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Evaluation of an Electronic Portfolio Template System

Jane Costello

**A Thesis
in
The Department
of
Education**

**Presented in Partial Fulfillment of the Requirements
for the Degree of Master of Arts at
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Montreal, Quebec, Canada**

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ABSTRACT

Evaluation of an Electronic Portfolio Template System

Jane Costello

The design, development and formative evaluation of an Electronic Portfolio Template System for Cycle 1 students in the Quebec Education System is described. The prototype is a web-based, database-driven process and showcase portfolio container that facilitates portfolio development. This system contains administrator, teacher and student environments. Each of these environments, along with the installation, set-up and documentation process was evaluated. In all, twenty-six participants evaluated the various environments and processes. Results of all evaluations are presented. The student environment received the most feedback with strengths reported relating to interface design, usability, learnability and aesthetics and weaknesses reported relating to suitability and navigation. Interface design, learnability and aesthetics were reported as strengths while marginal navigation weaknesses were reported in the teacher and administrator environments. Evaluative comments, recommendations for improvement and suggestions for further research are presented.

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CHAPTER 1: INTRODUCTION

Context of the Study

The aim of this thesis was to evaluate a prototype of a web-based, database-driven electronic process portfolio template system for Cycle 1 students (6-8 year-olds). In this environment, the learner developed, set goals for, self-evaluated, was able to conference (with peers, teachers and parents), and provided a final showcase version of his/her work. See Appendix A for a visual of the student environment. This thesis reports on the evaluation of the prototype (Alpha Version II) produced in Phase III of the software development lifecycle. It includes the design, development and evaluation of the template. The design and development stages were completed, with the assistance of peers. The researcher completed the evaluation as the basis of her thesis. The evaluation focuses on two main areas: (a) usability of portfolio, and (b) facilitation of Québec Education Program (QEP) methodological competencies with the template.

This thesis contributes to theory and practice by identifying areas of the e-portfolio template system that are in need of pedagogical, design or aesthetic improvement. Incorporating recommendations into the design process of the next iteration of the template allows for more robust, efficient and effective process and showcase portfolio usage with this template system. Providing users—students, teachers, parents and school administrators—with such an effective educational technology enhances the likelihood of their success with the template environment. Additionally, determining the degree to which this e-portfolio template system allows for the attainment of the Québec Education Program (QEP) methodological competencies provides a strong argument for the use of portfolios in today's school system. If the

template system allows for the attainment of the competencies there will be stronger support for the use of portfolios under the new education program. Evidence of existence of and direct links among the portfolio theory, the QEP methodological competencies and the template system provides justification for this argument.

Justification for Research

The need to fulfill the mandates of the Québec Education Program (QEP) provides the context of this project. Since the new QEP has been introduced into the Québec curriculum, schools have sought ways in which to implement it. The QEP calls for giving more autonomy to students by taking advantage of new information and communications technologies (Ministère de l'Éducation, 2001). One form these technologies can take is electronic portfolio (e-portfolio). E-portfolio allows for student-centered learning through a purposeful collection of student work that exhibits the student's efforts, progress, and achievements. The students become active learners and seekers of knowledge, taking responsibility for their learning. The teacher, under the new system, provides support and guidance to facilitate learning and promote learning processes. It is believed that e-portfolio provides a medium to deal with methodological competencies (see below), one of the mandates of the QEP.

While children have been working with portfolios since they began school a few years ago, most of their portfolio work has been limited to paper-based portfolios or electronic showcase portfolios. There was no electronic process portfolio. The most effective means to determine the effectiveness of this tool is to evaluate it with

representatives of the target populations, in this case, Cycle 1 students, their teachers and parents.

Scope of the Research

There are two main objectives to this study. The first objective is to evaluate the usability of this e-portfolio tool with Cycle 1 students. The secondary objective of this study is to determine the degree to which electronic portfolios provide an effective means for the implementation of the QEP methodological competencies, specifically, competencies five and six (discussed in chapter 2). Areas of investigation were:

1. Does the e-portfolio template system require improvement?
 - 1.1. Are the pedagogical aspects appropriate for the e-portfolio template?
 - 1.2. Are the design aspects appropriate for the e-portfolio template?
 - 1.3. Are the aesthetic aspects appropriate for the e-portfolio template?
2. Is the e-portfolio template suitable for attainment of the QEP methodological competencies?

Definition of Terms

There are several terms that should be defined as they may not be familiar to the reader. They include: formative evaluation, portfolio, electronic portfolio, template, expert.

Electronic Portfolio: Electronic portfolios contain the same types of information as traditional portfolios, but the information is collected, stored, and managed electronically.

Current technological innovations allow for the storage of information in the form of text, graphics, sound and video.

Expert: An expert is a specialist who has special knowledge, skill, or experience with regard to the content, features or audience of the instruction (Tessmer, 1993, p. 48)

Formative Evaluation: Formative evaluation refers to the systematic collection of information for the purpose of information decisions to design and improve the product (Flagg, 1990, pp. 1-2).

Portfolio: A portfolio is a purposeful collection of student work that exhibits the student's efforts, progress, and achievements. The collection must include student participation in selecting contents, the criteria for selection, the criteria for judging merit, and evidence of student self-reflection (Paulson, Paulson, and Meyer, 1991).

Template: A template is a file or system with a preset format.

CHAPTER 2: LITERATURE REVIEW

A Review of Portfolios and Evaluation

Literature relating to the context of the research is presented in this chapter, including: portfolios, the design and development of the electronic portfolio template system being evaluated, and evaluation.

Portfolio

Portfolio allows for student-centered learning through a purposeful collection of student work that exhibits the student's efforts, progress, and achievements. While the type of portfolio container may vary from one learning situation to another, the portfolio process remains more or less the same. Collins (1990) suggests that portfolios were first used in the Plato math curriculum study in 1975. Portfolio reflects the constructivist paradigm of learning that focuses on authentic and challenging activities and projects. The portfolio process mandates that learners take an active role in their learning. Active participation promotes and supports greater understanding of content through interaction, discussion and reflection. They become active learners and seekers of knowledge, taking responsibility for their learning, constructing their own knowledge within a community of learners. The teacher provides support and guidance to facilitate learning and promote the learning process.

Two key concepts vital to portfolios are peer-conferencing and reflection. Peer-conferencing allows for students to provide constructive feedback to their classmates. Peer-conferencing contributes towards the development of communication and interpersonal skills. Students engage in active learning by reflecting upon their own work

and evaluating the work samples of other students. This is supported by Chen, Liu, Ou and Lin (2001), who state that portfolios provide “learning effects such as encouraging self-reflection, demonstrating skill acquisition, self-directive learning, teacher-student communication and expanding creativity” (p. 22).

Reflection allows for students to analyze their work and judge its merit for themselves. Self-reflection or self-assessment is one of the main elements of portfolio assessment. Self-assessment, allows students to express an understanding of their own progress, they take some of the responsibility for their writing, they become self-directed and independent learners (Rigoni-Reeves, 1999, p. 1). As Martin (2001), indicates, one of the strongest assets of the portfolio process is its ability to allow learns to reflect on their work.

Another important element of the portfolio process is goal setting. It allows students to identify areas for improvement. Rigoni-Reeves (1991) qualifies goals as being clear, specific, realistic and challenging.

With respect to portfolio use in Québec, little research has been published, to date, relating to the success of portfolios. However, Hall and Herwitt-Gervais (1999) presented some findings of a recent study they conducted. In this study, they compared the actual application of portfolios in Québec to the purported advantages of student portfolios. These advantages espoused by portfolio researchers include: (a) permitting more authentic (reliable) assessment of student learning; (b) promoting student reflection and self-evaluation; (c) facilitating teacher-student, teacher-parent and student-parent communication; (d) encouraging students to take charge of their own learning (Hall and Herwitt-Gervais, 1999).

Results of Hall and Herwitt-Gervais' study indicated that portfolios, indeed, accommodate these advantages. Portfolios were beneficial in (a) showing student's growth or change over time; (b) communicating with students, parents and other teachers; (c) diagnosing students' strengths and weaknesses; (d) assigning marks at the end of each grading period; (e) promoting student self-evaluation/self-reflection; (f) positively impacting student effort and motivation by encouraging students to take charge of their own learning and become more actively engaged in the learning process; (g) allowing teachers to focus their teaching on students' areas of weaknesses; and (h) helping teachers plan instruction.

Hall and Herwitt-Gervais (1999) point out that not everything is positive with portfolios. They highlighted two disadvantages from the literature: (a) portfolios required time to develop, and (b) portfolios generated more paper. They found that their survey population identified these disadvantages. Both of these difficulties may be addressed through the use of electronic portfolios as part of the class culture. This is a difficult challenge for those who rely on a more didactic manner in their pedagogy. Design of the electronic portfolio must be based on sound design, pedagogical and usability decisions.

Why Electronic Portfolios?

Electronic portfolios are simply portfolios that employ electronic technologies, such as computers, as their containers. While there is one fundamental difference between traditional (paper) and digital portfolios, the media, there are several differences to be found between the media choices. There are also similarities to be found. The similarities and differences of paper and electronic portfolios are outlined in Table 1.

Table 1

Comparison of Paper and Digital Portfolios

Similarities	Differences	
One philosophy Process is the same Security issues Student-centered Conferencing Regular updating and maintenance required Reflective thinking Multimedia Showcase should contain TOC, reflective introduction, reflections, examples Promotes life-long learning Stresses accomplishments	Media	
	Paper	Digital
	Storage problems Conferencing is easier in person Cheaper to develop Easier to display contents	Compatibility and knowledge of difficulties Convenience of conferencing May focus on end product rather than process Updateable from any location Access difficulties for those without computers Prohibitive

Several authors provide arguments in support of the appropriateness of electronic portfolios in grade school (Anderson, 1999; Barrett, 1994; Bergman, 1996; Chen, Liu, Ou and Lin, 2001; Lankes, 1998; LACOE, 2000; Marajanovic, 1995; and Moersh and Fisher, 1995). Table 2 outlines the important pedagogy-related and design-related features of digital portfolios as identified by these authors. It imperative that any portfolio contains fundamental pedagogical portfolio elements. Some pedagogy-related features of portfolios are learner-centered, motivating, emulate real life, encourage critical thinking skills, demonstrate process and product for work and facilitate self-evaluation. The electronic portfolio container should be flexible and robust to be effective. Design-related features of an electronic portfolio provide for ease of use, incorporate multimedia, provide expedient organization of work, and show a chronicle of work for a learner.

Table 2

Pedagogy-related and User-related features of Electronic Portfolios

Portfolio Pedagogy-related Features	Portfolio Design-related Features
<ul style="list-style-type: none"> ● Learner-centered ● Students are motivated as they take responsibility for their portfolios ● Show progress from a benchmark ● Students control their learning ● Students perform through real life situations ● Encourage critical thinking and decision making skills ● Include projects demonstrating problem-solving skills, analysis and synthesize information into skills ● Increase authentic communication between home and class ● Show process and final product ● Teach self-evaluation of literacy, growth and learning ● Teach to develop goals ● Allow students and parents to see how they are progressing 	<ul style="list-style-type: none"> ● Accessible ● Maintenance, additions and deletions require minimum teacher time ● Easy to use in relation to additions, storage, display, and deletion of work ● They can chronicle work from pre-k through high school ● A presentation for parents can be produced on CD ● Cross-platform ● Portable/transferable to other electronic systems ● Enable students to obtain online and instantaneous feedback ● Simple user interface ● Incorporate multimedia ● Incorporate existing software files ● Import/export large quantities of data, quickly ● Access or long-term storage

Learning Theories and Portfolios

Portfolios are founded on a constructivist-based learning process (Bergman, 1996; Brooks and Brooks, 1993; and Martin, 2001). Constructivism has its roots in a synthesis of work in cognitive psychology, philosophy, sociology and education. Learning is seen as being ‘constructed’ in which learners “build new knowledge upon the foundation of previous learning” (SEDL, 1996). The focus of the learning, learner and teacher alike are altered in a constructivist classroom as compared to a traditional classroom. The learners take a more active role, pursuing activities that allow them to discover for themselves the meaning of their environment. The teachers shift from the role of sage to that of mentor or facilitator in the learning process. Table 3, taken from Brooks and Brooks (1993),

outlines the principle differences between a traditional and constructivist classroom in relation to curriculum, roles, learning strategies and assessment. Traditional classrooms see the curriculum as a prescribed, micro process firmly based on prescribed resources. Constructivist classrooms see curriculum as a macro process wherein student inquiry is encouraged and resources are authentic and lend themselves to students learning through exploration. Students are more passive receivers of the teacher's didactic methodology, learning what the teacher advises as pertinent in traditional classrooms. Constructivist classrooms see students as active participants who challenge and think for themselves. Their teachers facilitate their learning processes by addressing students' conceptions in future lessons. Traditionally, assessment is used to validate a student's learning whereas constructively, assessment is interspersed into the learning process. Traditional classrooms often see students working independently, whereas constructivist classes see more emphasis on group and interdependent work.

Table 3

Comparison of Traditional versus Constructivist Classroom

Traditional Classrooms	Constructivist Classrooms
Curriculum is presented part to whole, with emphasis on basic skills.	Curriculum is presented whole to part with emphasis on big concepts.
Strict adherence to fixed curriculum is highly valued.	Pursuit of student questions is highly valued.
Curricular activities rely heavily on textbooks and workbooks.	Curricular activities rely heavily on primary sources of data and manipulative materials.
Students are viewed as "blank slates" onto which information is etched by the teacher.	Students are viewed as thinkers with emerging theories about the world.
Teachers generally behave in a didactic manner, disseminating information to students.	Teachers generally behave in an interactive manner, mediating the environment for students.
Teachers seek the correct answer to validate student learning. Students learn that school is about learning "what the teacher tells them."	Teachers seek the students' points of view in order to understand students' present conceptions for use in subsequent lessons.
Assessment of student learning is viewed as separate from teaching and occurs almost entirely through testing.	Assessment of student learning interwoven with teaching, includes observations, student exhibitions and portfolios.
Students primarily work alone.	Students primarily work in groups.

Several established learning theories and principles are evidenced in the learning contexts incorporated in portfolio process. These learning theories can be divided into three groups for portfolio purposes: (a) social learning theories, (b) child development theories, and (c) motivational theories. A review of learning theories is outside the scope of this thesis. Highlights of these learning theories are provided in Appendix B.

Table 4 shows the relationship between the learning theories, the portfolio-based learning components and their corresponding portfolio process, as evidenced in the e-portfolio template system. As is shown in the table, each of the portfolio-based learning components has a direct link to at least one learning theory and is promoted through the use of the electronic portfolio template system. There is strong support for the various

portfolio processes and activities found in the e-portfolio template system in terms of both learning components and related learning theory. For example, conversation theory, which sees learning as occurring as a result of meaningful conversations about a topic, is attained through the portfolio processes of cooperative learning and is evidenced in the template through conferencing.

Table 4

Theoretical Links of Portfolio Components

Learning Theory	Portfolio-based Learning Component	Evidenced in Electronic Portfolio Template by:
<p>Social Learning Theories</p> <ul style="list-style-type: none"> • Social Development • Zone of Proximal Development (ZPD) • Social Learning • Constructivism • Conversation Theory • Experiential Learning 	<ul style="list-style-type: none"> • Socially mediated • Holistic paradigm • Outcome based education • Cooperative learning • Evidence of process and product • Contextualized learning • Students take responsibility for their own learning • Periodic assessment of learning • Developmentally appropriate practice 	<ul style="list-style-type: none"> • Conferencing • Cross-curricular work • Setting goals • Process portfolio usage • Showcase portfolio usage
<p>Developmental Learning Theories</p> <ul style="list-style-type: none"> • Genetic Epistemology • Multiple Intelligences • Schema Theory • Discovery Learning • Situated Cognition • Cognitive Flexibility • Self Regulated Learning (SRL) • Reflexivity/ Metacognition 	<ul style="list-style-type: none"> • Cross-disciplinarian • Active learning • Project approach • Student discovery • Reflective process/critical thinking • Self-directed learning • Find meaning in what happened • Self-designed learning activities • TQM methodology • Self-paced • Intellectual diversity 	<ul style="list-style-type: none"> • Cross-curricular work • Process portfolio usage • Selecting examples • Reflection • Conferencing • Setting goals • Showcase portfolio usage

	<ul style="list-style-type: none"> • Individual learning plan • Learning style accommodated • Support child's sense of self and importance of self • Metacognition • Thinking through stages of 'how' they learned • Critical thinking • Experiences suited to development level • Students take responsibility for their own learning • Periodic assessment of learning • Developmentally appropriate practice 	
<p>Motivational Theories</p> <ul style="list-style-type: none"> • Self-efficacy • Motivation 	<ul style="list-style-type: none"> • Self-esteem increased • Avoid self-fulfilling prophecy • Dependent on memory (emotionally loaded) 	<ul style="list-style-type: none"> • Reflection • Showcase portfolio usage • Setting goals • Conferencing

Quebec Education Program (QEP)

Previously in Quebec standardized tests were used as the means to determine a student's academic achievements and whether any learning had taken place as a result of teacher-led instruction. Today, the education program has shifted to promote learning as an active process in which the student takes the lead and responsibility for his or her own learning. Of primary importance of the new Quebec education system is the need to:

prepare students to participate actively in a changing society by playing a constructive role as citizens. To this end, the focus is not only on the acquisition of knowledge, but also on the progressive development of competencies that will enable students to find answers to questions arising out of their everyday experience, to develop a personal and social value system and to adopt responsible and increasingly autonomous behavior. (Ministère de l'Éducation, 2001, p. 5)

Learning can take many forms. Portfolios are a form that allow for empowerment of the learners, stressing a more active role in the learning process.

Recent changes to the Quebec Education Program (QEP) (Ministère de l'Éducation, 2001) have produced many repercussions for teachers and students alike. Some of these changes include: (a) restructuring the school boards on a linguistic basis (French/English); (b) refocusing of the curricular approach to adopt a constructivist paradigm; (c) introduction of the concept of cycles (where one cycle equals two years of schooling); (d) adoption of curriculum definitions based on competencies (intellectual, methodological, personal and social, and communication-related competencies); (e) streamlining of the subject areas (languages; mathematics, science and technology; social sciences; arts education' and personal development); (f) recognizing the professional nature of teaching; and (g) encouraging collaboration amongst learners and members of the school community by making the classroom and the school a learning community. .

Under the new Quebec Education Program (Ministère de l'Éducation, 2001) the new components are intended to ensure the "comprehensive development of the students" (p. 7). The QEP envisions a learning environment in which competencies are developed in a synergistic, interactive way (p. 7). Such an environment may be facilitated through portfolios.

QEP Methodological Competencies

The Quebec Education Program (Ministère de l'Éducation, 2001) contains nine cross-curricular competencies grouped in four categories. Category four is Methodological Competencies: to adopt effective work methods to use ICT (information

and communications technologies). It contains two competencies: (a) to adopt effective work methods (Competency 5), and (b) to use Information and Communications Technologies (ICT) (Competency 6). See Appendix C for a list of all ICT competencies.

Competency 5 emphasizes developing problem-solving skills. It is believed that this competency is developed in all aspects of the curriculum. Key features of the competency require that learners be able to: (a) analyze the task to be performed; (b) begin the process; (c) analyze his/her procedure; and (c) perform the task.

Competency 6 emphasizes providing learners with opportunities to develop their computer skills. It is suggested that, through the use of this technology, students may accelerate in their other courses, as defined under the cross-curricular and subject-specific competencies. Key features of the competence require that learners be able to: (a) master the information and communications technologies; (b) evaluate their use of information and communications technologies; and (c) use information and communications technologies to carry out a task.

The QEP stresses the importance of using technology in schools. Particularly, ICT are a compulsory requirement as tools and resources for teaching and learning. It is believed that the ICT provide access to documentary resources and at the same time serve as means of production (Ministère de l'Éducation, 2001). Collins (1990) echoes the support for the use of portfolios by children. He says that portfolios reflect the way decisions are made in the real world because they focus on the accomplishments rather than simply the measured aptitudes of students. Furthermore, stressing accomplishments leads to a change in the 'motivation structure' for students in school.

One of the key components of portfolio is reflection (Anderson, 1999; Barrett, 1994; Bergman, 1996; Martin, 2001; and Reeves, 1999). Martin (2001) provides a summary of thirty characteristics of the reflective learner in relation to reflection as an integral component of the portfolio process. The summary, found in Table 5, includes activities such as: (a) describing characteristics of objects and people, (b) recalling events, (c) becoming aware of thinking processes, (d) evaluating, (e) problem-solving and (f) decision making. Several of these characteristics correspond to the QEP Methodological Competencies, numbers 5 and 6. It is believed that if these competencies and characteristics are evidenced in the e-portfolio template system, it provides the basis for support of the use of portfolios as a medium in which learners may pursue the attainment of these competencies. Such a connection can only be made through a two-step process: (a) identification of corresponding reflective learner characteristics and the QEP Methodological Competencies, and (b) determination of the degree to which these competencies are facilitated with a portfolio medium, such as the e-portfolio template system. The facilitation should be assessed by an expert in portfolios.

Interestingly, not all of the characteristics of a reflective learner that correspond to the competencies' main components are found under the sub-components. Perhaps this is because Martin's (2001) list of reflective learner characteristics was compiled independently of the QEP competencies. What is more important is that each of the characteristics is accounted for under one or more of the QEP methodological competencies. Table 5 presents a comparison of the reflective learner characteristics to the QEP methodological competencies, numbers 5 and 6.

Table 5

QEP Methodological Competencies and the Reflective Learner

5 To adopt effective work methods	
Key Features of the Competency	Martin's (2001) Characteristics of Reflective Learners
To analyze the task to be performed.	Describing characteristics of objects and people Determining similarities and differences Conceptualizing Acknowledging challenges Observing
To espouse the objectives.	Describing characteristics of objects and people
To understand the instructions and visualize the elements of the task.	Determining similarities and differences Conceptualizing Acknowledging challenges Comprehending
To understand the context of the task.	Determining similarities and differences Conceptualizing Acknowledging challenges Comprehending
To begin the process.	Recording observations, ideas and thoughts Increasing knowledge Categorizing information
To reflect, before and during the action, on the best way to attain the objective.	Observing Re-telling Evaluating
To adapt his/her work method to the task and the context.	Developing strategies Making connections between ideas
To anticipate the requirements of the method chosen and the resources that will be needed.	Sequencing/ordering Making connections between ideas Planning
To use his/her imagination.	Conceptualizing Brainstorming ideas
To analyze his/her procedure.	Trial and error behavior Establishing cause and effect Matching Recalling events Comparing/contrasting Comprehending Re-telling
To examine the procedure used through out the task.	Becoming aware of thinking processes Conceptualizing

	Sequencing/ordering Evaluating Making connections between ideas
To understand what was effective and what worked less well.	Categorizing information Recalling events Evaluating Analyzing/synthesizing
To draw conclusions.	Establishing cause and effect Making connections between ideas Analyzing/synthesizing
To perform the task.	Sequencing/ordering Evaluating Developing strategies
To make use of the appropriate resources: people, materials, etc.	Identifying objects, people and places Recording observations, ideas and thoughts Sequencing/ordering Planning Problem-solving
To manage his/her materials and time and to adjust his/her actions as required.	Establishing cause and effect Evaluating Developing strategies Planning Decision-making
To complete the task.	Recording observations, ideas and thoughts Following instructions, step-by-step
To discover the pleasure and satisfaction of work completed and well done.	Becoming aware of thinking processes Acknowledging challenges Comprehending Evaluating Making connections between ideas
6 To use Information and Communications Technologies (ICT)	
Key Features of the Competency	Martin's (2001) Characteristics of Reflective Learners
To master the information and communications technologies.	Following instructions, step-by-step
To be familiar with the purposes, concepts, vocabulary, procedures and techniques of ICT.	Identifying objects, people and places Describing characteristics of objects and people Determining similarities and differences Conceptualizing
To recognize familiar concepts in a new context.	Increasing knowledge Matching
To explore new functions of software	Increasing knowledge

programs and operating systems.	Trial and error behavior
To evaluate his/her use of information and communications technologies.	Evaluating Analyzing/synthesizing
To recognize his/her successes and difficulties.	Becoming aware of thinking processes Comparing/contrasting Evaluating Constructing arguments
To identify the limitations of the technology employed in a given situation.	Re-telling Evaluating Problem-solving
To identify ways to improve his/her use of ICT.	Acknowledging challenges Brainstorming ideas Developing hypotheses
To use information and communications technologies to carry out a task.	Decision-making Problem-solving Following instructions, step-by-step
To explore the potential of ICT for a given task.	Comparing/contrasting Solving practical situational issues Constructing arguments Developing hypotheses
To choose software programs and functions appropriate for the task.	Evaluating Making connections between ideas Decision-making Problem-solving
To use appropriate working and troubleshooting strategies.	Trial and error behavior Developing strategies

Children and Computer Usage

Several researchers, Filipenko and Rolfsen (1999), Haughland (2000), Hitchcock and Noonan (1999) and Seng (1998), address benefits of computer use for young children. The benefits can be categorized in terms of (a) learning strategies, (b) learning theories, (c) attitudes, and (d) usage.

With respect to learning strategies it is reported that computers promote independence, cooperation and communication. Computers are thought to reinforce learning of academic skills during guided practice. Computers are motivating. Computers

promote teacher and student interaction; Computers create more opportunities for practice and promote inclusion (Hitchcock and Noonan, 1999 and Seng, 1998).

Haughland (2000) reported on children's use of the Internet and computers in general. The Internet provides children with a variety of learning opportunities that appear to enhance (a) problem solving, (b) critical thinking skills, (d) decision-making (e) creativity, (f) language skills, (g) knowledge, (h) research skills, (i) the ability to integrate information, (j) social skills, and (k) self-esteem. Computers promote motivation. Children who use computers (a) exhibit gains in conceptual understanding, (b) develop abstract thinking, (c) increase verbal skills and (d) have gains in problem-solving.

According to Seng (1998), computers provide for multiple theories of learning to be incorporated into the classroom. For example, computers (a) encourage more cooperation and collaboration; (b) promote social development of young children; (c) improve problem-solving ability; and (d) reflective thinking. (p. 6).

Seng (1998) reported that children had positive attitudes towards the use of computers and that children showed high levels of self-esteem and confidence. (p. 3).

In terms of usage, Seng (1998) indicates that "neither gender nor age influenced their (six year olds') computer usage" (p. 3). Filipekno and Rolfsen (1999) looked more at technology integration. They had three things to tell us: (a) technology should be integrated into the regular learning environment and used as one of the many options for supporting children's learning; (b) process oriented programs rather than programs concerned with specific outcomes should be employed; and (c) software should reflect the child's level of abilities and interest (p. 37).

From Haughland (2000) we learn four important things in regards to children's use of computers in school: (a) First, "How computers are used with young children is more important than *if* computers are used at all" (Haughland, 2000, p. 12), (b) computer activities need to mesh with children's educational goals (p. 14 \$is the above supposed to be a quote? Ditto for the others), (c) placing computers in classrooms rather than in labs is more effective in learning (p. 17), and (d) computers empower young children because they are totally immersed in the joys of learning with computers (p. 18).

It is evident from the recent literature that any use of computers in the classroom will have a positive impact on the child's development. It is imperative that there be a purpose to the use and that the use reflect the child's developmental abilities. It is more important how computers are used than if they are use at all. There needs to be a balance of the desires of the designer and the users, for nothing is created in a vacuum. All design decisions have repercussions and it is, therefore, to everyone's advantage to take the learner's likes, aptitudes, strengths, and development into consideration when decisions about computer use and application design are being made. Such was the case with the early development of this e-portfolio template system.

Rationale for Development of Tool

Recent changes to the Quebec Education Program (QEP) have far-reaching implications for those involved in the school system today. For example, the methodology of evaluation has been affected. Under the new education program, students are given a greater role to play in evaluation The QEP (Ministère de l'Éducation, 2001) characterizes the new evaluation system as one in which:

Techniques such as self-evaluation and peer evaluation enhance students' awareness of their own progress throughout the learning process and allow them to analyze it and to compare their ideas with those of their teachers, classmates and parents. (p. 5).

As a means of delivering and measuring this new education program's learning-centered approach, the QEP promotes the use of various tools to evaluate learning and assess the degree of development of competencies by students. It is also felt that enhancements to evaluation will lead to better communication channels between school and parents. This communication may take a variety of forms such as annotated portfolio or meetings between the parents and the teacher. (Ministère de l'Éducation, 2001).

Clearly, the QEP promotes the use of portfolio as a means of assessment under the new program. Local schools have been using portfolios for a few years. Some, at the high school level, have been employing electronic portfolios. However, few at the elementary level have been employing them. One reason given for this is that schools have been unable to find a satisfactory electronic portfolio template suitable for elementary students, particularly Cycle 1 students (Costello, 2000). This is significant because the new education program has already been implemented in Cycle 1.

Existing E-portfolio Templates

Two options recently being explored in the Quebec schools at the Cycle 1 level include School Master, and Digital Portfolio. See Appendix D for screen shots of the main environments of these templates.

SchoolMaster.

SchoolMaster is an enterprise marketed by BiblioTech (2002) in the UK. One school was using the Sitebuilder tool that was supported by SchoolMaster. It is designed for use by any age or knowledge level. It boasts the following features within its ePages template: (a) A Web-based point and click interface that requires no html or other technical web authoring skills; (b) Templates allow members to simply replace default text and pictures with their own content; (c) Each site created has six pages as a standard number but additional pages can be added; and (d) Members can create multiple self-contained Web sites.

While this template is very easy for Cycle 1 students to learn and functions very well as a secure-access showcase portfolio, it does have a few limitations. Each student is allowed only 5MB of storage space. It does not allow for reflection or conferencing and is therefore incomplete in terms of portfolio intractability. Its primary intent is to provide a secure environment in which students may build web pages. Excluding the showcase capabilities, the remainder of the portfolio activities required other tools for their completion (Costello, 2000). See Appendix D for a sample of the main interface.

Digital portfolio.

Digital Portfolio is a storage template offered by A.P.O. Monterege (2002) in Quebec. It was created through the collaboration of a few experienced portfolio teachers in two school boards in Quebec. The template is database-driven, using Claris FileMaker as the engine. Its interface employs the use of Web pages (html). There is no age or knowledge background specified, only that users should already be familiar with

portfolio. This template is an organizer that facilitates the compilation of multi-media or multi-modal student work. As such, it is ineffective as a process portfolio template. It is intended for use strictly as a storage container. To its credit, the container is simple to use. Aesthetically, it is ugly. See Appendix D for a sample of the main interface.

Limitations of Existing Templates

As discussed above, there are a few portfolio templates being considered in Quebec. They are not acceptable as process portfolios due to their limitations. They were developed for wrong audience or have a dependence upon Filemaker. Some are incomplete in terms of portfolio interaction- or function solely as a storage container). After careful deliberation and research, an alternate electronic portfolio template system was designed and developed.

The E-portfolio Template System History

The researcher (Jane Costello) and a partner (Mariette Xenopoulos) initially undertook the conceptualization of this e-portfolio project as the term project of the Computer-Assisted Learning (CAL) class in the MA program. The initial prototype was conceptualized into storyboards and later a functioning prototype was developed with support of the Centre for the Study of Learning and Performance (CSLP). The e-portfolio development project is currently in its third stage, with Alpha Version II being completed in February 2002. It is this version that was evaluated for this thesis. Further background on this template follows.

Design Specifications of the Template

The template in question is a database-driven, Web-based electronic portfolio template system that is installed on a PC server to house the MA Access database. Users access the system with Internet Explorer by logging-in to the relevant environment. It contains three environments: (a) student, (b) teacher, and (c) administrator. According to Chen (1995), a computer-based learning environment (CBLE) refers to the “display...and user-computer interactions elicited by the program...for a specific educational purpose...” (p. 185). The E-portfolio template system is an example of a CBLE as it employs text and graphics, requires input from the user such as goals, reflections, etc., and is used for the purpose of allowing students to collect and develop work to meet their learning goals. Visual representations of the template’s architecture, in the form of flowcharts are found in Appendix E and samples of screen environments in Appendices A and O.

Learners actively integrate with the student environment portfolio by manipulating the features found on the various screens. In the student environment, learners: (a) log-in to the process portfolio from the static splash page or view showcase portfolios; (b) set their learning goals for each terms under ‘goals’ ;(c) add work to the portfolio for development under ‘add work’; (d) modify work and refine it saving each version under ‘modify work’; (e) reflect on versions of their work under ‘reflect’; (f) conference with parents, peers or teachers under ‘conference’ on their work; (g) select work to add to showcase portfolio (which anyone may see) under ‘send to showcase’; (h) review contents of showcase (arranged by subject) under ‘showcase’; (i) seek help on

how to use student environment or advice on how to use portfolios under 'help'; and (j) log-out of the process portfolio by selecting 'quit'.

The teacher environment is designed to support the activities of the student portfolio environment by setting-up their class' portfolios, and the reflection and conferencing questions. Here the teachers: (a) log-in to administrate their classes' portfolio activities; (b) register students, assigning user names and passwords under 'student'; (c) compile list of subject for organizing the portfolio work under 'subject'; (d) enter (a maximum of ten) reflection and conferencing (peer, parent and teacher) questions under 'questions'; (e) edit contents of student's portfolio under 'portfolios'; (f) generate student reports of work for assessment purposes under 'reports'; and (g) log-out of the teacher environment by selecting 'quit'.

The administrator environment is designed to support the teacher and student environments. The administrator environment is intended for the person who will be setting-up the schools to use the portfolio template system. This may occur at the board or school level. Here, administrators: (a) log-in to administrate their classes' portfolio activities; (b) registers schools to use the template system under 'school'; (c) registers teachers, assigning user name and passwords, under 'teacher'; and (d) log-out of the administrator environment by selecting 'quit'.

The student environment has been designed for children aged 6-8. Students of this age tend to have shorter attention spans and emergent reading skills. Therefore, the e-portfolio contains only static media (text and graphics). Dynamic media (sound, video and animation) are recommended for future versions.

This tool has been designed based upon the features reported as necessary to the portfolio process in the literature (see section on Design Rationale for Template System below) and, in part, to attempt to facilitate the Quebec Education Program's (QEP) requirements for use of the methodological Information and Communications Technologies (ICT) competencies.

The portfolio process reflects a learner-centered pedagogy in which students are encouraged to actively participate in the learning process and take responsibility for their learning. The environment supports the portfolio process by providing a secure environment wherein students can develop their work in accordance with the portfolio philosophy. This philosophy suggests that students: (a) set goals, (b) collect work, (c) select work to refine which will aid the attainment of their learning goals, (d) reflect on the work to determine if any improvements need to be made and what they have learned from the work, (e) evaluate their work through conferences with peers, teachers and parents, and (f) at a predetermined time, celebrate their work by choosing pieces to showoff in the showcase portfolios. Each phase of this philosophy are clearly accommodated in the e-portfolio template system. Users of the student environment are also provided with assistance on how to use the template ('help') and on the portfolio process ('advice'). Additionally, the teachers help guide the students in their learning by: (a) identifying subjects for organizing their work, (b) providing thoughtful questions to guide the reflection and conferencing sessions and (c) monitoring the content and progress of the student's portfolio development.

In terms of the QEP, the new methodology encourages a student-centered pedagogy. Learning activities incorporated into this template environment incorporate the

QEP Methodological Competency (ICT) for Cycle One in that they: (a) transfer text and illustrations from one application to another; (b) learn to use E-mail, to surf the Web; (c) learn to use some peripherals; (d) store and organize their information with assistance; (e) explore and use troubleshooting strategies; and (f) become familiar with the hierarchical organization of information and control the basic functions of the operating system. (Ministère de l'Éducation, 2001).

In this constructivist environment, the learner engages in the task activities where he/she sets goals for, develops, self-evaluates, peer-conferences, and provides a final showcase version of his/her work. The content involves the students learning to use the environment in terms of the sequence, scope, and depth. He/she follows the portfolio process as outlined in the literature, both in terms of sequence—collection, selection, reflection, evaluation and celebration, in terms of scope—employing both process and showcase portfolios and selecting pieces of work to meet their own learning goals, and in terms of depth—developing selected pieces based on feedback and own desired learning outcomes to a showcase piece.

Design Rationale for Template System

When designing the electronic portfolio, it was important to keep in mind a variety of factors: (a) learning theories associated with portfolios; (b) criteria of an effective electronic portfolio; (c) appropriate user-interface design principles appropriate for the target audience; and (d) level and degree of computer usability and competence of the target audience.

There are some design components that are fundamental to any successful electronic portfolio (Barrett, 1994; Bergman, 1996; LACOE, 2000; Lankes, 1998; and Pierce and O'Malley, 1992). These components, in conjunction with the features outlined previously (see the section on portfolios) make for a solid portfolio system. The fundamental design components necessitate an electronic portfolio that has a certain set of attributes regarding its methodology, process, usability, practicality, and learnability. These features are consolidated in Table 6. Any template system that incorporates (the majority of) these features can be deemed robust and suitable for portfolio use.

Table 6

Features of an Effective Electronic Portfolio System

-
- It should be seen as a strategy, not a formula
 - It should incorporate a variety of media
 - It should be organized by: date, table of contents, graphic menu, hypertext links, subject, project or theme
 - It should clearly indicate the learner's goals, criteria for selecting material, samples of work, drafts, evaluation criteria, examples of good work and reflections
 - It should present best pieces as well as display progress
 - It should include comments, feedback, and assessment in the form of text, sound or video
 - It should employ passwords to protect each student portfolio, gain teacher access to all portfolios and create protected "teacher views"
 - It should contain an indexed and topical help
 - It should contain necessary documentation for installation and use
 - It should contain an indexing feature to help categorize and find portfolio entries
 - It should contain a lock text feature to protect work
 - It should be exportable to CD containing student portfolios k-high school
-

Early Prototype Evaluation

The prototype has been through two iterations of the product development lifecycle. It is presently undergoing its third iteration. The template was evaluated in phases I and II. Recommendations were subsequently made to improve the design. The

evaluations were conducted informally, though applying traditional evaluation methodology. A historical timeline or lifecycle of the e-portfolio template system is presented in Appendix O.

Stage I began in February, 2001. Initial design specifications were compiled following an extensive review of literature describing electronic portfolios (Anderson, 1999; Armbruster, 1999; Barrett, 1994; Bergman, 1996; LACOE, 2000; and Martin, 2001), a review of existing portfolio containers and interviews with teachers using other e-portfolio containers. Following this, design specifications and storyboards for the e-portfolio template system were developed. Design and content subject matter experts (SMEs) conducted a review of storyboard and flowcharts of prototype A, using a think aloud protocol. Here, they talked their way through the screens to determine whether the interaction was complete and whether the pedagogy was being incorporated correctly. Minor changes were made. A presentation to peers, employing a cognitive walkthrough focusing on usability and learnability was conducted in April 2001. Mock-up electronic versions of the storyboards were completed and the designers/developers talked their way through the prototype, explaining their choices, when necessary. Feedback was also solicited from classmates in an informal debriefing following the cognitive walkthrough. Suggestions were noted.

The suggestions were reviewed and changes were implemented. At this point, the database feature was implemented with limited functionality. This prototype (Prototype B) was presented (May-July, 2001) to teaching/training experts, employing a think-aloud protocol, who provided constructive feedback regarding what they would like to see changed should they consider implementing this tool in their classes. All

teaching/training experts taught at the Cycle I level, which is the target audience.

Following the collection of these comments, recommendations for future design considerations were prepared and subsequently implemented.

Stage II began in August, 2001. At this point, the Centre for the Study of Learning and Performance (CSLP) expressed interest in assisting Mariette and myself develop the template system. We reworked the storyboards and specifications and began overseeing the development of the template by the CSLP-hired programmer. The full-functioning database component was added to the design and the template system was expanded to include two new environments: teacher and administrator. A review of next version (Alpha) was done in December, 2001. Constructive feedback, regarding interface and pedagogy, was solicited from three groups, each of whom had experience working with portfolios. The feedback was compiled and recommendations were prepared for the improvement of the template system. This brought us to Phase III of the development lifecycle.

Phase III development and field testing of Phase II's version were undertaken concurrently. The Alpha version was completed and ready for testing in January, 2002. Some of the problems reported by the field test site were being addressed in the development of the present version. The proposal and storyboards from Phase II were updated. Further development continued with a new programmer. The new development involved implementing outstanding improvements from previous reviews as well as some new features. The present version (Beta) was completed in February, 2002. It is this version (Beta) that was evaluated for this thesis. It is at this point where my thesis project came into play.

CHAPTER 3: METHODS

Research Design

The evaluation of a product is needed in order to test its worthiness. There are several means at one's disposal to do so. In part, knowing which to employ, and when, is as much part of the evaluation process as the actual evaluation model itself. To identify problems with the instructional environment so that recommendations can be generated to deal with the problems is the goal of this project. "Without evaluating, we do not know which performance interventions to stop, modify, continue, or improve" (Kaufman, Keller and Ryan, 1995, p. 8). I reviewed a collection of evaluation methods to determine the evaluation approach most appropriate for this study. Most were found to be limited. The evaluation methodologies are presented in the order in which they were considered.

Evaluation Methods for Educational Products

There are several evaluation techniques available for testing educational technologies. Oliver (2000) suggests "different methodologies will be useful depending on the situation in which the evaluation takes place" (p. 21). Reiser and Kegelmann (1994) identified over 30 articles describing software evaluation procedures. Some such methods include: (a) usability testing, (b) cognitive walkthrough, and (c) formative evaluation.

Usability Testing

Usability testing involves users evaluating an entire system to ensure that it meets pre-defined usability criteria. In an attempt to evaluate the usefulness of the product, it

looks at computer ergonomics, user fatigue, and the interface between the user and the system (Cory, Frick and Hansen, 1997). Usability testing presents a potential problem for young children as they may be too shy or self-conscious to participate in think aloud protocols that are often employed in this sort of evaluation. Usability testing is of little value once production is complete, as is the case with the e-portfolio template system. As Nielsen (1994) states, usability testing is unsuitable once the system has been released to the customers. A method more appropriate for in-production systems was needed. Cognitive walkthrough was considered next.

Cognitive Walkthrough

Cognitive walkthrough is a method typically employed with software engineering wherein the evaluator *thinks* his/her way through the educational product. Cognitive walkthroughs provide a richness of feedback from the evaluator. The effectiveness of a cognitive walkthrough is dependent on the evaluator's familiarity with human-computer interactions (HCI) and comfort with orally expressing his or her thoughts. The art of performing cognitive walkthroughs can be challenging to master. They are time-consuming and costly. Time is a primary consideration of this project. Therefore, given the uncertainty that seven year-olds will be able to master this technique, the time and expense involved and the skill set/background required of the evaluators, this method was deemed inappropriate. The method finally chosen was formative evaluation.

Formative Evaluation.

Scriven's greatest contribution to evaluation was made in his classic 1967 essay. He is credited with making the explicit distinction between summative and formative evaluation. Popham, (1992) reports the distinction as follows: "[f]ormative evaluation refers to appraisals of quality focused on instructional programs that are still capable of being modified...Summative evaluation refers to appraisals of quality focused on completed instructional programs" (pp. 13-14). This is important because it was during the 1960s that several 'formal' evaluation models being developed and tested within the educational community. Until Scriven, there was no clear distinction between the types of evaluation.

Formative evaluation is completed for the purpose of testing an educational product in order to determine where and whether improvements are required. It is conducted by representatives of the target user population and/or experts conversant in the topic of the educational product. Typical methodologies include expert review, user review, observation of individual learners, pilot studies and field tests. Data collection is achieved through the use of observations, questionnaires, interviews, checklists and extant data (Flagg, 1990; Patterson and Bloch, 1987; Popham, 1988, Reiser and Kegelmann, 1994; Smith and Ragan, 1994; and Tessmer, 1993).

Flagg (1990) defines formative evaluation as "the systematic collection of information for the purpose of information decisions to design and improve the product" (pp. 1-2). Tessmer (1993) suggests that formative evaluation can instruct developers on "how to make instruction more effective, efficient, interesting/ motivating, usable, (and) acceptable", (p. 19). In this sense it is a means of quality control. A formative evaluation

should be conducted before a product is implemented for a field test. Software evaluation organizations promote trying the programs out with students.

Patterson and Bloch (1987) view formative evaluation as a component of the development process. It is also beneficial to the quality of the instructional materials. Conducting formative evaluations is an integral part of the development of quality, effective educational products. Formative evaluations do, however, have a few weaknesses. They can be time-consuming to conduct and when making revisions. Formative evaluation is not forgivable of computer hardware and software malfunctions, in the case of evaluations involving computer technologies. Similar to usability testing, formative evaluations do not necessarily consider the whole system the user faces.

The benefits reaped from a formative evaluation far outweigh the limitations. The biggest concern is not having sufficient time to complete an informative evaluation. Limiting the number of participants and working under a tight research schedule are recommended means for reducing this risk. The environment or whole system was considered when the usability testing was conducted in Phase I of the development process for this template system. Some usability considerations will be considered as part of this formative evaluation. Finally, in regards to the computer malfunctions, any evaluation is susceptible to difficulties of this nature. As with any research project, contingency plans will be made to deal with the unexpected.

The benefits of building a model to meet the evaluation needs of this research project, employing several evaluation approaches, soliciting several (26) participants (see section on participants below) and the tried and true methodologies outlined in the plethora of formative evaluation literature provide support for the use of formative

evaluation for this research project. The next step is to determine which formative evaluation model to employ. Following, I contrast several formative evaluation models before outlining the chosen model for this study.

Formative Evaluation Models

As Patterson and Bloch (1987) indicate, there is a plethora of evaluation models intended for use in formative evaluations. Each of these models was created for a specific evaluation project. The models do not compete with each other so much as complete the formative evaluation spectrum. As each educational product is unique, so too must its evaluation be. Three models were considered for this research project. A brief description of the model and reason for its disqualification is presented. The models considered were: (a) Kirkpatrick Plus Model, (b) Reiser and Dick's 'New Software Evaluation Model', and (c) the ISD Model. The models are contrasted in Table 7. Each of the three models is described in terms of its definition, purpose, strengths, weaknesses, processes and data collection instruments.

Table 7

Comparison of Formative Evaluation Models

Approach	Description	Purpose	Strengths	Weaknesses	Process	Instruments
Kirkpatrick Plus Model	Identify training deficiencies and excesses in four stages-reaction, learning, behavior, results and evaluation.	Evaluating training programs.	Tested and true evaluation method. User- friendly approach to Needs Analysis. Simple to use.	Implemented without any input from those directly affected. Time consuming. As levels increase, so do expenses and scope.	Criterion referenced tests.	Questionnaire, pre-test, post-test and observation.
Reiser and Dick's 'New' Software Evaluation Model	Select software, identify characteristics develop instructional strategies and conduct one-on-one evaluation. (Gill, Dick, Reiser and Zahner, 1992, p 40).	Evaluate appropriateness of existing software to if see students acquire skills software is designed to teach.	Focus on collection of student performance data. Specific process to follow.	Time-dependent and time-consuming, requires two-week break between treatment and follow-up. Important to assess what students learned.	One-on-one and small group evaluations followed by retention test and evaluation report. Pre-testing, observing post-test for learning.	Pretest, post-test, attitude data, retention tests.
Instructional Systems Design (ISD) Model	Part of Instructional Design process, formative evaluation determines weaknesses of instructional materials. (Smith and Ragan, 1993, p 388).	To identify necessary revisions to instructional materials so as to make them more effective and efficient.	Integral part of instructional design process.	More so for training materials than educational products.	Design reviews, expert reviews, learner validation and ongoing evaluation. Employing one-to-one, small group and field trials.	Questionnaires, observations, focus groups, interviews, extant data.

Kirkpatrick Plus Model

Typically, evaluation of training programs use a model designed specifically for that purpose. One such model is the Kirkpatrick four-level model (Kirkpatrick, 1978, 1996). The Kirkpatrick model is a tested and true way of evaluating training programs to identify training deficiencies and excesses. The Kirkpatrick model involves four stages or elements—reaction, learning, behavior and results (Kirkpatrick, 1978, p. 6). Carliner (1997) claims that the Kirkpatrick four-level model has limitations. For example, it “fails to assess client satisfaction with the materials produced for them” (p. 16). To address this limitation a fifth stage is proposed—evaluation (Carson, 1997; Watkins et al., 1998). Watkins (1998) calls this the Kirkpatrick Plus model.

The Kirkpatrick model is considered to be a tested and true evaluation model. It employs a user-friendly approach to needs analysis and is considered simple to use. It often involves the use of criterion-reference tests. Data is collected through the use of questionnaires, pre- and post tests and observations. The Kirkpatrick model has been used in testing training programs in corporations.

A major drawback of this sort of evaluation model is that it is implemented without any input from those directly affected—the stakeholders. What is needed to ensure that the stakeholders have a voice is for them to be actively involved in the evaluation process. One way to do this is by approaching the evaluation as a research project in which all interested stakeholders can contribute. This model is often time consuming and tends to balloon. By this I mean that as the stages increase, so does the expense and scope of the evaluation. This can lead to disastrous effects such as having an

ever-growing evaluation with little chance of an end-in-sight. A more contained model designed for software evaluation is considered next.

Reiser and Dick's 'New' Software Evaluation Model

Reiser and Dick (1990) presented the 'new' software evaluation model. The purpose of this model is to allow educators to reliably evaluate the appropriateness of existing software for their learners.

The basic process of the model entails: (a) selecting a piece of software, (b) identifying characteristics of the software, (c) developing instructional objectives, (d) developing test items and attitudinal questions, and (e) conducting one-on-one evaluation. At this point the evaluator needs to determine whether further evaluation is required. If so, changes are made to the test items until they are satisfactory and then a small group evaluation is conducted. After a two-week period, a retention test is administered and an evaluation report is prepared. It has been used in the evaluation of graphics and icons.

This model is attractive because it focuses on the collection of student performance data and outlines a specific process to follow. However, it is time-consuming and time-dependent, requiring a two-week break between treatment and follow-up. This model is more appropriate for evaluating of an existing product than for the evaluation of educational materials being developed. It is, therefore, not appropriate for this project.

ISD Model

Inherent to Instructional Systems Design (ISD) is the application of evaluation. It is considered to be a vital phase or aspect of the design of instructional materials. Smith and Ragan (1993) see formative evaluation as relating to the development of instructional materials. Its purpose is to “evaluate the materials to determine the weakness in the instruction so that revisions can be made to make them more effective and efficient” (p. 388). They distinguish this from summative evaluation in which materials are evaluated post-implementation to determine their effectiveness.

In the ‘Smith and Ragan’ ISD model, formative evaluation has four stages: (a) design reviews, (b) expert reviews, (c) learner validation, and (d) ongoing evaluation. Design reviews serve to “confirm the accuracy of the design process at each phase” (p. 389) of the ISD process. During an expert review, those who are specialists in their field—subject matter, design, pedagogy—review the materials for accuracy and completeness. Learner validation involves the evaluation of the materials by representatives of the learner target population.

Smith and Ragan identify three types of evaluations: one-to-one, small group and field trials. In one-to-one evaluations the evaluator tests the educational product with a few representatives of the target audience to determine and correct significant problems with the materials. Small group evaluations occur following one-to-one to determine the efficacy of the revisions made based on the one-to-one evaluation. The field tests are a means to verify all revisions, identify implementation problems and validate the effectiveness of the instructional material.

The final stage in the ISD model is ongoing evaluation. This evaluation takes place while the instructional materials are being implemented. Adjustments can be made to the materials as problems present themselves. A partial adaptation of this model would be appropriate for this research project.

Tessmer (1993) provides a detailed explanation of how to gather data for four types of formative evaluations (expert review, one-to-one, small group and field test). These methods of evaluation are applicable to most models of formative evaluation.

Evaluation Method for this Study

The proposed design for this research project was a hybrid formative evaluation process based on the Scriven (Popham, 1992 and Scriven, 1996) and Instructional Systems Design model (Smith and Ragan, 1993). It employed three approaches (or stages) described by Tessmer (1993): (a) one-to-one, (b) expert, and (c) small group.

The evaluation was applied to the e-portfolio template system. While most models propose revisions be made following each approach to evaluation (expert, one-to-one, small group and field test), recommendations for revision of this version of the template were made following the completion of all three proposed approaches. The evaluation was concurrent in that there will be no revisions made to the template between each approach. The evaluation began with the expert review. Shortly thereafter, the one-on-one evaluation began, followed by the small group evaluation. All three evaluations ended at approximately the same time.

Rationale for Chosen Evaluation Model

A formative evaluation should be conducted before a product is implemented for a field test. Its purpose is to identify problems with the instructional environment so that recommendations can be generated to deal with the problems. Ideally, the model chosen should be one that allows for the evaluation of an educational product that is in the midst of being developed.

There are many evaluation models, each of which was designed with a specific need in view. It would seem that because each evaluation situation is unique so too must be the model employed. Reeves (1992) recommends that when it comes to evaluation one should “[u]se whatever works to improve the decisions people make” (p. 49).

Patton (1990) suggests that evaluators see each evaluation situation as a problem to be solved. The design employed reflects their thinking about the problem rather than an attempt to adhere to a prescriptive model. This allows for more flexibility than will be attained by strictly adhering to any single model.

Reese tells us that evaluations employing experimental or quasi-experimental designs “should not be carried out until the IMM (interactive multimedia) is optimized through various formative evaluation strategies” (pp. 49-50). He justifies this by saying that this type of evaluation produces little benefit, due to “weaknesses in the comparative evaluation design itself and /or a lack of understanding of the dimensions” (p. 49). This, therefore, ruled out the field test approach as one of the preliminary evaluation methods. However, once the expert, one-to-one and small group reviews were complete, and revisions have been made to the educational product, the e-portfolio template, further evaluation research should be implemented in the nature of a field test. Tessmer (1993)

stresses that “[a]s long as the purpose of the evaluation is to ‘revise’ the instruction by reorganizing or supplementing it, the evaluation can be a type of formative evaluation” (p. 14). Additionally, Patton stresses the importance of placing the evaluation situation foremost and selecting or developing a model or hybrid of models that reflects the thinking about the problem as opposed to an attempt to carefully follow a prescriptive model. This provides for more flexibility than is likely to be provided by any single model (1990).

Several formative evaluation models have been reviewed, all of which suit this project, to a limited degree, but none in its entirety. What was needed is a hybrid model. The model combined the formative evaluation approach distinguished by Scriven, as well as the ISD methodology prescribed by Smith and Ragan. Additionally, the data collection approaches outlined by Tessmer were also an asset.

Scriven provides a methodology for deciding whether changes need to be made to the e-portfolio template system before it is implemented or field tested. It is his classic distinction between formative and summative evaluation which is important here. The product, while likely close to readiness for implementation, is still being developed. The ISD methodology recommended the use of expert reviews and learner validations as part of the design and development stages of the design of instructional materials. Again, this coincides with the stage of production of the template system. Finally, the detailed descriptions and proven track record of the data collection approaches outlined by Tessmer allowed for a robust evaluation of the e-portfolio template system.

This hybrid model allowed for inclusion of stakeholders in the decision making process, it did not require an extensive time commitment and accommodated influence of

external factors through exploration of their impact during debriefing and interviews. The evaluator did not need to be an 'expert' in the subject matter and it was a valuable part of the design process for instructional materials.

Data was collected to instruct the research on how to make the educational product, the e-portfolio template system, more effective, efficient, motivating, usable and acceptable (Tessmer, 1991). Areas of investigation were identified following a review of literature dealing with evaluation of educational software and Internet-based applications. Areas of investigation included: (a) interface design, (b) usability, (c) learnability, (d) navigability, (e) suitability, (f) feedback and help, and (g) aesthetics. Interface design deals with how things are organized on the screen. Usability deals with how the application responds to input, its fitness for use. Learnability deals with how facile it is to master application. Navigability deals with ease of moving from one area to another in application. Suitability deals with appropriateness of application for intended audience and use. Feedback and help deals with support and prompts provided to assist with use. Aesthetics deals with the appropriateness of the 'look' of aspects of the application. See appendix K for details of aspects relating to each component.

Evaluation literature says that it is not beneficial to conduct evaluation with members of target audience as they have a stake in the educational product's quality (Flagg, 1990; Popham, 1990; Smith and Ragan, 1993; and Tessmer, 1993). Time limitations required careful consideration of how evaluator's time would be used. Portfolio experts were chosen to evaluate template system because of their background in portfolios, education and instructional design. It was felt that sufficient feedback would be attained from parents, students and portfolio experts with regards to student

environment. Therefore, teachers were asked to focus on teacher and administrator environments.

Research Method

The following section outlines the details of the research process, participants and data collection instruments.

Participants

In total 26 individuals participated in the evaluation of the e-portfolio template system study: 18 students, 2 teachers, 2 parents, 3 portfolio experts and 1 technical expert. Twelve of the students participated in four groups of three while all other participants conducted their evaluations individually.

Students

Eighteen students (12 boys, 6 girls) aged seven to nine evaluated the student environment of the template system. Fourteen students spoke English only, none spoke French only, one spoke another language only and five spoke all three (English, French and another language). All eighteen students like using computers and had some previous experience with portfolios. Five said they used portfolios a lot while 13 indicated not very much portfolio use. All students liked working with portfolios and felt portfolios helped them learn better. They used portfolios last year to varying degrees, found paper portfolios easier to use than electronic portfolios and liked others commenting on their portfolios (see Table 8) for summary of student demographics.

Table 8

Summary of Student Demographics

Question	Frequency	Percentage
Gender		
Male	12	66.7%
Female	6	33.3%
Age		
6	0	0.0%
7	8	44.4%
8	9	50.0%
9	1	5.6%
Mother Tongue		
English	14	77.8%
French	0	0.0%
Other	1	5.5%
All three	3	16.7%
Computer use		
Do like	18	100%
Do not like	0	0.0%
Portfolio use		
A lot	5	27.8%
Not very much	13	72.2%

Teachers

Two teachers (1 male, 1 female) participated in the evaluation of the administrator and teacher environments of the template system. Both spoke English, liked using computers and portfolios, used portfolios last year, found paper portfolios easier to use than computer portfolios and believed that portfolios help users learn better. While one liked using portfolios the other did not. Teachers spent between ten and forty minutes exploring the administrator and teacher environments. They explored all screens.

Parents

Two parents (1 male, 1 female) participated in the evaluation of the student environment. One spoke English and the other spoke English, French and Italian. Parents shared the following characteristics: liked using computers, working with portfolios, used portfolios last year, found paper portfolios to be easier to use than computer portfolios, believed portfolios help with learning and did not use portfolios very much with their children. Parents spent between fifteen and thirty-eight minutes exploring the student environment. They explored all screens.

Portfolio Experts

Three portfolio experts evaluated all three template environments. All were female, used portfolios extensively, were very comfortable using computers. Two typically used both PC and Mac platforms and one used only Mac. Two spoke English and the third spoke another language. One was a grad student and two were education professionals. While one had zero to two years experience with portfolios the other two had between six and nine.

Technical Expert

One technical expert completed the evaluation of the installation and set-up process. The technical expert was male, spoke English, was an education professional was very comfortable using PC and Mac computers, and frequently installed applications on computers.

Constraints

There were a few constraints encountered including difficulties: (a) accessing templates (S, P, T and Px); (b) saving work to database (all evaluators); and (c) concentrating in a noisy student evaluation site. Three separate sites were used to conduct the evaluations as evaluators encountered a variety of difficulties with the initial test site. All participants were initially directed to the primary site that was set-up with individual accounts for each participant. When the students could not access the site from their school a second test site was attempted. The programmer was contacted to see if the site to troubleshoot the difficulty. In the meantime a third test site to which the researcher had access was employed and three accounts were set-up for testing purposes. Similar difficulties were encountered by one of the teachers, a parent and two portfolio experts. They were directed to the second and, in some cases, the third site in order to complete their evaluations.

Students took a long time to find appropriate files and upload. Most had Appleworks files (.cwk). To expedite the evaluation process, I logged in three times on the network and placed a folder of six images (.jpg or .gif) on the desktop. When it was time to add a piece of work, I suggested students choose one of the pre-saved images (cats or dogs). Unscheduled classes occasionally overlapped with the evaluations. This created a noisy lab environment. At such times, students were encouraged to concentrate on their online activities. Questionnaires and subsequent interviews were completed in the hall.

Instruments

Data collection was included both quantitative and qualitative instruments to secure participant feedback. The primary data collection methods used included questionnaires, interviews and observations.

Questionnaires

Questionnaire design for this project employed closed and open-ended questions. Questionnaires covered the following topics: (a) demographics, (b) use of portfolios, (c) usability of the proposed research tool: the e-portfolio template system, (d) attitudes and perceptions of the e-portfolio template system, and (e) degree of attainment of QEP methodological competencies. See appendix F for sample questionnaires.

Students were asked to respond to 16 items in part 2 (6 design, 2 usability, 4 learnability, 2 navigability, 1 suitability and 1 aesthetics) and 11 items in part 3 (portfolio use). All items used a three-point scale (Yes, Sort of and No). Part 4 contained 12 items (screen effectiveness) and used a four-point scale (Like it very much, Like it a bit, Do not like it much and Do not like it at all).

Parents were asked respond to 9 items (4 design, 3 learnability, 1 navigability and 1 aesthetics) in part 2. A four-point scale was used (Strongly Agree, Agree, Disagree and Strongly Disagree). Parents were asked to respond to 12 items in part 3 (screen effectiveness). All items used a four-point scale (Very effective, somewhat effective, ineffective and Do not know). The remainder of the questionnaire contained 2 open-ended items (strengths of and recommendations to improve student environment).

Teachers were asked respond to 9 items (4 design, 3 learnability, 1 navigability and 1 aesthetics) in part 2. A four-point scale was used (Strongly Agree, Agree, Disagree and Strongly Disagree). Teachers were asked to respond to 19 items (7 and 12) in part 3 (screen effectiveness). All items used a four-point scale (Very effective, somewhat effective, ineffective and Do not know). The remainder of the questionnaire contained 4 open-ended items (strengths of and recommendations for improvement to teacher and administrator environments).

Portfolio experts were asked to respond to 76 items in part 2 (9 design, 10 usability, 10 learnability, 10 navigability, 10 suitability, 10 feedback and help, 10 aesthetics and 7 students task completion). A four-point scale was used (Strongly Agree, Agree, Disagree and Strongly Disagree). Part 3 contained 14 items (portfolio process). All items used a four-point scale (Very effective, somewhat effective, ineffective and Do not know). Part 4 contained 12 items (environment feedback). All items used a four-point scale (Very effective, somewhat effective, ineffective and Do not know). Part 7 contained 30 items (18 and 12). All items used a three-point scale (absolutely, somewhat and not at all). The remainder of the questionnaire contained open-ended items. Part 5 contained three items on recommendations for improving each environment. Part 6 contained 19 items (3 administrator, 5 teacher and 11 student) on environment strengths and weaknesses.

Technical experts responded to 16 (6 and 10) true or false items in part 2 (set-up and documentation). The remainder of the questionnaire contained 3 open-ended items (recommendations to improve the installation, set-up and documentation).

Observation Protocol

During the observations, the researcher recorded problems or comments evaluator made or encountered regarding the functionality of the e-portfolio template environment they used. This information provided data to explore in-depth during debriefing, in the case of small group and one-to-one evaluations. Sample observation items (see Appendix G) included: (a) date, (b) evaluation method, (c) start and end time of template use, (d) order of accessing items in respective environments, (e) areas where difficulty was experienced, and (f) comments.

Interview Protocol

Students responded to 10 items, parents and teachers responded to 8 items, portfolio experts responded to 10 items and technical experts responded to 4 items. See Appendix H for interview questions. Sample interview questions include: (a) what participants liked best; (b) how the template can be improved; (c) whether the participants would like to use the template; (d) will the template help conferences; (e) will the template help reflections; (f) how the template compares to other templates; (g) questions generated from observations; (h) evaluation experience; and (i) comments on recommended changes. Items (h) and (i) refer to expert review interviews only.

Data Collection Procedure

The evaluation was conducted employing three stages or methods: (a) expert review, (b) one-to-one, and (c) small group. A consent form, with introductory letter, was provided to all potential participants. Parents of participating children were asked to sign

and return the form indicating their consent to allow their child to participate in the research study. All participants completed a consent form prior to beginning the evaluation. See Appendix I for sample consent form and introductory letter. Expert reviews took place on the experts' own premises by connecting to a remote site that hosts the e-portfolio template system. Testing for one-on-one and small group evaluation methods was reflective of the actual learning environment. The homeroom teacher assigned the students to groups by selecting a low, mid and high academic achiever. This assignment was not indicative of their comfort or competence with compute usage. All participants were given usernames and passwords.

Portfolio Experts (Px) and Technical Experts (Tx) were given direction sheets (see Appendix J). All participants were reminded not to delete anyone else's work in the portfolio. The non-experts, Students (S), Parents (P) and Teachers (T), were observed while they explored their respective environments. All participants were asked to complete a questionnaire following their exploration. A follow-up interview took place once the questionnaires and observations were reviewed. Questions arising from the observations or questionnaires were recorded on the interview form and added to the interview sessions. Table 9 outlines the data collection methods employed to attain feedback regarding specific aspects with each evaluator. In some cases more than one method was employed with a stakeholder group to attain the necessary data. For example, Students, parents and teachers evaluated suitability aspects through quantitative questionnaire items, interviews and observations.

Table 9

Data Collection Matrix

	Portfolio Expert	Technical Expert	Teacher	Parent	Student
Interface Design	Qn	N/A	Qn Ql I	Qn Ql I	Qn I
Usability	Qn I	I	Qn I O	Qn I O	Qn I O
Learnability	Qn	N/A	Qn	Qn	Qn
Navigability	Qn	N/A	Qn	Qn	Qn
Suitability	Qn Ql I	Ql I	Qn I	Qn I	Qn I
Feedback and Help	Qn	N/A	Qn Ql	Qn Ql	Qn
Aesthetics	Qn	N/A	Qn	Qn	Qn
Pedagogy	Qn	N/A	N/A	N/A	Qn
Competencies	Qn	N/A	N/A	N/A	N/A
Installation and set-up	N/A	Qn	N/A	N/A	N/A

Note. Qn = Quantitative questionnaire; Ql = Qualitative questionnaire; O = Observation; I = Interview; and N/A = Not asked.

Data AnalysisQuestionnaire

Quantitative data from questionnaires was scored, and descriptive statistics were calculated. For demographic data, responses were counted and percentages calculated for each participant group. These data were described in the participants' section. All Likert scale items were assigned a value of 4 to 1, respectively. Since items on the student questionnaire used a smaller Likert scale, responses were assigned 3 to 1. Totals were calculated per person and participant group for each sub-scale (interface design, usability, learnability, navigability, suitability and feedback and help). Data was summarized

according to key themes in the questionnaire item structure. These correspond to the areas of exploration listed above. Ranking scales were scored as indicated in the data.

Reverse-scale items appear in Appendix F with an asterix. For these items reverse scores were entered. For example, item 2.2 (The screens are cluttered) in the parent and teacher questionnaires. The statement is written with a negative connotation and was answered in the negative, to which all respondents chose 'Strongly Disagree'. By inserting 'not' in the sentence the result was flipped to 'Strongly Agree'. Scales were reversed in three questionnaires: (a) student questionnaire, part 2 items 5,6,12,14 ,15; (b) teacher and parent questionnaires, part 2 items 2, 4,5; and (c) portfolio expert questionnaire part 2 items 1.4, 2.7, 2.9, 3.8, 4.10, 5.3, 5.4, 5.5, 5.6, 5.7, 6.6, 6.8.

Missing data was replaced with the group response mean for the particular group, on an item-by-item basis. Results of two questionnaires, student and portfolio expert, contained missing data including: (a) student questionnaire, part 2 items 8 and 11; part 3, item 4; part 4 items 1, 7 and 11. (b) portfolio expert questionnaire, part 2 items 1.3, 6.9 and 6.10; part 3 item 14; part 4 item 1.1; and part 7 item 1.0, 2.0, 3.0, 4.0, 5.0 and 6.0.

Observation Data

Observation forms provided quantitative data regarding the length of time spent each evaluator spent exploring their environments, the order of screens they visited. Additionally, qualitative data relating to any difficulties encountered and general comments was also recorded. Students, parents and teachers were observed during their evaluation sessions.

Interview Data

Qualitative data was attained from open-ended questionnaire items, observations (see source indicated above) and interviews. Interviews were held with all participants. Qualitative data from open-ended questionnaire items, interviews, and observations was coded with the following scheme: (a) pedagogy; (b) design (interface design, usability, learnability, navigability, suitability, feedback and help); (c) aesthetics; and (d) Quebec Education Program (QEP). See Appendix K for details of the coding scheme. Data was categorized according to code and reexamined for themes and patterns.

CHAPTER 4: EVALUATION RESULTS PART 1 - 6

The e-portfolio template system's three environments (student, teacher and administrator) as well as installation process were evaluated to determine whether they were in need of improvement and whether the template allowed for the attainment of the QEP methodological competencies. Specifically, the appropriateness of the template in terms of pedagogy (portfolio), design decisions (interface design, usability, navigability, suitability, learnability, and help) and aesthetic appeal were examined. Due to limited time in the remaining school year, portfolio experts were asked to evaluate all three environments holistically whereas teacher, student and parent quantitative questionnaire items evaluated specific template environments. This made it difficult to compare portfolio expert's quantitative data to that of the other evaluators when analyzing the data. Therefore, portfolio expert's quantitative data is presented in a section of its own. All other environment feedback is presented per environment.

Part 1: Results of Portfolio Experts' Holistic Evaluation of E-portfolio Template

Portfolio experts holistically evaluated the three environments of the e-portfolio template system by responding to likert scale questionnaire items relating to aesthetic appeal and various aspects of design: (a) interface design, (b) usability, (c) navigability, (d) learnability, (e) suitability, and (f) feedback and help. Results are presented according to each of the main design components listed above.

(a) interface design (entire template system).

Portfolio experts responded to nine questionnaire items regarding interface design of the template system. Results are presented in Table 10. There was overall agreement that aspects of the interface were well designed with 29.63% of responses to interface items indicating strong agreement and 55.56% of responses indicating agreement. For example, the font was suitable, screen transitions were smooth and screens were uncluttered.

Questionnaire results indicate 14.81% of portfolio expert responses disagree with some of the interface design decisions. For example, the icons were not considered intuitive and the template was not motivating.

Table 10

Portfolio Expert Interface Design Quantitative Responses

1. Presentation/Layout/Interface Design:	N=3	Strongly Agree	Agree	Disagree	Strongly Disagree
Text is printed in font suitable for target audience.	3	3			
Screens are free from grammar and spelling errors.	3		3		
There is a smooth transition between screens.	3	2	1		
Screens are (not) cluttered.*	3	2	1		
The icons are intuitive.	3			3	
The divided screen (frames) is attractive.	3		3		
The 'language level' is appropriate.	3	1	2		
The presentation is attractive.	3		3		
The template is motivating.	3		2	1	
Total responses	27	8	15	4	0
Percentage of total responses		29.63%	55.56%	14.81%	0.00%

Note. Items marked with an * identify reversed results.

(b) usability (entire template system).

Portfolio experts responded to ten items relating to the usability of the student environment. Results are presented in Table 11. There was overall agreement that aspects relating to usability were well designed with 23.33% of responses to usability items indicating strong agreement and 63.33% of responses indicating agreement. For example, responses showed strong agreements that the log-in was easy and the template was not slow in responding. Additionally, agreement was found that the user was encouraged to interact with the content and that the gallery screen contains all necessary information. Portfolio experts reported the log-in, reflection and export to showcase as being easy or simple to use. Additionally, the help was reported as being easy to access.

Questionnaire results indicate usability problems with the template. Portfolio experts' responses indicated a disagreement (13.33%) with certain usability aspects. For example, it was disagreed (33.33%) that user could interact with others, information required is clear, correcting errors is easy and directions are clear.

Table 11

Portfolio Expert Usability Quantitative Responses

2. Usability:	N=3	Strongly Agree	Agree	Disagree	Strongly Disagree
The log-in is easy.	3	2	1		
User is encouraged to interact with content.	3		3		
User can interact with instructor or other learners.	3		2	1	
The type of information to be entered is clear.	3		2	1	
It is possible to move to different areas as desired.	3	1	2		
It is easy correct errors after saving in database.	3	1	1	1	
The template is (not) slow in	3	2	1		

responding.*					
Users are clear on what needed to be done.	3		2	1	
Template is (not) frustrating to use.*	3	1	2		
Gallery screen contains all necessary information.	3		3		
Total responses	30	7	19	4	0
Percentage of total responses		23.33%	63.33%	13.33%	0.00%

Note. Items marked with an * identify reversed results.

(c) learnability (entire template system).

Portfolio experts responded to ten questionnaire items regarding learnability of the template system. Results are presented in Table 12. There was overall agreement that aspects relating to learnability were well designed with 6.67% of responses to learnability items indicating strong agreement and 66.67% of responses indicating agreement. For example, there was strong agreement that users know where they are at all times. Additionally, there was agreement that screen directions were clear, user can independently operate system, system was quick to learn, and there was not too much typing to do.

Results of the portfolio expert questionnaire indicate learnability problems with the template. Portfolio experts' responses indicated a disagreement (20.00%) with certain learnability issues. For example, they disagreed that it was easy to add work to the portfolio, the user was encouraged to learn through manipulation and that the required interaction promotes learning. Additionally, portfolio experts strongly disagreed that users learn about and develop an interest in portfolios while using this template.

Table 12

Portfolio Expert Learnability Quantitative Responses

3. Learnability:	N=3	Strongly Agree	Agree	Disagree	Strongly Disagree
Screen directions are easy to follow.	3		3		
It is easy to add work to the portfolio (text/graphics).	3		1	2	
User can independently operate program.	3		3		
User is encouraged to learn through manipulation.	3		1	2	
The interaction required promotes learning.	3		1	2	
User knows where they are at all times.	3	2	1		
Tool was quick to learn to use.	3		3		
There is (not) too much typing to do.*	3		3		
Uses learn about portfolio using this template.	3		2		1
User can develop interest in portfolio using tool.	3		2		1
Total responses	30	2	20	6	2
Percentage of total responses		6.67%	66.67%	20.00%	6.67%

Note. Items marked with an * identify reversed results.

(d) navigability (entire template system).

Portfolio experts responded to ten items regarding the navigation of the template system (see Table 13 for results). There was overall agreement that aspects relating to navigability were well designed with 23.33% of responses to navigability items indicating strong agreement. For example, it was strongly agreed by all portfolio experts that the user could exit from any screen, at any time, and could go back at any stage.

Responses of the portfolio expert questionnaire indicate that 10.00% of responses disagreed that the navigational design decisions were sound. The two areas of concern were the navigational buttons and processing time for the database. For example, the buttons were not considered effective.

Table 13

Portfolio Expert Navigability Quantitative Responses

4. Navigability:	N=3	Strongly Agree	Agree	Disagree	Strongly Disagree
User can exit from any screen.	3	3			
Navigational buttons are effectively designed.	3	1		2	
User can exit the program at any time.	3	3			
User can 'go back' at any stage.	3	3			
Transitions between screens is comfortable.	3	2	1		
User can get around easily.	3	2	1		
The reaction time to clicked button is adequate.	3	2	1		
Processing time for database is adequate.	3	1	1	1	
Is there an adequate level of student control.	3	1	2		
User (did not) felt lost.*	3	3			
Total responses	30	21	6	3	0
Percentage of total responses		70.00%	20.00%	10.00%	0.00%

Note. Items marked with an * identify reversed results.

(e) suitability (entire template system).

Portfolio experts responded to ten questionnaire items regarding the suitability of the template system. Results are presented in Table 14. Responses indicate a strong agreement (20.00%) or an agreement (60.00%) that aspects relating to usability were well designed. For example, it was agreed that the template matches interest level of target audience and that the user felt confident using tool. There was strong agreement that the template was not complex and that it contains no bias.

Responses of the portfolio expert questionnaire indicate a strong disagreement (3.00%) or disagreement (16.67%) with the suitability of the template system. For example, there was strong disagreement that the selection of image type was not too

narrow. Other areas of disagreement included: appropriateness of expected input for target audience, selection of image type, and provision of collaborative learning experiences.

Table 14

Portfolio Expert Suitability Quantitative Responses

5. Suitability:	N=3	Strongly Agree	Agree	Disagree	Strongly Disagree
Template matches interest level of target audience.	3		3		
Expected input is appropriate for target audience.	3		2	1	
Template was (not) complex.*	3	2	1		
Template was (not) too easy.*	3	1	2		
There were (not) too many inconsistencies.*	3	1	2		
Selection of image type is (not) too narrow (.jpg or .gif). *	3		1	1	1
The template contains (no) bias based on gender, culture, disability or socioeconomic status.*	3	2		1	
User felt confident using tool.	3		3		
User would recommend tool to others.	3		2	1	
Collaborative learning experiences are provided for.	3		2	1	
Total responses	30	6	18	5	1
Percentage of total responses		20.00%	60.00%	16.67%	3.33%

Note. Items marked with an * identify reversed results.

(f) feedback and help (entire template system).

Portfolio experts responded to ten questionnaire items regarding the feedback and help in the template system. Results are presented in Table 15. Results indicate that 76.67% of responses to feedback and help items agree and 3.33% strongly agree with aspects relating to feedback and help. For example, help and advice were considered accurate.

Responses on the portfolio expert questionnaire indicate 20.00% disagreement with the feedback and help incorporated in the template system. For example, there was disagreement regarding provision of collaborative learning experiences, motivational feedback, appropriateness of prompts after wrong response, helpfulness and friendliness of error messages, limitations of help and effectiveness of advice.

Table 15

Portfolio Expert Feedback and Help Quantitative Responses

6. Feedback and Help	N=3	Strongly Agree	Agree	Disagree	Strongly Disagree
Feedback is immediate.	3		3		
Collaborative learning experiences are provided for.	3		2	1	
Feedback is motivational.	3		2	1	
Use of prompts after wrong response is appropriate.	3		2	1	
Error messages are helpful and friendly.	3		2	1	
Help was (not) limited.*	3		2	1	
Help was accurate.	3		3		
A printed copy of help and advice is (not) preferred.*	3	1	2		
Advice is effective.	3		2	1	
Advice is accurate.	3		3		
Total responses	30	1	23	6	0
Percentage of total responses		3.33%	76.67%	20.00%	0.00%

Note. Items marked with an * identify reversed results.

(g) aesthetics (entire template system).

Portfolio experts responded to ten questionnaire items regarding the aesthetics of the template system. Results are presented in Table 16. There was overall agreement that aspects relating to aesthetics were well designed with 30.00% of responses to aesthetic items indicating strong agreement and 40.00% of responses indicating agreement. For example, there was strong agreement that the placement of icons was appropriate and

consistent; that the font colors were consistently used; that the interface was aesthetically pleasing, and that the color of the screen was attractive.

Responses of the portfolio expert questionnaire indicate disagreement (30.00%) with the aesthetic decisions made for the template system. All negative responses were made in reference to items that questioned the aesthetics of the buttons. For example, the metaphors employed were unsuitable as they were not easy to understand, they did not enhance learning nor were they easy to understand or use.

Table 16

Portfolio Expert Aesthetics Quantitative Responses

7. Aesthetics of interface and media quality:	N=3	Strongly Agree	Agree	Disagree	Strongly Disagree
Buttons enhance learning.	3		1	2	
Buttons stimulate student interest.	3		2	1	
Buttons are appropriate for target audience.	3		2	1	
Color of screen is attractive.	3	1	2		
Placement of icons is appropriate.	3	2	1		
Buttons are easy to understand and use.	3		1	2	
Buttons are located consistently through the program.	3	2	1		
Metaphors used for buttons are easy to understand.	3			3	
Font colors are used consistently.	3	2	1		
The interface is aesthetically pleasing.	3	2	1		
Total responses	30	9	12	9	0
Percentage of total responses		30.00%	40.00%	30.00%	0.00%

Part 2: Results of Evaluation of the Template System's Student Environment

The student environment was evaluated for pedagogy, design and aesthetic suitability. Portfolio experts, parents and students evaluated the student environment. Details of evaluations regarding pedagogy, design and aesthetics are reported in this section.

Evaluation of the Pedagogical Aspects of the E-portfolio Student Environment

Evaluations of the pedagogical soundness of the portfolio template included data collected from portfolio expert questionnaires and interviews. Parents and students also provided some data during interviews and observations. Table 17 summarizes questionnaire responses to the 14 pedagogical evaluation items by the three portfolio experts.

Results indicated strong agreement that the portfolio template is pedagogically sound with 80.95% of item responses indicating agreement and 4.76% indicating strong agreement. Qualitative comments collected through interviews and observations provided specific details about perceived strengths (see Table 18). For example, portfolio experts liked the tie between the work added and the student's reflections as well as the selection of conference person to the purpose of the conference. Parents also provided some comments regarding how the portfolio template would facilitate the learning process. Most commonly, they indicated that using this system would alert teachers and parents to any difficulties a student may be having and thereby allow them to be addressed sooner.

A goal of this evaluation is to identify potential pedagogical weaknesses that may be improved in future versions. Disagreement regarding the pedagogical soundness of the template was limited to six questionnaire items representing only 14.29% of overall pedagogical item responses. Areas of concern included: (a) representation and means of learning about portfolio philosophy through template; and (b) effectiveness of environment for reflection, conferencing, adding work and active learning with template. Comments made during interviews and observations highlighted some of the pedagogical concerns. Experts felt the connection between the goals and work was weak. They

considered there to be too much the reliance on typing for young children, particularly those who struggle. The help provided within the template system was deemed insufficient. It was recommended that the criteria for selecting items for showcase should be presented in template. Portfolio experts also reported that teachers ought to be able to record their own goals and self-evaluations somewhere in the template system.

Parental concerns raised indicated a need for a better sense of the portfolio process. Parents felt the present design depicted places more so than a process. One parent felt that all work added to portfolio ought to be tied to goals so that the progress could be more closely monitored. One student commented that 'the send to showcase is not working and others might not see my work' when asked about difficulties they encountered while exploring the student environment. Additionally, students ascertained that the e-portfolio would help them in their learning.

Overall, findings about pedagogical aspects of the template indicated that, for most stakeholders the portfolio template met many of the criteria for pedagogical soundness initially identified by the researcher. Stakeholders, however, identified a number of areas that could be improved upon in future versions. These include: (a) improve the help and explanation of portfolio process; (b) provide stronger link between, goals, work added, conferencing and reflection; and (c) provide alternatives to typing for users.

Table 17

Portfolio Expert Pedagogy Quantitative Responses

Pedagogy Question	N=3	Strongly Agree	Agree	Disagree	Strongly Disagree
1. Instructional strategies are based on current research.	3		3		
2. The purpose of the template as a process and showcase portfolio is clear.	3	1	2		
3. The purpose is appropriate to your learner's needs.	3		3		
4. The content is written clearly for the target audience.	3		3		
5. The content is presented in learnable 'chunks'.	3	1	2		
6. The content reflects key principles of the portfolio process.	3		2	1	
7. The reading level is appropriate for target audience.	3		3		
8. The scope of the content is appropriate for the target audience.	3		3		
9. The template is useful in terms of learning about portfolios.	3		2	1	
10. The student is provided with a constructivist environment in which she/he can self-evaluate and conference with others on his/her work.	3		2	1	
11. This template provides an environment in which students learn through a purposeful collection of work exhibiting their efforts, progress and achievements.	3		2	1	
12. This template provides an environment in which a student is an active learner and seeker of knowledge, taking responsibility for his/her learning.	3		2	1	
13. This template allows students to learn about portfolio, technology and pursue their day-to-day curriculum under the guidance of their teacher.	3		2	1	
14. This template is (not), overall, flawed in terms of pedagogy, methodology and design.*	3		3		
Total responses	42	2	34	6	0
Percentage of total responses		4.76%	80.95%	14.29%	0.00%

Note. Items marked with an * identify reversed results.

Table 18

Student Environment - Pedagogy Comments

<u>Pedagogy</u>	<u>Portfolio Experts</u>	<u>Parents</u>	<u>Students</u>
<p>Strengths</p> <ul style="list-style-type: none"> • Reflection-makes students <i>anchor</i> reflection to piece • Conference pick person-makes student focus on purpose of conference 	<ul style="list-style-type: none"> • It would be nice for teachers to have a section for their goals. • Goals-unclear where actions are stated or goals linked to selections. No monitoring. • Reflection-High reliance on typing, what about the struggling student? Perhaps recording verbal reflections. • Export to showcase-need to indicate criteria for when a selection moves to showcase • Showcase-bring in goals and teacher assessment • Help-definitions are very thin in content, needs elaboration. • I don't think I saw anything on "self-evaluation" for teachers. 	<ul style="list-style-type: none"> • A teacher and parent can see a piece of work and address problems sooner, grammar... • I also like that if a student has difficulties in certain areas it can be addressed sooner. 	<ul style="list-style-type: none"> • Can learn about stuff • Can learn a lot of things.
<p>Weaknesses</p>	<ul style="list-style-type: none"> • Possibility of modifying or deleting goals. They can Add but should not be able to delete goals. Perhaps tie it to the date. • I need to have a better idea of what drives portfolio process. It seems to depict places as opposed to process. • Must be careful that they see that what they are doing is more than a collection of stuff, perhaps they could view URLs. Process-oriented and dynamic. 	<ul style="list-style-type: none"> • Put games inside that teach kids to learn. 	

Evaluation of the Design Aspects: E-portfolio Student Environment

Portfolio experts, teachers, parents and students were asked to evaluate various aspects of the design of the student environment including: (a) interface design, (b) usability, (c) navigability, (d) learnability, (e) suitability, and (f) feedback and help. Data was gathered through questionnaires, interviews and observations. The results are presented according to each of the main design components listed above.

(a) interface design (e-portfolio student environment).

Results to open-ended items on the portfolio expert questionnaire indicated that the “export to showcase” was well designed (see Table 20).

Parents responded to four items on a questionnaire (see Table 19) relating to interface design of the student environment. Responses indicated a strong agreement (25.00%) or agreement (75.00%) that the template’s presentation was well designed.

Students responded to six items relating to interface design of the student environment in a questionnaire (see Table 21). In terms of student environment interface design decisions, 66.67% of student responses agreed and 23.15% ‘sort of agreed’ with interface design decisions made for the student environment.

Portfolio experts expressed concerns about the interface design in questionnaire open-ended responses as well as interview and observation data. All portfolio experts indicated that the icons were not intuitive. See Appendix L for screen shots of all major problem areas reported by evaluators. Portfolio experts also suggested that the text at the bottom of the button be removed to aid students with visual impairments and that both descriptions of goals and places for teacher’s goals be added (see Table 20).

Table 19

Parent Responses to Quantitative Items

Interface Design	N=2	Strongly Agree	Agree	Disagree	Strongly Disagree
2. The screens are (not) cluttered.*	2	2			
3. The tool is fun to use.	2		2		
7. The buttons are easy to understand.	2		2		
9. The order of the screens is logical.	2		2		
Total responses	8	2	6	0	0
Percentage of total responses		25.00%	75.00%	0.00%	0.00%
Learnability	N=2	Strongly Agree	Agree	Disagree	Strongly Disagree
1. This tool helps me learn about portfolios.	2	1	1		
4. The tool is (not) hard to learn to use.*	2		2		
5. This portfolio (does not) requires too much typing.*	2	1	1		
Total responses	6	2	4	0	0
Percentage of total responses		33.33%	66.67%	0.00%	0.00%
Navigability	N=2	Strongly Agree	Agree	Disagree	Strongly Disagree
6. It is easy to get around in this E-portfolio.	2		1	1	
Total responses	2		1	1	0
Percentage of total responses		0.00%	50.00%	50.00%	0.00%
Aesthetics	N=2	Strongly Agree	Agree	Disagree	Strongly Disagree
8. The color of the screens is satisfactory.	2	1	1		
Total responses	2			0	0
Percentage of total responses		50.00%	50.00%	0.00%	0.00%

Note. Items marked with an * identify reversed results.

Table 20

Student Environment – Interface Design Comments

Design Strengths	Portfolio Experts	Parents	Students
<ul style="list-style-type: none"> • Export to showcase-well designed. 	<ul style="list-style-type: none"> • The metaphors are not so intuitive I would change them. • I would move the text off of the actual bottom—this helps student with visibility problems. • It would be nice for teachers to have a section for their own goals. • Change icons, for emergent readers the animals do not provide intuitive visual clues to the task required. • Goals-a description of what a "goal" is... • Help-instructions are not clear (e.g. portfolio advice). 	<ul style="list-style-type: none"> • Liked environment. • The student environment did not need improvement. 	<ul style="list-style-type: none"> • Nothing really.
<p>Weaknesses</p>		<ul style="list-style-type: none"> • Rename or clarify gallery, showcase, perhaps via clarification of <i>process</i> as opposed to <i>places</i>. • Wondered why navigational items were repeated on main screen. 	<ul style="list-style-type: none"> • More colors. • Only has one picture on screen. • Add games and reading stuff. • Animals, should be more to choose from. • Need more work and stuff to do. Games, a lot of Microsoft, and word processing. • Make another web site out of it • Use it in other computers with • More power because computer lab is slow and takes too long. • Be able to add pictures. • Write stuff that makes sense. • Go to Add and take away stuff that does not make sense. • Have more writing.

Table21

Student Responses to Quantitative Items

Interface Design	N=18	Yes	Sort of	No
1. The screens are clear.	18	13	5	0
3. The buttons make sense.	18	14	3	1
7. The order of the screens is good.	18	16	2	0
9. The words are easy to read.	18	12	5	1
12. There is (not) too much information on the screens.*	18	3	6	9
13. The tool is fun to use.	18	14	4	0
Total responses	108	72	25	11
Percentage of total responses		66.67%	23.15%	10.19%
Usability	N=18	Yes	Sort of	No
2. The log-in is easy.	18	12	5	1
8. This e-portfolio is easy to use.	18	16	2	0
Total responses	36	28	7	1
Percentage of total responses		77.78%	19.44%	2.78%
Learnability	N=18	Yes	Sort of	No
10. The directions on each screen help.	18	16	2	0
11. This tool helps me learn about portfolios.	18	17	0	1
14. The tool is (not) hard to learn to use. *	18	5	4	9
15. There is (not) too much typing to do.*	18	6	4	8
Total responses	72	44	10	18
Percentage of total responses		61.11%	13.89%	25.00%
Navigability	N=18	Yes	Sort of	No
5. There are (not) too many parts to this e-portfolio.*	18	2	6	10
16. It is easy to get around in this e-portfolio.	18	11	4	3
Total responses	36	13	10	13
Percentage of total responses		36.11%	27.78%	36.11%
Suitability	N=18	Yes	Sort of	No
6. I (do not) get confused using this e-portfolio.*	18	4	4	10
Total responses	18	4	4	10
Percentage of total responses		22.22%	22.22%	55.56%
Aesthetics	N=18	Yes	Sort of	No
4. The colors are good.		15	3	0
Total responses	18	15	3	0
Percentage of total responses		83.33%	16.67%	0.00%

Note. Items marked with an * identify reversed results.

While parents did not identify areas of concern with respect to the interface design, two suggestions were made: (a) eliminate the repetition of the navigational buttons on the main screen, and (b) rename 'gallery' to 'studio', to reflect an artist's studio for working and gallery for showing off work.

Results of the student questionnaire indicated student responses disagree with the interface design decisions for the student environment. On the questionnaire (see Table 21). For example, students identified difficulties with (a) the amount of information on each screen, and (b) buttons making sense. During the interviews, students made several recommendations for interface design including adding more: colors, pictures, games, writing opportunities and editing control.

Stakeholders consistently expressed concerns about the design of the buttons. All evaluators indicated that changes were required to the buttons to make them more intuitive. For example, while a turtle on its back indicated the need for help, a monkey swinging from a branch did not indicate an exit. The 'help' button was more intuitive than the 'quit' button.

Overall, findings regarding interface design indicated that evaluators agreed with aspects of the interface design. Some areas for improvement in future versions of the template were identified. These include improving the button design, allowing teacher's goals, improve editing control for students, and changing the labels of the screens in the student environment to make them more intuitive.

(b) usability (e-portfolio student environment).

Parents were not asked usability items on their questionnaire. However, data was collected during observations and interviews. Parents reported that the student environment was easy or simple to use. One parent indicated that she liked being able to work with the teachers on her child's portfolio together.

Students responded to two usability items in their questionnaire (see Table 21). Responses indicate an agreement (77.78%) to the usability aspects of the template. For example, students indicated that the log-in and e-portfolio were easy to use. Qualitative data included more elaborate commentary about usability. For example, students reported liking to add work, write and just using the student environment in general.

Results of the portfolio expert questionnaire qualitative comments emphasized concerns regarding the usability (see Table 22). In addition, these responses indicated that technical difficulties were encountered. For example, "If it weren't for the technical glitches, everything would be very clear. See [error message] attachments." (Px1), or "not able to access [database]." (Px1). Copies of these error message are found in Appendix M Potential usability problems for students with visual impairments were also identified and the suggestion was made to add media capability to allow students to save audio or video files to their portfolios.

During interviews and observations parents identified some concern about the amount of typing required and wondered how much reliance the child would place on adults to assist with typing. Errors were also encountered while saving modifications to work.

During interviews, students indicated that usability would be enhanced by adding more picture types than '.jpg' and '.gif' as well as adding more things to the portfolio. Students were reminded of the difficulties observed while testing the student environment. They were asked why they found the problem difficult and how it might be improved (see Appendix N). Difficulties were experienced with sending to 'showcase', 'reflection' and uploading images. They had both positive and negative reactions to the difficulties encountered. Suggestions for dealing with the difficulty included: (a) try again; (b) seek help; (c) change answer; (d) add games; and (e) give up. Ten suggestions were for trying again while only two students suggested giving up.

Students, teachers and parents were asked a series of four questions relating to usability during the interviews. Results are presented in Appendix N. A summary of common responses and themes is presented next.

Students, teachers and parents were asked why they would like to use this template system. Responses indicated the most common reasons as being (a) to write more; (b) learn more; (c) create stories; and (d) have fun.

Students, teachers and parents were asked how this template helps with conferencing. Responses indicated the most common methods as being (a) facilitates communication; (b) allows users to see work that is done; and (c) it enables learning.

Students were asked how this template system helps with reflection. Responses indicate (a) to understand work completed better; (b) help with reading and writing; and (c) allows users to see work that is done.

Teachers and Parents were asked how this template system helps with conferencing from home. Both indicated that the template system facilitates

communication. Both parents and teachers were concerned about ensuring that parent is not doing child's work from home. They felt that there was not way to monitor this.

In summary, stakeholders identified a number of usability features that could be improved upon in future versions. These include expanding media capability for storage and to reduce typing dependence, and eliminate functionality errors.

Table 22

Student Environment – Usability Comments

Usability	Portfolio Experts	Parents	Students
Strengths <ul style="list-style-type: none"> • Log-in-easy • Reflection-simple to use • Export to showcase-easy to use • Help-easy to access 		<ul style="list-style-type: none"> • Generally, easy to use. • I liked the fact that parents and teachers can work on the student's portfolio together. • Easy to use. • Quite simple to use. 	<ul style="list-style-type: none"> • Add own stuff. • Really fun to do. • Adding things, I like writing. • Writing to add things. • When I did my own picture • Doing it • Things you can write in, take away stuff if I make a mistake. • Make your own work • New and take away pieces • When we got to write • Get to choose the animals
Weaknesses <ul style="list-style-type: none"> • Make it more graphically driven. (re: student actions). • I feel I am unable to make recommendations because I was unable to get in databank. • I would like to see media capability, e.g. recording sound for reading, etc. • Specify memory size for uploading files in error msg. • Glitches w/ all screens. • Conference pick person and conf form--not able to access. 		<ul style="list-style-type: none"> • What is the extent to which teacher sits/works with students when keyboarding or it only Johnny? • Saving as new version caused error page in Modify work. • Files are not saving to database properly. • Conferencing not saving properly to database. 	<ul style="list-style-type: none"> • Put own pictures. • Have fun. • More adding stuff.

(c) learnability (e-portfolio student environment).

Parents responded to three learnability questionnaire items (see Table 19).

Parents' responses indicate an agreement (66.67%) or strong agreement (33.33%) to the learnability aspects present. For example, parents strongly agreed or agreed that this tool does not require too much typing. Data relating to the learnability of the student environment was gathered from parents during the interviews and observations. Parents seemed pleased with the learnability of the student environment. A parent reported that he believed his child would have little difficulty with it once he/she has had a chance to become accustomed to the process. The child could refer to help should difficulties arise.

Students responded to four learnability questionnaire items (see Table 21).

Results indicate that students agreed (61.11%) to the learnability aspects of the student environment. For example, the directions were reported as helpful. Additionally, the students reported that the tool helped them learn about portfolios.

Data relating to the learnability of the student environment was gathered from portfolio experts during the interviews and open-ended questionnaire items (see Table 23). Portfolio experts' difficulties regarding learnability of the student environment centered around the 'add work' feature. Changes were recommended in order to improve the learnability. They recommended changing the order of the placement of the 'add' and 'modify' buttons on the 'add work' screen as they found it distracting. They also indicated that the wording was inconsistent, 'modify' was also 'change'. Finally, the Pxs reported that all error messages ought to provide some directions on what to do to remedy problems encountered.

Results of the parent questionnaire (see Table 19) responses indicate no disagreement with the learnability of the student environment. Data relating to problems with the learnability of the student environment was gathered from parents during the interviews and observations. Parents recommended adding more directions. A parent was concerned about children who do not adhere to the portfolio process. He wondered what their portfolios would look like and how they would effectively learn the process. A parent felt the procedures for adding work to showcase was not clear. Finally, a parent recommended changing the name of the 'gallery' screen to that of 'studio' in stricter reflection of an artist's studio and gallery to develop and show her works.

Results of the student questionnaire (see Table 21) indicate 16.67% of responses disagree with the learnability aspects of the student environment. For example, students responses indicate that the tool was (not) hard to learn to use and that there was (not) too much typing to do. Students did not provide any learnability comments during interviews or observations.

Overall, findings of the learnability of the student environment indicate that the design decisions were sound. Some areas for consideration in improving future versions were identified. These include improve 'adding of work', increasing motivation to learn about portfolios, improve interaction with environment, clarifying procedures and labels to make environment more intuitive.

Table 23

Student Environment – Learnability Comments

Learnability	Portfolio Experts	Parents
Strengths		<ul style="list-style-type: none"> • Functionality good at upload. • Once the child is facile with it, should be fine. Use peer support. My guess is Help would be a last resort. • Curious explorer who went everywhere.
Weaknesses	<ul style="list-style-type: none"> • Add work-add new work button is second, screen title puts “add” as first option. Check screen title “Add or Change work” should be “Add or change a piece of work” • Add work-Icons for Add and Change are the same—errors may occur. • When uploading file, the error message should guide the user as to what to do. 	<ul style="list-style-type: none"> • Maybe more directions it’s very pictorial. • What happens to children who are not selective? How do they learn the process? • Watch children to see what they can do on their own. Looking for features they would use. My own child uses computer on own. • Procedure of adding work to showcase is not clear. • Confusion about gallery screen. Rename as ‘studio’.

(d) navigability (e-portfolio student environment).

No data was collected from the portfolio experts regarding navigation during the interviews or from the open-ended questionnaire items.

Parents responded to one item relating to navigation of the student environment (see Table 19). Responses indicate a split regarding navigation. Fifty percent of responses indicated agreement relating to the ease of getting around the template. Data from the interviews and observations of the parent evaluations (see Table 24) provided details of strengths of the student environment navigation. For example, parents reported that the

student environment was very uncluttered and navigation for kids is relatively straightforward.

Students responded to two items relating to the navigation of the student environment in a questionnaire (see Table 21). Responses indicate an agreement (36.11%) with the navigation aspects. For example, it was easy to get around. No other data relating to navigation of the student environment was collected from students.

Table 24

Student Environment – Navigability Comments

Navigability	Parents
Strengths	<ul style="list-style-type: none"> • It has a very uncluttered environment. • Navigation for kids is relatively straightforward.

Responses of the parents’ questionnaire (see Table 19) indicate 50.00% disagreed with the navigational aspects. For example, a parent disagreed that it was easy to get around the template. No other data relating to difficulties with navigation of the student environment was collected from parents during interviews or observations.

Responses of the student questionnaire (see Table 21) indicate 36.11% in disagreement with the navigation aspects of the student environment. For example, there were too many parts to the e-portfolio. No other data relating to navigation of the student environment was collected from students.

Overall, findings indicate that the navigation of the student environment is sound. Some areas for improvement in future versions of the template were identified. These include improving the design of the navigational buttons, reduce the number of parts and improve the overall navigation of the environment.

(e) suitability (e-portfolio student environment).

Results of the open-ended items on the portfolio expert questionnaire highlight aspects of suitability. For example, portfolio experts reported liking the look of the 'showcase' and the large text used in the 'help'.

Parents were not required to respond to any items regarding suitability on the questionnaire. However, data was collected from parents during the interviews and observations. For example, parents liked the size of the 'buttons' and the idea children using the web.

Students responded to one questionnaire item relating to the suitability of the student environment. Results (see Table 21) indicate that 44.44% of responses indicate agreement with suitability aspects. For example, users do not get confused. Data was collected during interviews and observations regarding the suitability of the student environment from students. Students' comments regarding the suitability of the student environment report that they thought it suitable. For example, they liked it and thought it was good. One student was not sure why he/she liked it. In the end he/she put it down to the animals "being big and having a horn".

Teachers also looked at the student environment and provided some comments regarding its strengths. They reported that (a) students would deal better with it (than other templates); (b) students can look at their stuff at home as it is web-based; and (c) the 'conference' and 'reflection' sections are very cool.

Data was collected from portfolio experts during interviews and from open-ended items in the questionnaires (see Table 18). Portfolio experts provided criticisms and recommendations for improving the suitability of the student environment. For example,

two problems were reported with regards to the 'log-in'. They thought the 'add work' text entry field was too small and that 'secret code' ought to be called 'password' in keeping with standard computer terminology. They recommended removing the prompt from the 'goals' text entry field as they believed that not all goals begin this way.

Parents were not required to respond to any items regarding suitability on the questionnaire. However, data was collected during interviews and observations regarding suitability of the student environment. Parents reported some difficulties with the student environment (see Table 26). For example, parents felt the alphabet in the 'help' was too small, and they were weary of the potential dangers inherent in web activity and felt the child's use ought to be monitored. Parents recommended using a glossary in addition to the alphabet for those who do not know the term or how to spell the term they are seeking in the 'help'.

Responses of the student questionnaire (see Table 21) indicate 55.56% in disagreement with suitability aspects of the student environment. Ten students indicated that they found the student environment confusing. No data was collected from observations.

During the interview sessions, students were shown a picture of the navigational buttons used in the student environment. They were asked to identify the animal and indicate whether the button made sense based on the activity presented when the button was selected. For example, set their goals when they chose the 'goals' button. The students were encouraged to explain the button to me first. If they had trouble with this I explained the button and asked if it made sense. These responses were recorded for all answers provided. A summary is presented in Table 25. Overall, the students had

difficulty explaining the meaning of the images used for the buttons. They had the most success explaining the 'help' (50.00%) and 'quit' (53.33%) buttons. The least success was with the 'goals' (6.67%) and 'reflection' (7.14%) buttons. After prompting, students indicated an understanding of the 'goals' (60.00%), 'reflection' (64.29%) and 'conference' (57.14%) buttons. After prompting, students still had difficulty understanding the purpose of the 'send to showcase' (71.49%) and 'showcase' (64.29%) buttons. Clearer were the 'goals', 'add/modify' and 'reflection' buttons. The 'conference', 'help' and 'quit' buttons were understood with more clarity after prompting.

Table 27 shows the details of the students' responses. Data is incomplete for Groups 2 and 3 as not all students in each group had the opportunity to provide answers. All students identified the 'conference' (giraffes) and 'help' (turtle) animals. Most students were able to identify the 'showcase' (lion) and 'add/modify' (elephants) animals. The 'send to showcase' (baby lion) and 'quit' (monkey/ape) buttons were identified by 50.00% and 60.00% of the students, respectively. Only fourteen percent of the students asked were able to identify the animal used for the 'reflection' button (bird). No students were able to identify the 'goal's' animal (mountain goat). The closest response was an antelope.

Table 25

Student Evaluation of Button Suitability

Button	N=	Explained purpose to me	Makes sense, after prompt	Does not make sense, after prompt	N=	Identified animal	Did not identify animal
Goals	15	6.67%	60.00%	33.33%	15	0.00%	100.00%
Add/ Modify	14	14.29%	42.86%	42.86%	14	85.71%	21.43%
Reflection	14	7.14%	64.29%	28.57%	14	14.29%	85.71%
Conference	14	35.71%	57.14%	7.14%	14	100.00%	0.00%
Send to Showcase	14	21.43%	7.14%	71.43%	14	50.00%	50.00%
Showcase	14	21.43%	14.29%	64.29%	14	92.86%	7.14%
Help	14	50.00%	42.86%	7.14%	14	100.00%	0.00%
Quit	14	53.33%	40.00%	6.67%	14	60.00%	40.00%

Overall, findings of the suitability of the student environment indicate that the suitability design decisions were sound with one exception, the 'buttons'. It is obvious from the results of the button interview question and comments reported in other sections that the buttons need to be redesigned to address, design, navigation, learnability, suitability and aesthetics issues. Other areas for improvement in future versions of the template's suitability were identified. These include using ICT terminology, improving 'help' structure and font.

Table 26

Student Environment – Suitability Comments

Suitability	Portfolio Experts	Parents	Students
<p>Strengths</p> <ul style="list-style-type: none"> • Showcase-easy to identify selections • Help-large text 	<ul style="list-style-type: none"> • Add work-limited options • Showcase-enlarge picture • Remove prompt from 'goals' text box ("I want to") not all goals will begin with this prompt. • Log-in-small place to type in name/ID • Log-in-language should be proper to teach ICT competency ex, secret code should be password 	<ul style="list-style-type: none"> • Some buttons are big, easy to see, accessible. • Like functional feature of multiple access points. Can look at it from home. • Not sure some parents will have time to complete at home. • It's okay. 	<ul style="list-style-type: none"> • Pretty good • Very fun. • Very good • I like it because there were animals, pictures and stuff to write • Because there were pictures with cats and dogs. • Really liked it. • I do not know, the animals are big and have a horn.
<p>Weaknesses</p>	<ul style="list-style-type: none"> • The alphabet is small, kids may have difficulty compared to other buttons. • If children could change their goals, may a problem later • The connectiveness to outside world can be a potential danger. How is it controlled? • We must monitor and control places visited. • Help as is does not work if I do not know how to spell the word or know the terms. • May create digital divide. 		

Table 27

Student Navigational Button Identification Results

	Goals	Add/Modify	Reflection	Conference	Send to Showcase	Showcase	Help	Quit
	Animal	Animal	Animal	Animal	Animal	Animal	Animal	Animal
S1	Antelope	M Elephant	X Beaver	M Giraffes	E Baby cat	X Lion	E Turtle	M Kangaroo
S2	Horse	X Elephant	E Beaver	M Giraffe	M Baby cat	X Lion	E Turtle	M Kangaroo
S3	Donkey	M Elephant	M Dolphin	M Giraffe	M Tiger	M Horse	M Turtle	M Monkey
S4	Deer	M Elephant	X Beaver	M Giraffe	X Baby cat	X Lion	X Turtle	X Turtle
S5	Goat	M Elephants	E Turtle	X Giraffe	E Baby lion	E Big lion	X Turtle	E Monkey
S6	Deer	M Elephants	X Crocodile	X Giraffes	X Baby lion	E Lion	X Turtle	E Kangaroo
G2A	Not sure	E N/R	-- N/R	-- Giraffes	E N/R	-- N/R	Turtle	E N/R
G2B	N/R	-- N/R	-- N/R	N/R	Baby lion	N/R	N/R	Monkey
G2C	N/R	-- N/R	-- Bird	N/R	N/R	Lion	N/R	N/R
G4A	Not sure	M Elephants	X Duck	M Giraffe	E Cat	X Lion	X Turtle	E Monkey
G4B	Wolf	M Elephants	X Dolphin	X Giraffe	M Lion	X Lion	X Turtle	E Monkey
G4C	Stallion	M Elephant	X Wolf	X Giraffe	M Leopard	X Lion	X Turtle	E Orangutan

Note. 'E'=explained to me, 'X'=does not make sense, 'M'=makes sense, and '--'=not asked.

(f) feedback and help (e-portfolio student environment).

Parents were not required to respond to any questionnaire items regarding feedback and help. No data relating to strengths of the feedback and help of the student environment was collected during interviews or observations.

Students were not required to respond to any questionnaire items regarding feedback and help. No data was collected during interviews or observations regarding feedback and help.

Data was collected from open-ended items in the portfolio expert questionnaire. Portfolio experts made recommendations to improve the feedback and help in future versions. It was recommended to incorporate a search field in the 'help'.

Parents were not required to respond to any questionnaire items regarding feedback and help. A recommendation for improvement of the feedback and help was recorded during observation of the parent evaluation. A parent recommended more imaginative writing with the use of a glossary, as opposed to letters at the top of the screen.

While not required to evaluate the student environment's feedback and help, a teacher provided some recommendations for improving future versions. Teachers reported that they would like to have access to a completed sample of a portfolio, with screen shots, to see what it looked like.

Overall, findings of the feedback and help of the student environment indicate that the design decisions were sound. Some areas for improvement in future versions of the template were identified. These include improving content of the help and advice,

incorporating a search field or glossary and including samples of complete portfolios as guides.

Evaluation of the Aesthetics of the E-portfolio Student Environment

Data from the interviews and open-ended questionnaire items regarding aesthetics of the student environment was gathered (see Table 28). Portfolio experts highlighted aesthetic strengths of the student environment. For example, the 'log-in', 'goals' and 'add work' were described as having a clean design. The 'gallery' and 'showcase' were reported as visually positive. The 'modify work' and 'export to showcase' were also praised.

Parents responded to one questionnaire item relating to aesthetic aspects of the student environment (see Table 19). Responses indicate a strong agreement (50.00%) and agreement (50.00%) to the usability aspects of the template. For example, the color of the screen was satisfactory. No data was obtained during interviews or observations regarding aesthetic qualities of the student environment from parents.

Students responded to one questionnaire item relating to aesthetics of the student environment. See results in (see Table 21). There was overall agreement that aspects of the interface were well designed with 83.00% of responses to the aesthetic item indicating yes and 17.00% of responses indicating sort of. Overwhelmingly, it was agreed that the colors used were good. Data from the interviews and observations highlighted aesthetic successes of the student environment (see Table 23). For example, students reported the colors and animals as good. Additionally, one student thought the student environment to be very imaginative.

Table 28

Student Environment – Aesthetic Comments

Aesthetics	Portfolio Experts	Students
Strengths	<ul style="list-style-type: none"> • Log-in-clean design • Goals-clean design • Add work-clean design • Gallery-available pictures visible • Gallery-Excellent visual overview • Modify work-good • Export to showcase-simple display • Showcase-very visual 	<ul style="list-style-type: none"> • Very imaginative. • Colors • Colors good • The animals

Additionally, students were asked to indicate how much they liked each of the twelve screens in the student environment. Results (see Table 29) indicate that, on average, six of the screens were liked very much: ‘main’, ‘add work’, ‘modify work’, ‘conference’, ‘send to showcase’ and ‘showcase’. All other screens were somewhat liked.

Table 29

Student Evaluation of Student Environment Screens

Student Screens	Mode All N=18	Mean All N=18
Log-in screen	4	3
Main screen	4	4
Goals screen	4	3
Add work screen	4	4
Gallery screen	4	3
Modify work screen	4	4
Reflection screen	3	3
Pick Conference Person screen	4	3
Conference screen	4	4
Send to Showcase screen	4	4
Showcase screen	4	4
Help screens	4	3

Overall, findings of the aesthetics of the student environment indicate that the design decisions were sound. One main area for improvement in future versions of the student environment was identified: improving the button design.

Part 3: Results of Evaluation of the Template System's Teacher Environment

Portfolio experts and teachers evaluated the teacher environment for various design aspects and aesthetic suitability. Results are presented below.

Evaluation of the Design Aspects of the E-portfolio Teacher Environment

Portfolio experts and teachers were asked to evaluate various aspects: (a) interface design, (b) usability, (c) navigability, (d) learnability, (e) suitability, and (f) feedback and help of the design of the teacher environment. Data was gathered through questionnaires, interviews and observations. The results are presented according to each of the main design components listed above.

(a) interface design (e-portfolio teacher environment).

Portfolio experts reported several strengths in the interface design of the teacher environment in response to open-ended questionnaire items (see Table 31). For example, portfolio experts liked the login, student and subject features as they were not cluttered and had a familiar structure. The 'questions' section was thought to have a clean design.

Teachers responded to four questionnaire items regarding interface design of the teacher environment (see Table 30). Results indicate 50.00% of responses strongly

agreed and 37.5% of responses agreed with the design aspects of the teacher environment. For example, the screens were not to be cluttered, the tool was fun to use; and 'buttons' were easy to understand.

Table 30

Teacher Responses to Quantitative Evaluation Items

Interface Design	N=2	Strongly Agree	Agree	Disagree	Strongly Disagree
2. The screens are (not) cluttered.*	2	2			
3. The tool is fun to use.	2	1	1		
7. The buttons are easy to understand.	2	1	1		
9. The order of the screens is logical.	2		1		1
Total responses	8	4	3	0	1
Percentage of total responses		50.00%	37.50%	0.00%	12.50%
Learnability	N=2	Strongly Agree	Agree	Disagree	Strongly Disagree
1. This tool helps me learn about portfolios.	2	1		1	
4. The tool is (not) hard to learn to use. *	2		1	1	
5. This portfolio (does not) requires too much typing.*	2	1	1		
Total responses	6	2	2	2	0
Percentage of total responses		33.34%	33.33%	33.33%	0.00%
Navigability	N=2	Strongly Agree	Agree	Disagree	Strongly Disagree
6. It is easy to get around in this e-portfolio.	2	1		1	
Total responses	2	1	0	1	0
Percentage of total responses		50.00%	0.00%	50.00%	0.00%
Aesthetics	N=2	Strongly Agree	Agree	Disagree	Strongly Disagree
8. The color of the screens is satisfactory.	2	2			
Total responses	2	2	0	0	0
Percentage of total responses		100.00%	0.00%	0.00%	0.00%

Note. Items marked with an * identify reversed results.

Portfolio experts provided suggestions for improvement to future versions of the teacher environment in open-ended questionnaire items (see Table 31). For example, portfolio experts noted some grammatical inconsistencies. A portfolio expert suggested adding portfolio theory section (perhaps in the form of help). A Px recommended making

the ‘student’ feature more of a profile. Finally, a Px found that the ‘questions’ section had too few directions as well as limited options.

Results of the teacher questionnaire (see Table 30) indicate that 12.50% of responses strongly disagreed with the design aspects of the teacher environment. Specifically, a teacher strongly disagreed that the order of the screens was logical. Data gathered in open-ended questionnaire items from teachers was limited (see Table 31). For example, a teacher recommended more directions to improve use.

Overall, findings of the interface design of the teacher environment indicate that the design decisions were sound. Some areas for improvement in future versions of the teacher environment were identified. These include (a) adding more portfolio theory, (b) improving ‘questions’ section, (c) making ‘student’ section more of a student profile, and (d) adding more directions.

Table 31

Teacher Environment – Interface Design Comments

Design	Portfolio Experts	Teachers
Strengths	<ul style="list-style-type: none"> ● Log-in, student and subject-not cluttered. ● Student and subject-familiar structure. ● Questions-clean design. 	
Weaknesses	<ul style="list-style-type: none"> ● Keep consistent capitalization. ● Provide a theory section and overall map of how all the pieces fit together. The portfolio process may be very unclear to those new to this form of learning-assessment. ● Student- more of a profile. ● Questions-limited options. ● Questions-too few instructions. 	<ul style="list-style-type: none"> ● More direction (instructions) for areas I am not certain on.

(b) usability (e-portfolio teacher environment).

Portfolio experts reported several strengths regarding the usability of the teacher environment in open-ended questionnaire items (see Table 32). For example, they found the 'log-in' easy to use; liked that the 'students' portfolios' were listed; and found adding to a 'students' portfolio' easy.

Teachers reported strengths regarding the usability of the teacher environment in open-ended questionnaire items. For example, teachers found the teacher environment easy to use; they liked being able to edit student work from teacher environment; and the 'reporting' feature for assessment purposes.

Portfolio experts highlighted usability problems encountered with the teacher environment in response to open-ended questionnaire items. For example, a Px had difficulty seeing the 'students' portfolios' from the teacher environment; and with adding, editing and viewing existing questions. Portfolio experts provided recommendations for improvement to future versions of the teacher environment. For example, adding a 'help' feature similar to that found in the student environment; adding a means of seeing all students and being able to add more categories ('subjects').

Teachers highlighted usability problems encountered with the teacher environment in open-ended questionnaire items. A teacher had difficulty with the 'log-in' when the password was denied. Teachers provided recommendations for improvement to future versions of the teacher environment. For example, allowing teachers to edit students' work without only being able to delete an item. Teachers would like to see a link to the student environment from the teacher's environment.

Overall, findings of the usability of the teacher environment indicate that the usability design decisions were sound. Some areas for improvement in future versions of the teacher environment were identified. These include: (a) improving the ‘questions’ section, (b) adding ‘help’, (c) being able to see all ‘students’ portfolios’ from teacher environment, and (d) being able to edit students’ work.

Table 32

Teacher Environment – Usability Comments

Usability	Portfolio Experts	Teachers
Strengths	<ul style="list-style-type: none"> • Log-in-very easy. • Log-in, student and subject-easy to use. • Student Portfolio-students are listed. • Student Portfolio-clear to add but I was not able to see them. 	<ul style="list-style-type: none"> • Ease of use. • Simple to use. • Easy to use. • Allowing teacher to edit student work. • New listing of portfolio contents (grey icon).
Weaknesses	<ul style="list-style-type: none"> • Like in the student’s environment, I would add a help function to the teacher’s. • A way of seeing <i>all</i> students (not just add/modify/remove). • To be able to add more categories. • Questions and student portfolio-clear to add but I was not able to see them. • Questions-difficult to edit. 	<ul style="list-style-type: none"> • Allow teacher to edit students work without deleting. • To see the student environment as well. • Difficulty logging-in.

(c) learnability (e-portfolio teacher environment).

Data collected from portfolio experts in completion of the open-ended questionnaire items provided data relating to the learnability of the teacher environment (see Table 33). Portfolio experts reported strengths. For example, the learnability of the ‘log-in’, ‘student’ and ‘subject’ areas were reported as clear or very clear. Also, they found the ‘adding of questions’ to be clear.

Qualitative data was collected in open-ended questionnaire items completed by teachers regarding the learnability of the teacher environment. Teachers reported strengths with regards to the learnability (see Table 33). For example, the teacher environment was reported as being well planned.

Portfolio experts provided recommendations for improving the learnability of the teacher environment in future versions (see Table 33) in open-ended questionnaire items. For example, incorporating an alternate layout of viewing questions once they were saved to the data base so the user could see the contents of the question and not just a question number.

Teachers highlighted learnability problems with the teacher environment (see Table 33) in open-ended questionnaire items. For example, the 'portfolios' button was misleading as they expected to see all of the students' portfolios. Teachers provided recommendations for improving the learnability of the teacher environment in future versions. For example, including more details regarding the 'adding work' area as it was not clear.

Overall, findings of the learnability of the teacher environment indicate that the design decision were sound. Some areas for improvement in future versions of the teacher environment were identified. These include: (a) redesigning the 'questions' section, and (b) adding more directions for 'adding work'.

Table 33

Teacher Environment – Learnability Comments

Learnability	Portfolio Experts	Teachers
Strengths	<ul style="list-style-type: none"> • Log-in, student and subject-very clear • Log-in, student and subject-clear • Questions-clear to add. 	<ul style="list-style-type: none"> • Well planned
Weaknesses	<ul style="list-style-type: none"> • Provide clearer instructions for the question section, I was not sure where the question went after I typed it or how I could identify which question I wanted to edit without opening up each question. 	<ul style="list-style-type: none"> • Add work is not clear, need more information about it. • Button label “portfolios” is misleading.

(d) navigability (e-portfolio teacher environment).

Portfolio experts did not provided any comments regarding the navigation of the teacher environment during interviews or in open-ended items of the questionnaire.

Teachers responded to one questionnaire item regarding navigability of the teacher environment. Results (see Table 30) indicate a marginal agreement (50.00%) with navigation aspects. For example, it is easy to get around the e-portfolio.

Portfolio experts did not provided any comments regarding the navigation of the teacher environment during interviews or in open-ended items of the questionnaire.

Results of the teacher questionnaire item (see Table 30) regarding navigability of the teacher environment indicate a marginal disagreement (50.00%) with navigation aspects. For example, it is not easy to get around the e-portfolio.

Overall, findings of the interface design of the teacher environment indicate that the design decisions were sound. One area for improvement in future versions of the teacher environment was identified: improving navigation, perhaps, through design.

(e) suitability (e-portfolio teacher environment).

Data collected in open-ended questionnaire items from teachers highlighted strengths of the suitability of the teacher environment (see Table 34). For example, the teacher environment was reported as not being time-consuming and was plain and simple.

Portfolio experts reported a difficulty with the suitability of the teacher environment in completion of open-ended items of the questionnaire. A Px indicated that the 'question' section was not flexible enough. A Px recommended that the 'student' section be organized by classroom for tracking purposes.

Teachers provided suggestions for improving the suitability of the teacher environment in future versions in open-ended questionnaire items. For example, being able to access the child's entire portfolio as the child sees it for monitoring and editing purposes. Also, a teacher indicated that the 'modify student' page should be contents of the 'default' page for the 'student' option.

Overall, findings of the interface design of the teacher environment indicate that the design decision were sound. Some areas for improvement in future versions of the teacher environment were identified. These include: (a) improving 'questions' section, (b) organizing students according to class, (c) allowing for access of student's entire portfolio, and (d) changing default of 'student' area to be that of the 'modify' page.

Table 34

Teacher Environment – Suitability Comments

Suitability	Portfolio Experts	Teachers
Strengths		<ul style="list-style-type: none"> • Not as time consuming as others I've seen. • I like it, plain and simple.
Weaknesses	<ul style="list-style-type: none"> • Questions-not flexible to accommodate additional activities the teacher may design. • Student Portfolio-needs a classroom organization for the teacher to help her keep track of all students. 	<ul style="list-style-type: none"> • Need access to child's entire portfolio to edit work. • Need to be able to see what the kids see—their environment. • Modify a student should be default.

(f) feedback and help (e-portfolio teacher environment).

Portfolio experts did not provide comments regarding the help of the teacher environment during interviews or in open-ended questionnaire items.

During interviews, teachers reported suggestions for improving the help. For example, they would like to have access to a completed sample of a portfolio so they could see what it looks like. Furthermore, this sample should use screen shots and be added to 'help' in the teacher environment.

Overall, findings of the feedback and help of the teacher environment indicate that the design decision were sound. One area for improvement in future versions of the teacher environment was identified: adding help to the teacher environment.

Evaluation of the Aesthetics of the E-portfolio Teacher Environment

Portfolio experts reported aesthetic strengths of the teacher environment in open-ended questionnaire items. For example, the portfolio expert reported that the access to the 'student portfolio' from the teacher environment was good.

Teachers responded to one questionnaire item regarding aesthetics of the teacher environment (see Table 30). Results indicate a strong agreement (50.00%) or agreement (50.00%) that the aesthetic choices are sound. For example, results indicate that the color of the screens is satisfactory. Data collected from completion of open-ended questionnaire items highlighted strengths regarding the aesthetics of the teacher environment. For example, a teacher reported that the teacher environment had a simple design and presentation.

One overwhelming consistency reported by all stakeholders relates to the look and feel of the teacher environment. Both evaluators indicated that they liked they liked the screens in the teacher environment.

Overall, findings of the aesthetics of the teacher environment indicate that the design decisions were sound. One area for improvement in future versions of the teacher environment was identified: improving the 'button' design.

Part 4: Results of Evaluation of the Template System's Administrator Environment

Portfolio experts and teachers evaluated the administrator environment for various design aspects and aesthetic suitability. Results are presented below.

Evaluation of the Design Aspects of the E-portfolio Administrator Environment

Portfolio experts and teachers were asked to evaluate various aspects: (a) interface design, (b) usability, (c) navigability, (d) learnability, (e) suitability, and (f) feedback and help of the design of the administrator environment. Data was gathered through questionnaires, interviews and observations. The results are presented according to each of the main design components listed above.

(a) interface design (e-portfolio administrator environment).

Portfolio experts reported interface design strengths of the administrator environment in open-ended questionnaire items (see Table 35). For example, they liked the consistent structure of the school and teacher features. A Px indicated that it was “nice and easy as it is!”

Portfolio experts provided a recommendation to improve the design of the administrator environment in future versions in open-ended questionnaire items. For example, it was recommended to add a ‘help’ section.

Teachers reported no comments regarding the administrator environment relating to the interface design during interviews or observations.

Table 35

Administrator Environment – Interface Design Comments

Design	Portfolio Experts
Strengths	<ul style="list-style-type: none"> • School and teacher-consistent structure. • No, nice and easy as it is!
Weaknesses	<ul style="list-style-type: none"> • Help section.

Overall, findings of the interface design of the administrator environment indicate that the design decision were sound. One area for improvement in future versions of the template was identified: adding a 'help' section.

(b) usability (e-portfolio administrator environment).

Portfolio experts reported strengths in the administrator environment regarding usability in open-ended questionnaire items (see Table 36). For example, portfolio experts reported the 'log-in' to be easy.

Teachers reported strengths in the administrator environment regarding usability in open-ended questionnaire items (see Table 36). For example, they liked the quick response time to the server.

Portfolio experts highlighted one difficulty with respect to usability (see Table 36) of the administrator environment in open-ended questionnaire items. They could not see the entire text written in the text field. Portfolio experts provided recommendations to improve future versions of the administrator environment in open-ended questionnaire items. They recommended incorporating a means to see the "bigger picture" rather than the individual screens.

Teachers highlighted one difficulty with respect to usability (see Table 36) of the administrator environment during open-ended questionnaire items. A teacher encountered problems trying to quit as the operation would not be recognized and he had to open a new window to continue evaluation. Teachers provided recommendations to improve future versions of the administrator environment in interviews. For example, adding a link to allow seeing the teacher environment from the administrator environment; and

including a hierarchical structure to see the placement of students in relation to classes and schools.

One consistency reported by all stakeholders relates to the usability of the template system. Both evaluators suggested adding a means to see the entire system as a whole so viewers could see where each environment fit in to the “bigger picture”.

Overall, findings of the usability of the administrator environment indicate that the design decision were sound. Some areas for improvement in future versions of the administrator environment were identified. These include: (a) adding a class list, and (b) adding a site map to see the entire system at-a-glance.

Table 36

Administrator Environment – Usability Comments

Usability	Portfolio Experts	Teachers
Strengths	<ul style="list-style-type: none"> • Log-in-easy. 	<ul style="list-style-type: none"> • Quick response time to server.
Weaknesses	<ul style="list-style-type: none"> • A way to see the “bigger picture” not just individual screens. • Log-in-can’t see entire text you wrote (i.e. Login ID). 	<ul style="list-style-type: none"> • To see the teacher environment as well. • Reference to hierarchical information. For example, school and class chosen. • Quit would not quit.

(c) learnability (e-portfolio administrator environment).

Portfolio experts reported strengths in regards to the learnability of the administrator environment in open-ended questionnaire items (see Table 37). For example, portfolio experts were pleased with the learnability of all areas of the administrator environment, finding them either clear or very clear.

Teachers provided suggestions for improvements to the learnability (see Table 37) of future versions of the teacher environment in open-ended questionnaire items. For

example, teachers would prefer to see a preview of changes made to verify that they are happy with them before moving on; and the addition of additional labels.

Overall, findings of the learnability of the administrator environment indicate that the design decision were sound. Some areas for improvement in future versions of the administrator environment were identified. These include: (a) being able to preview changes before accepting them, and (b) adding more labels.

Table 37

Administrator Environment – Learnability Comments

Learnability	Portfolio Experts	Teachers
Strengths	<ul style="list-style-type: none"> • Log-in, school and teacher-very clear • Log-in, school and teacher-clear 	
Weaknesses		<ul style="list-style-type: none"> • As an administrator, not seeing changes I made and if I like it is difficult. Need a preview, other than log-in again. • I'm often lost. Not enough labels.

(d) navigability (e-portfolio administrator environment).

Portfolio experts did not provide any comments regarding navigation of the administrator environment.

Teachers highlighted a navigational strength relating to the teacher environment in open-ended questionnaire items (see Table 38). Teachers indicated that the administrator environment was easy to navigate through.

Teachers recommended an improvement for future versions of the administrator environment in open-ended questionnaire items. Teachers would like to be able to see all environments from the administrator environment.

Overall, findings of the navigability of the administrator environment indicate that the design decision were sound. One area for improvement in future versions of the administrator environment was identified: adding a link to all other environments from the administrator environment.

Table 38

Administrator Environment – Navigability Comments

Navigability	Teachers
Strengths	<ul style="list-style-type: none"> • Easy to navigate through
Weaknesses	<ul style="list-style-type: none"> • Administrator should be able to see all environments from the admin environment.

(e) suitability (e-portfolio administrator environment).

Portfolio experts provided a recommendation for improving the suitability of the administrator environment in future versions in open-ended questionnaire items (see Table 39). The portfolio expert recommended making the ‘selecting of schools’ more efficient through the use of a drop list.

Teachers provided recommendations for improving the suitability (see Table 39) of the administrator environment in future versions in open-ended questionnaire items. For example, change the ‘password’ to be 8 characters minimum and not a common term. Additionally, change the ‘default’ page for the ‘teacher’ and ‘school’ areas of the administrator environment to be the contents of the ‘modify teacher’ and ‘modify school’ pages, respectively so as to reduce the confusion that presently exists.

Overall, findings of the suitability of the administrator environment indicate that the design decision were sound. Some areas for improvement in future versions of the administrator environment were identified. These include: (a) adding a drop list to select

schools, (b) improving the sophistication of the passwords for security purposes, and (c) changing the default of the ‘teacher’ and ‘school’ pages to be that of their present ‘modify’ pages.

Table 39

Administrator Environment – Suitability Comments

Suitability	Portfolio Experts	Teachers
Weaknesses	<ul style="list-style-type: none"> • School-you have to type it in— drop list would be more efficient 	<ul style="list-style-type: none"> • Password should be more than 8 characters minimum and no easy passwords. • Modify teacher should not go back to school but back to teacher page. Thought it was an error. • Add teacher default should be modify teacher page. • Add school’s default should be pick a school and it should remain as default.

(f) feedback and help (e-portfolio administrator environment).

Teachers did not provide any comments regarding the help of the administrator environment during interviews or in open-ended questionnaire items.

Portfolio experts provided a recommendation to improve the feedback and help of the administrator environment in future versions in open-ended questionnaire items. For example, it was recommended to add a ‘help’ section.

Overall, findings of the feedback and help of the administrator environment indicate that the design decision were sound. One area for improvement in future versions of the administrator environment was identified: adding a ‘help’ section.

Evaluation of the Aesthetics of the E-portfolio Administrator Environment

Portfolio experts responded to ten questionnaire items regarding aesthetics of the template system (see Table 16). There was overall agreement with aesthetic aspects of the administrator environment with 30.00% of responses to aesthetic items indicating strong agreement and 40.00% of responses indicating agreement. For example, placement of icons was appropriate and consistent; the font colors were consistently used; and the interface was aesthetically pleasing.

Results of the portfolio questionnaire items (see Table 16) regarding aesthetics indicate 30.00% disagreement with the aesthetic decisions. For example, button metaphors were unsuitable, not easy to understand nor enhanced learning.

Neither the portfolio experts nor the teachers provided any comments regarding the aesthetics of the administrator environment during interviews or in open-ended questionnaire items. .

Overall, findings of the aesthetics of the administrator environment indicate that the design decisions were sound. One area for improvement in future versions of the administrator environment was identified: improving the button design.

Part 5: Results of Evaluation of the Installation, Set-up and Documentation

Technical experts responded to six questionnaire items regarding the installation and set-up process of the template system. Results are presented in Table 40. Responses indicate an overall satisfaction (83.33%) with the set-up and installation process. For example, installation was hassle-free and did not require unnecessary steps; the technical

expert was not required to rely on his own knowledge to complete the process. Also the set-up of a school and teacher were easily accomplished.

Results (see Table 40) indicate a mild dissatisfaction (16.67% response rate) with the installation. For example, installation took longer than expected. Results of the interview provided recommendations to improve the installation, set-up process and documentation in future versions. For example, the installation process required better information regarding software and hardware requirements; the set-up process would be better served by a prerequisite list of hardware and software as well as documentation on what to expect from the program.

Overall, findings of the installation and set-up of the template system indicate that it was sound. Some areas for improvement in future versions of the installation and set-up were identified. These include improving details of specifications to indicate what is needed and what to expect throughout the process.

Table 40

Technical Expert Installation Evaluation Responses

Installation and Set-up Process	True	False
Installation was hassle-free.	1	
Installation (did not) took longer than expected. *		1
Installation (did not) required a lot of unnecessary extra steps.*	1	
I had (not) to rely on my own knowledge to complete installation.*	1	
Set-up of a school was easily accomplished.	1	
Set-up of a teacher was easily accomplished.	1	
Total responses	5	1
Percentage of total responses	83.33%	16.67%

Note. Items marked with an * identify reversed results.

Technical experts responded to ten questionnaire items regarding the documentation materials of the template system. Results are presented in Table 41.

Responses indicate a marginal degree of satisfaction (50.00%) with the documentation. For example, directions were considered logically organized and easily understood; content was considered clearly written; and printed directions were not considered necessary for the set-up of a school nor teacher.

Responses (see Table 41) indicate a marginal degree of dissatisfaction (50.00%) with the documentation. For example, necessary documentation was not included, the installation documentation was inaccurate; hardware and software requirements were not clearly stated; documentation materials were considered ineffective, inaccurate and contained spelling, punctuation and grammatical errors. Results of the interview provided recommendations to improve the documentation in future versions. For example, more documentation was recommended, particularly for novices who would be setting up web-enabled databases. The existing documentation could indicate what to expect from the program and what it looks like when installation is complete. A step-by-step set-up guide with screenshots was reported to be helpful.

Table 41

Technical Expert Documentation Evaluation Responses

Documentation Materials	True	False
The necessary technical documentation was included.		1
The directions were logically organized.	1	
The directions were easily understood.	1	
Hardware and software requirements were clearly stated.		1
The content was clearly written.	1	
The content was accurate.		1
Spelling, punctuation, and grammar were correct.		1
Documentation materials were effective.		1
I would (not) prefer printed directions for the set-up of the school.*	1	
I would (not) prefer printed directions for the set-up of the teacher.*	1	
Total responses	5	5
Percentage of total responses	50.00%	50.00%

Note. Items marked with an * identify reversed results.

Overall, findings of the installation and set-up documentation of the template system indicate that it was sound. Some areas for improvement in future versions of the documentation were identified. These include improving documentation, perhaps by adding more screenshots for clarity.

Part 6: Results of Evaluation of the Attainment of the QEP Methodological Competencies

Portfolio experts responded twice to questionnaire items evaluating the degree to which the student environment of the electronic portfolio template system allowed for/facilitated the attainment of the QEP methodological competencies 5 and 6. In the first instance (see Table 42) they were asked to evaluate only the 7 primary outcomes. In the second instance (see Table 43) they were asked to evaluate the 7 primary and 23 sub-outcomes of the competencies.

Results for most primary outcomes varied from item-to-item. In both instances, however, portfolio experts were slightly marginal regarding whether they felt the outcomes could be attained. In the first instance, portfolio experts strongly agreed (9.52%) or agreed (57.14%) that the outcomes were attainable. While only 33.33% of responses indicated disagreement that the outcomes were attainable. In the second instance, the portfolio experts indicated that the outcomes could be somewhat (90.48%) or absolutely (9.52%) attainable through the template system.

Table 42

QEP Questionnaire Item 3.8

Outcomes	N=	Strongly Agree	Agree	Disagree	Strongly Disagree
To analyze the task to be performed.	3	1	1	1	
To begin the process.	3	1	2		
To analyze his/her procedure.	3		2	1	
To perform the task.	3		2	1	
To master the information and communications technologies.	3		2	1	
To evaluate his/her use of information and communications technologies.	3		1	2	
To use information and communications technologies to carry out a task.	3		2	1	
Total responses	21	2	12	7	0
Percentage of total responses		9.52%	57.14%	33.33%	0.00%

Table 43

QEP Questionnaire Item 7

Outcomes	N=	absolutely	somewhat	not at all
To analyze the task to be performed.	3		3	
To begin the process.	3		3	
To analyze his/her procedure.	3		3	
To perform the task.	3		3	
To master the information and communications technologies.	3		3	
To evaluate his/her use of information and communications technologies.	3		3	
To use information and communications technologies to carry out a task.	3	2	1	
Total responses	21	2	19	0
Percentage of total responses		9.52%	90.48%	0.00%

Portfolio experts responded to 30 questionnaire items relating to the attainment of the QEP methodological competencies. A comparison of the within group responses (see

Table 44) indicate that the portfolio experts feel that the template system marginally (somewhat) allows for the attainment of the methodological competencies.

Table 44

Comparison of Task Completion Competencies 5 and 6

	Mean Px1	Mean Px2	Mean Px3	St Dv
Task completion Competency 5 and 6	2.07	2.14	1.96	0.09

While completing Part 7 of the portfolio expert questionnaire (the second set of questions regarding competencies) one evaluator recorded some comments in the margins to explain her choices (see Table 45). Nine out of eleven of these items received a response of 'not at all' when asked if the competency was attainable with the template system. The remaining two items, 4c and 5a, were marked with 'somewhat' as the response. The comments identified weaknesses or limitations with the e-portfolio template system: (a) outcome not inherent in design, (b) outcome not requested of student, (c) no overall reflection, (d) no monitoring, (e) non-use of standard ICT terminology, and (f) outcome limited to certain areas of portfolio only.

Table 45

Additional Comments added to the Portfolio Experts' Choices for Part 7

Question	Additional Comment
2b--To adapt his/her work method to the task and the context.	No guidance.
2c--To anticipate the requirements of the method chosen and the resources that will be needed.	Not requested of student.
2d--To use his/her imagination.	Structure pre-determined.
3c--To draw conclusions.	No place for overall reflection.
4a--To make use of the appropriate resources: people, materials, etc.	Not inherent in design.
4b--To manage his/her materials and time and to adjust his/her actions as required.	Not inherent in design.
4c--To complete the task.	No monitoring aspect to see if portfolio criteria are completed.
4d--To discover the pleasure and satisfaction of work completed and well done.	Showcase and Gallery.
5a--To be familiar with the purposes, concepts, vocabulary, procedures and techniques of ICT.	Need to be ensure that proper terms are being used ex. Secret Code → Password.
7a--To explore the potential of ICT for a given task.	May the selections will do this the tool does not provide exploration opportunity since it is pre-established.
7c--To use appropriate working and troubleshooting strategies.	Probably in classroom, but not documented or prompted to document this in the e-portfolio.

Overall, findings of the evaluation regarding the attainability of the QEP methodological competencies were consistent. Portfolio experts consistently reported the attainability of the competency's outcomes as slightly better than marginal, in both instances. Some discrepancies included the following outcomes: (a) To analyze the task to be performed. (b) To begin the process. (c) To use information and communications technologies to carry out a task. It was strongly agreed by one portfolio expert that the first two outcomes were attainable the first time round and only somewhat attainable the

second. Similarly, it was agreed (66.67%) or disagreed (33.33%) that the third outcome was attainable the first time the question was asked and in the second instance 66.67% indicated absolutely and 33.33% indicated somewhat.

Summary of Results

Overall, the template system's three environments were well received by the evaluators. Aspects relating to interface design and aesthetics were generally approved of in each environment. Approval was also found for usability aspects relating to the student environment. In the teacher and administrator environments, navigability aspects were marginally approved of. Problems with the navigation in 'student', 'teacher' and 'school' default pages were raised. A summary of the results indicates that the student environment had more problems reported overall than the teacher and administrator environment. This may be attributed to the size of the student environment. It is the primary environment of template system, the teacher and administrator environments serving to support the functions of the student activities.

Problems are not distributed evenly across evaluation components. While every environment had problems with suitability there were some problems unique to each environment. The student environment had problems with interface design and learnability. The teacher environment had problems with interface design while administrator environment had usability issues. There were some consistencies among stakeholders in the identification of problems. For example, all stakeholders indicated that the buttons, adding work and directions were problematic. Primary problems specific to each environment are summarized next.

In the student environment, the biggest problem was reported with the navigational buttons. They just did not work. All stakeholders agreed with this. A new metaphor is needed. More directions are required to help users learn how to use the student environment. The process for adding work needs to be improved. Adding work needs to be more flexible in terms of attachable file types and formatting of text. Increasing media capability will also aid in this respect. Additionally, allowing audio and video capability will reduce the reliance on typing for young children. More control must be given to students to personalize their containers add file types they choose as opposed to being dictated to by template design restrictions. Finally, motivation will be improved when other design issues area addressed, such as button redesign and once learners have had an opportunity to successfully learn to use the student environment.

In the teacher environment, the biggest problem was with the functionality of the 'questions' section. Its structure is not clear. For example, it is not possible to see the content of the questions unless you modify the or look at them in a student's portfolio. More directions are needed to help users learn how to use the environment. The navigation within the 'student' area needs improving by changing the default page. Finally, the 'help' feature needs to be added to the teacher environment.

In the administrator environment, the biggest problem is with the lack of directions on how to use the template. Adding more directions to the screens will help users learn how to use the environment. The navigation within the 'teacher' and 'school' areas need improving by changing the default pages of this areas. Additionally, the 'help' feature needs to be added to the administrator environment.

The installation process would benefit from providing more detailed documentation. This would reduce frustration and errors for technicians responsible for installing and maintaining the template system.

With regards to the QEP, more means for students to self evaluate and monitor progress is needed. This will allow them to take greater responsibility for their learning as intended under the new education program.

CHAPTER 5: DISCUSSION

The formative evaluation of the prototype provided a wealth of information regarding the successes and limitations of the e-portfolio template system. From these, areas of improvement are identified for consideration in future versions. Some areas of the template system generated more suggestions for improvement than other areas. Having members of the product's intended audience test usability of a prototype is a recommended component of formative evaluation, according to Corry, Frick and Hansen (1997). Compiling data from representatives of three stakeholder groups (students, teachers, and parents) increases the likelihood that all users' concerns are addressed. It also provides a valuable, rich array of perspectives that allows a closer consideration of whether the template meets the needs of all potential users. Interestingly, stakeholders' comments rarely contradicted each other. Rather, they were more often complimentary or they consistently highlighted the same weaknesses and suggestions.

Quantitative questionnaire data provide an overview of opinions regarding various design aspects as incorporated in the template system. Evaluators' elaboration (qualitative data) provides deeper insight into strengths and difficulties previously highlighted during observations and in review of questionnaires. The consistent overlap that stakeholders report of regarding weaknesses highlights areas that obviously must be addressed in future versions.

Design Review of Template System

A review of the e-portfolio literature (Anderson, 1999; Barrett, 1994; Bergman, 1996; Chen, Liu, Ou and Lin, 2001; LACOE, 2000; Lankes, 1998; Marajanovic, 1995; Moersh and Fisher, 1995; and Pierce and O'Malley, 1992) indicates several design and pedagogy features of an e-portfolio template (see summary in Table 46). A comparison of these features to the template indicates that most have been successfully employed, some have been employed but not to their full potential and a few have not been successfully employed. Features that have been employed, to a limited degree, are discussed next.

Table 46

Design and Pedagogy Features Employed in E-portfolio Template System

	Design-related features	Pedagogy-related features
Successfully employed	<ul style="list-style-type: none"> • Accessible • Easy to use in relation to additions, storage, display, and deletion of work • Cross-platform • Enable students to obtain online and instantaneous feedback • Simple user interface • Incorporate existing software files • Import/export large quantities of data, quickly • Organized by: date, table of contents, graphic menu, hypertext links, subject, project or theme • Access or long-term storage • Employ passwords to protect each student portfolio, gain teacher access to all portfolios and create protected “teacher views” • Exportable to CD containing chronicle of student portfolios k-high school 	<ul style="list-style-type: none"> • It should be learner-centered • Increase authentic communication between home and class • Show process and final product • Teach self-evaluation of literacy, growth and learning • Teach to develop goals • Seen as a strategy, not a formula. • Encourage critical thinking and decision making skills
Employed with restrictions	<ul style="list-style-type: none"> • Maintenance, additions and deletions require minimum teacher time • Indexed and topical help • Necessary documentation for installation and use • Lock text feature to protect work 	<ul style="list-style-type: none"> • Show progress from a benchmark • Include projects demonstrating problem-solving skills, analysis and synthesize information into skills • Clearly indicate the learner’s goals, criteria for selecting material, samples of work, drafts, evaluation criteria, examples of good work and reflections • Include comments, feedback, and assessment in the form of text, sound or video
Not employed	<ul style="list-style-type: none"> • Incorporate multimedia • Indexing feature to help categorize and find portfolio entries 	<ul style="list-style-type: none"> • Students are motivated as they take responsibility for their portfolios

Design Features

Presently, teachers are required to perform some of the maintenance of the portfolio in order to set-up the subject, reflection and conferencing sections as well as edit some of the student's work. Additionally, with young children using the template system teachers are often required to provide extensive assistance to help them scan and save work in order that students have 'pieces' to 'add' to the portfolio. The help is not organized both with a traditional index and topical order. It does employ a 'content' structure arranged by alphabet. Findings suggested that users struggled to find the necessary assistance. The help function should be redesigned to include topics as well as alphabet listing. Contents of the help are currently divided into 'portfolio help' and 'portfolio advice'. The structure of the help needs to be improved so those who are not familiar with the portfolio process are better able to find the necessary assistance to be successful with portfolios and this template in particular. Additional documentation is required for installation. Specifying hardware and software requirements will eliminate many incompatibility issues. Expanding the documentation will allow novice database-web interface technicians to comfortably use install and use the template system. While there is a security feature built-in, in the form of a 'log-in' to access student process portfolios, or the teacher and administrator environments, more security features are required. While work is locked once it has been exported to the showcase users should be able to select pieces to be locked; thereby preventing further changes to be saved on the piece unless the piece is unlocked. Also, goals should be locked once a student is satisfied with their wording so as to prevent changing the goals to match the work entered in the portfolio.

Some features were not successfully employed in the template system.

Technically, more multimedia capability and indexing of work are required. The importance of multimedia is highlighted above. While not all users will necessarily take advantage of all options available, it is important to provide choice. Presently, students see a 'gallery' of their work as a series of thumbnails labeled with the title and version number and organized by subject. However, they have no means to search for a particular piece or identify it based on date, size or other descriptors. Providing an organization of work in a list or table of contents would be helpful. Also, providing a search feature to find pieces based on preset criteria, such as work related to goal x or work with reflections completed will help students in determining what work they still have to complete. The search feature should be kept very simple for Cycle 1 students as the goals it to facilitate the completion of their work and allow them control and ownership while not overwhelming them with too much process and 'paperwork'.

Pedagogical Features

From a pedagogical perspective, some features are not employed to their full potential. Progress is monitored through the use of version control on pieces added to the portfolio and through the recording of goals. Presently, it is possible for a student to alter their goals to reflect the work completed rather than completing work to attain the goals. This needs to be addressed, perhaps through locking goals once they are established. Additionally, improvements would allow students to monitor which goals or outcomes they are attaining. This speaks both to the pedagogy and the attainment of the QEP methodological competencies. Students' portfolios should contain projects that

demonstrate higher order thinking skills. The responsibility for ensuring that this happens lies both with the students and teachers. Teachers need to provide students with learning activities that require problem-solving skills, analysis and synthesis. For their part, students need to incorporate evidence of such work in their portfolios. Highlighting criteria for selection of work will assist in ensuring necessary work is developed for the portfolio. If students know the criteria for selecting work, they will collect, develop and select pieces to meet the criteria. Including a sample of a completed portfolio (with screen shots) that identifies a learner's goals, criteria for selecting material, samples of work, drafts, evaluation criteria, examples of good work and reflections will assist all users in employing the portfolio process successfully.

While it is presently possible to include comments, feedback and assessment in the form of text, audio and video are not available options. The absence of multimedia features places a high reliance on user's ability to read and write (and in some cases, to type). Expanding the media capability to include sound and video will allow users to record and review comments, etc. with more ease. This is particularly essential for Cycle I students who are just learning to read and write.

In terms of pedagogy, student's motivation will be increased in relation to the success they have with their work completion and use of the e-portfolio template system. Addressing each of the above design features as well as the other recommendations outlined in the recommendations section below will go a long way towards achieving. Success builds success and people are intrinsically motivated to work with things with which they are successful (Bandura, Barbaranelli, Caparara and Pastorelli, 1996; Driscoll, 2000; and Kearsley, 2001).

Recommended Improvements

Results of the evaluation research and design review highlighted areas of the template system that are in need of improvement. Weaknesses and suggestions reported by the various stakeholders for improving the e-portfolio template system have been formulated into recommendations for further development and presented according to category evaluated: (a) pedagogy, (b) environmental design and aesthetics, (c) installation and set-up, and (d) Methodological competencies of the QEP. Environmental design and aesthetic recommendations are presented on a per-environment basis. There are consistent themes in areas of recommendation. All recommendations relate to one of four categories: (a) instructions, which deal with improving learnability through use of directions and labels. (b) interface, which deals with any aesthetic or cosmetic change to the look of the interface; (c) functionality, deals with any structural or architecture changes to the environments; and (d) pedagogy, which deals with anything related to the portfolio process or learning process.

Improving Pedagogy

One area of investigation related to the appropriateness of the pedagogical aspects in the e-portfolio template. Findings indicated that portfolio pedagogy is well designed and employed in the template system. For example, the template's pedagogy was acknowledged as a learner-centered environment that enables reflection, self-direction, realistic situations, monitoring of progress and communication regarding process and final produces. These pedagogy-based characteristics of electronic portfolios are espoused by Anderson, 1999; Barrett, 1994; Bergman, 1996; Chen, Liu, Ou and Lin,

2001; Lankes, 1998; LACOE, 2000; Marajanovic, 1995; Moersh and Fisher, 1995; and Seng, 1998.

Nevertheless, several areas were identified as needing improvement. Table 47 presents a summary of recommendations for further development. Consistent with findings that there is a high reliance on typing, students need an environment in which they learn with technology and are not hampered by their own impediments with technology. Requiring typing of young children may impede student's development as they may focus on the difficulties they are having with typing rather than the work they are producing. Providing an alternative, such as audio or video capability, will address this difficulty. In keeping with the portfolio philosophy, the template needs to show a stronger connection between goals, work and selecting items for showcase. This could be achieved by specifying the criteria for selection within the template. Finally, the 'advice' portion of the 'help' needs to be improved to provide better guidance and instruction on portfolio process, in keeping with suggestions made by portfolio experts. The 'help' should be improved and included in all three environments of the template.

Table 47

Summary of Pedagogy Recommendations

Category	Recommendations
Pedagogy	<ul style="list-style-type: none"> • Strengthen the connection between the goals and work (to monitor progress closer). • Reduce the high reliance on typing for young children. • Criteria for selecting items for showcase should be presented in template. • Make template more motivating. • Improve pedagogical content of help.

Improving Environmental Design and Aesthetics

One area of investigation related to the appropriateness of the design and aesthetic aspects of the three environments in the e-portfolio template. The template's three environments and set-up were evaluated in detail to determine their efficacy. Evaluation of the template's environmental design and aesthetic appeal indicated that the template system would be suitable for the target audience's pursuit of curricular outcomes. However, some design issues and aesthetics ought to be addressed first to increase user's success with the template. Issues and recommendations for improvement are discussed following.

While portfolio experts approved overall of the design, usability, navigation, suitability, learnability, help and aesthetics, they also indicated notable problems or concerns with learnability, help and aesthetics. Portfolio experts reported results were in conflict with student, teacher and administrator environments' navigability and learnability in comparison to other evaluators' results. Whereas portfolio experts approved of navigation and disapproved of learnability aspects, other evaluators' results were the inverse for each environment.

Improving the design and aesthetics of the student environment.

Students and parents approved of aspects relating to design and aesthetics. Students approved of usability aspects and parents of learnability aspects however, concern was expressed by students regarding learnability and suitability aspects. Both students and parents expressed concern about navigational aspects in the student environment. Stakeholders' suggestions for improvement tended to complement one another.

Areas for design and aesthetic improvements to the student environment are summarized next. Suggestions and weaknesses have been formulated as recommendations to be considered in future development. Recommended changes (see Table 48) are organized in a hierarchical order indicating priority of changes per environment, based on category (instructions, interface, functionality and pedagogy). Priority was established by assessing which recommendations were essential to the employment of the e-portfolio design- and pedagogy-related features. They are arranged from must have to would like to have.

Some of the recommendations include adding more directions to screens, as suggested by teachers and portfolio experts. All evaluators found problems with the navigational button design. Addressing teachers concerns that the process is not clearly laid out, adding better descriptions and more directions and labels would benefit the users. Addressing portfolio experts difficulties evaluating the template system, I recommend eliminating all technical glitches from the system.

Table 48

Summary of Student Environment Recommended Changes

Category	Recommendation
Instructions	<ul style="list-style-type: none"> • Add more directions on the screens to teach users how to use the template. • Clarify type of information to be entered on each screen (directions). • Reword error messages providing directions on how to remedy problems encountered. • Improve procedures for 'adding work' to showcase. • Add criterion for selection of work feature to 'add/modify work' area. • Add a description of a 'goal' on screen. • Add label to identify source of conferences (peer, parent or teacher) in 'review past conferences' screen.
Interface	<ul style="list-style-type: none"> • Choose more suitable, intuitive metaphor for 'navigational buttons'. • Make labels of 'modify' buttons consistent. • Change the order of the placement of the 'add' and 'modify' buttons on the 'add work' screen.

	<ul style="list-style-type: none"> ● Rename 'secret code' to 'password' in keeping with standard computer terminology. ● Remove prompts (':') from 'questions text entry field'. ● Remove prompts ('I want to') from the 'goals text entry field'. ● Increase size of alphabet in the 'help'. ● Rename 'gallery' to 'studio'. ● Add more colors. ● Add more graphics. ● Eliminate repetition of the navigational items on the main screen
Functionality	<ul style="list-style-type: none"> ● Eliminate all technical glitches. ● Reduce amount of typing required. ● Use drop-down lists. ● Add more media capability. ● Improve process for correcting errors after saving work. ● Increase editing control. ● Increase writing opportunities. ● Improve process of 'adding work' to the portfolio. ● Expand selection of image type. ● Change property of 'text entry field' to grow as amount of text entered grows. ● Add choice to lock 'work' and 'goals'. ● Improve the organizational structure of 'help'. ● Use a 'glossary' in addition to the 'alphabet' in 'help'. ● Add completed 'portfolio' reference sample (with screen shots) to 'help'. ● Add a 'search' feature to 'help'. ● Add a 'search' feature to find pieces based on preset criteria.
Pedagogy	<ul style="list-style-type: none"> ● Make use of template more fun. ● Add monitoring feature to see which goals or outcomes are being attained. ● Increase interaction with instructors and other users. ● Add a place for teacher's own 'goals'. ● Improve content of the 'advice'. ● Improve content of 'help'. ● Provide environment that allows users to learn about and develop an interest in portfolios while using this template.

Improving the design and aesthetics of the teacher environment.

Design, learnability and aesthetic aspects were met with praise in the teacher environment. However, concern was found with navigational aspects. Recommendations for design and aesthetic improvements to the teacher environment follow. Suggestions

and weaknesses have been formulated as recommendations to be considered in future development. A hierarchical summary, based on priority, of all recommended changes for the teacher environment are presented in Table 49, based on category (instructions, interface, functionality and pedagogy).

Consistent with findings that the navigational button design was unsuitable, I recommend redesigning the buttons and selecting a new metaphor. Addressing teachers concerns that the ‘questions’ section is limited, I recommend redesigning the functionality and increasing features. Addressing teachers concerns that the student area is confusing, I recommend redesigning the functionality of this area and making the default page that of the existing ‘modify’ page.

Table 49

Summary of Teacher Environment Recommendations

Category	Recommendation
Instructions	<ul style="list-style-type: none"> • Add more directions to screens.
Interface	<ul style="list-style-type: none"> • Improve ‘navigational button’ design.
Functionality	<ul style="list-style-type: none"> • Remove grammatical inconsistencies. • Add a ‘help’ feature similar to that found in the student environment. • Present questions’ content rather than question number. • Provide more options for the ‘questions’ section. • Improve functionality (adding, editing and viewing) of ‘questions’. • Make ‘modify student page’ the default page for the ‘student’ area. • Make the ‘student’ area more of a student profile. • Organize ‘student’ section by class for tracking purposes. • Make link from ‘portfolios’ button to entire students’ portfolio.

Improving the design and aesthetics of the administrator environment.

While favor was found for the design, learnability and aesthetic aspects, concern was found with navigational aspects in the administrator environment. Foci for design and aesthetic improvements to the student environment follow. Suggestions and

weaknesses are formulated as recommendations to be considered in future development.

A hierarchical summary, based on priority, of all recommended changes for the administrator environment are presented in Table 50 according to category (instructions, interface, functionality and pedagogy).

The recommendation for redesigning the buttons and selecting a new metaphor is consistent with findings that the navigational button design was unsuitable. Based on teachers' and portfolio experts' desire to see 'help' added to the administrator environment, I recommend adding 'help' similar to that found in the student environment. Addressing teachers concerns that the school and teacher areas are confusing, I recommend redesigning the functionality of these areas and making the default pages that of the existing 'modify' pages for each.

Table 50

Summary of Administrator Environment Recommendations

Category	Recommendation
Instructions	<ul style="list-style-type: none"> ● Provide more labels to facilitate learning of environment.
Interface	<ul style="list-style-type: none"> ● Improve 'navigational button' design.
Functionality	<ul style="list-style-type: none"> ● Add 'help' section. ● Incorporate a means to see the "bigger picture" rather than the individual screens. ● Provide accessibility to all environments from the administrator environment. ● Make 'modify school' page the default page for the 'school' area. ● Make 'modify teacher' page the default page for the 'teacher' area. ● Add a 'drop list' for selecting schools. ● Change the password to 8 characters minimum. ● Prevent password from being a common term. ● Provide preview of changes made before saving to database. ● Include a hierarchical structure to see the placement of students in relation to classes and schools.

Improving installation and set-up process.

While the technical expert encountered no difficulties with the installation and set-up of the template system on his server, he made several recommendations to improve the process for future technicians, particularly those with less experience. The primary concerns dealt with the install documentation which, as the technician felt, needed to be improved. See Table 51 for details. Addressing the technical experts' concerns that the documentation is insufficient, I recommend updating documentation. I recommend addressing concerns regarding error messages by eliminating any technical glitches in the system.

Table 51

Summary of Installation and Set-up Recommendations

Category	Recommendation
Directions	<ul style="list-style-type: none"> • Remove inaccuracies in the installation documentation. • Provide a step-by-step set-up guide with screen shots. • Add better information regarding software and hardware requirements. • Add documentation on what to expect from the program. • Add documentation on what it template system like when installation is complete.
Functionality	<ul style="list-style-type: none"> • Remove any technical glitches.

Improving facilitation for attainment of QEP methodological competencies.

The final area of investigation related to the likelihood for the attainment of the QEP methodological competencies with the e-portfolio template. Reflection is an integral component of the portfolio process (Chen, Liu, Ou and Lin; Hall, 1998; Herwitt-Gervais, 1999; Martin, 2001; and Rigoni-Reeves, 1999). Any portfolio container must allow for reflective practices for learners. Successful portfolio learners exhibit characteristics of a reflective learner as described by Martin (see portfolio section under literature).

Reflective learner characteristics were aligned with the QEP methodological competencies. It is believed that if these competencies and reflective learner characteristics are evidenced in the e-portfolio template system, it provides the basis for support of the use of portfolios as a medium in which learners may pursue the attainment of these competencies.

If the competencies are deemed attainable then there is a strong connection to the e-portfolio being used as a means to allow students to become reflective learners. This in turn provides support for the use of constructive-based classes which, in turn, supports the new Quebec Education Program.

Results indicated that it is inconclusive whether the student portfolio environment allowed for the attainment of the QEP methodological competencies as the results show marginal agreement with this premise. If this portfolio is insufficient for guaranteeing the attainment of the ICT and consequently allowing students to become reflective learners then changes must be considered. Several recommendations are presented (see Table 52) to improve the facilitation of QEP ICT competencies in the template. Addressing portfolio experts' concerns that the template system does not absolutely allow for the attainment of the ICT competencies, I recommend the template be improved upon or used in conjunction with other technologies and learning strategies (and assessments) in order to facilitate the new education program in Quebec.

Table 52

Summary of QEP Recommendations

Category	Recommendation
Functionality	<ul style="list-style-type: none"> • Improve flexibility to allow for attainment of more competencies.
Interface	<ul style="list-style-type: none"> • Employ standard ICT terminology (change 'secret code' to 'password').
Pedagogy	<ul style="list-style-type: none"> • Incorporate means for student to monitor whether portfolio criteria are met. • Incorporate area for overall reflection on work. • Provide means for students to evaluate use of ICT through template. • Employ other technologies in conjunction with the e-portfolio template to attain all QEP's ICT competencies.

Recommendations are consistent with the literature relating to portfolios, human computer interface design and computer use for children. As indicated in the design review discussion, the recommendations correspond to items that have not been successfully implemented or have been overlooked in the initial design.

Recommendations for Improvement of Evaluation Process

The model employed for this evaluation project is a mixed-model. It employed formative evaluation methodology based on Scriven's decision-facilitation and Instructional Systems Design models employing 3 approaches (Tessmer): (a) one-to-one, (b) expert, and (c) small group. Evaluations (observations, questionnaires and interviews) were conducted concurrently over a six-week period. The model allowed the researcher to determine whether changes needed to be made to the e-portfolio template system before it is implemented or field-tested. Resulting recommendations for improvement were presented in the first part of the discussion.

Issues raised during the evaluation sessions were explored more in-depth as needed. For example, asking students details about the button design and intuitiveness

during the interviews was not one of the original questions. However, at the last minute, the researcher decided to explore the controversy surrounding the buttons (previous feedback indicated that the students would be unlikely to understand the buttons) with the students. Had the researcher ignored this controversy and not asked representative primary users (students) more in-depth questions about the buttons, the degree of unsuitability may still be in question.

As with any research method adopted for the first time, I encountered some challenges employing this mixed method evaluation model. The most prominent challenge was encountered in the design and analysis of the questionnaires. Limitations encountered as a result of questionnaire design are discussed in the next section. It is recommended that researchers pilot test instruments prior to the real data gathering time. Researchers should consider inputting 'play data' and analyzing the data to see if the anticipated analyses are applicable. If not, the design should be revisited. Recommendations are consistent with the literature relating to evaluation (Flagg, 1990; Patterson and Bloch, 1987; Popham, 1998; Reiser and Kegelmann, 1994; Smith and Ragan, 1994; and Tessmer, 1993).

Project Limitations

Conducting this project was a profoundly valuable experience. I learned a tremendous amount about portfolios, design, development and evaluation of a computer based learning environment and research, particularly questionnaire design. I believe that the e-portfolio template system is a noteworthy contribution to education. While there is

little I would change regarding architecture of the template system, there are several details that I would address. The majority of which stem from the results of this project.

Methodological Limitations

There are four limitations with regard to methodology employed that need to be recognized. The first involves the choice of instrument content per stakeholder. By having each stakeholder respond to slightly different questionnaire items per environment, I was not able to make direct comparisons across stakeholder groups on specific issues. However, I was able to see a holistic complimentary perspective of changes that should be considered. Nevertheless, having one instrument per environment would facilitate comparison of differences in opinion across stakeholders on an environmental level. Additionally, I would field test the questionnaires before conducting the actual research.

A second limitation was that I did not have teachers evaluate the student environment. I made this decision for several reasons: (a) two of the portfolio experts were also teachers thus the line between portfolio experts and teachers became blurred; (b) time limitations required that evaluator's time on-task be optimized; (c) portfolio experts evaluated pedagogy, aesthetics and design aspects; (d) teachers evaluated the storyboards and previous builds of the template system earlier in the project history; and (e) both of the template designers are teachers who are familiar with the new Quebec education program. In retrospect, I acknowledge that teachers are responsible for student learning outcomes and therefore may have provided an additional source of stakeholder information regarding the student environment. This was done for several reasons: When

the parents were introduced into the equation it was decided that parents would evaluate the student environment and teachers would focus on environments parents would never access (teacher and administrator). This allowed for both students and parents to evaluate each environment in detail. Interestingly, teachers explored the student environment anyway and offered feedback.

Thirdly, balancing the wishes of all stakeholders in the research required some compromise regarding the evaluation method employed. The initial plan was to conduct usability testing over an eight-week period during which the template would be used as part of actual classroom portfolio activities.. The application for permission to conduct research in one of the board's schools was received with enthusiastic interest. The school board was interested in research relating to portfolios and the attainability of the QEP ICT methodological competencies. The research committee had to gain approval from technical services department at the school board before approval could be granted. They wanted to ensure that the board server's security would not be breached by using the template system. The application was further delayed in pedagogical services at the school board. There was resistance to allow any portfolio-based research to be conducted in the schools at this time due to labor negotiations with the local teacher's union. Discussions regarding approval continued for several weeks at the school board. As time passed, I began to be worried about completing the data collection before year-end. After careful consideration of my proposed research plan I decided to refine the research from a short-term field trial to a more in-depth review of the application through formative evaluation with SMEs, and sample end-users.

Finally, related to the previous limitation, choice of evaluation method, expert review versus field testing presented some challenges as well. In the end, I chose to employ expert review and recommended field testing for subsequent reiterations of the template system. While experts have extensive knowledge regarding the topic they are removed from the context in which the product will be used. They approach the product from a critical standpoint of someone who has extensive experience and knowledge relating to the product being evaluated. Field testing gathers data from target end-users, in situ. It is possible to see how target end-users actually use the product. Additionally, as field testing would be conducted over a longer period of time, it would be possible to gather more data relating to how the template system was used, the nature of problems encountered and how users addressed these problems.

Analytical Limitations

It was not until I began analyzing my data that I realized that some of the comparisons I had hoped to make were not possible. For example, I was not able to compare quantitative details of portfolio expert evaluations with those of any other stakeholders as the level of detail in their questions differed. Nevertheless, I was able to compare the qualitative data that was reported. This provided a very rich description of the strengths and weaknesses of the template system (and its environments). From this evidence, I was able to fairly review the design considerations and compile recommendations for improving future versions of the e-portfolio template system.

Conclusions and Future Directions for Research

In this research project, I invited representatives of the target audience (teachers, parents, students, technicians and portfolio/pedagogical consultants) to evaluate the e-portfolio template system. The evaluations were designed to respond to a series of questions relating to template design and attainment of the QEP methodological competencies. Results indicated that while the template does meet portfolio design standards and allows for the attainment of the QEP methodological competencies, there is room for improvement in all areas. Additionally, the proposed evaluation model was proven to be successful overall. Limitations were found with regards to questionnaire design. Recommendations are discussed to guide future development of the template system and improve the evaluation model. Like most products/projects in the education field, this project is but an iteration of design process, on the road to refinement.

Future Directions for Research

The funny thing about research and development is that even as you finish one project you start thinking of how it could have been improved or where to take your finding in a subsequent project. This thesis is no exception. Several areas for consideration in future research have been identified and are outlined following.

After changes are made, the template system ought to be formatively evaluated again but using a consistent set of questionnaire items and subscales for all stakeholders regardless of the environment evaluated. Should an evaluator evaluate more than one environment, he/she should complete an evaluation questionnaire for each environment.

This way it will be easier to compare differences in opinion across stakeholders on an environmental level when looking at both quantitative and qualitative data.

Summative trials should be employed to determine whether the template system actually performs in the instructional manner that was intended. A year-long field trial, which large sample size, monitoring progress of users with template system in actual classroom practice would be beneficial to the field. In this trial research would look at whether students employ the portfolio process (developing work and thinking critically about why they have chosen pieces for their showcase and if they have met their self-defined learning goals) while using the template system.

Further exploration of e-portfolio use with young children is essential both to see how they deal with technology and the portfolio process. It would be interesting to see whether they follow the e-portfolio process, as outlined in the literature religiously or treat templates as storage containers. I suspect it will depend on the learner's competence with computer use and the classroom environment's promotion of the use of the portfolio process. Should the learning environment be set up in such a way that it is conducive to the application of authentic assessment through the portfolio process?

More research is needed in the schools to determine whether portfolios assist in fulfillment of the ICT competencies. This would allow administrators to make quantifiable decisions regarding the use of portfolio assessment as a means to achieve the ICT learning competencies and outcomes. Initial research indicates that this template system alone does not. However whether it is a matter of employing the template after improvements alone or in conjunction with other technologies is yet to be determined.

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Appendix A – Visual of E-Portfolio Template System Student Environment

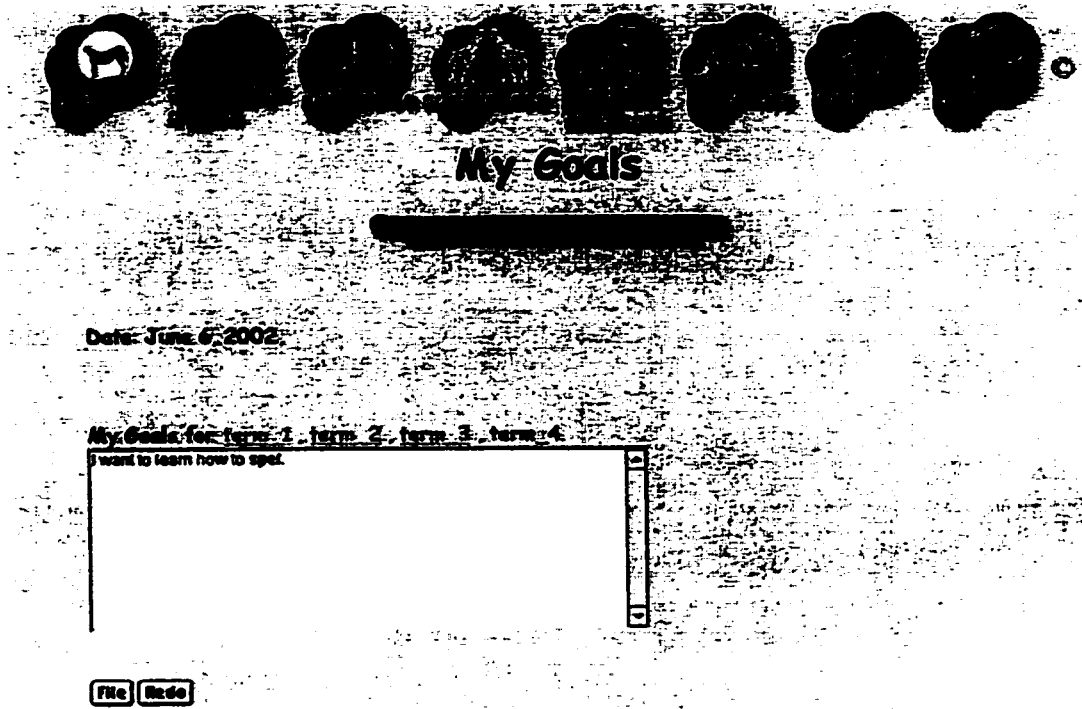


Figure 1. Sample screen shot of student environment of e-portfolio template system.

Appendix B – Portfolio-based Learning Theories

Social Learning Theories.

Social Learning Theories are those which employ a more interactional and cultural emphasis. The social learning theories and related theorists include: (a) Social Development, (b) Zone of Proximal Development (ZPD), (c) Social Learning, (d) Constructivism, (e) Conversation Theory, and (f) Experiential Learning.

Social Development is espoused by Vygotsky. It maintains that social interaction plays a fundamental role in learning. Learning is firstly, social (with people) and secondly, individual (on one's own). (Driscoll, 2000 & Kearsley, 2001). Social development is achieved through social mediation and cooperative learning which is attainable through conferencing.

Zone of Proximal Development (ZPD) is also espoused by Vygotsky. ZPD looks at the gap between the actual development level versus potential development level. (Driscoll, 2000 & Kearsley, 2001). ZPD is monitored through outcome-based education and developmentally appropriate practice. It is attainable through completing the work identified to attain the set goals.

Social Learning is credited to Bandura. This theory emphasizes the importance of observing and modeling the behaviors, attitudes and emotional reactions of others as part of the learning process. It also involves a degree of reciprocity. (Driscoll, 2000 & Kearsley, 2001). Social learning is evidenced in social mediation. It is attainable through process portfolio work.

Constructivism is espoused by Bruner. Constructivism describes learning as an active process in which the learner constructs new ideas based on their previous experience. (Driscoll, 2000, Cobb, 1999, & Kearsley, 2001). It is evidenced through a holistic paradigm, students taking responsibility for their own work and developmentally appropriate practice. Constructivism is attainable through process and showcase portfolio work.

Conversation Theory is credited to Pask. It comes from the field of cybernetics. Conversation Theory sees learning as occurring as a result of meaningful conversations about a topic. (Driscoll, 2000 & Kearsley, 2001). Conversation Theory is evidenced through cooperative learning and social mediation. It is demonstrated through conferencing.

Experiential Learning is attributed to Rogers. It sees learning as equitable to personal growth in which the needs and wants of the learner are foremost. The learner is provided with the context and assistance to learn by the facilitator/teacher. (Driscoll, 2000 & Kearsley, 2001). Experiential Learning is evidenced through contextualized learning and developmentally appropriate practice. It is evidenced by cross-curricular work and process portfolio usage.

Child Development Theories.

Child Development Theories are those which employ a more cognitive and developmental perspective as well as a more contextual nature of learning. The child development theories and related theorists include: (a) Genetic Epistemology, (b) Multiple Intelligences, (c) Schema Theory, (d) Discovery Learning, (e) Situated Cognition, (f) Cognitive Flexibility, (g) Self Regulated Learning (SRL), and (h) Reflexivity/Metacognition.

Genetic Epistemology was formulated by Piaget. It purports that “knowledge is invented and reinvented as the child develops and interacts with the world surrounding her” (Driscoll, p. 188) as evidenced as she passes from stage-to-stage of development. (Driscoll, 2000, Inagik, 1992, & Kearsley, 2001). It is evidenced through experiences suited to development level of child and intellectual diversity. It is attainable through process portfolio usage.

Multiple Intelligences Theory was developed by Gardner. This theory sees cognitive development as proceeding independently in at least seven distinct forms—language, music, logical-mathematical reasoning, spatial processing, bodily-kinesthetic, interpersonal knowledge and intrapersonal knowledge. The development will vary for each of these domains depending on the learning’s cultural context. (Driscoll, 2000 & Kearsley, 2001). It is evidenced through cross-disciplinarian work, accommodation of learning style, intellectual diversity and individual learning plans. It is attainable through cross-curricular work and selecting examples.

Schema Theory is attributable to the work of Bartlett, Anderson, Spiro & Ausubel. Schema Theory sees learning as filing new knowledge into an existing mental framework by associating it with existing knowledge. (Driscoll, 2000, Winn and Snyder, 1999 & Kearsley, 2001). It is evidenced through finding meaning in experiences and Total Quality Management (TQM) methodology. It is attainable through goal setting and selecting examples.

Discovery Learning is espoused by Bruner. Discovery Learning allows the learner to discover what is in their minds. (Driscoll, 2000 & Kearsley, 2001). It is evidenced through a project approach, active learning, student discovery and finding meaning in experiences. It is attainable through process portfolio usage.

Situated Learning is attributable to Lave, Wenger & Dewey. This theory sees learning as a function of the activity, context and culture in which it occurs. Through social interaction the learner moves within a ‘community of practice’ towards an expert-like role as their knowledge increases. (Driscoll, 2000 & Kearsley, 2001). It is evidenced through a project approach and cross disciplinarian work. It is evidenced through process and showcase portfolio usage.

Cognitive Flexibility was developed by Sprio. It focuses on the nature of learning, and the ability of the learner to adapt to new learning environments by transferring knowledge and skills from one situation to another. (Driscoll, 2000 & Kearsley, 2001). It is evidenced through cross-disciplinarian work, reflective process/critical thinking and in finding meaning in what happened. It is evidenced through process portfolio work and reflection.

Self Regulated Learning (SRL) is attributed to Zimmerman, Schunk & Bandura. SRL sees learning as being a process of monitoring and controlling one’s own learning. It involves motivation, metacognition and cognitive processes. (Driscoll, 2000 & Kearsley, 2001). It is evidenced through critical thinking skills, metacognition, taking responsibility for one’s own learning, reflective processes, self-directed learning and TQM methodology. It is attainable through reflection, selecting examples, setting goals and process portfolio usage.

Reflexivity/ Metacognition is espoused by Schoenfield & Cunningham. It purports that as learners develop they are better able to adjust their learning strategies as a result of being more aware of their own learning or cognitive processes. (Driscoll, 2000

& Kearsley, 2001). It is evidenced through critical thinking, reflective process, individual learning plan, self-directed learning, TQM methodology and finding meaning in what happened. It is attainable through reflection, selecting examples, setting goals and process portfolio usage.

Motivational Theories.

Motivational Theories are those which focus on the feedback or reward the learner receives as a result of their learning efforts. It may be either intrinsic (internal) or extrinsic (rewards). The motivational theories and related theorists include: (a) Self-efficacy, and (b) Motivatoin.

Self-efficacy is attributable to Bandura. Self-efficacy looks at the learner's beliefs in his or her abilities to succeed in relation to a particular task or outcome. (Driscoll, 2000, Bandura, Barbaranelli, Caparara & Pastorelli, 1996, & Kearsley, 2001). Self-efficacy evidenced by avoiding the self-fulfilling prophecy. It is attainable through setting goals, reflection and showcase portfolio.

Motivation is espoused by Maslow & Weiner. Motivation sees learning as the result of the anticipation of feedback or an award. Behavioristically, the reward will be extrinsic in nature, such as a prize. Cognitively, the reward or feedback will be intrinsic in nature, such as feeling proud of one's accomplishments. (Driscoll, 2000 & Kearsley, 2001). Motivation is evidenced by increasing self-esteem and providing positive experiences. It is attainable through reflection, conferencing and showcase portfolio usage.

Appendix C – QEP ICT Methodological Competencies

MEQ Methodological Competencies

5 To adopt effective work methods.

Focus of the Competency

The many kinds of situations in which one has to carry out an activity or project all depend on a type of practical knowledge that underlies virtually all human endeavors. This ability to get things done takes many forms and is required in various proportions depending on the nature of the task, but it is extremely useful to have.

Schools can help students to acquire this competency by encouraging them to be self-reliant, to select appropriate means for attaining objectives, to analyze the way they use the available resources and to evaluate the effectiveness of their work methods. All subjects lend themselves to this exercise, and methods applied in a given situation should be readily transferable to other areas.

Key Features of the Competency

To analyze the task to be performed. To espouse the objectives. To understand the instructions and visualize the elements of the task. To understand the context of the task.

To being the process. to reflect, before and during the action, on the best way to attain the objective. To adapt his/her work method to the task and the context. To anticipate the requirements of the method chosen and the resources that will be needed. To use his/her imagination.

To analyze his/her procedure. To examine the procedure used through out the task. To understand what was effective and what worked less well. To draw conclusions.

To perform the task. To make use of the appropriate resources: people, materials, etc. To manage his/her materials and time and to adjust his/her actions as required. To complete the task. To discover the pleasure and satisfaction of work completed and well done.

6 To use Information and Communications Technologies (ICT)

Focus of the Competency

...familiarizing those who don't have access to ICT at home. They must also help students to diversify their use of ICT and to develop critical judgement with regard to them.

If used appropriately in teaching subject matter, information and communications technologies can accelerate the development of many cross-curricular and subject-specific competencies in the Quebec Education Program. By providing access to a multitude of information sources and individuals, they give students the benefit of expertise from throughout the world and enable them to share their ideas and achievements with others.

Key Features of the Competency

To master the information and communications technologies. To be familiar with the purposes, concepts, vocabulary, procedures and techniques of ICT. To recognize familiar concepts in a new context. To explore new functions of software programs and operating systems.

To evaluate his/her use of information and communications technologies. To recognize his/her successes and difficulties. To identify the limitations of the technology employed in a given situation. To identify ways to improve his/her use of ICT.

To use information and communications technologies to carry out a task. To explore the potential of ICT for a given task. To choose software programs and functions appropriate for the task. To use appropriate working and troubleshooting strategies. (pp. 26-29.)

Appendix D – Sample Interface of Other Portfolio Templates

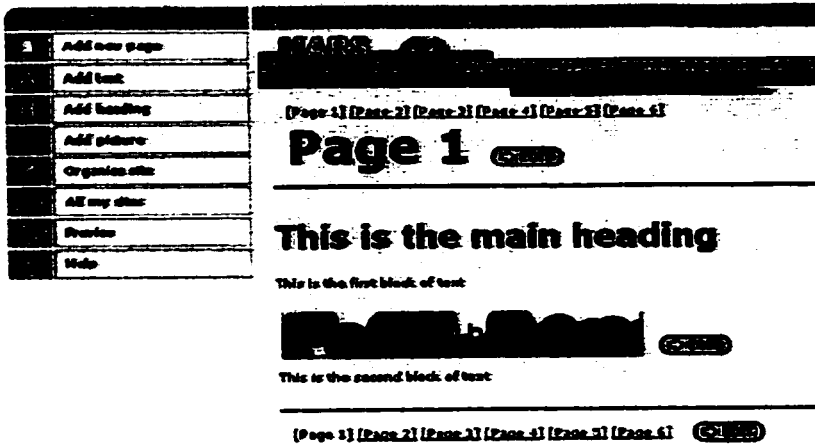


Figure 2. Sample of School Master environment.

Name of the document: <input type="text"/>	Indicate your group: <input type="text" value="- Choose one -"/>
A brief description: <input type="text"/>	Starting Date: <input type="text"/> (Leave blank to use today's date) (month/day/year ...eg. 5/28/2001)
Category: <input type="text"/>	Version: <input type="text"/>
Software: <input type="text"/>	
Your URL: <input type="text" value="http://domain.qc.ca"/>	
Text Field: (If you like you can write or paste your text into the field below. For larger window click here) <input type="text"/>	
Your comments... <input type="text"/>	

Figure 3. Sample of Digital Portfolio environment.

Appendix E – Template Environment Flowcharts

Student Environment

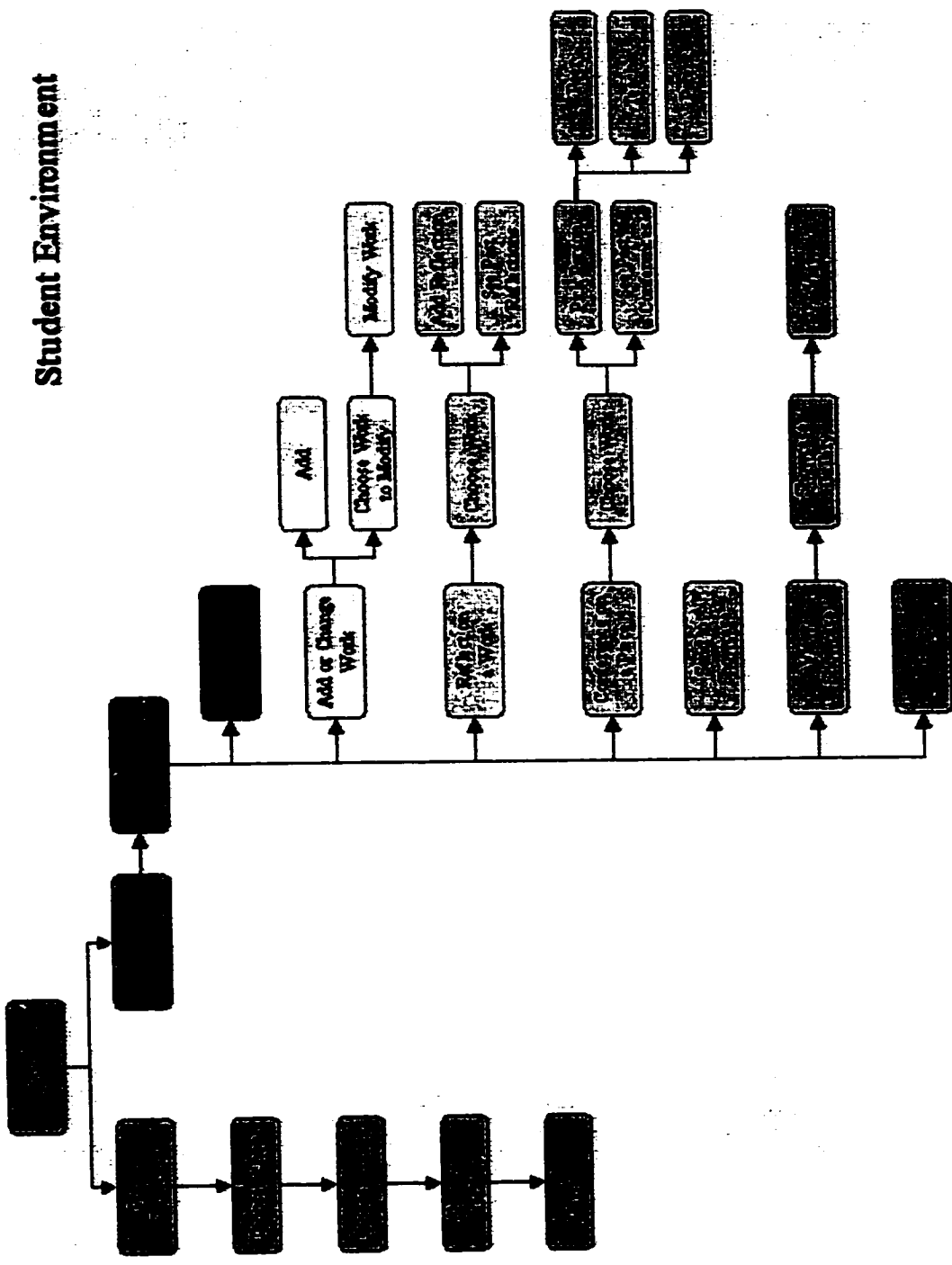


Figure 4. Flowchart of student environment's architecture.

Teacher Environment

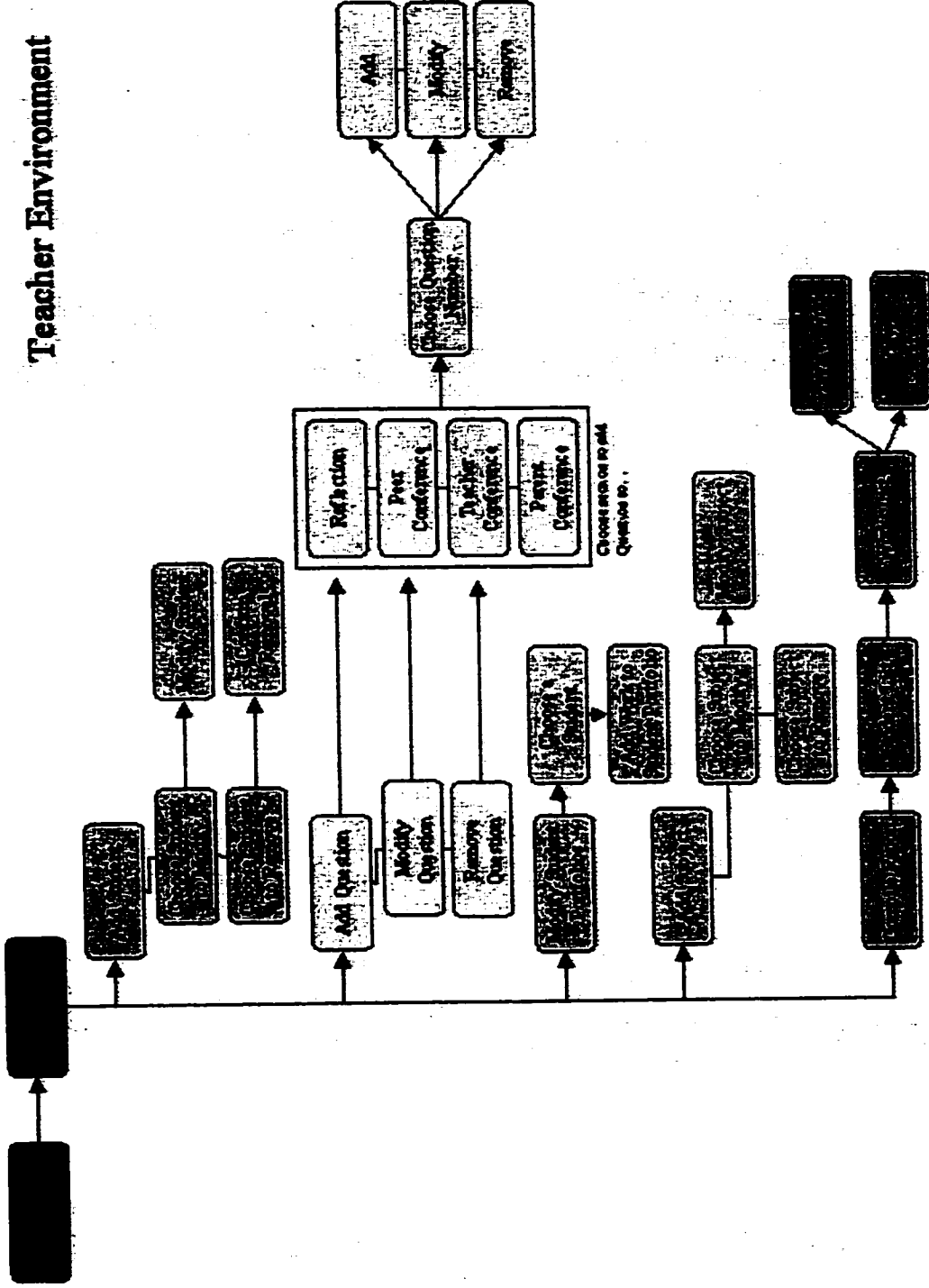


Figure 5. Flowchart of teacher environment's architecture.

Administrator Environment

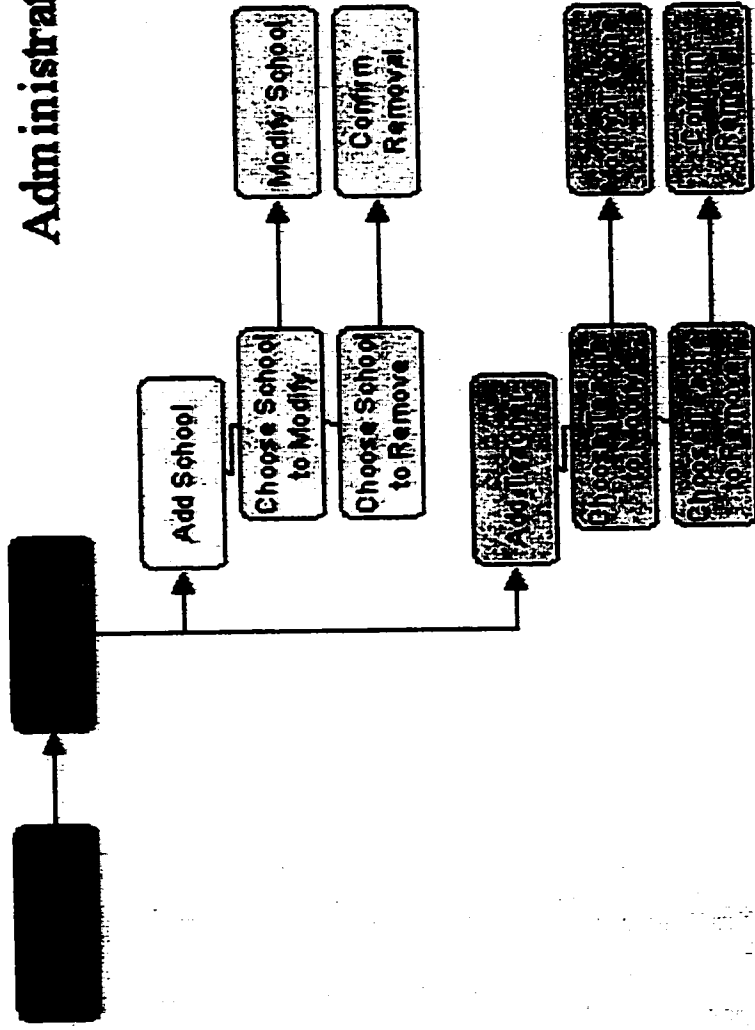


Figure 6. Flowchart of administrator environment's architecture.

Appendix F – Sample Questionnaire Data Collection Instruments

One-to-One and Small Group Student Questionnaire

One-to-One Teacher Questionnaire

One-to-One Parent Questionnaire

Portfolio Expert Questionnaire

Technical Expert Questionnaire

**E-portfolio Template System Evaluation—Student Environment
One-to-One and Small Group Student Evaluations**

Directions to Evaluator:

- This questionnaire should take about 15 minutes to complete.
- Distribute questionnaires after participants have had an opportunity to try out the E-portfolio Template System Student Environment.
- You may use overheads of this questionnaire to assist you with the completion of this evaluation questionnaire.
- You may read each of the questions to the participants for both sections.
- The symbols may be translated as follows: ☺ (yes, true) and ☹ (no, false).
- Read each of the questions to the participants and ask them to choose their responses by circling their answer or marking an "X" on their choice.
- Part 4 should be completed with researcher.
- Refer participants to samples if they are not sure what to do.
- Verify that participants have responded to all questions in a section before moving to the next section.
- Verify that respondents have written their name on their questionnaire.
- The term 'computer portfolio' may be interchanged for 'electronic portfolio'.
- Collect all questionnaires at end of session.
- Remind participants that their identity will remain confidential.

Date: _____

Name: _____

Part 1

Answer the following questions by circling your answer.

1. I am a boy girl.
2. I am 6 7 8 9 years old.
3. I speak English French Another language.
4. I do like do not like using computers.
5. I use portfolios a lot not very much.

Part 2

Pick the best answer to these statements.

	Yes	Sort of	No
1. The screens are clear.	☺☺	☺	☹
2. The log-in is easy.	☺☺	☺	☹
3. The buttons make sense.	☺☺	☺	☹
4. The colors are good.	☺☺	☺	☹
5. There are too many parts to this e-portfolio. *	☺☺	☺	☹
6. I get confused using this e-portfolio. *	☺☺	☺	☹
7. The order of the screens is good.	☺☺	☺	☹
8. This e-portfolio is easy to use.	☺☺	☺	☹
9. The words are easy to read.	☺☺	☺	☹
10. The directions on each screen help.	☺☺	☺	☹
11. This tool helps me learn about portfolios.	☺☺	☺	☹
12. There is too much information on the screens. *	☺☺	☺	☹
13. The tool is fun to use.	☺☺	☺	☹
14. The tool is hard to learn to use. *	☺☺	☺	☹
15. There is too much typing to do. *	☺☺	☺	☹
16. It is easy to get around in this E-portfolio.	☺☺	☺	☹

Part 3

Pick the best answer to these statements.

	Yes	Sort of	No
1. I like working with portfolios.	😊😊	😊	😞
2. I used portfolios last year.	😊😊	😊	😞
3. Paper portfolios easier to use than computer portfolios.	😊😊	😊	😞
4. I like others commenting on my portfolio.	😊😊	😊	😞
5. Portfolios help me learn better.	😊😊	😊	😞
6. I understand how to use portfolios.	😊😊	😊	😞
7. It is easy to add work to my portfolio.	😊😊	😊	😞
8. It is easy to think of learning goals.	😊😊	😊	😞
9. I like reflecting on my work.	😊😊	😊	😞
10. I like conferencing on my work.	😊😊	😊	😞
11. It is easy to add things to my showcase portfolio.	😊😊	😊	😞

Part 4

Tell me how much you like the following screens in the student environment.

Student Screens	Like it very much	Like it a bit	Do not like it much	Do not like it at all
Log-in screen	😊😊😊	😊	😞	😞😞😞
Main screen	😊😊😊	😊	😞	😞😞😞
Goals screen	😊😊😊	😊	😞	😞😞😞
Add work screen	😊😊😊	😊	😞	😞😞😞
Gallery screen	😊😊😊	😊	😞	😞😞😞
Modify work screen	😊😊😊	😊	😞	😞😞😞
Reflection screen	😊😊😊	😊	😞	😞😞😞
Pick Conference Person screen	😊😊😊	😊	😞	😞😞😞
Conference screen	😊😊😊	😊	😞	😞😞😞
Send to Showcase screen	😊😊😊	😊	😞	😞😞😞
Showcase screen	😊😊😊	😊	😞	😞😞😞
Help screens	😊😊😊	😊	😞	😞😞😞

Thank-you 😊

**E-portfolio Template System Evaluation—
Administrator and Teacher Environments
One-to-One Teacher Evaluation**

Directions to Evaluator:

- This questionnaire should take about 40 minutes to complete.
- Distribute questionnaires after participants have had an opportunity to try out the E-portfolio Template System Student Environment.
- You may read each of the questions to the participant.
- Ask the participants to respond by circling the answer or marking an "X" on their choice or recording their response in the space provided.
- Refer participant back to the specific screen being evaluated.
- Record additional comments on back of sheets.
- Verify that participants have responded to all questions.
- Verify that respondents have written their name on their questionnaire.
- The term 'computer portfolio' may be interchanged for 'electronic portfolio'.
- Collect all questionnaires at end of session.
- Remind participants that their identity will remain confidential.

Date: _____

Name: _____

Part 1—Demographics

Answer the following questions by circling your answer.

1. I am a male female.
2. I am 16-35 36+ years old.
3. I speak English French Another language.
4. I do like do not like using computers.
5. I use portfolios a lot not very much with my child.
6. I do like do not like working with portfolios.
7. I did did not use portfolio last year.
8. Paper portfolios are are not easier to use than computer portfolios.
9. Portfolios do do not help users learn better.

Part 2—Template System Usage

Indicate the degree do you agree with the following statements.

1. This tool helps me learn about portfolios.	Strongly Agree	Agree	Disagree	Strongly Disagree
2. The screens are cluttered. *	Strongly Agree	Agree	Disagree	Strongly Disagree
3. The tool is fun to use.	Strongly Agree	Agree	Disagree	Strongly Disagree
4. The tool is hard to learn to use. *	Strongly Agree	Agree	Disagree	Strongly Disagree
5. This portfolio requires too much typing. *	Strongly Agree	Agree	Disagree	Strongly Disagree
6. It is easy to get around in this E-portfolio.	Strongly Agree	Agree	Disagree	Strongly Disagree
7. The buttons are easy to understand.	Strongly Agree	Agree	Disagree	Strongly Disagree
8. The color of the screens is satisfactory.	Strongly Agree	Agree	Disagree	Strongly Disagree
9. The order of the screens is logical.	Strongly Agree	Agree	Disagree	Strongly Disagree

Part 3—Administrator and Teacher Screens

Answer the following questions about the administrator and teacher screens.

To what degree are the following screens effective for the target audience?

Administrator Screens				
Log-in	Very effective	Somewhat Effective	Ineffective	Do not know
Main	Very effective	Somewhat Effective	Ineffective	Do not know
Add School	Very effective	Somewhat Effective	Ineffective	Do not know
Modify School	Very effective	Somewhat Effective	Ineffective	Do not know
Delete School	Very effective	Somewhat Effective	Ineffective	Do not know
Add Teacher	Very effective	Somewhat Effective	Ineffective	Do not know
Modify Teacher	Very effective	Somewhat Effective	Ineffective	Do not know
Teacher screens				
Log-in	Very effective	Somewhat Effective	Ineffective	Do not know
Main	Very effective	Somewhat Effective	Ineffective	Do not know
Add Student	Very effective	Somewhat Effective	Ineffective	Do not know
Modify Student	Very effective	Somewhat Effective	Ineffective	Do not know
Delete Student	Very effective	Somewhat Effective	Ineffective	Do not know
Add Subject	Very effective	Somewhat Effective	Ineffective	Do not know
Modify Subject	Very effective	Somewhat Effective	Ineffective	Do not know
Delete Subject	Very effective	Somewhat Effective	Ineffective	Do not know
Add Question	Very effective	Somewhat Effective	Ineffective	Do not know
Modify Question	Very effective	Somewhat Effective	Ineffective	Do not know
Delete Question	Very effective	Somewhat Effective	Ineffective	Do not know
Modify Student Portfolio	Very effective	Somewhat Effective	Ineffective	Do not know

Part 4—Feedback and Recommendations

Answer the following questions about the e-portfolio tool administrator and teacher environments.

1. What do you like best about the administrator environment?

--

2. What three things would you do to make the administrator environment better?

1.
2.
3.

3. What do you like best about the teacher environment?

--

4. What three things would you do to make the teacher environment better?

1.
2.
3.

Thank-you ☺

**E-portfolio Template System Evaluation—Student Environment
One-to-One Parent Evaluation**

Directions to Evaluator:

- This questionnaire should take about 20 minutes to complete.
- Distribute questionnaires after participants have had an opportunity to try out the E-portfolio Template System Student Environment.
- You may read each of the questions to the participant.
- Ask the participants to respond by circling the answer or marking an "X" on their choice or recording their response in the space provided.
- Refer participant back to the specific screen being evaluated.
- Record additional comments on back of sheets.
- Verify that participants have responded to all questions.
- Verify that respondents have written their name on their questionnaire.
- The term 'computer portfolio' may be interchanged for 'electronic portfolio'.
- Collect all questionnaires at end of session.
- Remind participants that their identity will remain confidential.

Date: _____

Name: _____

Part 1—Demographics

Answer the following questions by circling your answer.

1. I am a male female.
2. I am 16-35 36+ years old.
3. I speak English French Another language.
4. I do like do not like using computers.
5. I use portfolios a lot not very much with my child.
6. My child likes does not like working with portfolios.
7. My child used did not use portfolios last year.
8. Paper portfolios are are not easier to use than computer portfolios.
9. I like do not like others commenting on my child's portfolio.
10. Portfolios help do not help with my child's learning.

Part 2—Template System Usage

Indicate the degree do you agree with the following statements.

1. This tool helps me learn about portfolios.	Strongly Agree	Agree	Disagree	Strongly Disagree
2. The screens are cluttered. *	Strongly Agree	Agree	Disagree	Strongly Disagree
3. The tool is fun to use.	Strongly Agree	Agree	Disagree	Strongly Disagree
4. The tool is hard to learn to use. *	Strongly Agree	Agree	Disagree	Strongly Disagree
5. This portfolio requires too much typing.*	Strongly Agree	Agree	Disagree	Strongly Disagree
6. It is easy to get around in this E-portfolio.	Strongly Agree	Agree	Disagree	Strongly Disagree
7. The buttons are easy to understand.	Strongly Agree	Agree	Disagree	Strongly Disagree
8. The color of the screens is satisfactory.	Strongly Agree	Agree	Disagree	Strongly Disagree
9. The order of the screens is logical.	Strongly Agree	Agree	Disagree	Strongly Disagree

Part 3—Student Screens

Answer the following questions about the administrator and teacher screens.

To what degree are the following screens effective for the target audience?

Administrator Screens				
Log-in	Very effective	Somewhat Effective	Ineffective	Do not know
Main	Very effective	Somewhat Effective	Ineffective	Do not know
Goals	Very effective	Somewhat Effective	Ineffective	Do not know
Add work	Very effective	Somewhat Effective	Ineffective	Do not know
Gallery	Very effective	Somewhat Effective	Ineffective	Do not know
Modify work	Very effective	Somewhat Effective	Ineffective	Do not know
Reflection	Very effective	Somewhat Effective	Ineffective	Do not know
Pick Conference Person	Very effective	Somewhat Effective	Ineffective	Do not know
Conference	Very effective	Somewhat Effective	Ineffective	Do not know
Send to Showcase	Very effective	Somewhat Effective	Ineffective	Do not know
Showcase	Very effective	Somewhat Effective	Ineffective	Do not know
Help	Very effective	Somewhat Effective	Ineffective	Do not know

Part 4—Feedback and Recommendations

Answer the following questions about the e-portfolio tool student environment.

1. What do you like best about the student environment?

--

2. What three things would you do to make the student environment better?

1.
2.
3.

Thank-you 😊

**E-portfolio Template System Evaluation—
Administrator, Teacher and Student Environments
Portfolio Expert Review Evaluation**

Directions to Evaluator:

- This questionnaire should take about 40 minutes to complete.
- Complete the questionnaire after you have had an opportunity to try out the E-portfolio Template System Administrator, Teacher and Student Environments.
- You may refer back to the individual environments to refresh your memory when completing the questionnaire.
- Please keep in mind that this template is designed for young children, aged 7-8 in (Cycle 1) Grade 2.
- Choose your response by marking an "X" on your choice or responding in the space provided, as appropriate.
- Record additional comments on back of sheets.
- Verify that you have responded to all questions in a section before moving to the next section.
- Your identity will remain confidential.

Date: _____

Name: _____

Part1—Demographics

Please provide the following information.

Gender: Male Female

Mother tongue: English French other

Occupation: grad student education professional

Years of portfolio-related experience: 0-2 3-5 6-9 10+

Use of portfolios: very little moderate extensive

Level of comfort using computers: not very moderate very comfortable

Platforms used: PC Mac PC and Mac

Part 2—E-portfolio Template System Evaluation

Please indicate the degree to which you agree with the following statements

1. Presentation/Layout/Interface Design:	Strongly Agree	Agree	Disagree	Strongly Disagree
Text is printed in font suitable for target audience.	SA	A	D	SD
Screens are free from grammar and spelling errors.	SA	A	D	SD
There is a smooth transition between screens.	SA	A	D	SD
Screens are cluttered. *	SA	A	D	SD
The icons are intuitive.	SA	A	D	SD
The divided screen (frames) is attractive.	SA	A	D	SD
The 'language level' is appropriate.	SA	A	D	SD
The presentation is attractive.	SA	A	D	SD
The template is motivating.	SA	A	D	SD

2. Usability:	Strongly Agree	Agree	Disagree	Strongly Disagree
The log-in is easy.	SA	A	D	SD
User is encouraged to interact with content.	SA	A	D	SD
User can interact with instructor or other learners.	SA	A	D	SD
The type of information to be entered is clear.	SA	A	D	SD
It is possible to move to different areas as desired.	SA	A	D	SD
It is easy correct errors after saving in database.	SA	A	D	SD
The template is slow in responding. *	SA	A	D	SD
Users are clear on what needed to be done.	SA	A	D	SD
Template is frustrating to use. *	SA	A	D	SD
Gallery screen contains all necessary information.	SA	A	D	SD

3. Learnability:	Strongly Agree	Agree	Disagree	Strongly Disagree
Screen directions are easy to follow.	SA	A	D	SD
It is easy to add work to the portfolio (text/graphics).	SA	A	D	SD
User can independently operate program.	SA	A	D	SD
User is encouraged to learn through manipulation.	SA	A	D	SD
The interaction required promotes learning.	SA	A	D	SD
User knows where they are at all times.	SA	A	D	SD
Tool was quick to learn to use.	SA	A	D	SD
There is too much typing to do. *	SA	A	D	SD
Uses learn about portfolio using this template.	SA	A	D	SD
User can develop interest in portfolio using tool.	SA	A	D	SD

4. Navigability:	Strongly Agree	Agree	Disagree	Strongly Disagree
User can exit from any screen.	SA	A	D	SD
Navigational buttons are effectively designed.	SA	A	D	SD
User can exit the program at any time.	SA	A	D	SD
User can 'go back' at any stage.	SA	A	D	SD
Transitions between screens are comfortable.	SA	A	D	SD
User can get around easily.	SA	A	D	SD
The reaction time to clicked button is adequate.	SA	A	D	SD
Processing time for database is adequate.	SA	A	D	SD
Is there an adequate level of student control.	SA	A	D	SD
User felt lost. *	SA	A	D	SD

5. Suitability:	Strongly Agree	Agree	Disagree	Strongly Disagree
Template matches interest level of target audience.	SA	A	D	SD
Expected input is appropriate for target audience.	SA	A	D	SD
Template was complex. *	SA	A	D	SD
Template was too easy. *	SA	A	D	SD
There were too many inconsistencies. *	SA	A	D	SD
Selection of image type is too narrow (.jpg or .gif). *	SA	A	D	SD
The template contains bias based on gender, culture, disability or socioeconomic status. *	SA	A	D	SD
User felt confident using tool.	SA	A	D	SD
User would recommend tool to others.	SA	A	D	SD
Collaborative learning experiences are provided for.	SA	A	D	SD

6. Feedback and Help	Strongly Agree	Agree	Disagree	Strongly Disagree
Feedback is immediate.	SA	A	D	SD
Collaborative learning experiences are provided for.	SA	A	D	SD
Feedback is motivational.	SA	A	D	SD
Use of prompts after wrong response is appropriate.	SA	A	D	SD
Error messages are helpful and friendly.	SA	A	D	SD
Help was limited. *	SA	A	D	SD
Help was accurate.	SA	A	D	SD
A printed copy of help and advice is preferred. *	SA	A	D	SD
Advice is effective.	SA	A	D	SD
Advice is accurate.	SA	A	D	SD

7. Aesthetics of interface and media quality:	Strongly Agree	Agree	Disagree	Strongly Disagree
Buttons enhance learning.	SA	A	D	SD
Buttons stimulate student interest.	SA	A	D	SD
Buttons are appropriate for target audience.	SA	A	D	SD
Color of screen is attractive.	SA	A	D	SD
Placement of icons is appropriate.	SA	A	D	SD
Buttons are easy to understand and use.	SA	A	D	SD
Buttons are located consistently through the program.	SA	A	D	SD
Metaphores used for buttons are easy to understand.	SA	A	D	SD
Font colors are used consistently.	SA	A	D	SD
The interface is aesthetically pleasing.	SA	A	D	SD

8. Student's Task Completion	Strongly Agree	Agree	Disagree	Strongly Disagree
With this E-portfolio Template System Environment students can...				
analyze the task to be performed.	SA	A	D	SD
begin the process.	SA	A	D	SD
analyze his/her procedure.	SA	A	D	SD
perform the task.	SA	A	D	SD
master the technologies.	SA	A	D	SD
evaluate their use of the technologies.	SA	A	D	SD
use technologies to carry out a task.	SA	A	D	SD

Part 3-Portfolio Process

Indicate the degree to which you agree with the following statements, based on your knowledge of current portfolio practices and research.

1. Instructional strategies are based on current research.

Strongly Agree	Agree	Disagree	Strongly Disagree
-------------------	-------	----------	----------------------

2. The purpose of the template as a process and showcase portfolio is clear.

Strongly Agree	Agree	Disagree	Strongly Disagree
-------------------	-------	----------	----------------------

3. The purpose is appropriate to the learner's needs.

Strongly Agree	Agree	Disagree	Strongly Disagree
-------------------	-------	----------	----------------------

4. The content is written clearly for the target audience.

Strongly Agree	Agree	Disagree	Strongly Disagree
-------------------	-------	----------	----------------------

5. The content is presented in learnable 'chunks'.

Strongly Agree	Agree	Disagree	Strongly Disagree
-------------------	-------	----------	----------------------

6. The content reflects key principles of the portfolio process.

Strongly Agree	Agree	Disagree	Strongly Disagree
-------------------	-------	----------	----------------------

7. The reading level is appropriate for target audience.

Strongly Agree	Agree	Disagree	Strongly Disagree
-------------------	-------	----------	----------------------

8. The scope of the content is appropriate for the target audience.

Strongly Agree	Agree	Disagree	Strongly Disagree
-------------------	-------	----------	----------------------

9. The template is useful in terms of learning about portfolios.

Strongly Agree	Agree	Disagree	Strongly Disagree
-------------------	-------	----------	----------------------

10. The student is provided with a constructivist environment in which she/he can self-evaluate and conference with others on his/her work.

Strongly Agree	Agree	Disagree	Strongly Disagree
-------------------	-------	----------	----------------------

11. This template provides an environment in which students learn through a purposeful collection of work exhibiting their efforts, progress and achievements.

Strongly Agree Agree Disagree Strongly Disagree

12. This template provides an environment in which a student is an active learner and seeker of knowledge, taking responsibility for his/her learning.

Strongly Agree Agree Disagree Strongly Disagree

13. This template allows students to learn about portfolio, technology and pursue their day-to-day curriculum under the guidance of their teacher.

Strongly Agree Agree Disagree Strongly Disagree

14. This template is, overall, flawed in terms of pedagogy, methodology and design.*

Strongly Agree Agree Disagree Strongly Disagree

Part 4—Environment Feedback

Indicate the degree to which you agree with the following statements based on your perceptions of each of the three environments you reviewed.

Administrator Environment				
	Strongly Agree	Agree	Disagree	Strongly Disagree
1. The environment provides for flexibility in terms of user needs				
2. Instructions in the environment are clear	SA	A	D	SD
3. The environment transfers authority to teachers	SA	A	D	SD
4. There were no surprises	SA	A	D	SD
Teacher Environment				
	Strongly Agree	Agree	Disagree	Strongly Disagree
1. The environment provides for flexibility in terms of user needs				
2. Instructions in the environment are clear	SA	A	D	SD
3. Allows for teacher autonomy	SA	A	D	SD
4. There were no surprises	SA	A	D	SD
Student Environment				
	Strongly Agree	Agree	Disagree	Strongly Disagree
1. The environment provides for flexibility in terms of user needs				
2. Instructions in the environment are clear	SA	A	D	SD
3. Provides a student-centered environment	SA	A	D	SD
4. There were no surprises	SA	A	D	SD

Part 5—Recommendations

Provide answers to the following:

Student Environment

I would recommend the following three things to improve the student environment:

1. _____

2. _____

3. _____

Teacher Environment

I would recommend the following three things to improve the teacher environment:

1. _____

2. _____

3. _____

Administrator Environment

I would recommend the following three things to improve the administrator environment:

1. _____

2. _____

3. _____

Part 6—Screen Feedback

Please provide a brief constructive comment on each of the following screens. Consider either what you like best or least.

Administrator Screens	Strength(s)	Weakness(es)
Log-in		
School		
Teacher		

Teacher Screens	Strength(s)	Weakness(es)
Log-in		
Student		
Subject		
Questions		
Student Portfolio		

Student Screens	Strength(s)	Weakness(es)
Log-in		
Goals		
Add work		
Gallery		
Modify work		
Reflection		
Conference pick person		
Conference form		

Export to showcase		
Showcase		
Help		

Part 7—MEQ Methodological Competencies Facilitation

Place a check mark in the column that represents the degree to which you believe the e-portfolio template system's student environment facilitates the student's ability to attain the following key features of the two competencies presented.

1 To adopt effective work methods

Key Features of the Competency	absolutely	somewhat	not at all
To analyze the task to be performed.			
To espouse the objectives.			
To understand the instructions and visualize the elements of the task.			
To understand the context of the task.			
To begin the process.			
To reflect, before and during the action, on the best way to attain the objective.			
To adapt his/her work method to the task and the context.			
To anticipate the requirements of the method chosen and the resources that will be needed.			
To use his/her imagination.			
To analyze his/her procedure.			
To examine the procedure used through out the task.			
To understand what was effective and what worked less well.			
To draw conclusions.			
To perform the task.			
To make use of the appropriate resources: people, materials, etc.			
To manage his/her materials and time and to adjust his/her actions as required.			
To complete the task.			
To discover the pleasure and satisfaction of work completed and well done.			

2 To use Information and Communications Technologies (ICT)

Key Features of the Competency	absolutely	somewhat	not at all
To master the information and communications technologies.			
To be familiar with the purposes, concepts, vocabulary, procedures and techniques of ICT.			
To recognize familiar concepts in a new context.			
To explore new functions of software programs and operating systems.			
To evaluate his/her use of information and communications technologies.			
To recognize his/her successes and difficulties.			
To identify the limitations of the technology employed in a given situation.			
To identify ways to improve his/her use of ICT.			
To use information and communications technologies to carry out a task.			
To explore the potential of ICT for a given task.			
To choose software programs and functions appropriate for the task.			
To use appropriate working and troubleshooting strategies.			

Thank-you ☺

**E-portfolio Template System Evaluation—Installation
Technical Expert Review Evaluation**

Directions to Evaluator:

- This questionnaire should take about 10 minutes to complete.
- Complete the questionnaire once you have had an opportunity to try out the installation procedures for the E-portfolio Template System.
- Choose your response by marking an "X" on your choice or responding in the space provided, as appropriate.
- Record additional comments on back of sheet.
- Verify that you have responded to all questions.
- Your identity will remain confidential.

Date: _____

Name: _____

Part1—Demographics

Please provide the following information.

Gender: Male Female

Mother tongue: English French other

Occupation: grad student education professional

Level of comfort using computers: not very moderate very comfortable

Platforms used: PC Mac PC and Mac

Installation of applications: frequent not very often never

Part 2—Installation Feedback

Please answer the following questions regarding the installation of the E-portfolio Template System and the set-up of a school and teacher in the administrator environment by indicating your choice in the appropriate box.

Installation and Set-up Process

Installation was hassle-free.	True	False
Installation took longer than expected. *	True	False
Installation required a lot of unnecessary extra steps. *	True	False
I had to rely on my own knowledge to complete installation. *	True	False
Set-up of a school was easily accomplished.	True	False
Set-up of a teacher was easily accomplished.	True	False

Documentation Materials

The necessary technical documentation was included.	True	False
The directions were logically organized.	True	False
The directions were easily understood.	True	False
Hardware and software requirements were clearly stated.	True	False
The content was clearly written.	True	False
The content was accurate.	True	False
Spelling, punctuation, and grammar were correct.	True	False
Documentation materials were effective.	True	False
I would prefer printed directions for the set-up of the school. *	True	False
I would prefer printed directions for the set-up of the teacher. *	True	False

Part 3—Recommendations

Provide answers to the following:

I would recommend the following three things to improve the installation process:

1. _____

2. _____

3. _____

I would recommend the following three things to improve the set-up process:

1. _____

2. _____

3. _____

I would recommend the following three things to improve the documentation:

1. _____

2. _____

3. _____

Thank-you ☺

Appendix G – Sample Observation Data Collection Instruments

One-to-One Student/Small Group Observation
One-to-One Parent/Teacher Observation

E-portfolio Environment Evaluation Observation Form —One-to-one Student and Small Group Evaluations

Date: _____ Participant's Name: _____

Evaluation Type: One-to-one Small Group

Start Time: _____ End Time: _____

Participant had difficulty working with tool. True False

Indicate the order in which participants access the following screens.

Log-in	1	Conference pick person	
Goals		Conference form	
Add work		Export to showcase	
Gallery		Showcase	
Modify work		Help	
Reflection			

Participant experienced difficulty with (Describe nature of the problem):

Comments

E-portfolio Environment Evaluation Observation Form —One-to-one Parent and Teacher Evaluations

Date: _____ Participant's Name: _____

Start Time: _____ End Time: _____

Environment: Administrator Teacher Student

Participant had difficulty working with tool. True False

Indicate the order in which participants access the following screens.

Student Screens		Administrator Screens	
Log-in	1	Log-in	1
Goals		School	
Add work		Teacher	
Gallery			
Modify work		Teacher Screens	
Reflection		Log-in	1
Conference pick person		Student	
Conference form		Subject	
Export to showcase		Questions	
Showcase		Student Portfolio	
Help			

Participant experienced difficulty with (Describe nature of the problem):

Comments

Appendix H – Sample Interview Data Collection Instruments

Small Group Focus Group

One-to-One Parent and Teacher Interview

Portfolio Expert Interview

Technical Expert Interview

Small Group Evaluation—Student Focus Group Questions

Record any feedback given by participants to the following questions.

Participants present at Focus Group:

1. What do you like best about this e-portfolio tool?

Participant 1	Participant 2	Participant 3

2. What would you do to make the e-portfolio tool be better?

Participant 1	Participant 2	Participant 3

3. Why would you like to use this e-portfolio tool?

Participant 1	Participant 2	Participant 3

4. How would this e-portfolio tool help you conference on your portfolio?

Participant 1	Participant 2	Participant 3

5. How would this e-portfolio tool help you reflect on your portfolio work?

Participant 1	Participant 2	Participant 3

6. Have you seen any other e-portfolio templates?

Participant 1 Yes No

Participant 2 Yes No

Participant 3 Yes No

7. How does this e-portfolio template compare to any others you have seen?

Participant 1	Participant 2	Participant 3

Questions generated from Observations

8. Can you tell me about the difficulty you encountered with the (specify area) of the student environment? Refer student to look again to environment if necessary.

Participant	Area of Difficulty	Why was it difficult?	How might be improved?

9. Record any other questions that arise from the observation and their responses.

Questions generated from Questionnaires

10. Record any other questions that arise from the questionnaires and their responses.

Thank-you 😊

One-to-one Evaluation—Parent and Teacher Interviews

Record any feedback given by participants to the following questions.

Participant: _____

1. What do you like best about this e-portfolio tool?

2. What would you do to make the e-portfolio tool be better?

3. Why would you like your child / student to use this e-portfolio tool?

4. How would this e-portfolio tool help you conference on your child's / student's portfolio?

5. How would this e-portfolio tool help you conference on your child's / student's portfolio from home?

6. Have you seen any other e-portfolio templates? Yes No

6a. Can you name and describe them?

Tool	Description

7. How does this e-portfolio template compare to any others you have seen?

8. Questions generated from Observations

8. Questions generated from Questionnaires

Thank-you ☺

One-to-One Evaluation—Student Focus Group Questions

Record any feedback given by participants to the following questions.

Participant: _____

1. What do you like best about this e-portfolio tool?

2. What would you do to make the e-portfolio tool be better?

3. Why would you like to use this e-portfolio tool?

4. How would this e-portfolio tool help you conference on your portfolio?

5. How would this e-portfolio tool help you reflect on your portfolio work?

6. Have you seen any other e-portfolio templates? Yes No

7. How does this e-portfolio template compare to any others you have seen?

Questions generated from Observations

8. Can you tell me about the difficulty you encountered with the (specify area) of the student environment? Refer student to look again at environment if necessary.

Area of Difficulty	Why was it difficult?	How might be improved?

9. Record any other questions that arise from the observation and their responses.

Questions generated from Questionnaires

10. Record any other questions that arise from the questionnaires and their responses.

Thank-you ☺

**E-portfolio Template System Evaluation—
Portfolio Expert Review Interview**

Participant: _____

1. Tell me about your experience evaluating this template system.

2. Listen to the list of recommended changes to the Administrator Environment. Place them in order of priority. (List will be compiled for all portfolio expert evaluations.)

3. Listen to the list of recommended changes to the Teacher Environment. Place them in order of priority. (List will be compiled for all portfolio expert evaluations.)

4. Listen to the list of recommended changes to the Student Environment. Place them in order of priority. (List will be compiled for all portfolio expert evaluations.)

5. Please elaborate on your choices of recommendations for the

Administrator Environment
Teacher Environment
Student Environment

6. Record questions arising from completion of questionnaire and respective responses.

**E-portfolio Template System Evaluation—
Technical Expert Review Interview**

Participant: _____

1. Tell me about the installation process, what steps did you follow.

2. Listen to the list of recommended changes to the installation process. Place them in order of priority. (List will be compiled for all technical expert evaluations.)

3. Please elaborate on your choices of recommendations for the

Installation
Set-up
Documentation

4. Record questions arising from completion of questionnaire and respective responses.

Appendix I – Consent Forms and Introductory Letters to Participate in Research

Letter of Introduction

E-Portfolio Template System Participant Consent Form—Expert Review

E-Portfolio Template System Participant Consent Form—One-to-one Parent and Teacher Evaluation

E-Portfolio Template System Student Participant Consent Form—One-to-One Student and Small Group Evaluations

Letter of Introduction to Parents for Attainment of Permission to Allow their Child to Participate in Study

E-Portfolio Template System Parental Consent of Child's Participation Consent Form—One-to-One Student and Small Group Evaluations

March 11, 2002

Dear Participant,

A prototype of an electronic process portfolio template has recently been developed for Cycle 1 students in the Quebec school system. This prototype is being developed by the researcher, with support of the CSLP at Concordia University.

A formative evaluation of the product is being conducted to ensure the quality of the product. I am requesting your participation in this evaluation, as your input will make a valuable contribution to the product's development.

Should you agree to participate in this evaluation please sign the attached consent form. As a participant, you will be asked to try out the prototype and then complete a questionnaire and participate in a brief interview.

I am conducting this research to fulfill the requirements of my Master's Thesis under the supervision of Dr. Allyson Hadwin. The data gathered from this study will be published in a thesis. Your identity will be protected by replacing your name with a pseudonym. Additionally, any data which is unique in nature and which may inadvertently allow your identity to be known will not be published. You may choose to discontinue at any time, without consequence, by telling me, your child's teacher or my supervisor. Our contact information follows.

If you have any questions about this research study, please do not hesitate to contact me at (514) 934-2559 or Dr. Hadwin at (514) 848-2022. Your participation is greatly appreciated and valued. Please consider your decision carefully.

Sincerely,

Jane Costello
M.A. Candidate, Educational Technology
Concordia University
jane.costello@education.concordia.ca

E-Portfolio Template System Participant Consent Form—Expert Review

This is to state that I agree to participate in a program of research being conducted by Jane Costello of the Education Department of Concordia University.

A. Purpose

I have been informed that the purpose of the research is as follows: to evaluate the content, usability and interface of the E-portfolio Template System, a prototype database-driven web-based process portfolio environment.

B. Procedures

The following procedures will be used in evaluating this prototype:

- The evaluation will take place in my own office/environment.
- The researcher will provide access to the E-portfolio template system by giving me an URL and a unique user name and password.
- The participant (I) will be asked to spend approximately 60 minutes completing the evaluation of the prototype.
- I will be asked to try out the prototype.
- I will be asked to complete a questionnaire at the end of the study.
- I will be asked to respond to a series of brief questions about use of the prototype.
- This interview will be tape recorded to ensure accuracy of details.
- I will be permitted to take breaks between tasks.

C. Conditions of participation

- I understand that I will not be physically or psychologically harmed in any way.
- I understand that I am free to withdraw my consent and discontinue my participation at anytime without negative consequences.
- I understand that my participation in this study is voluntary.
- I understand that my name and results will remain confidential. Steps will be taken to protect my identity: my name will be replaced with a pseudonym, my name will not be published nor will any data which is unique in nature and which may inadvertently allow my identity to be known.
- I understand that the data from this study may be published and that I have the right to view the results at any time in the future.

I have carefully studied the above and understand this agreement. I freely consent and voluntarily agreed to participate in this study to be conducted March-April, 2002.

Date: _____

Name: _____

Signature: _____

(Note: if you are under 18 years of age, you must ask a legal guardian to sign.)

E-Portfolio Template System Participant Consent Form—One-on-one Parent and Teacher Evaluation

This is to state that I agree to participate in a program of research being conducted by Jane Costello of the Education Department of Concordia University.

A. Purpose

I have been informed that the purpose of the research is as follows: to evaluate the content, usability and interface of the E-portfolio Template System, a prototype database-driven web-based process portfolio environment.

B. Procedures

The following procedures will be used in evaluating this prototype:

- The evaluation will take place in a school environment similar to an authentic user environment.
- The participant (I) will be asked to spend approximately 40 minutes completing the evaluation of the prototype.
- I will be asked to try out the prototype.
- I will be observed by the researcher while using the prototype.
- I will be asked to complete a questionnaire at the end of the study.
- I will be asked to respond to a series of brief questions about use of the prototype.
- This interview will be tape recorded to ensure accuracy of details.
- I will be permitted to take breaks between tasks.

C. Conditions of participation

- I understand that I will not be physically or psychologically harmed in any way.
- I understand that I am free to withdraw my consent and discontinue my participation at anytime without negative consequences.
- I understand that my participation in this study is voluntary.
- I understand that my name and results will remain confidential. Steps will be taken to protect my identity: my name will be replaced with a pseudonym, my name will not be published nor will any data which is unique in nature and which may inadvertently allow my identity to be known.
- I understand that the data from this study may be published and that I have the right to view the results at any time in the future.

I have carefully studied the above and understand this agreement. I freely consent and voluntarily agreed to participate in this study to be conducted March-April, 2002.

Date: _____

Name: _____

Signature: _____

(Note: if you are under 18 years of age, you must ask a legal guardian to sign.)

**E-Portfolio Template System Student Participant Consent Form—One-on-One
Student ad Small Group Evaluations**

This is to state that I agree to participate in a program of research being conducted by Jane Costello of the Education Department of Concordia University.

A. Purpose

I have been informed that the purpose of the research is as follows: to evaluate the content, usability and interface of the E-portfolio Template System, a prototype database-driven web-based process portfolio environment.

B. Procedures

The following procedures will be used in evaluating this prototype:

- The evaluation will take place in a school environment similar to an authentic user environment.
- The participant (I) will be asked to spend approximately 20 minutes completing the evaluation of the prototype.
- I will be asked to try out the prototype.
- I will be observed by the researcher while using the prototype.
- I will be asked to complete a questionnaire at the end of the study.
- I will be asked to respond to a series of brief questions about use of the prototype.
- This interview will be tape recorded to ensure accuracy of details.
- I will be permitted to take breaks between tasks.

C. Conditions of participation

- I understand that I will not be physically or mentally harmed in any way.
- I understand that I can quit anytime without negative reactions.
- I understand that my participation in this study is my choice.
- I understand that my name and results will remain confidential. Steps will be taken to protect my identity: my name will be replaced with a pseudonym, my name will not be published nor will any data which is unique in nature and which may inadvertently allow my identity to be known.
- I understand that the data from this study may be published and that I have the right to view the results at any time in the future.

I have carefully studied the above and understand this agreement. I freely consent and voluntarily agreed to participate in this study to be conducted March-April, 2002.

Date: _____

Name: _____

Signature of Parent: _____

(Note: if you are under 18 years of age, you must ask a legal guardian to sign.)

March 11, 2002

Dear Parent,

A prototype of an electronic process portfolio template has recently been developed for Cycle 1 students in the Quebec school system. This prototype is being developed by the researcher, with support of the CSLP at Concordia University.

A formative evaluation of the product is being conducted to ensure the quality of the product. I am requesting your permission to allow your child to participate in this evaluation, as your child's input will make a valuable contribution to the product's development.

Should you agree to allow your child to participate in this evaluation please sign the attached consent form. As a participant, your child will be asked to try out the prototype and then complete a questionnaire and participate in a brief interview.

I am conducting this research to fulfill the requirements of my Master's Thesis under the supervision of Dr. Allyson Hadwin. The data gathered from this study will be published in a thesis. Your child's identity will be protected by replacing his or her name with a pseudonym. Additionally, any data which is unique in nature and which may inadvertently allow the identity of your child to be known will not be published. You, or your child, may choose to discontinue at any time, without consequence, by telling me, my supervisor or your child's teacher. Your child may ask you to do so on his or her behalf. Our contact information follows.

If you have any questions about this research study, please do not hesitate to contact me at (514) 934-2559 or Dr. Hadwin at (514) 848-2022. Your participation is greatly appreciated and valued. Please consider your decision to allow your child to participate carefully.

Sincerely,

Jane Costello
M.A. Candidate, Educational Technology
Concordia University
jane.costello@education.concordia.ca

E-Portfolio Template System Parental Consent of Child's Participation Consent Form—One-on-One Student and Small Group Evaluations

This is to state that I agree to allow my child to participate in a program of research being conducted by Jane Costello of the Education Department of Concordia University.

A. Purpose

My child and I have been informed that the purpose of the research is as follows: to evaluate the content, usability and interface of the E-portfolio Template System, a prototype database-driven web-based process portfolio environment.

B. Procedures

The following procedures will be used in evaluating this prototype:

- The evaluation will take place in a school environment similar to an authentic user environment.
- My child will be asked to spend approximately 20 minutes completing the evaluation of the prototype.
- My child will be asked to try out the prototype.
- My child will be observed by the researcher while using the prototype.
- My child will be asked to complete a questionnaire at the end of the study.
- My child will be asked to respond to a series of brief questions about use of the prototype.
- My child will be tape recorded to ensure accuracy of details.
- My child will be permitted to take breaks between tasks.

C. Conditions of participation

- I understand that my child will not be physically or psychologically harmed in any way.
- I understand that my child is free to withdraw my consent and discontinue my participation at anytime without negative consequences.
- I understand that my child's participation in this study is voluntary.
- I understand that my child's name and results will remain confidential. Steps will be taken to protect my child's identity: his/her name will be replaced with a pseudonym, his/her name will not be published nor will any data which is unique in nature and which may inadvertently allow his/her identity to be known.
- I understand that the data from this study may be published and that I, or my child, have the right to view the results at any time in the future.

I have carefully studied the above and understand this agreement. I freely consent and voluntarily agreed to allow my child to participate in this study to be conducted March-April, 2002.

Date: _____

Name of Child: _____

Name: _____

Signature of Parent: _____

(Note: if you are under 18 years of age, you must ask a legal guardian to sign.)

Appendix J – Directions to Expert Reviewers

Directions for Portfolio Expert Reviews

You will need the following things:

1. A computer with Internet access.
2. Internet explorer to access the site. (The template system does not function as expected in Netscape Composer due to incompatibility issues.)
3. Access to two to three (2-3) image files. (The template system only accepts .jpg or .gif files at this time.)
4. A pen or pencil to complete the questionnaire.

To access the E-portfolio Template Environment System

1. To go the following URL: <http://www.portfoli.brinkster.net>
2. Access codes for the environment(s) you are evaluating are as follows:
(this will be provided to each evaluator)

	Administrator	Teacher	Student
Username:	eportf~	Pxone	Sally
Password:	admini~	one	dog

Notes:

Please feel free to create a teacher or student account. However, please do not delete any accounts that you yourself do not set-up. There are nineteen (19) evaluators using this system each with their own unique username and passwords.

Please contact me should you encounter any difficulties at 848-4007, 934-2559 or jane.costello@education.concordia.ca

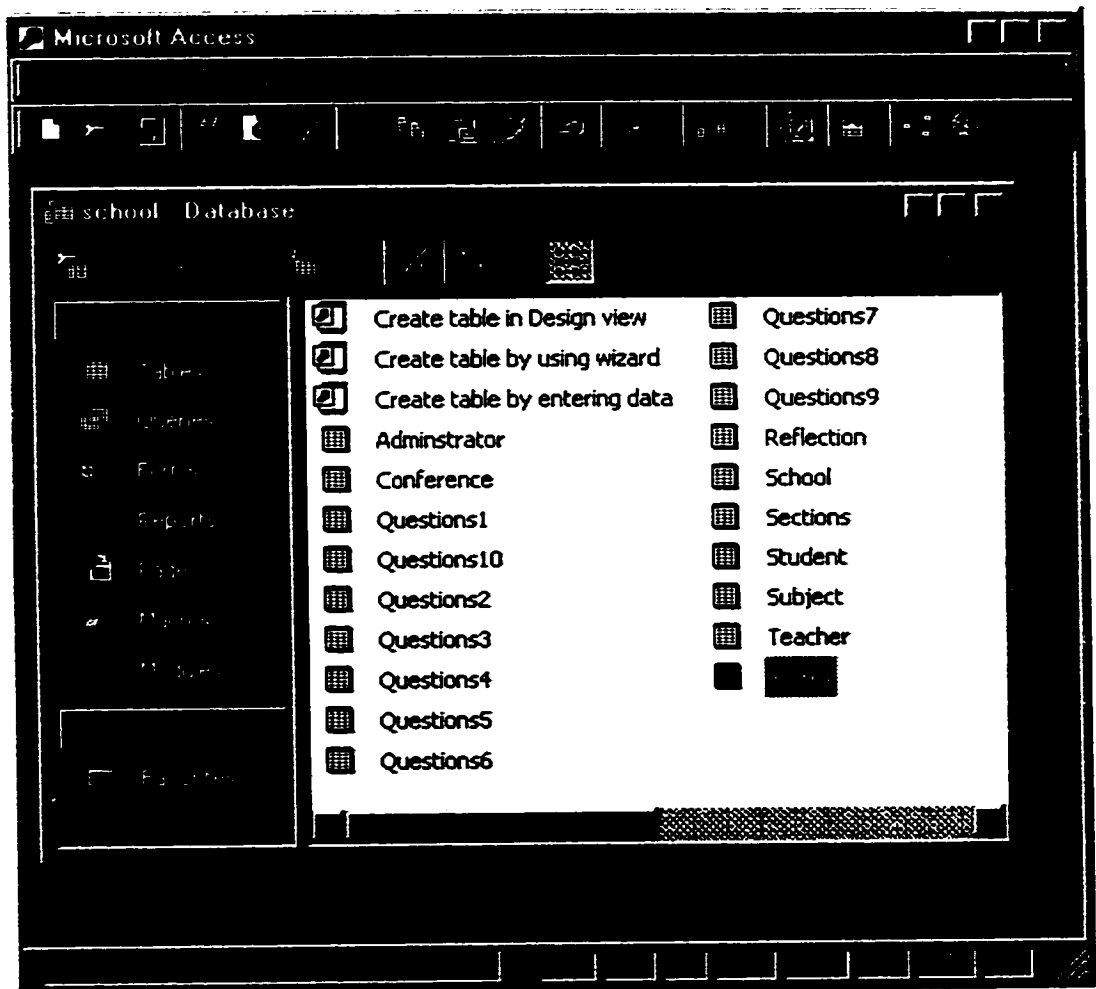
Please contact me once you have completed the evaluation questionnaire to arrange pick-up.

Thank-you very much for participating,

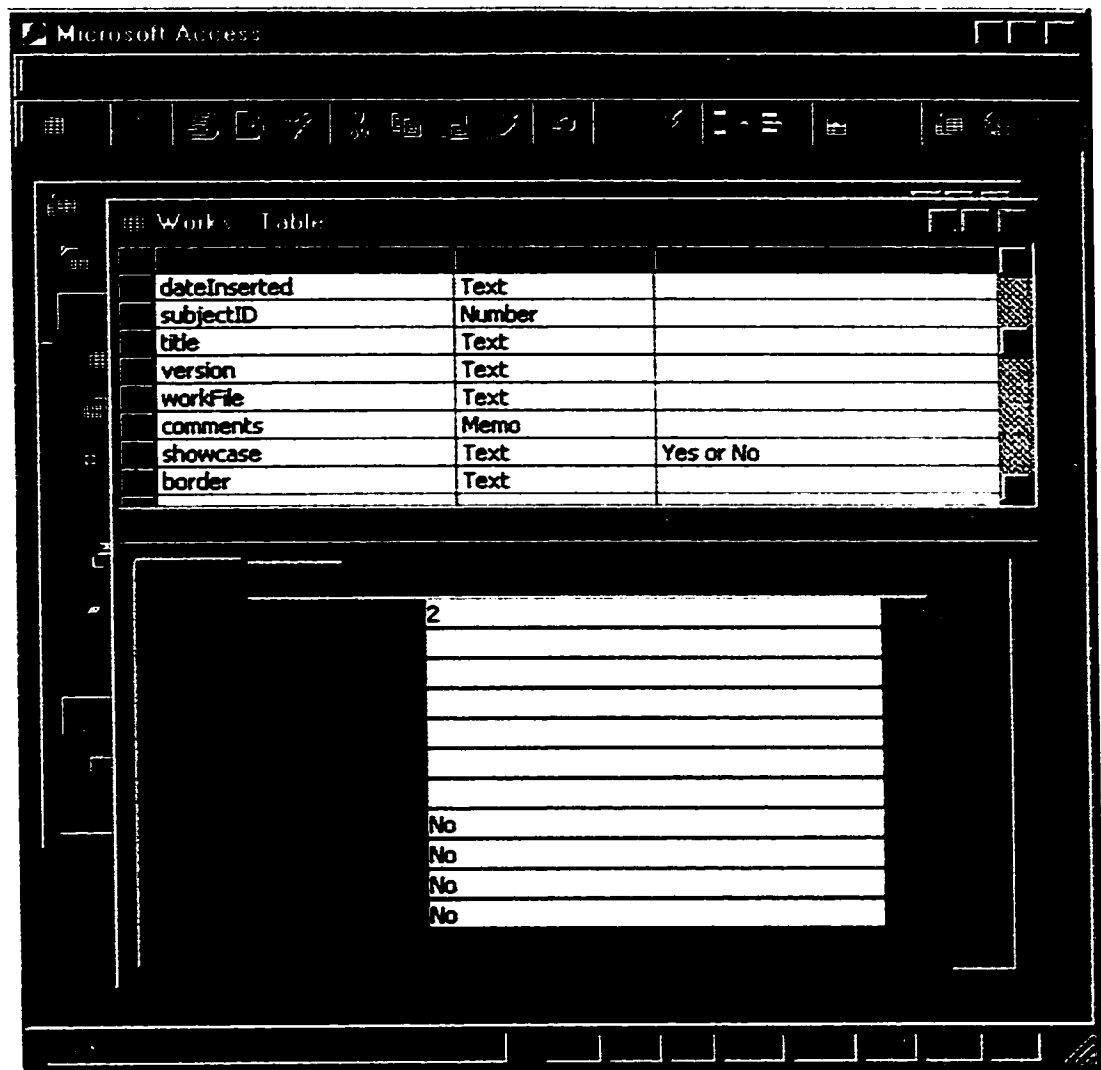
Jane Costello

Installation Instructions for Technical Experts

1. Copy the files from the *French* or *English* folder to the server.
2. If you already have the e-Portfolio tool and want to keep the student works and other data that has previously been entered into the system, do not overwrite the contents of the **DB** or **StudentWork** directories. Keep these files and update all others. However, one table in the *School.mdb* file has changed. This can be altered in your existing database file to match with the new version while maintaining your current data:
 - a. Open the *School.mdb* file in MS Access 2000 or XP.
 - b. In the Tables view, select the **Works** table.



- c. Click the **Design** button.



- d. Scroll to the last *Field* in the list and add a new one after it called **border**. This field will have a **Text Data Type** with a *Field Size* of **2**.
 - e. Click the **Save** button and close the table design window.
 - f. The *School.mdb* database can now be placed on the server in the DB folder.
3. Database connections: The two .asp files in the Connections directory should be pointing to the directory in which the School and Help databases are located.

In *connSchool.asp*, there will be a line that looks like this:

```
MM_connSchool_STRING = "DRIVER={Microsoft Access Driver (*.mdb)}; DBQ=" &
Server.MapPath("DB/school.mdb")
```

In *connHelp.asp*, there will be a line that looks like this:

```
MM_connSchool_STRING = "DRIVER={Microsoft Access Driver (*.mdb)}; DBQ=" &
Server.MapPath("DB/help.mdb")
```

If you will be keeping the database in the default location (the DB folder within the portfolio directory), then you do not need to change either of these files.

If you will be keeping the database in a directory that is not in the website's main folder (ie. on a different disk, or network share) Replace *DBQ=" & Server.MapPath("DB/school.mdb")* by the path of the Access .mdb file you will be using, e.g.: *DBQ=c:\datafolder\school.mdb"*.

Therefore, the line in *connHelp.asp* would look like this:

```
MM_connSchool_STRING = "DRIVER={Microsoft Access Driver (*.mdb)};
DBQ=c:\datafolder\help.mdb"
```

And the line in *connSchool.asp* would look like this:

```
MM_connSchool_STRING = "DRIVER={Microsoft Access Driver (*.mdb)};
DBQ=c:\datafolder\school.mdb"
```

4. Users must have permission to write in the *DB* folder and on the .mdb files within it (make sure files are not read-only -> Right-click on the files, select Properties, make sure that the Read Only box is not checked).
5. Users must have Write access to the *StudentWork* folder.
6. For French and English sites, the administrator information are:
 Login: administ~
 Password: eportf~

Appendix K – Coding Scheme Employed in Data Analysis

Interface Design (D)

Text is printed in font suitable for target audience.
Screens are free from grammar and spelling errors.
There is a smooth transition between screens.
Screens are cluttered.
The icons are intuitive.
The divided screen (frames) is attractive.
The 'language level' is appropriate.
The presentation is attractive.
The template is motivating.
Buttons are easy to understand.

Usability (U)

The log-in is easy.
User is encouraged to interact with content.
User can interact with instructor or other learners.
The type of information to be entered is clear.
It is possible to move to different areas as desired.
It is easy correct errors after saving in database.
The template is slow in responding.
Users are clear on what needed to be done.
Template is frustrating to use.
Template is fun to use.
Gallery screen contains all necessary information.

Learnability (L)

Screen directions are easy to follow.
It is easy to add work to the portfolio (text/graphics).
User can independently operate program.
User is encouraged to learn through manipulation.
The interaction required promotes learning.
User knows where they are at all times.
Tool was quick to learn to use.
There is too much typing to do.
Users learn about portfolio using this template.
User can develop interest in portfolio using tool.

Navagibility (N)

User can exit from any screen.
Navigational buttons are effectively designed.
User can exit the program at any time.
User can 'go back' at any stage.
Transitions between screens are comfortable.
User can get around easily.
The reaction time to clicked button is adequate.
Processing time for database is adequate.

Is there an adequate level of student control.
User felt lost.

Suitability (S)

Template matches interest level of target audience.
Expected input is appropriate for target audience.
Template was complex.
Template was too easy.
There were too many inconsistencies.
Selection of image type is too narrow (.jpg or .gif).
The template contains bias based on gender, culture, disability or socioeconomic status.
User felt confident using tool.
User would recommend tool to others.
Collaborative learning experiences are provided for.
Too much typing is required.

Feedback and Help (H)

Feedback is immediate.
Collaborative learning experiences are provided for.
Feedback is motivational.
Use of prompts after wrong response is appropriate.
Error messages are helpful and friendly.
Help was limited.
Help was accurate.
A printed copy of help and advice is preferred.
Advice is effective.
Advice is accurate.

Aesthetics (A)

Buttons enhance learning.
Buttons stimulate student interest.
Buttons are appropriate for target audience.
Color of screen is attractive.
Placement of icons is appropriate.
Buttons are easy to understand and use.
Buttons are located consistently through the program.
Metaphores used for buttons are easy to understand.
Font colors are used consistently.
The interface is aesthetically pleasing.

Pedagogy (P)

Portfolio process.
Learning strategy.
Learning theory.
Instructional events.
Learning outcomes.

Appendix L – Screen Shots of Sample Problem Areas in Template System

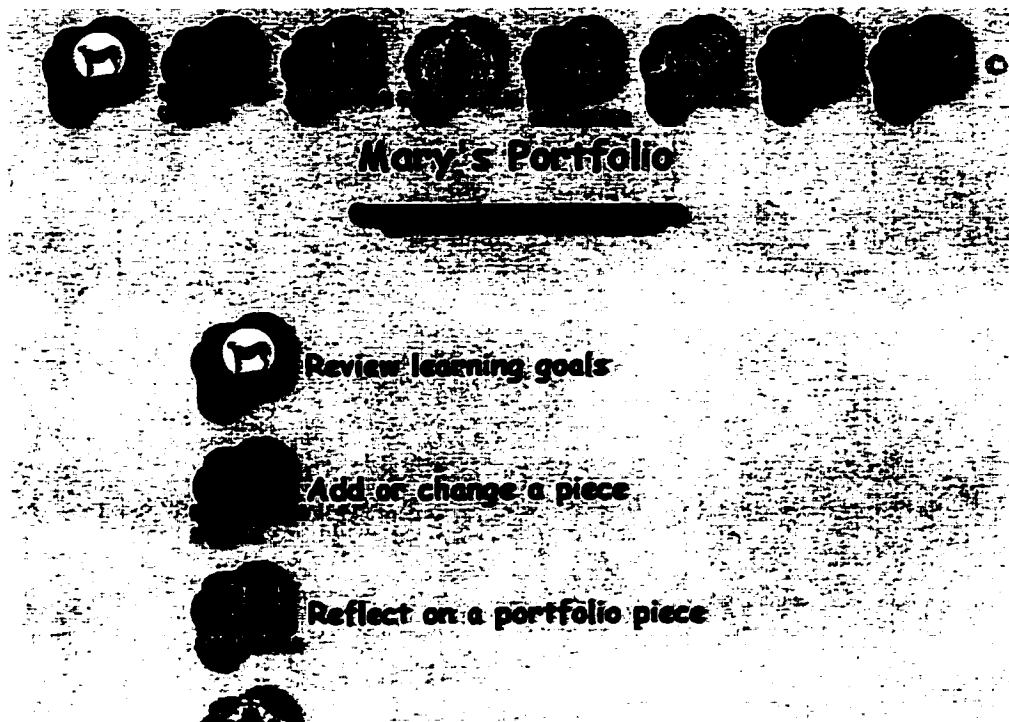


Figure 7. Problem regarding redundancy of navigational buttons on main screen in student environment.

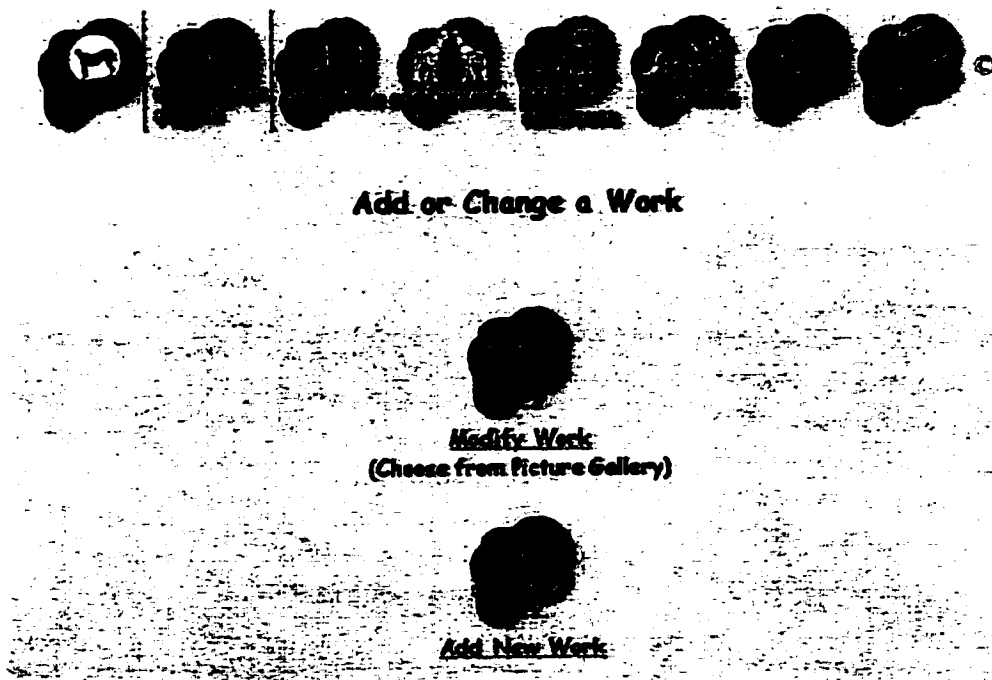


Figure 8. Problem regarding placement and wording of 'add' and 'modify' buttons in student environment.

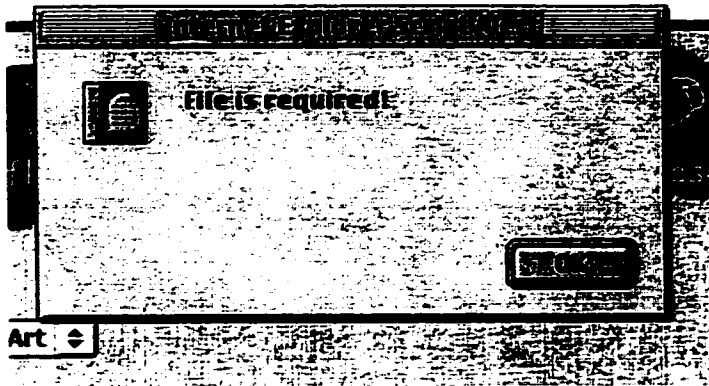


Figure 9. Problem with insufficient directions to remedy uploading image problem on error message dialog in student environment.

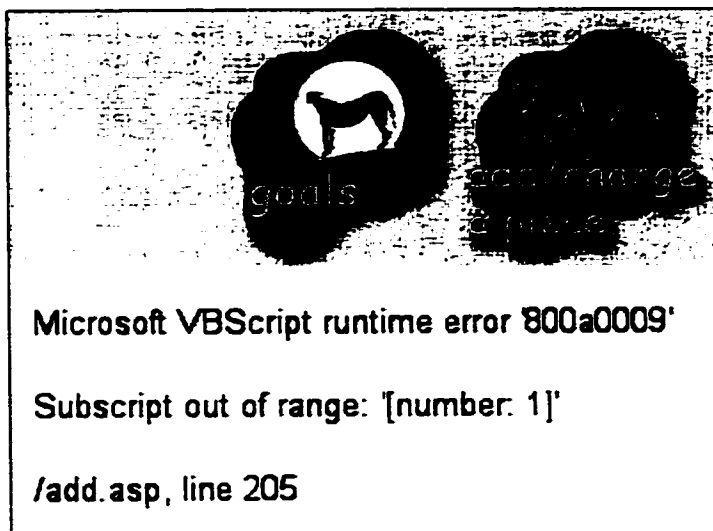


Figure 10. Technical glitch encountered when attempting to add unacceptable file type to database in student environment.

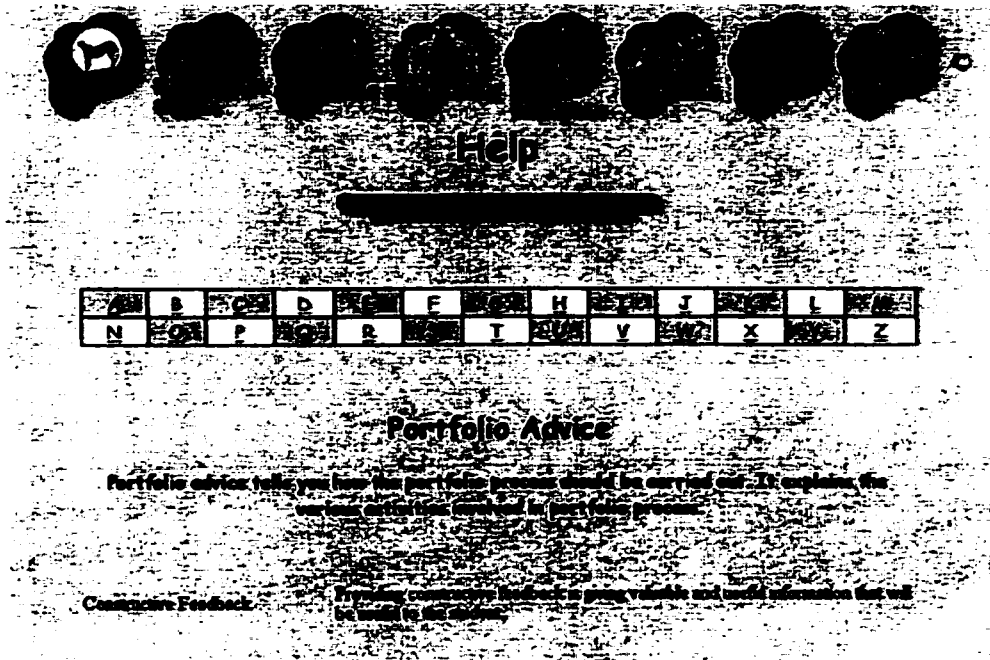


Figure 11. Problem with design of 'help', alphabet was deemed too small and insufficient in student environment.

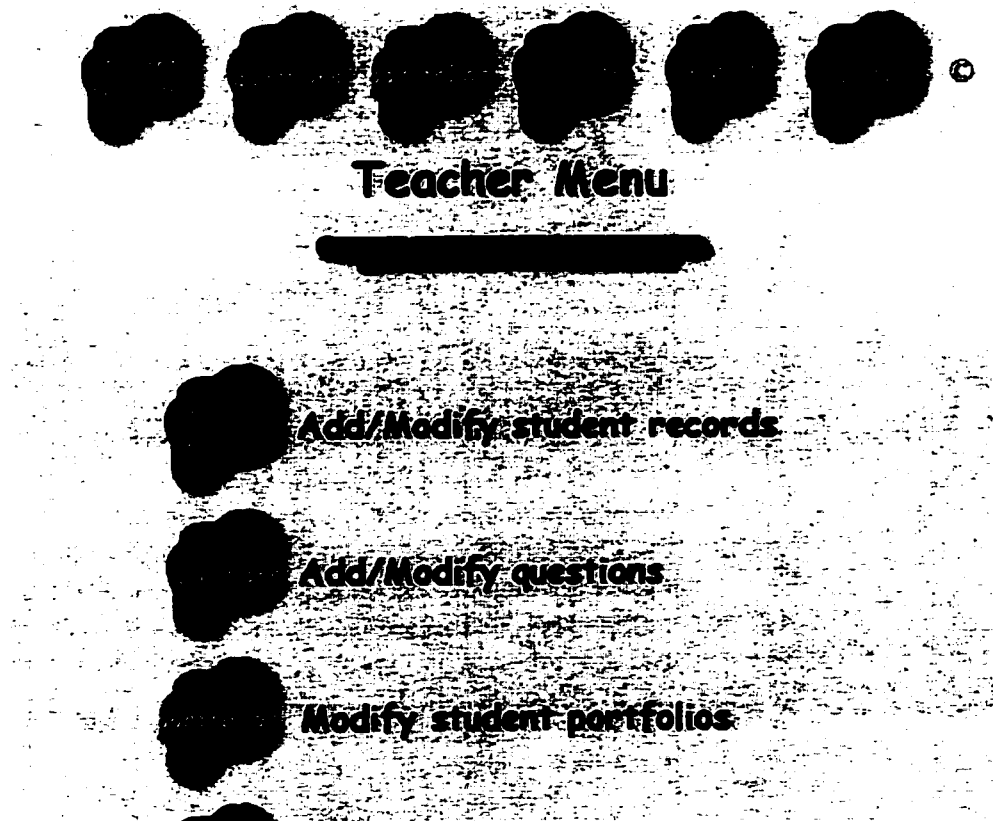


Figure 12. Problem with absence of 'help' and perceived deception of 'portfolios' button in teacher environment.

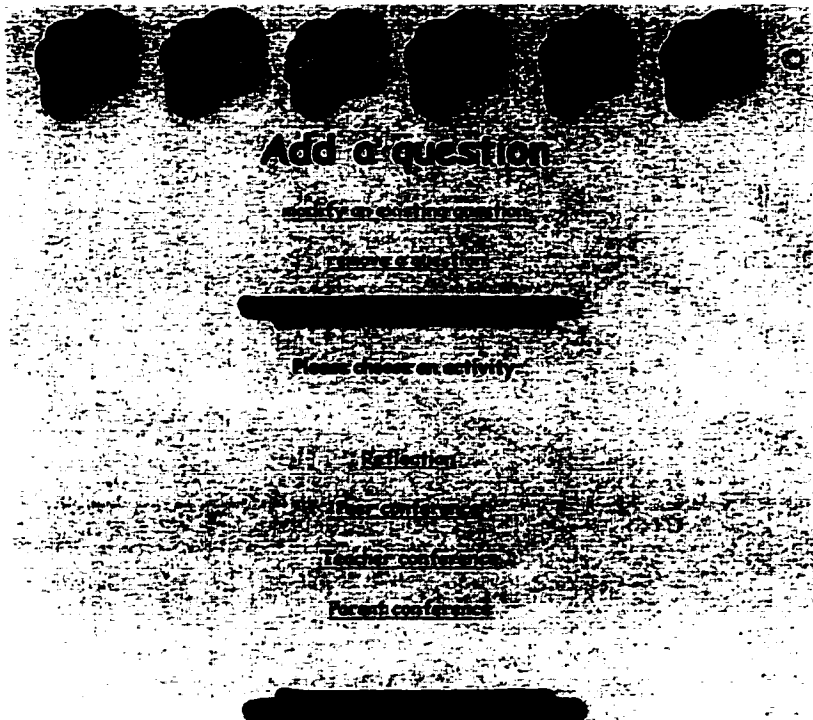


Figure 13. Problem with default page of 'questions' area, default area was suggested to be that of 'modify an existing question' page in teacher environment.

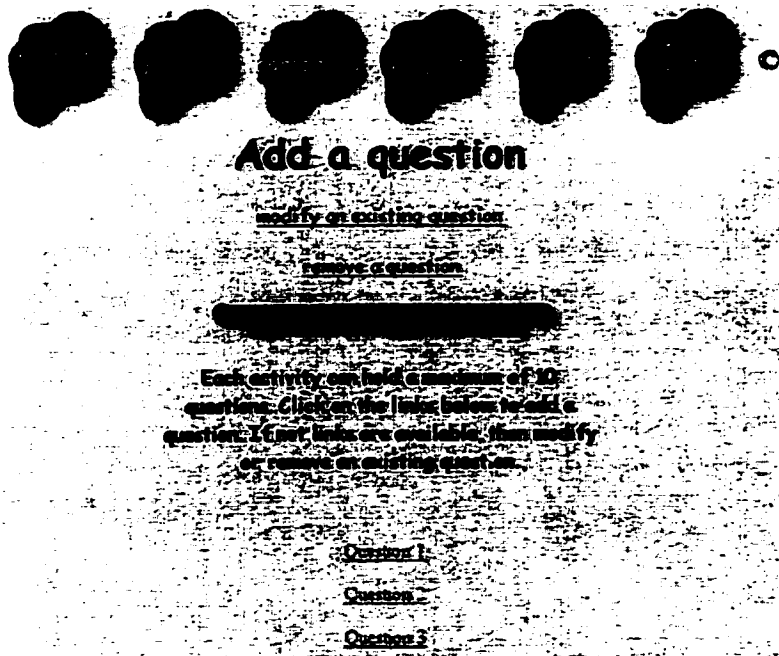


Figure 14. Problem with question content. Viewers could only see question content if they chose to 'modify an existing question' in teacher environment.

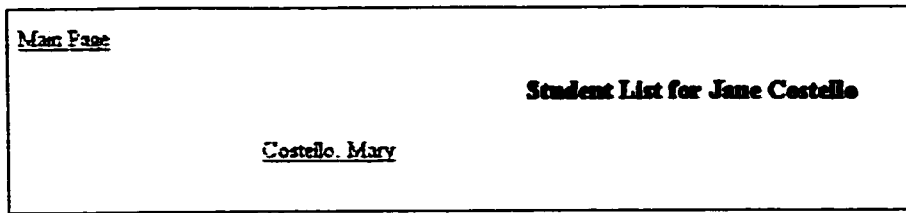


Figure 15. Problem with organization of 'report' area, viewer would like to see lists of students by 'class' in teacher environment.



Figure 16. Problem with organization of 'works for student x', viewer would like to see link to reflections and conferences recorded on each work in teacher environment.

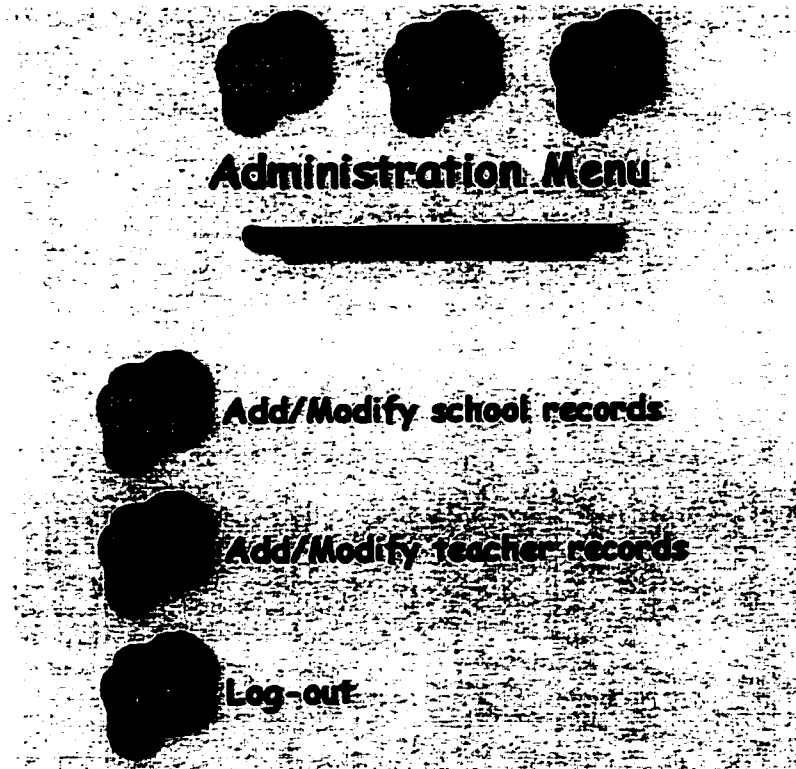


Figure 17. Problem with absence of 'help' in administrator environment.

Appendix M – Error Messages Reported by Expert Evaluators

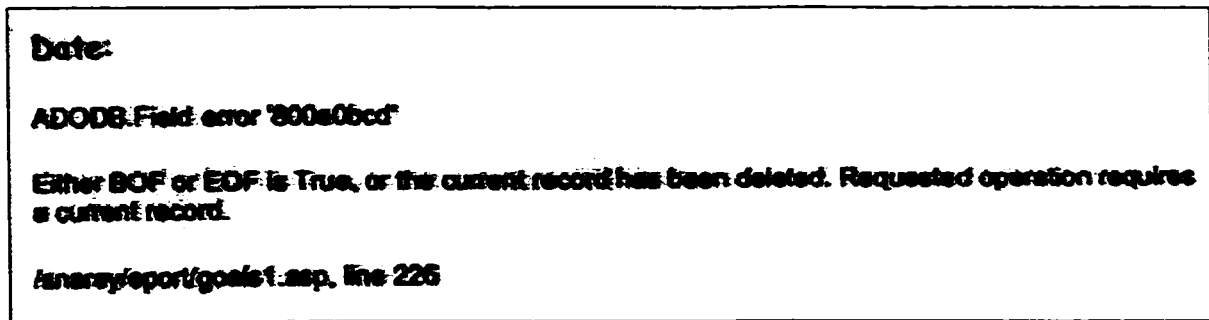


Figure 18. Error message reported when saving goals in student environment.

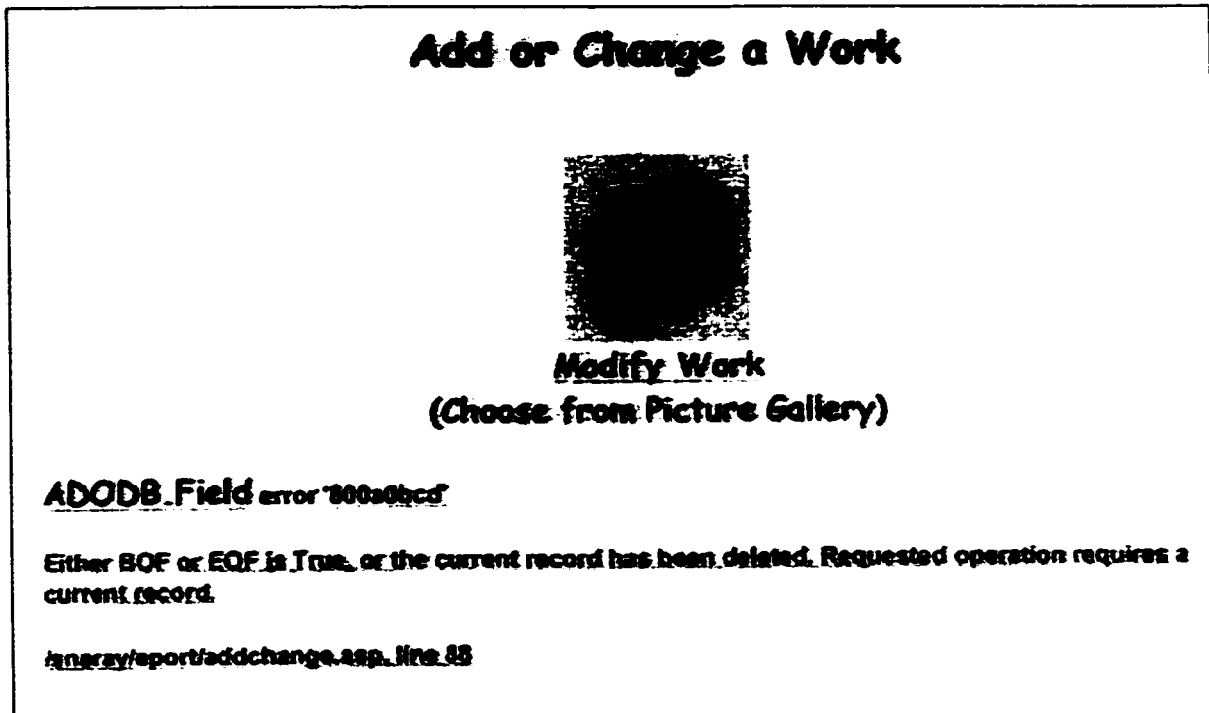


Figure 19. Error message reported when saving changes to an existing piece of work in student environment.

Appendix N – Results of Usability Interview Questions

Table 53
 Comparison of How this Template Helps with Conferencing

Student	Teacher	Parent
<ul style="list-style-type: none"> ● I like the portfolio. I'll tell my friends to check it out. I'll show it to them. ● Really fun to talk with people. You can talk so much that it's fun and incredible. ● It speaks to me and helps me work. Its cool, fun to play. Wish to play more. Like it a lot. ● I would like to talk about it to my teacher or friends. ● Like to do this very much. Write and remember what you wrote. ● Don't like it that much, so-so. Help me learn stuff. ● Not sure ● Its fun, learn when others talk ● Put your secret stuff in it. Nobody could look at it but you and your teacher. Tell the people and show them what's there. ● Good, helps to write, help each other ● Good, tell people it helps you out. Helps them to learn. ● Good, looking at other's work helps me learn things. ● Clicking on the stuff ● Talk to others ● I would not like to share my work 	<ul style="list-style-type: none"> ● Because for grade 2 it's difficult. But we have it there in front of us. It's more direct for them to see what they've done and talk about it. ● It would enable me to do it at a different time, not just face-to-face. All the work is there. Organized by subjects. The students would have done reflections ahead of time and that would save time. I'd look at it and have questions ready. A reporting feature would be nice so a teacher could check a box to say it was evaluated. Have somewhere to add feedback. The teacher needs to add comments on work from the teacher environment. Check out Wiggleworks. 	<ul style="list-style-type: none"> ● We do homework together now. We would work more together. Parents would get more involved. ● I've never done it before. Parents sign an agenda. This would provide a means for parents to view child's work. Child can bring home artifacts from it. This provides another means to showcase work. It shows extent to which child demonstrates process. I get static knowledge. No sense of progress or growth. ● The evidence shown to parent is child needs to do better. There needs to be more communication about the child's progress. With Allophone student's challenge we were not able to actively participate in their language—we didn't learn French. This might be a tool that could accomplish this sort of thing. An e-portfolio may be a way to share more with parent in their own language and learn other language as well.

Table 54
Comparison of How this Template Helps with Conferencing from Home

Teacher	Parent
<ul style="list-style-type: none"> • Good question. Have not done it yet. Parents look and make comments when they come in. Parents have to be taught that they have some responsibility and they have a job too. Can use it to communicate with teacher. They need to try too. • Don't know. Can't put comments right now. The teacher conference should be in teacher environment. Also, how do you know it's a parent answering? Think of Nicenet. 	<ul style="list-style-type: none"> • You can see what they're doing in class during day. See upcoming projects, see what they're doing each week. • By getting on computer, access question. No child can be penalized by it. Must be careful of over advantaging children. There is a danger that a parent may edit the child's work. The level and nature of activity needs to be monitored.

Table 55
How this Template Helps with Reflection – Student Response

<ul style="list-style-type: none"> • It's fun and obvious. Help you to read more and write words. • Not sure, I always think about it and I remember it with this • Because you write it • Looking at it helps me write better • Because you can write stuff in it • To read, write, show pictures • Helps to read, write • Shows animals, you can see the stuff you added • When we do our home work • When I put it in the computer and looked at it. Looked at the questions. 	<ul style="list-style-type: none"> • It's fun to do. You could go to the different work. I want more color. The cats were nice. • Help me think more. Teaches me more. Would like to be more things on it. Who ever created it is very creative. It's very good. • I liked working with it and talking about it. • To have fun on it. To look at one of the pictures of the animals. I would work with more animals. • Use help to learn about everything. Help you to do writing and reading.
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Table 56
Descriptions of Other Templates Seen by Evaluators

	Students	Teachers and Parents
Have you seen any other templates?	Yes 9 No 9	Yes 1 No 3
Name and describe them	<ul style="list-style-type: none"> • Microsoft Windows XP and found it. Took me four hours. • I saw a snake and other animals. • More games and really fun. • Different animals. • Paper-based • Kid Pix, email (3 responses) • On my computer at home it has animals, roses & apples • On my computer at home 	<ul style="list-style-type: none"> • Saskatchewan “Brentcrest”, from Bob’s place - Extremely busy, Things moving that become annoying after a while. Not Organized. More of a collage. Hard to navigate. • SWLSB high school - Could not put a picture on it. Fine for high school, not cycle 1.
How does this template compare to the others?		<ul style="list-style-type: none"> • Much better than others. • Well though out and planned. Non education designers don’t meet their needs. • There is no happy medium between them. They’re limited or too much. Elementary students need user friendly. A+.

Appendix O – Prototype Development Timeline

