In many instances the actual implementation proceeded as divided co-operative tasks. In the reality of everyday life in kindergartens and primary schools it is often rational enough

to share out the roles and tasks once the basic content has been agreed upon together. Also the responsibility for technical implementation was usually divided co-operatively among teachers or only some teachers took care of it.

The collaboration in portfolio development was extended from a particular kindergarten or school ecology to all teacher groups. First, the development process included local workshops in which several teacher groups from a certain area participated. Second, all teacher groups met once in face-to-face sessions and several times in on-line workshops. In the workshops one aim was to have a larger community of teachers to engage in a joint venture of portfolio construction.

In addition to the collaboration in design and implementation, there was an emphasis for collaboration in assessment. It became evident that reflection and especially *collaborative reflection* is an essential part in all cycles of portfolio development. It is not something to be taken into use subsequent to the processes of documentation and selection of materials. Rather, collaborative reflective practice is inherently present in portfolio development from the outset, since the very first discussions concerning strategic questions about assessment or portfolio usage and first scratches of portfolio plans in content maps. Reflection is an inherent part of the overlapping phases of documentation, selection of materials, and writing of descriptions about the daily life. Naturally, it is also related to web-based sharing of pedagogical practices and meaningful experiences as well as to collegial feedback on portfolio design and contents.

A portfolio provides a means to make this collaborative reflection visible and to share thoughts with others. On the other hand, in general a portfolio also gives rise and stimulates reflection.

8.7 Ethical considerations about digital web portfolios

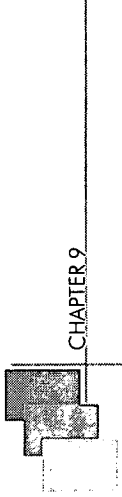
The progress of digital portfolio development also triggered *ethical considerations about web publishing.* Ethical considerations became highlighted after the portfolio project was presented to the parents. This happened as soon as the first versions of the digital portfolios were available. The use of digital portfolios raised on surface the ethics of Internet publishing, e.g. the use of child photos. Some parents were extremely cautious about giving their permission to utilize child photos on the web. It became evident that the consideration of ethical questions ought to be an essential element at all stages of digital portfolio development.

Discussions about ethical issues, in this case concerning digital portfolios, are especially important in the field of early childhood education. Ethical considerations about digital portfolios are crucial, however, also at other educational levels, because

assessment is always a sensitive area. Publishing of a portfolio on the web should be preceded with strategic considerations about the ethical and moral questions involved. The author of a web portfolio has, of course, according to the principles of portfolio assessment the power to choose the contents of the portfolio. The age and maturity of the portfolio author bear a crucial relationship to the choices made in the portfolio process. The younger an author is, the more support and guidance is needed either from teachers or other adults concerned. In this perspective, a young child's portfolio or 'folder of growth' is not suitable as such for publishing on the web for various audiences.

ICT can be powerfully utilized, however, especially in the documentation and storing of a young child's portfolio collection. Furthermore, one part of a child's portfolio can include evidence of his or her technological competence or tasks done with a computer. It can be even made in a multimedia format and stored e.g. on a computer diskette or CD-ROM (see Barrett 1998). The technology-supported documentation in a kindergarten can involve materials produced about children's development, information for parents and the surrounding community about daily activities, and teachers' reflection about their own work (e.g. Kangassalo 1998). Whenever parts of a young child's portfolio are shared on the web, this should be a decision made together with the child, teacher and parents. And all parties need to be aware of the affordances and disadvantages this may bring along. If a young child's portfolio is published on the web, it should be protected and accessed only with a password. On the other hand, this kind of protection causes that it cannot be widely shared.

Personally I think that instead of just questioning, for ethical or other reasons, the use of digital web portfolios or ICT more generally, there should be critical discussions about their meaning and purposes in early childhood education and especially about the ethical and moral questions associated with the use of information networks. In this study the digital kindergarten or school portfolios were authored by teacher groups. The aim was to make visible pedagogical practices and daily experiences especially from the teacher perspective. Nevertheless, many teacher groups included also evidence of children's and even parents' perspectives. This kind of open possibility to select and choose, but also to check the contents and methods of documentation gave different parties a possibility to decide and influence what to include and what to leave out. In this kind of school portfolio the works and activities of children can be shown, but there is no need to attach them with detailed information about the children. However, the dynamic nature of information networks entails that discussion and reflections are never final or complete but their significance rises from their ongoing nature and also from their orientation towards future (Baker 1999).



CHAPTER 9

Discussion

The challenges of action research are [much more difficult] in the realm of communicating and abstracting results of action research in a way that others who did not participate in a particular project will understand and believe, and that will enable them to generate their own effective courses of action. Precisely because the knowledge is cogenerated, includes local knowledge and analyses, and is built deeply into the local context, it is a challenge to compare results across cases and to create generalizations. (Greenwood & Levin 2000, 97.)

In the preceding chapters I have described and analyzed the progress and related findings of an action research study during five intense cycles of digital portfolio development in childhood learning environments. The latest cycles also involved actual implementation of the portfolios so that the teacher groups were opening and sharing their work in the respective childhood ecologies for display, feedback and discussion on the web.

In this final chapter I will first discuss the meaning of the ecological approach for the study and then review the quality and success of the action research inquiry. I have chosen to view these aspects through the notions of trustworthiness and authenticity. The choice of these notions is justified by the action research nature of the inquiry (see Denzin & Lincoln 2000), and believing that there are ways for achieving and establishing the quality of action research in light of certain criteria, also for the benefit of the reader (see Olesen 2000). Also the intent of the study to develop methods for collaborative evaluation of childhood learning environments entitles the use of the notions (see Greene 2000).

9.1 Ecological approach to digital portfolios

In this study I have applied the ecological approach in three main dimensions. First, its theoretical foundations provided a frame for the development of digital portfolios as a collaborative, authentic and technology-enriched assessment method. I was interested in examining the meaning of technology in digital portfolio development as well as the interaction between teachers and technology during the development process (see Bruce & Hogan 1998). Technology and, more specifically, digital portfolios were regarded as integral, yet novel, elements of childhood information ecologies. Teachers' evolving ICT capabilities were examined as resulting from the respective factors of access, competence and motivation (Viherä 1999).

Portfolios as an assessment method and the use of ICT brought along changes – e.g. novel ideas, methods, procedures, skills and technical devices – for the work of teachers in childhood learning environments. According to the ecological perspective, because of these changes also the ecology of kindergarten or school was changing (cf. Nardi & O'Day 1999; Salomon 1996). The findings confirmed the ecological view that there is a powerful synergy between changing tools and practices (see Nardi & O'Day 1999). As teachers became more involved in the use of digital portfolios in their kindergartens and schools, they were able to articulate more clearly and precisely what works and what doesn't, what they value, and what they need and want. They became better aware of the possibilities of digital portfolios and technology and more creative and empowered in pushing them forwards to meet their own needs.

Second, the actual use of digital portfolios enables the examination of childhood environments, i.e. kindergartens and primary schools, as multilevel ecologies. The overall goal was to attain multiple perspectives on learning environments and to widen and broaden the scope of learning environments to various directions. Already the preliminary portfolio analyses yielded useful information about the purposes, audiences and ecological focus of the technology-enriched assessment practices. The portfolios also offered the web audience a view on various multilevel childhood ecologies with their daily activities and experiences, relationships among people, samples of children's work and festive moments. The preliminary analyses raised the following questions:

- How do digital portfolios increase our understanding about childhood growth and learning ecologies?
- What kind of interaction does a digital portfolio create and stimulate in the local and virtual childhood environments?
- How does a digital portfolio suit for the qualitative evaluation of childhood environments?

- How does a digital portfolio fit as a collaborative self-assessment tool in early childhood settings?

And third, the development and use of digital portfolios as an assessment and research method is examined from the perspective of ecological validity. Bronfenbrenner (1979) defines that ecological validity refers to the extent to which the environment experienced by an individual contains properties that the researcher assumes it to contain. In other words, the examination of ecological validity implies that the researcher investigates how the research subjects or participants experience the environment in which the study is conducted and especially, whether they experience the research situation in the way the researcher presumes they do. Recently, the notion of ecological validity has been expanded to refer also to other than research situations (e.g. Patry 1997). The expansion of the definition was seen necessary because of the desire for more authentic information about what really is happening in schools and other learning environments. It was considered that the premise about valid information includes that the behavior observed through research methods should correspond to what is happening when the observer is not present.

The ecological validity and authenticity of research results can be sought by developing research methods that would better bring forth the experiences and thoughts of the participants in different learning environments. A real participant perspective requires that the information be received directly from participants rather than being passed through some other parties (see Strandell 1992). One of the central questions is how to establish methods that would elicit children's and teachers' experiences, make their perspectives visible, and adequately describe the diversity of learning and teaching in different learning environments. However, there are concerns about the illusion of authenticity and about too strict and narrow interpretations of the participant perspective.

The use of digital portfolios as an assessment and research method can be examined in accordance with the expanded definition of ecological validity and the requirements of authenticity. The aim was that the participants or teachers would select the portfolio contents, and thus the data gathering would not be limited to certain specific research situations. Instead, this kind of data would be based on the everyday events that teachers choose for presentation in their digital portfolios. In this way, teachers participate in the documentation, selection and interpretation of data and the researcher has an opportunity to get acquainted also with events where he or she is not present. A portfolio as a research method brings teachers beside the researcher as collaborative partners both in data gathering and analysis but also when it comes to drawing conclusions (Kankaanranta 1998a, b; Stowell & Tierney 1995). When teachers act as interpreters together with a researcher, the subjectivity of the researcher's interpretations is likely to diminish (Moss 1998).

In order to avoid the illusion of authenticity, the digital portfolios were developed both as an assessment method for childhood learning environments and as a research method for data gathering in various research projects. It was regarded that the authenticity of data gathering would be enhanced by developing the method in collaboration with the teachers of the participating kindergartens and schools (see also Moss 1998).

Shulman (1998) argues that the introduction of new forms of assessment or arguments for the continuation of older ones necessitates reflection on their consequential or systemic validity. This 'fifth form of validity' requires evidence of the assessment method's "*positive consequences for the entire system of which it is part*". To ensure validity the choice of a portfolio as an assessment method should be preceded with reflection on fundamental questions about the purpose and forms of the assessment and the suitability of portfolio assessment for measuring the qualities involved in the assessment context (Barrett 1999; Gellman 1996).

9.2 The procedures for ensuring the quality criteria

In the following, I conceptualize the notions of trustworthiness and authenticity through the criteria of credibility, confirmability, sustainability and transferability in this study (cf. Lincoln & Guba 1985; Greenwood & Levin 2000). In the course of the study I have sought to satisfy each criteria through specific procedures concerning the aspects of gathering and using the data, participant roles and perspectives, the process of digital portfolio development as a research phenomenon, and the ways to ensure the quality of reporting. (See Wolcott 1994; Denzin & Lincoln 2000; Greene 2000; Olesen 2000). Table 9.1 presents the four criteria with respective main focus areas and related procedures. It must be borne in mind that the different criteria are partly overlapping.

9.2.1 Ensuring credibility and confirmability

Credibility of an inquiry and research findings refers to their capacity to communicate the reality of the phenomenon under study in consistence with the contextualized lived experiences of the participants (Lincoln & Guba 1985). Here, the procedures focused on gaining diversified background and context information about the participants, employing multiple methods and perspectives in data gathering, emphasizing collaborative ways of using the data, and on ensuring the quality of writing and reporting.

The emphasis placed on participant perspectives involved getting feedback from the teacher groups with regard to portfolio evaluation reports and case stories. The accuracy and completeness of written information was checked through sharing the drafts with colleagues and to some degree also with the teachers. In the research report I have sought credibility through the use of authentic excerpts from the data. The foremost aim has been to take the reader in the middle of events in order to enable his or her own interpretations, as well.

According to Lincoln and Guba (1985) research or evaluation findings are *confirmable "when inferences can be traced back through analyses to data actually collected"*. The interpretations about data should also have correspondence with the events in the settings of the study. The procedures to maintain confirmability had mainly to do with the background and role of the researcher, the nature of data and reporting, but also with the exactness of data analysis descriptions. In regard to the researcher background, the researcher and student mentors had prior expertise and working experience in the field of early childhood education. This aided them in judging and guiding the progress of portfolio development and in making balanced interpretations.

Table 9.1 *The criteria, related focus areas and procedures for ensuring the quality of the inquiry*

Criterion	*Focus area*	*Procedure*
Credibility	Participant and context information	Visits to the kindergartens and schools Workshops with teachers Drawing on researchers' prior expertise in the field of childhood education
	Data gathering Role of participants	The use of multiple research methods and perspectives
	Processes of using data	Collaborative portfolio analysis and evaluation Feedback from teacher groups to the portfolio evaluation reports and case stories
	Writing and reporting	Beginning writing early in the process Seeking feedback through sharing developing manuscripts with research participants and colleagues Letting readers see for themselves through using excerpts from data

Confirmability	Nature of data and reporting	Gathering authentic data about portfolio development and use Description of the principles and procedures of using data
	Roles of participants	Being candid about participants' roles in the action research process Trying to achieve honesty, fairness and balance of perspectives in research and reporting
Sustainability	Sustainable portfolio development and use in participating kindergartens and schools	Design and introduction of a user-friendly portfolio application Providing teacher support Contributing to the participants' role development
Transferability of action research procedures and portfolio methodology	Gathering of data	The exact description of research participants, contexts, action research cycles, methods for data gathering and analysis
	Use of data	Reporting with maximum coverage Accurate documentation of the field work and virtual interaction during the action research process (field notes from workshops and school visits, e-mail communication)
	Digital portfolio development process	Determining essential design and implementation issues

The varied forms of data gathering aimed at achieving authentic data about digital portfolio development and use (see Chapter 4). For example teacher interviews, discussions during workshops and e-mail messages elicited teachers' thoughts and experiences during different stages of portfolio development. The actual digital portfolios provided data for the preliminary analysis of portfolio purposes and the daily life in childhood learning ecologies.

In qualitative research it is also essential to describe in detail the processes and principles of using data in order to inform and convince the readers about the analysis and interpretations. In this study, the data analysis started already during the period of data gathering in the five cycles of action research. Characteristically of an action research process, the fieldwork and data analysis were partly synchronous and com-

plemented each other. The experiences and results gained along earlier stages were utilized in the subsequent cycles for contribution to the digital portfolio development. In this research report the processes of using data is presented in Appendix 4.

9.2.2 Sustainability and transferability of the study

> *Given our position that knowledge is context-bound, the key to utilizing this knowledge in a different setting is to follow a two-step model. First, it is important to understand the contextual conditions under which the knowledge has been created. This contextualizes the knowledge itself. Second, the transfer of this knowledge to a new setting implies understanding the contextual conditions of the new setting, how these differ from the setting in which the knowledge was produced, and involves reflection on what consequences this has for applying the actual knowledge in the new context. Hence generalization becomes an active process of reflection in which involved actors must make up their minds about whether or not the previous knowledge makes sense in the new context. (Greenwood & Levin 2000, 98)*

As the above quotation aptly underlines, the findings of an action research are context-centered. But how is it with the sustainability and transferability of this kind of practice and development work? What happens when the research project ends and outside support is withdrawn? Are the findings and developed assessment practices transferable to other learning environments and users? As yet, there are no conclusive answers for the questions about the further use of digital portfolios because the scope of the study did not extend to the follow-up of portfolio implementation and management.

As regards sustainability, the uppermost aim was to develop a portfolio scheme for active and continuous use and not just as an experimental application for the study period. Thus, during the research process there were several procedures which aimed at encouraging and helping the teacher groups to continue with the novel assessment practice. Central factors among the diverse design and implementation issues (see Chapter 8) comprised the development of a user-friendly portfolio application, the search for forms of teacher support and mentoring, and an effort to change participant roles towards an emancipatory orientation. It was positive to note that the further contacts with the teacher groups have revealed that they have continued the construction and use of digital portfolios in their own ways. Nevertheless, there are also various challenges and questions calling for further exploration. An overall challenge concerns exposing the digital portfolios to wider audiences, which leads us to the following questions:

- What kind of strategies can be established to enable and ensure technological support to teachers?

- How to increase and maintain the collaborative and interactive use of digital portfolios?
- What are the forms and possibilities of guidance and mentoring inherent for creating a reflective portfolio community?
- What kind of collaborative and reflective tools ought to be incorporated in the digital portfolio application? How can such tools contribute to the reflective discourse?

In this connection, the criterion of transferability includes two dimensions, namely the transferability of the action research procedures and that of the digital portfolio approach. As Greenwood and Levin (2000) point out, an action research process is always unique and dependent on the particular contexts and participant perspectives. Yet, again, there were procedures seeking to provide the readers with an access to exact documentation and description of the research process, aiming at as clear and comprehensive reporting as possible. I think that the methods of the study are applicable to other research contexts as well, although there is no way of replicating the action research process in an exactly equivalent form.

On the other hand, a distinct aim of this kind of collaborative action research is to develop procedures, methods and applications which teachers in any kindergarten or school can apply in their work. The same design and implementation issues apply here and require further reflection, as was the case with the question about sustainability. For example, in this study teacher training was provided through a research project with various forms of teacher support and mentoring. How could then similar procedures of digital portfolio development be realized in other kindergartens or schools, which are not involved in any research project?

One solution could be enhanced teacher training, both pre-service and in-service, for the development of teachers' ICT capabilities regarding the utilization of ICT in general and information networks in particular. Some parts of the curriculum could even be realized through various forms of virtual learning. In this connection, also digital portfolios of kindergartens and schools could have a special role. Along increased understanding and competence in the use of ICT, teachers will gain courage for more versatile usage in general and, perhaps more importantly, also to utilize the new technologies with children, as a vehicle for learning (Ash 2000; Barrett 1999). Thus, serious attention needs to be given to staff development that demonstrates successful strategies for the pedagogical use of ICT (Moersch & Fisher 1995). Plans for staff development should also concern the teacher support needed in the development and use of different forms of assessment like digital portfolios in this case (Shaklee et al. 1997).

9.3 The developing roles of participants

The role of participants deserves further reflection, as all the quality criteria presume the recognition and validation of relationships between the researcher and the participants of the research (see Cheek 2000). It is also argued that the research perspectives differ in their standpoint about the location of the researcher in the research act (Kemmis and McTaggart 2000). In this participatory action research a central background assumption was that the collaborative development of assessment practices involves that the researcher will to some extent affect the progress of action in the study. Thus, both the teacher groups in their respective childhood settings and the research team were regarded as participants of the study with developing roles (see Chapter 4). In Table 9.2 the developing participant roles during the inquiry are compared with the different knowledge-constitutive orientations (cf. Habermas 1972; Huttunen & Heikkinen 1999; Kemmis & MgTaggart 2000; Linnakylä 2000).

The aim was to reach toward the authentic idea of 'the melting of horizons', which Kemmis and McTaggart (2000, 574) defines to mean *"seeing things intersubjectively, from one's point of view and from the point of view of others (from the inside and the outside)"*. The participant roles in the development of digital portfolios were defined according to the empowerment orientation. As defined earlier it was desired that teachers would enter into a collaborative and reflective process of making pedagogical practices visible and shared among various audiences. In the long run, digital portfolios were seen to provide a forum for interactive discussions in the field of early childhood education. The aim was also that they would become a multiperspective method for research and assessment in childhood environments.

However, the authentic ideal was not yet completely reached during the action research cycles observed, even though there was a distinct move towards the empowerment orientation. Especially in the beginning the prevailing reality of actual digital portfolio development required distinct differences in the participant roles. There appeared to be several design issues which required more intensive input from the researcher than was anticipated. A specific and unpredictably notable element for the study arose from the use of ICT as a distinct part of the assessment method under development. The use of ICT challenged the participants to constant learning and evolvement of their ICT capabilities. It also challenged the research team to search and find appropriate means of teacher support and mentoring. In addition, the crucial role of ICT in the technology-enriched method development entailed that also technological tools had to be developed and adapted.

Table 9.2 *The developing participant roles compared with the knowledge-constitutive orientations*

Orientation	*Aim*	*Role of the research team*	*Role of the teacher groups*	*The nature of relationships*
Technical	Development of teachers' ICT capabilities Teacher training in the area of portfolio assessment	Technical experts Content experts in the area of portfolio assessment	Learners of ICT competences and assessment practices	Apprenticeship
Practical	(as above and...) Documentation of the daily life and discussions about the meaning of the work	Teacher support and guidance Web editing of portfolio contents Encouraging teachers to participate in digital portfolio development	Collaborative documentation and reflection	Co-operation - division of tasks in digital portfolio development
Emancipatory	(as above and...) Active and teacher group driven digital portfolio construction Reflective learning culture Motivation in the pedagogical use of ICT	Teacher guidance Development of a user-friendly portfolio application Mentoring	Compiling digital portfolios with the guidance of mentors from the research team	Collaboration
Empowerment	The use of digital portfolio as research and assessment methods Digital portfolio as an inherent part of pedagogical practices Empowerment to request and acquire appropriate ICT capabilities	Being an active participant in a networked and reflective childhood education community The use of digital portfolios as a research method	Being an active participant in a networked and reflective childhood education community Collaborative portfolio authoring and multi-purpose use	Community of childhood education developers

The first cycles of action can be characterized in terms of technical orientation, because the main focus was on the improvement of teachers' capabilities in view of the digital portfolio activities ahead. The members of the research team acted as technological and assessment experts, while the teachers shared a role of learners. The next level of participant roles had resemblance with the practical orientation. The teachers and members of the research team co-operated with a clear division of tasks. Teachers had already assumed an active role in the documentation of the daily activities in their settings and were engaged in planning and choosing the contents for the digital portfolios. Their technical competence, however, was still inadequate for web editing. Thus, the technical experts of the research team acted in the role of web editors and drafted the first digital versions of portfolios according to the teachers' plans.

The critical dimension here is divided to the sub-categories of emancipatory and empowerment orientations. The emancipatory orientation was emerging as teachers engaged themselves in the digitalization of the portfolio materials and in the web editing of the contents. Teachers had also gained courage to request proper access to ICT and become able to realistically proportion their own capabilities and possibilities with the existing means of web editing. They were keen to experiment with a user-friendly portfolio application offered to them so that they could concentrate on the content issues instead of fighting with technical specialties. The role of the research team consisted now of tasks like providing support and mentoring for the teachers, but also of contributing to the design of the portfolio application.

In the last cycle of the reported action research period there were obvious signs of the empowerment orientation. The research team was gradually withdrawing aside and the teacher groups were empowered to take the main responsibility over the portfolio work. The continuance of the development and use of portfolios was no longer dependent solely on the activities and encouragement by the researchers.

Participation in such a long-term research-based development work as was the case in this study raises questions about teacher commitment and the existence of change resistance. All the teachers participated in the study on a voluntary basis and they were free to withdraw at any moment. There were, indeed, constant changes in the composition of the teacher groups but the set of the participating kindergartens remained the same through all the cycles. However, there were clearer changes in the participation of schools. This raises yet another question, namely why the digital portfolio development failed to attract schoolteachers to the same extent as kindergarten teachers? However, it must be reminded here that there were also schoolteachers whose enthusiasm for digital portfolios was at least comparable to that of the kindergartens.

Generally, the negative changes in individual teachers' involvement were mainly explained by time restrictions, deficits in ICT access or competence, changes in staff composition, and with different longer-term leaves from work. A more precise explanation of the changes would have required a careful follow-up on the teachers dropping out from active portfolio construction to identify the specific reasons for withdrawals. Now, the main emphasis was on the motivation of those teachers who actively engaged themselves in portfolio activities. It would also be interesting and important to learn more about the relationships and attitudes of those members of kindergarten staff who did not belong to the active teacher group. It was observed that there were some signs of change resistance from their part. For example, they were more willing to set restrictions for the content of portfolios.

In lack of more extensive data and deeper analyses about withdrawals, there are only some hypotheses for the general differences in school participation. In my mind, the reasons are foremost related to differences in existing ICT capabilities but also to the differences in learning cultures in kindergartens and schools. It seems to me that the statement of the objectives of the study failed to communicate to the schoolteachers clearly enough the goals and relevance of their participation and the required investment of time and effort. There were also differences in the way schoolteachers perceived the meaning and proceeding of the project. While in the beginning some schoolteachers assumed the prime function being ICT-related competence building, some teachers got frustrated with the slow progress of portfolio construction resulting from the fact that especially kindergarten teachers needed extensive training in the use of ICT.

I also argue that the existing culture of kindergartens favors such assessment practice which involves collaborative documentation and reflection and aims at displaying meaningful experiences and working processes. Traditionally the kindergartens have also been open and flexible in presenting their daily life for parents and other interested parties. Co-operation with homes is also such an inherent part of kindergarten practices that teachers could easily see the meaning of digital portfolios for the enrichment of such interaction. Furthermore, the existing assessment or communication activities include different means such as so-called 'journal booklets' children carry with them, which bear some resemblance to a digital portfolio. In recent years there has also been a keen interest towards diverse child-centered documentation methods, such as pedagogical documentation along the principles of Reggio Emilia (e.g. Rinaldi & Lenz Taguchi 1995; Helm et al. 1997) or portfolio assessment in the form of 'folders-of-growth' (e.g. Kankaanranta 1998a).

Of course, there are also imaginable restrictions that the culture of kindergartens lays on digital portfolio development. There still seems to be a distinct gap between the ideas and approval of child-based, or more widely, between the multiple perspec-

tive assessment practices and their actual implementation in daily activities. I have often noticed that teachers expect and ask for clear directions or even manuals for the application of portfolio assessment. Of course, there are some universal and general principles for it. Yet, the actual implementation or application is always context-centered and depends on the decisions and choices of each kindergarten.

Another thing is the everlasting problem with limitations of time. Often the hastiness of the daily schedule takes such a strong hold of the activities that it seems almost impossible to find time for novel practices, even though they are accepted as relevant for the work and its development. One implicit problem, realized also in this study, has also to do with the difficulties of the kindergarten directors to participate in the portfolio workshops and training sessions because of their administrative duties. This is especially problematic because the teachers indicated that the role of the directors is essential in encouraging the whole staff for the development of practices and professional expertise. There are several questions related to the issues of commitment to be examined in future studies:

- How do the staff members other than the active portfolio authors experience the digital portfolio development and use?
- How does change resistance affect the process of portfolio development?
- How to involve the whole staff, but also the children, parents and other significant parties to the portfolio assessment along the principles of the whole school (kindergarten) approach?

Possible success in applying the findings of the study or the digital portfolio approach in general can be determined only in the future, and it presumes that the ideas and results are shared with teachers at large. The whole series of action research projects has also generated ideas for the advancement of portfolio assessment in several dimensions. In my mind the following are most essential ones:

- The wider use of portfolios as an ecological research method in evaluating the quality of childhood education
- The further development and deepening of a general portfolio approach in childhood education
- Coordinated use of different perspectives (child, teacher, learning community) and forms of portfolios (folders of growth, digital portfolios)
- Application of digital portfolios in other contexts and educational levels

Ideally, a set of digital portfolios can become a forum of reciprocal interaction, sharing and feedback in the field of childhood education. For teacher students, digital school portfolios can provide a means for familiarizing oneself with the pedagogical practices of kindergartens and schools. On the other hand, through learner portfolios students can display and integrate their own personal learning curricula in childhood education. For teachers attending in-service training, digital portfolios can be a means for reflecting, displaying and sharing their own work. Similarly, for academic experts in the field, portfolios offer an opportunity to show their competence in teaching and research work. In all, digital portfolios can provide a forum where different audiences can meet the builders of childhood learning environments and begin to understand the changing worlds of children.

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Appendices

Appendix 1

A list of articles authored or co-authored earlier on portfolio assessment

The chapters in part II and III are partly based on the following publications:

Kankaanranta, M. 2001a. Developing kindergarten and primary school teachers' capabilities in constructing collaborative digital portfolios. In E. Pantzar, R. Savolainen & P. Tynjälä (Eds.) In search for a human-centered information society. Tampere University Press, 121–141.

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Kankaanranta, M. 2001c. Constructing digital portfolios: teachers evolving capabilities in the use of information and communications technology. Teacher Development 5 (2), 259–274.

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Kankaanranta, M. 1999. Portfolioita esi- ja alkuopetuksesta. Päiväkodin ja koulun yhteistoiminnan suuntia etsimässä. [Portfolios from pre- and primary education. Exploring collaboration between kindergarten and primary school.] In M. Kankaanranta, K. Mäkitalo & E. Tiihonen (Ed.) Kasvun ja oppimisen polkuja. Kokemuksia esi- ja alkuopetuksen yhteistoiminnasta. Jyväskylän yliopiosto: Koulutuksen tutkimuslaitos, 5–32.

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Kankaanranta, M. 1998c. Communication and collaboration of teachers through networking and digital portfolios. In H. Maurer & R. G. Olson (Eds) Proceedings of the WebNet 98 – World Conference of the WWW, Internet and Intranet. Association for the Advancement of Computing in Education.

Appendix 2

The contents of the questionnaires

Themes of the open-ended questions	Background questionnaire	Follow-up questionnaire
ICT infrastructure		
Computers and peripherals	x	x
The adequacy of ICT resources		x
Short-term plans for ICT investments	x	x
Short-term plans for teachers' ICT training	x	
Access to Internet, server	x	x
Children's possibilities in using ICT	x	x
The use of ICT		
Assessment of current ICT competence	x	x
Rating of current computer skills on scale 1-5	x	x
Areas of strength		x
Challenging things		x
Utilization of ICT in a child group	x	x
Children's ICT competence		
Possibilities and problems in using ICT in instruction	x	x
Interest areas, need for further knowledge and skills		x
Portfolios		
Functions of assessment in a child group	x	
Definition and functions of a portfolio	x	
Portfolio construction	x	
Prior experience with portfolios	x	
Strengths of portfolios	x	
Weaknesses of portfolios	x	

Themes of the open-ended questions	Background questionnaire	Follow-up questionnaire
Planning a digital portfolio		
Things that are personally important and meaningful in a kindergarten / school		x
The main goals of a kindergarten / school		x
Areas of emphasis, special features		x
What would you like to tell to other teachers, parents or other persons about your kindergarten / school through your digital portfolio? (E.g. about daily working, different projects.)		x
Ways of documentation		x
A plan for the structure of a portfolio (e.g. content map)		x
Other		
Assessment of the teacher training in the portfolio project		x

Appendix 3

The web application for digital portfolio development

In the study, all the kindergartens and schools were offered a possibility to construct their digital portfolios with a web application developed in the collaborating Pedanet-project. The application was originally designed as a shared network magazine "Verkkolehti" for schools participating in the EU Comenius project. During the study two different development versions of the application were utilized. The later version was taken into use in autumn 1999. In this appendix I will present screen shots about the basic features of the digital portfolio application and about specific portfolio contents that have been mentioned in the report.

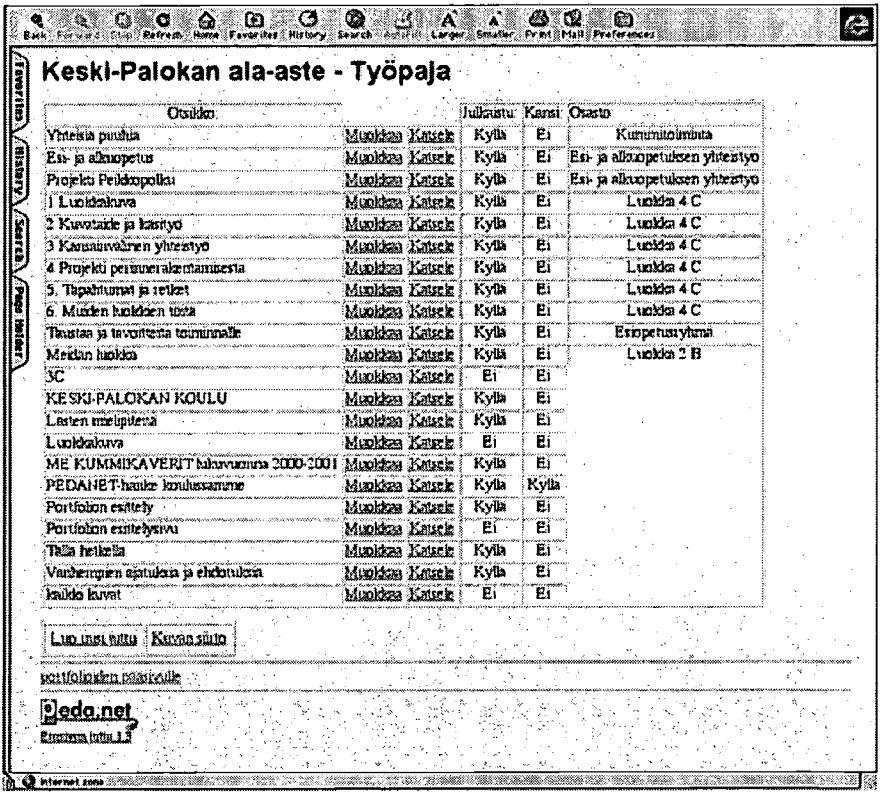


Image A3.1 *Portfolio workshop or editor user interface*

Image A3.2 *The front page of Keski-Palokka's digital portfolio*

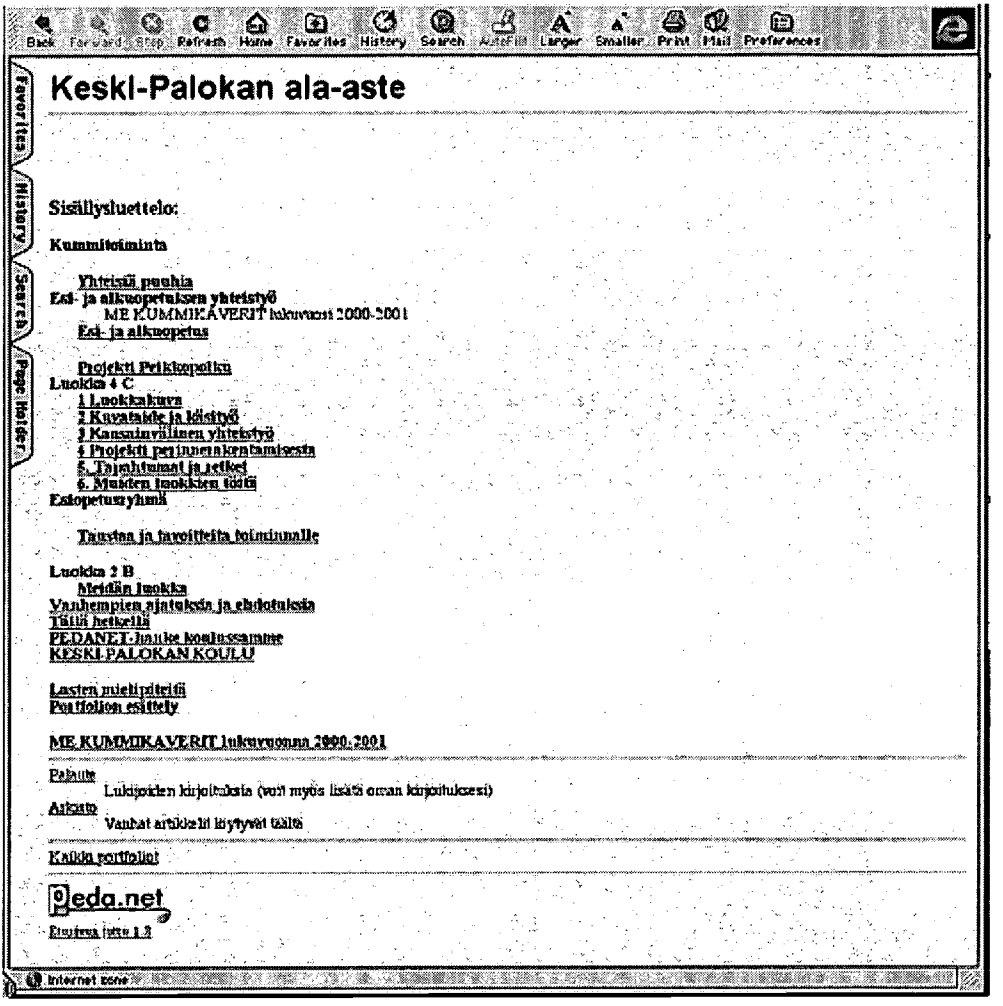
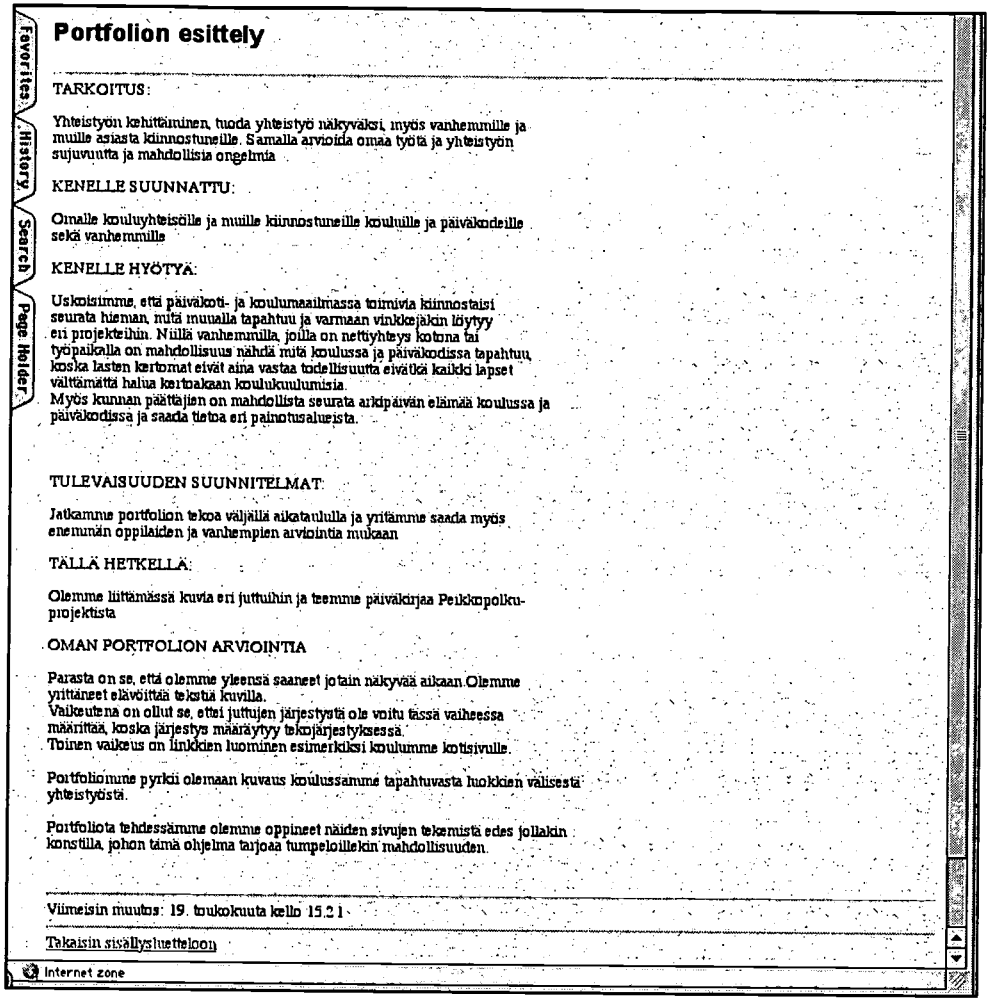


Image A3.3 *The portfolio contents*



Favorites History Search Page Holder

Portfolion esittely

TARKOITUS:

Yhteistyön kehittäminen, tuoda yhteistyö näkyväksi, myös vanhemmille ja muille asiasta kiinnostuneille. Samalla arvioida omaa työtä ja yhteistyön sujuvuutta ja mahdollisia ongelmia

KENELLE SUUNNATTU:

Omalle kouluyhteisölle ja muille kiinnostuneille kouluille ja päiväkodeille sekä vanhemmille

KENELLE HYÖTYÄ:

Uskoisimme, että päiväkoti- ja koulumaailmassa toimivia kiinnostaisi seurata hieman, mitä muualla tapahtuu ja varmaan vinkkejäkin löytyy eri projekteihin. Niillä vanhemmilla, joilla on nettiyhteys kotona tai työpaikalla on mahdollisuus nähdä mitä koulussa ja päiväkodissa tapahtuu, koska lasten kertomat eivät aina vastaa todellisuutta eivätkä kaikki lapset välttämättä halua kertoakaan koulukuulumisia.
Myös kunnan päättäjien on mahdollista seurata arkipäivän elämää koulussa ja päiväkodissa ja saada tietoa eri painotusalueista.

TULEVAISUUDEN SUUNNITELMAT:

Jatkamme portfolion tekoa väljällä aikataululla ja yritämme saada myös enemmän oppilaiden ja vanhempien arviointia mukaan

TÄLLÄ HETKELLÄ:

Olemme liittämässä kuvia eri juttuihin ja teemme päiväkirjaa Peikkopolku-projektista

OMAN PORTFOLION ARVIOINTIA

Parasta on se, että olemme yleensä saaneet jotain näkyvää aikaan.Olemme yrittäneet elävöittää tekstiä kuvilla.
Vaikeutena on ollut se, että juttujen järjestystä ole voitu tässä vaiheessa määrittää, koska järjestys määräytyy tekojärjestyksessä.
Toinen vaikeus on linkkien luominen esimerkiksi koulumme kotisivuille.

Portfoliomme pyrkii olemaan kuvaus koulussamme tapahtuvasta luokkien välisestä yhteistyöstä.

Portfoliota tehdessämme olemme oppineet näiden sivujen tekemistä edes jollakin konstilla, johon tämä ohjelma tarjoaa tumpeloillekin mahdollisuuden.

Viimeisin muutos: 19. toukokuuta kello 15.21

Takaisin sisällysluetteloon

Internet zone

Image A3.4 *The portfolio introduction page*

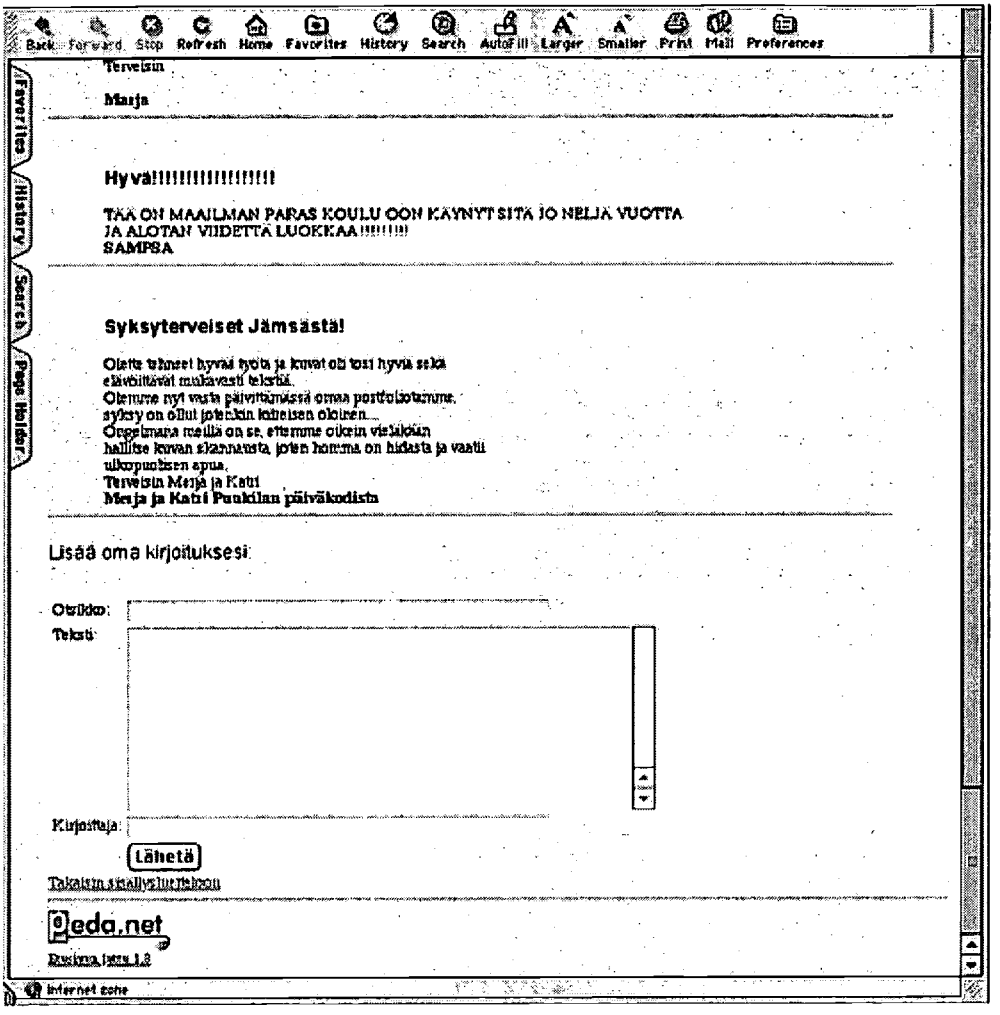


Image A3.5 *The feedback page*

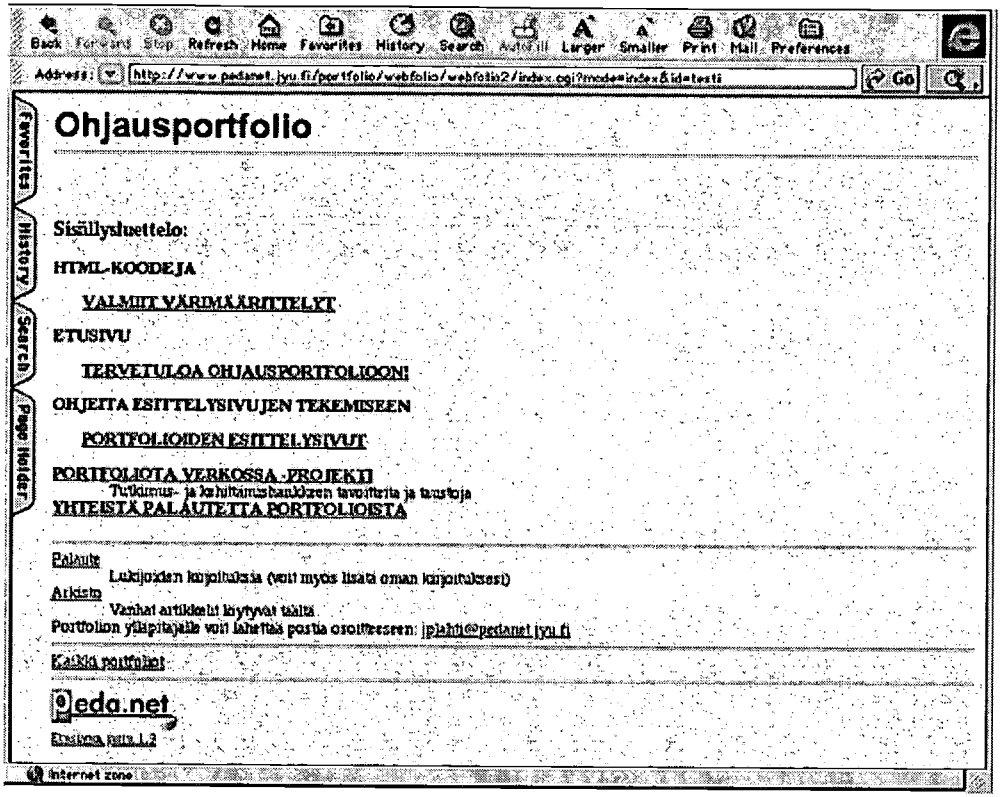


Image A3.6 *The contents of the mentoring portfolio*

Appendix 4

Description of data analysis

Wolcott (1994) argues that "the real mystique of qualitative inquiry lies in the processes of using data rather than in the processes of gathering data". In the discussion chapter I indicated the following procedures as most central to dispel this mystical impression and to ensure the quality of the inquiry in regard to data analysis (see Table 9.1):

- Description of the principles and procedures of using data
- Collaborative portfolio analysis and evaluation
- Reporting with maximum coverage

A more systematical analysis of the whole research data started after the last action research cycle. There were two types of data, namely process and outcome data (see Chapter 4). Data processing and analysis included several interconnected phases. The first phase aimed at data management and the data from different sources was organized and compiled together to form a total set of data for the study (Table A4.1). A part of the data was already in the digital form (e.g. e-mail messages, field notes, digital portfolios), but the rest needed to be transcribed (e.g. questionnaires, interviews). This organizing of data was followed by an orientation period with thorough and careful reading of the data. Data from each source was analyzed according to its specific requirements for analysis procedures. In the following I will describe separately the analysis procedures for process and outcome data.

Table A4.1 *Main data sources of the study*

Focus area in digital portfolio development	*Data source*	*Scope of data gathering*
Process data		
Participants' knowledge and experience in assessment, portfolios and ICT Evolving ICT capabilities Portfolio design	Teacher questionnaires	One background and two follow-up questionnaires for each teacher group, two follow-up questionnaires for each teacher
The processes of digital portfolio development	E-mail messages	The whole action research study
The processes of digital portfolio development	Field notes	The whole action research process
Portfolio design and implementation	Interviews	Three teacher group interviews
Collaborative portfolio evaluation, teacher feedback	Web discussions and feedback	During 3rd cycle - 5th cycle
Outcome data		
Portfolio implementation	Digital portfolios	Nine digital portfolios
Portfolio implementation: contents, purposes, audiences, forms of reflection	Portfolio evaluation reports	Nine final evaluation reports, several reports from earlier versions

The process data

The process data consisted of all such data which was gathered about digital portfolio development. There were certain text analysis procedures (see Ryan & Bernard 2000) that applied to all data sources, but there were also certain differences in coding between the data from e-mail messages and teacher questionnaires or interviews. The field notes were utilized in a procedural manner in the portfolio development. In general, the first phases of analysis included careful reading of data (e.g. interview transcriptions, email messages), division of the data into smaller units (e.g. according to the questions in questionnaires or according to the action research cycle during which an e-mail message was sent), and attachment of certain identification codes to the data segments. Such codes were participants' background information (geographical area, educational level of the participating setting) and when relevant also an

identification code for individual teachers (e.g. in e-mail messages and personal questionnaires).

E-mail messages

The analysis of e-mail messages included several phases of data coding. The first phase involved the search and marking of text segments with descriptive codes. The aim of coding was to identify themes and their contents in the text data. The research questions of the study directed coding to certain focus areas in the digital portfolio development. However, the codes were not strictly predetermined or set in advance. Thus, the analysis of e-mail messages had resemblance with the grounded theory (e.g. Lincoln & Guba 1985), because the coding categories emerged during the coding process. Naturally, the emergence of the codes was also influenced by the researcher's theoretical, methodological and practical knowledge about the research field.

Each e-mail message was marked with one or more codes. After that the coding process continued with the following intertwined steps: the text segments were grouped according to the codes, the text segments in each code group were re-read, the emergent coding system was checked and cleaned, and the relationships between codes were examined and determined. The occurrence of individual codes and the entity of the coding system were evaluated through counting the frequencies of text segments per code. Such frequency tables were utilized especially in cases where some codes had been used very heavily or in reverse cases where certain codes had been used only rarely. Code cleaning caused that the codes having similar or very close meaning were merged and some codes were divided into smaller parts.

After basic coding the analysis continued as careful examination of the text segments per code. The relationships between individual codes were looked for to discover meaningful contents or thematic entities. For the aims of this research report, the codes and themes were further explored in regard to their focus on digital portfolio development. The codes, themes and focus areas of e-mail messages are presented in Table A4.2.

Table A4.2 *The coding system of e-mail messages*

Code	*Theme*	*Focus area in digital portfolio development*
Problems with technology Worries about own technical skills Struggling to manage	Being uncertain and anxious	Access, competence, motivation
Continuous development Use of programs	Developing competence	Competence
E-mail etiquette Network ethics	Learning e-mail behavior	Competence
Motivation to learn and practice ICT Helping and guiding others	Becoming a more competent user	Motivation, competence
Complaining about busy school life Organizing work Describing life at schools Assessing the portfolio environment	Daily life at schools	Motivation, context, portfolio development
Planning and consulting the content of digital portfolios	Discussing the content	Portfolio development, context

Teacher questionnaires and interviews

In the beginning phase the content analysis of teacher questionnaires and interviews was more structured than what was the case with e-mail messages. It followed a different direction of coding, because the questions provided the theme for analysis. The aim of the coding was to build content for the pre-determined themes of digital portfolio development.

The analysis of teacher questionnaires followed rather strictly the structure of questions. Each question was coded separately. Most questions provided descriptive data, but some questions included also quantitative information (e.g. access to ICT, self-rating of ICT competence). The coding process of questions followed similar steps as was described in connection with the e-mail data. The coding system is presented in Table A4.3.

The aim of teacher interviews was to get deeper understanding about individual teacher groups' digital portfolio practices. The data was utilized in a descriptive manner for writing the individual kindergarten or school case stories. In the analysis of teacher interviews they were examined also from the viewpoint of whole interviews and not only as a series of answers per question. For the case stories published in this research report the coding focused mainly on such portfolio issues as stated purpose, content, actual ways of using, audiences, and experiences in digital portfolio development.

Table A4.3 *The coding system of teacher questionnaires*

Focus	*Themes of the open-ended questions*	*Main codes*
Access to ICT	Computers and peripherals	Different technical devices
	The adequacy of ICT resources	Hardware, software
	Short-term plans for ICT investments	Software, Internet connections, hardware
	Short-term plans for teachers' ICT training	Forms and amount of training
	Access to the Internet, server	Yes, no
	Children's possibilities in using ICT	Child-computer ratios, estimated using time
Competence and motivation in the use of ICT	Rating of current computer skills	Scale 1-5
	Assessment of current ICT competence	Computer handling, computer applications and related tasks, extent of use, skill level, years of user experience, user description
	Areas of strength	Computer handling, computer applications and related tasks, user description, learning profile
	Challenging things	Computer handling, computer applications and related tasks, teaching others, versatile use, natural use, experimenting, further training

	Utilization of ICT in a child group	ICT club, producing materials, games, Internet, library services, practicing basic skills, image processing
	Children's ICT competence	Degree of competence, don't know
	Possibilities in using ICT in instruction	Information retrieval & sharing, communication & collaboration, enrichment, teaching tool
	Problems in using ICT in instruction	Lack of: computers, time, staff, interest, skills; privacy protection, quality of web contents
	Interest areas, need for further knowledge and skills	Digital images, graphics, Internet, web editing, applications, enhancement of new skills, repetition, digital portfolio, ideas for daily use, instructional use
Assessment practices, portfolio assessment	Functions of assessment in a child group	Assessing realized activities, following child's growth and learning, self-assessment, feedback, individual curriculum, tests
	Definition and functions of a portfolio	Folder of growth, aid for teacher's work, child's story, collection of material, self-assessment
	Portfolio construction	Locus of control, documentation, content examples, features of construction
	Prior experience with portfolios	None, observation, personal curricula, preschool folder, folder of growth, memory folder, collaborative portfolio, student portfolio, number of years of experience
	Strengths of portfolios	Systemacy, child's role, self-assessment, follow-up of child development, documentation, information sharing and using

	Weaknesses of portfolios	Lack of time, continuity and collaboration, problems in construction, role definition, laborious, privacy protection
Portfolio development	Things that are personally important and meaningful in the kindergarten / school	Procedural data for common discussions about portfolio content
	The main goals of the kindergarten / school	Procedural data for common discussion about portfolio content
	Areas of emphasis, special features	Procedural data for common discussion about portfolio content
	Basic ideas about the content of the digital portfolio	Procedural data for common discussion about portfolio content
	Ways of documentation	Photos, drawings, stories, sound, plans, video, texts, interviews
	A plan for the structure of the portfolio	Content maps and lists
Teacher training within the study	Assessment of the teacher training within the portfolio project	Skills in computer applications and related tasks, need for continuous practice and training, time, encouragement, portfolio use

Outcome data

The outcome data included the digital portfolios that the teacher groups had made during the study and the evaluation reports on these portfolios. The aim of the case-based portfolio analysis was to draw profiles of each kindergarten and school having participated in the digital portfolio development. In the cross-case analysis specific issues of portfolio design and implementation were further explored. Main issues of analysis at both levels were the teacher-stated portfolio purposes and audiences, planned and implemented content areas, the relevance of the digital form, and the forms of reflection utilized in the portfolios.

During the action research process the different versions of digital portfolio had been evaluated several times by student mentors. Such evaluation aided them in acting as mentors for the teacher groups. The findings from evaluations were shared with the teachers (see Chapter 6). Digital portfolios were also collaboratively evaluated in the virtual teacher community.

The final portfolio evaluation was carried out in the fifth cycle of the study. This evaluation provided data for the case descriptions and cross-case interpretations. All the portfolios published on the web were evaluated by two evaluators, namely the researcher and one student mentor. For the final analysis of the digital portfolios the criteria were derived from the following sources:

- Teachers' own criteria used in the portfolio presentations and in the feedback towards other portfolios
- Criteria used in the portfolio evaluations in portfolio literature
- Criteria used in the previous action research study on kindergarten and school portfolios

Table A4.4 presents the criteria used in the analyses. Most criteria included several detailed sub-criteria to aid and focus the evaluation. Prior to an individual evaluation, the evaluators discussed the criteria together, experimented with their application, specified criteria, and then analyzed all the existing digital portfolios individually. The evaluators wrote their own evaluation reports and also drew content maps of all the portfolios in order to visualize and outline the contents. Then they again discussed the interpretations and based on this prepared a collaborative written evaluation feedback for each teacher group.

The cross-case analysis was based on the evaluation reports. The reports were combined and their contents organized in line with the criteria. Text segments were marked with the codes for the teacher group and evaluator. In further analysis the portfolio purposes, audiences and content areas were examined according to their ecological focus.

Table A4.4 *Criteria for digital portfolio evaluation*

Focus	Evaluation criteria	Sub-criteria
General	General quality level	Scale 1-5, written description
	General impression based on portfolio evaluation (implementation and content)	Strengths Areas for development Special features Relevance for a reader
	Portfolio purpose	Analysis of teacher statements in
	Portfolio audience	the portfolio or in an interview
	Advantage of a portfolio	
Portfolio implementation	Technical issues, layout	Front page, page layout, use of multimedia, navigation, links, document integration, outlining
	Use of ICT	Skills, tools
	Documentation	Versatility, comprehensiveness, connection to the portfolio purpose, thoroughness
	Self-reflection	Areas of development, current situation, further ideas and plans
Portfolio content	Presentation page	Connection with the content
	Author information	Share of responsibility, collaboration, tasks
	Structure	Outlining, formal-informal, versatility of materials, detailed-extensive, clarity
	The nature and quality of content	Content areas, authenticity, focussed-comprehensive, relevance, scope, temporal dimension, depth
	Content areas	Childhood education Teaching and learning Collaboration and interaction
	Use of multiple perspectives	Teachers, children, parents, staff, other
	Reflection	Forms, style, honesty, depth, meaningful experiences
	Feedback	Content, quality, nature of dialogue
	Special issues	Effort, investment, creativity, personality, interestingness, attraction, etc.

Appendix 5

The portfolio constructors in the study

The constructors of digital portfolios were the circulating special teacher in the City of Jämsä and the teacher groups in the following kindergartens and primary shools:

Kaipola kindergarten, City of Jämsä
Keski-Palokka primary school, Municipality of Jyväskylä
Palomäki kindergarten, City of Jämsä
Peltotie kindergarten, City of Jämsä
Pupuhuhta day care center, City of Jyväskylä
Puukila kindergarten, City of Jämsä
Viiskulma kindergarten, City of Jämsä
Vitikkala primary school, City of Jämsä

Digital portfolios offer a view on various childhood environments with their daily activities and experiences, relationships, samples of children's work and festive moments. The publication presents an action research study, in which teachers were challenged and encouraged to utilize digital portfolios to collaboratively share and evaluate the quality of childhood education. Developing digital portfolios required consideration of several design and implementation issues. What are the purposes of digital portfolios in childhood learning environments? What kind of support teachers need for the evolvement of ICT capabilities? How does kindergarten or school culture frame portfolio development and use? How does ethical considerations affect portfolio sharing on the web?

Research Reports 11
ISSN 1455-447X
ISBN 951-39-1182-9

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