Encouraging Self-Regulated Learning through Electronic Portfolios

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Abstract

At the Centre for the Study of Learning and Performance (CSLP), we have developed the Electronic Portfolio Encouraging Active Reflective Learning Software (ePEARL) to promote student self-regulation and enhance student core competencies. We wish to: disseminate the tool without charge to policy-makers, educators, students, and parents; encourage its active and sustained use on a wide scale; and learn about effectiveness, sustainability and scalability as we do. This paper summarizes the literature on electronic portfolios (EPs), describes ePEARL, and documents our research findings to date including analyses of teacher and student reactions.

Introduction

If we are to revolutionize and dramatically enhance education, it will require engaging students and getting them to think meaningfully and strategically about learning, especially the learning of core competencies such as literacy skills. Students must become active learners capable of dealing with complex problems in innovative and imaginative ways. Student-centred learning is an approach towards achieving this vision and technology can play an important role as a powerful tool in promoting educational change. But how? Among the most interesting and exciting new developments are electronic portfolios, not only because they act as multimedia containers for students and teachers but also because they support student self-regulation and core educational competencies, especially literacy skills.

In Canada, like many industrialized countries, more than 20 percent of primary-school students have to repeat a grade before going on to secondary school and 70 percent of those drop out of high school (Statistics Canada, 2001). Furthermore, rates of functional literacy among Canadian sixteen year olds on the PISA/OECD (2003) measures shows approximately

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25% of our youth are functionally illiterate. In a just released report on the state of learning in Canada, the Canadian Council of Learning (2007) elaborated on the importance of literacy skills and the challenges of dramatically improving our nation's literacy skills.

Currently, school is too often a place that disengages learners, which fails to encourage honest self-assessment, and where learning and evaluation are not meaningful acts of improvement but detached and punitive symbols of failure. One way to meet this challenge appears to lie in the use of electronic portfolios (EPs) that can be designed to support the process of students' self-regulated learning and the improvement of reading writing, and other literacy skills. Self-regulation refers to a set of behaviours that are used to guide, monitor and evaluate the success of ones own learning. Students who are self-regulated are metacognitively, motivationally, and behaviourally active participants in their own learning process (Zimmerman, 1989, p. 329) and thus succeed in academic learning (Rogers & Swan, 2004).

According to Abrami & Barrett (2005), an electronic portfolio (EP) is a digital container capable of storing visual and auditory content including text, images, video and sound. EPs may also be learning tools not only because they organize content but also because they are designed to support a variety of pedagogical processes and assessment purposes. Historically speaking, EPs are the Information Age's version of the artist's portfolio in the sense that they not only summarize an artist's creative achievements but also illustrate the process of reaching those achievements. An artist, architect, or engineer who displays her portfolio of work allows the viewer to form a direct impression of that work without having to rely on the judgments of others. EPs tell a story both literally and figuratively by keeping a temporal and structural record of events.

EPs have three broad purposes: process, showcase, and assessment. EPs may be designed as *process portfolios* supporting how users learn through embedded structures and strategies. A process EP can be defined as a purposeful collection of student work that tells the story of a student's effort, progress and/or achievement in one or more areas (Arter & Spandel, 1992; MacIsaac & Jackson, 1994). Process portfolios are personal learning management tools. They are meant to encourage individual improvement, personal growth and development, and

a commitment to life-long learning. The authors are especially interested in the use of EPs as process portfolios to support learning.

Process EPs are gaining in popularity for multiple reasons. They provide multimedia display and assessment possibilities for school and work contexts allowing the use a variety of tools to demonstrate and develop understanding—especially advantageous for at-risk children whose competencies may be better reflected through these authentic tasks. At the same time, by engaging these learners, their deficiencies in core competencies may be overcome. Process EPs may scaffold attempts at knowledge construction by supporting reflection, refinement, conferencing and other processes of self-regulation, important skills for lifelong learning and learning how to learn. They are superior for cataloguing and organizing learning materials, better illustrating the process of learner development. And they provide remote access encouraging anywhere, anytime learning and easier input from peers, parents, and educators, letting them provide feedback through a single electronic container.

According to Wade, Abrami & Sclater (2005; see also Abrami et al., 2006), EPs are linked to a student's ability to self-regulate their learning and to enhance their meaningful learning of important educational skills and abilities, especially literacy skills. Self-regulated learners are individuals who are metacognitively, motivationally, and behaviourally active participants in their own learning (Zimmerman, 2000). A main feature of self-regulated learning is *metacognition*. Metacognition refers to the awareness, knowledge and control of cognition. The three processes that make up metacognitive self-regulation are planning, monitoring, and regulating. Other aspects of self-regulated learning include time-management, regulating one's own physical and social environment, and the ability to control one's effort and attention. Proponents of socio-cognitive models emphasize that to develop effective self-regulated learning strategies, "students need to be involved in complex meaningful tasks, choosing the products and processes that will be evaluated, modifying tasks and assessment criteria to attain an optimal challenge, obtaining support from peers, and evaluating their own work" (Perry, 1998, p.716).

When students use portfolios, they assume more responsibility for their learning, better understand their strengths and limitations, and learn to set goals (Hillyer & Lye, 1996). One

study with pre-service teachers noted that using electronic portfolios helped them "engage in metacognitive activities while developing their philosophies" (Avraamidou & Zembal-Saul, 2003, 437). Azevedo (2005) also noted in his research on using hypermedia as a metacognitive tool for enhancing student learning that, "our findings provide the empirical basis for the design of technology-based learning environments as metacognitive tools to foster students' learning of conceptually challenging science topics" (206). Zellers & Mudrey (2007) also suggest that their study on electronic portfolios in a community college setting indicates that "electronic portfolios can be an effective tool for increasing student metacognition" (p. 428). In short, educators believe that portfolios allow students to think critically, and become active, independent and self-regulated learners (Blackburn & Hakey 2006; Riedeinger 2006; Vucko 2003; Perry, 1998; Mills-Courts & Amiran, 1991).

Zimmerman and Tsikalas' (2005) review of computer-based learning environments (CBLEs) designed to support self-regulated learning (SRL) provides a framework for development of a tool to support the three cyclical phases of SRL: forethought, performance and self-reflection. While the various processes involved in self-regulation have been discussed, the lessons of other partially SRL-supportive CBLEs has enabled us to plan for effective SRL-supportive design of ePEARL.

The three cyclical phases of self-regulation include both meta-cognitive and motivational components, providing the foundation for better sustainability of learning and skill development.

- The forethought phase includes task analysis (goal setting and strategic planning) and self-motivation beliefs (self-efficacy, outcome expectations, intrinsic interest/value and goal orientation). Tasks involved in the forethought phase are: set outcome goals, set process goals, document goal values, plan strategies, and set up learning log.
- The next phase, the performance phase, includes self-control (self-instruction, imagery, attention focusing and task strategies) and self-observation (self-recording and self-experimentation). Tasks involved in the performance phase are: creation of work, and learning log entries.

- Finally, the self-reflection phase includes self-judgment (self-evaluation and casual attribution) and self-reaction (self-satisfaction/affect and adaptive-defensive responses). Tasks involved in the self-reflection phase are: reflection on work, reflection on process, and awareness of new goal opportunities.

Unfortunately, evidence to date on the impacts of EPs on learning and achievement and other outcomes is sparse. Carney (2005) states "Electronic portfolios show promise for enhancing learning, but if we fail to critically evaluate our uses of the device, we may find that they will go the way of Papert's Logo turtles and become yet another educational fad—an innovation poorly understood and often implemented in ways contrary to its theoretical underpinnings" (p. 4). Zeichner and Wray (2001) concluded similarly: "Despite the current popularity of teaching portfolios, there have been very few systematic studies of the nature and consequences of their use for either assessment or development purposes" (p.615). Most recently, Barrett (2007) noted in her study of an electronic portfolio software being used in schools in the United States that, "The empirical research is very limited and focuses more on the development of teaching portfolios than on K-12 student portfolios" (p. 436). Therefore, our research is designed to study the impact of EPs on teaching and learning processes, especially those related to self-regulation.

About ePEARL

The CSLP in collaboration with our partner LEARN has developed web-based, student-centred electronic portfolio software, entitled ePEARL, which is designed to support the above-mentioned phases of self-regulation. Developed in PHP using a MySQL database, three levels of ePEARL have been designed for use in early elementary (Level 1), late elementary (Level 2) and secondary schools (Level 3). Features available include: customizing the portfolio; setting outcome and process goals; creating new work; linking to existing work; reflecting on work; sharing work; obtaining feedback from teachers, peers & parents; editing work; saving work under multiple versions and sending work to a presentation portfolio.

ePEARL promotes the creation of general learning goals for a term or year, or for a specific work/artefact; reflection; and peer, parent and teacher feedback on the portfolio or on a specific artefact. In levels 2 and 3, ePEARL offers two environments: the Work Space and the Portfolio.

The ePEARL Work Space screen guides students through the creation process, allowing enough flexibility for truly creative work and just enough scaffolding to keep students on the right track. The Work Space offers a text editor and an audio recorder for the creation of work. Readings, music pieces, or oral presentations may be recorded. The software also offers the ability to attach work completed using other software, so it can accommodate any kind of digital work a student creates, including scanned images or photographs of paper-based work.

Before work is created, students are encouraged to set their goals for this work, and may attach learning logs, evaluation rubrics and study plans to keep track of their learning process as it takes place. After the creation of work, sharing with peers or teachers is supported so that students may solicit feedback on drafts of work. Students may also reflect on their performance and strategies, and to use these to adjust their goals for the next work. The Work Space template is similar to that of the Portfolio entries so that information is easily transferred from one environment to the other.

The Portfolio environment within ePEARL is where students collect their selected artefacts - created either from the Work Space or from outside of the tool. The selection process allows students to reflect on why they feel a work belongs in their portfolio, its relationship to other work, and on their own advancements. Self-regulation is also supported when students create new goals for future work or modify learning behaviour based on their reflections on a particular piece they have collected. Sharing with peers and parents is encouraged and teachers have automatic access to view all of their students' ePEARLs.

In addition, there are both prose and multimedia support materials for teachers and students to develop a better understanding of the what, why and how of the process of self-regulation using the learning process supported by ePEARL. Embedded within ePEARL, the professional development just-in-time materials support the demonstration and modelling of

student-centred skills and instruction, explanation of those skills, and elaboration of skills through additional support material.

Phase I Research Project

Over the past six years, the CSLP has worked with school boards to help integrate use of ePEARL (and previous versions of the software entitled *e-portfolio*). Building on this experience, in 2006-2007, the CSLP was involved in a collaborative, province-wide project involving LEARN-Quebec, and school board administrators/teachers from English school boards. Phase I of this project addresses the question whether the use of the CSLP's ePEARL tool enhances both teaching strategies, via targeted professional development, and learning processes via an environment that supports self-regulated learning. Phase I is a precursor to Phase II, a larger, more rigorous, and definitive exploration of ePEARL's efficacy in promoting students' literacy achievement and self-regulation.

Methodology

The methodology describes the conduct of Phase I of the research including the development of tools and techniques for assessment.

Participants

Participants in this study were 62 school teachers, mostly from elementary schools, and their students (approximately 1200) from seven urban and rural English school boards across Quebec. All teachers received one day of training on the use of ePEARL from CSLP staff and follow-up training and in-class observations during the school year. At the conclusion of the school year, participating teachers were invited to a "Show and Share" day where they were encouraged to present their experiences using ePEARL. Informed consent was obtained from students' parents following Canada's Tri-Council Policy on the ethical treatment of research participants.

Design

The design of Phase I was a one-group pretest-posttest design. Teacher questionnaire data were collected in the Fall, 2006 prior to training and prior to the use of ePEARL in classrooms. Teacher questionnaire data were collected again in the Spring, 2007 after ePEARL was used for (some part of) the school year. Student questionnaires plus teacher and student focus groups data were collected in Spring, 2007 only. A sample of student portfolios (N = 66) were also analysed.

Instrumentation

Abrami, Aslan, and Nicolaidou (2007) developed the Teaching and Learning Strategies Questionnaire (TLSQ) as a way for teachers to describe their use of self-regulation strategies and portfolio processes in their classrooms. These instruments were developed based on Zimmerman's (2000) research and an analysis of recent literature on Self-Regulated Learning processes. The TLSQ contains several open-ended and 73 close-ended Likert scale questions, the latter divided into four sections: students' learning strategies, approach to teaching, portfolio use, and technology experience. This instrument was piloted in the field during this Phase of the research and several open-ended questions were added for use in Phase II of this study. Abrami and Aslan (2007) also developed the Student Learning Strategies Questionnaire (SLSQ) as a way to triangulate the data from the TLSQ and further validate the occurrence of self-regulation processes and portfolio use in classroom. The SLSQ contains several open-ended questions and 19 close-ended Likert scale questions designed to match the learning strategies questions asked of teachers. Current versions of the TLSQ and SLSQ can be found in Appendices 1 & 2, respectively.

Teacher focus groups were conducted that prompted participants to discuss their experiences with: learning goals; learning strategies; motivation; collaboration and feedback; work space and portfolio environments; support and professional development; and technical difficulties. A scoring rubric was also developed and pilot tested for analysing students' portfolios. It contains six major sections: degree of ePEARL use; writing ability; comprehension

ability; self-regulation strategies; presentation skills; and student progress. The scoring rubric (Bures & Bentley, 2007) can be found in Appendix 3.

Results and Discussion

At the beginning of the school year, we asked participating teachers to use ePEARL about three hours per week or about 12 hours per month with their students. Overall, teachers (N = 21) reported use was less than we hoped: 30% reported using ePEARL 1-4 hours per month; 50% reported using it 5-8 hours; 5% reported using it 9-12 hours; and only 10% reported using it 13 hours or more.

We statistically analysed pretest to posttest differences on the TLSQ. We found a few positive effects (two-tailed t-test, df = 16, $p < .10$) which included: students identifying strategies for achieving their goals; students documenting the processes they used when working on tasks; teaching students to identify strategies for achieving their goals; students using portfolios to demonstrate their strengths; students using portfolios to identify areas needing improvement. These are fewer positive differences than we hoped for but the results may be limited by our small sample size and low statistical power, even though we set a liberal alpha value for significance testing.

We also examined the posttest mean scores on both the TLSQ and SLSQ for student learning strategies. The mean scores for both teachers and students on all the items were positive, ranging from 3.19 to 4.29 for teachers (N = 21) and 3.65 to 4.32 for students (N = 150). Setting goals, developing strategies for learning, using feedback, and so on were described as part of the routine in those classrooms in which we collected data.

The focus group data provided us with some rich qualitative information that added greater dimension to the quantitative results. Analysis of the focus groups revealed the need for teachers to introduce processes involved in self-regulated learning and challenges inherent in teaching students learning goals, learning strategies, and collaboration and feedback. For example, not all teachers reported that students were aware of their learning strategies. In addition, teachers felt that learning goals were especially difficult to teach to very young students. Some teachers reported that students wanted to and shared feedback mostly with

their friends instead of other classmates. Otherwise, teachers generally valued the self-regulating processes explicit in ePEARL while students were very positive toward certain aspects of the tool, especially the customization features. Finally, teachers discussed their need for extensive support from school staff and administrators.

In level 1, teachers mainly felt that learning goals were difficult to teach and to introduce to very young students. Conceptually, students were not always ready for this. Teachers at this level used brainstorming to share or create a list of learning goals. Although student reflection was also a challenge, teachers saw the value in having students reflect, noting that to have students think about what they did is sometimes difficult, but it opens the door for learning about themselves. As previously mentioned, not all teachers understood 'reflection' in the same way, thus many teachers expressed the need to get all teachers at the same level, in terms of these crucial concepts.

In level 2, teachers used different techniques to teach learning goals: modelling from teachers and more capable peers; reviewing goals and strategies that have worked in the past; using a rubric to show students what they need to do; conferencing one on one with the teacher to help the child develop a better picture of themselves as a learner, as students have difficulty being self-reflective at a young age; and using concrete examples to illustrate objectives in specific subject areas. These are examples provided from teachers of what worked best with their students. A French teacher in Level Two identified "improving in French" as a common goal for his students.

When discussing learning strategies, it was perceived that many only teach strategy monitoring implicitly. This means that teachers notify students when they are getting off task, but do not explicitly teach them how to monitor their strategies in terms of what they are doing well or doing poorly. In some cases teachers do not provide the opportunity for their students to evaluate their own work beyond revising drafts. Some teachers reported that their students were aware of their learning strategies, yet others disagreed. Also, they expressed that students developed avoidant strategies when it came to providing feedback and comments. They told a joke or laughed instead of facing the truth. Everyone agreed that this is a process

that needs to occur consistently over time, as students need continuity in exercising these skills if they are to become proficient at using them naturally and with ease.

In terms of teaching students to link their reflections to their goals, teachers would encourage students to look back at their goals while reflecting along with reviewing their reflections in previous work. In line with the notion of "competencies" within the Quebec Education Plan, teachers reported that they could see their teaching had an impact on their students' goal-setting abilities if their skills carried over to 'real life' experiences. Teachers also reported that students enjoyed using the software, especially the customization feature. They loved the personal aspect of ePEARL as this allowed them to identify with the tool, and take ownership over their portfolio. The use of technology was often seen as a reward.

Analysis of student portfolios (N = 66) did not reveal widespread or extensive use of the tool. The majority of the portfolio pieces were reading responses, stories and poems, language arts presentations, social science or science projects, and music and art projects. Teachers tended to use ePEARL either to collect work or to teach self-regulated learning but not both. Furthermore, there was limited presence of self-regulated learning strategies, such as goal setting, monitoring progress, self-reflection and teacher feedback. However, on occasion there were teachers who implemented e-portfolios extensively; in these cases, teachers used ePEARL in both creative and practical ways. As a result, student portfolios in the classroom of these teachers were often richer, and demonstrated that students can learn self-regulation skills in order to improve their work and become better learners.

In addition to the research conducted, we developed pedagogical support materials in order to provide teachers with resources that would help them more effectively use the self-regulated learning tools embedded in ePEARL. These resources included job aids on customizing the portfolio and creating a new artefact, rubric templates, and instructional videos that can be viewed individually or with the entire class. The instructional videos are approximately two minutes long and each highlights one aspect of the SRL process: planning, doing, or reflecting. To support work in the first phase of the SRL cycle, videos were created on the following topics: overview of the planning phase, creating general goals, creating task goals, and identifying strategies for goals. For the "doing" phase, there is one overview video that

encourages students to follow their plan by referring to their task goals and strategies as they complete an assignment. For the final phase, "reflecting," there are four videos: overview of the reflection phase, reflecting on works in progress, reflecting on completed works, and providing feedback. We also embedded help throughout the software that provides examples and prompt questions to assist anyone having difficulty understanding the objectives of the steps in ePEARL that they are working on. These tools were designed to enhance teaching strategies and provide ongoing professional development for teachers using ePEARL.

Conclusion

Using only student and teacher posttest questionnaire responses as a guide, one might conclude that the use of portfolios, and the learning processes they support, were positively viewed and learned well enough to be emerging skills among students. But other evidence suggests otherwise. There were few statistically significant changes from pretest to posttest after teachers used ePEARL for a year. In addition, most teachers used ePEARL infrequently, with the majority of teachers limiting class use to less than the twelve hours per month we had asked for. The focus groups findings suggested that access to technology might have been a contributing factor. In addition, teachers commented that teaching SRL strategies was new and thus required a change in teaching strategies, strategies that they were not yet accustomed to. The focus groups also revealed the challenges of using portfolios to teach children to self-regulate. And finally, the analysis of student portfolios did not reveal portfolios that evidenced a large amount of student work or high levels of student self-regulation.

We made large efforts to engage teachers and other educators in the design of ePEARL and we are convinced that it is not a technically difficult tool to use. Nevertheless, we know that access to technology prevents some teachers and their students from using it more extensively. The pedagogical principles of self-regulation that underlie the tool are a different matter from technical issues. It is clear we need to go further in providing pedagogical training and support to teachers and their students. In this regard, multimedia support materials have been developed and will be integrated throughout ePEARL to provide 'Just-in-Time' support for both teachers and students.

Beginning in Fall, 2007, we will conduct a longitudinal investigation (Phase II) using a non-equivalent pretest-posttest design focusing on changes in student self-regulation and literacy skills improvement. Ultimately, our objective is to learn more about the impact of EPs on student learning.

While teachers and their students see great promise in the use of EPs for learning, there is much that remains to be done to insure this promise is realized. To teach the skills of self-regulation within an EP environment requires commitment, purpose and strategies on the part of teachers and students. It requires both "will" and "skill". The effective use of EPs isn't just about the destination but also about the journey—for teachers, students, and researchers. Stay tuned.

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Appendix 1

The Teaching and Learning Strategies Questionnaire (TLSQ)
Abrami, P.C. Aslan, O., & Nicolaidou, I. (2007)

Teaching and Learning Strategies Questionnaire

This questionnaire is part of a study being conducted by the Centre for the Study of Learning and Performance at Concordia University in Montreal, Quebec. One of the goals of our centre is to study classroom processes through an active association with teachers, students and administrators. In that regard, we have developed a questionnaire to learn more about the teaching and learning processes used in the classroom. To gain an accurate understanding of these processes, it is critical that we learn from you about your approach to teaching.

All information you provide will be kept strictly confidential and under no circumstances will your individual responses be released to the school or the school board administration. Participation in this project is voluntary and you are free to discontinue at any time. However, your professional experiences and opinions are crucial to helping us understand teaching from the educator's point of view. We would greatly appreciate your taking the time to complete our questionnaire. If you would like to obtain a copy of the report on our findings from this study, please fill out the enclosed form or contact us at the address above.

Thank you for your participation.

Philip C. Abrami, Ph.D.,
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CSLP

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Section I: Personal Information

- *Name:* _____
- *Gender: M__ F___*
- *School:* _____
- Years of teaching experience: _____
- Teaching position: Grade_____ Cycle_____ Specialization_____

INSTRUCTIONS

This questionnaire has five sections and consists of five printed pages. Please ✓ the most appropriate response when answering the questions.

Section II: Students' Learning Strategies

A. Strongly disagree **B.** Disagree **C.** Undecided **D.** Agree **E.** Strongly agree

In my class students generally:	**A**	**B**	**C**	**D**	**E**
1. Set their own learning goals (e.g. determine what they need to learn).					
2. Set their own process goals (e.g. determine what tasks are required to achieve the learning goals)					
3. Identify strategies for achieving their goals.					
4. Revise goals when necessary.					
5. Are motivated to learn.					
6. Can articulate what is expected of them.					
7. Document the processes they use when working on tasks.					
8. Monitor their progress towards achieving goals.					
9. Adjust their actions on their own to achieve goals.					
10. Modify or adapt strategies that are unsuccessful.					
11. Give constructive feedback to their peers.					
12. Use feedback from their teacher to improve on their work.					
13. Use feedback from their home to improve on their work.					
14. Use feedback from their peers to improve on their work.					
15. Revise versions of their work to improve them.					
16. Reflect on their process of achieving their goals.					
17. Evaluate their own work.					
18. Know how they are being evaluated.					
19. Attribute their success to their efforts.					
20. Work well with other students.					

Section III: Approach to Teaching

A. Strongly disagree **B.** Disagree **C.** Undecided **D.** Agree **E.** Strongly agree

In my class I teach students how to:	**A**	**B**	**C**	**D**	**E**
21. Set their own learning goals.					
22. Set their own process goals.					
23. Identify strategies for achieving their goals.					
24. Revise goals when necessary.					
25. Be motivated to learn.					
26. Articulate what is expected of them.					
27. Document the processes they use when working on tasks.					
28. Monitor their progress towards achieving goals.					
29. Adjust their actions on their own to achieve goals.					
30. Modify or adapt strategies that are unsuccessful.					
31. Give constructive feedback to their peers.					
32. Use feedback from their teacher to improve on their work.					
33. Use feedback from their home to improve on their work.					
34. Use feedback from their peers to improve on their work.					
35. Revise versions of their work to improve them.					
36. Reflect on their process of achieving their goals.					
37. Evaluate their own work.					
38. Identify how they are being evaluated.					
39. Attribute their success to their efforts.					
40. Work well with other students.					

Section IV: Portfolio Use

In my class, **over a month**, students work with portfolios:

0 hours_____ 1-4 hours_____ 5-8 hours_____ 9-12 hours_____ 13 hours or more_____

*If you answered **0 hours**, please move to section V (p.5).*

Years of experience with paper based portfolios_____
Years of experience with computer based portfolios (digital) _____
Please name the digital portfolio you use_____

Section IV: Portfolio Use (cont.)

A. Strongly disagree **B.** Disagree **C.** Undecided **D.** Agree **E.** Strongly agree

In my class portfolios are used for students to:	A	B	C	D	E
41. Showcase their work.					
42. Choose work to be included in their portfolios.					
43. Document their progress.					
44. Demonstrate their strengths.					
45. Identify areas needing improvement.					
46. Set their own learning goals.					
47. Set their own process goals.					
48. Document strategies for achieving their goals.					
49. Revise goals when necessary.					
50. Be motivated to learn.					
51. Articulate what is expected of them.					
52. Document the processes they use when working on tasks.					
53. Monitor their progress towards achieving goals.					
54. Adjust their actions on their own to achieve goals.					
55. Modify or adapt strategies that are unsuccessful.					
56. Give constructive feedback to their peers.					
57. Use feedback from their teacher to improve on their work.					
58. Use feedback from their home to improve on their work.					
59. Use feedback from their peers to improve on their work.					
60. Revise versions of their work to improve them.					
61. Reflect on their process of achieving their goals.					
62. Evaluate their own work.					
63. Identify how they are being evaluated.					
64. Attribute their success to their efforts.					
65. Work with other students.					

Section V: Technology Experience

i. Strongly disagree ii. Disagree iii. Undecided iv. Agree v. Strongly agree

With regard to computer technologies for education:	A	B	C	D	E
66. I have no experience with them.					
67. I have attempted to use them in my classroom but I still require help on a regular basis.					
68. I feel comfortable using them in my classroom.					
69. I am very proficient in using a wide variety of applications in my classroom.					
70. I often integrate them in my teaching activities.					
71. I often use my classroom computers.					
72. I often use our school lab.					
73. I feel comfortable using digital portfolios with my class.					

Section VI: ePEARL Use

Describe what you liked about using ePEARL.

_____
_____
_____

Describe what you did not like about using ePEARL.

_____
_____
_____

Did using ePEARL help you teach your students how to goal set and/or how to reflect? Please explain.

_____
_____
_____

Did using ePEARL improve your students' literacy skills? Please explain.

_____
_____
_____

Did using ePearl facilitate collaborative learning?

_____
_____

_____

Would you use ePearl again next year? Why?

_____
_____
_____

Thank you very much for taking the time to complete the questionnaire.

Appendix 2

The Student Learning Strategies Questionnaire
Abrami, P.C., & Aslan, O. (2007)

Learning Strategies Questionnaire

This questionnaire is part of a study being conducted by the Centre for the Study of Learning and Performance at Concordia University in Montreal, Quebec. We would like to know more about how you are learning this year. This questionnaire will help us learn about the strategies you are using in your class to help you with your work.

Please answer the questions on the next page. **There is no right or wrong answer.** Your answers are confidential (no one that you know will be told what you answered). Your teacher will not have access to your answers. You have the right to refuse, to participate, or to withdraw (stop answering the questions) at any time. However, your experiences and opinions are important, and will help us understand teaching from your point of view.

Thank you for your collaboration!

Vanitha Pillay, Research Coordinator, CSLP
Phil Abrami, Professor and Director, CSLP

PERSONAL INFORMATION

- *Name:* _____
- *Gender: Boy_____ Girl_____*
- *School:* _____ *Grade_____*

INSTRUCTIONS

Please circle the most appropriate response when answering the questions.

In my class…

1. I set my own learning goals (I decide what I need to learn).

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

2. I set my own process goals (I list what I need to do to achieve my learning goals).

Strongly disagree	Disagree	Undecided	Agree	Strongly agree

3. I identify strategies for achieving my goals.

Strongly disagree	Disagree	Undecided	Agree	Strongly agree

4. I revise my goals when necessary.

Strongly disagree	Disagree	Undecided	Agree	Strongly agree

5. I am motivated to learn.

Strongly disagree	Disagree	Undecided	Agree	Strongly agree

6. I explain what I need to do when I get an assignment.

Strongly disagree	Disagree	Undecided	Agree	Strongly agree

7. I list the strategies I'm using when I work on assignments.

Strongly disagree	Disagree	Undecided	Agree	Strongly agree

8. I check my progress towards achieving my goals.

Strongly disagree	Disagree	Undecided	Agree	Strongly agree

9. I modify (correct) my actions on my own to achieve my goals.

Strongly disagree	Disagree	Undecided	Agree	Strongly agree

10. I modify (correct) strategies that are not helping me achieve my goals.

Strongly disagree	Disagree	Undecided	Agree	Strongly agree

11. I give helpful advice to my classmate on their work.

Strongly disagree	Disagree	Undecided	Agree	Strongly agree

12. I use comments from my teacher to improve on my work.

Strongly disagree	Disagree	Undecided	Agree	Strongly agree

13. I use comments from my classmate to improve on my work.

Strongly disagree	Disagree	Undecided	Agree	Strongly agree

14. I use comments from my family to improve on my work.

Strongly disagree	Disagree	Undecided	Agree	Strongly agree

15. I revise versions of my work to improve them.

Strongly disagree	Disagree	Undecided	Agree	Strongly agree

16. I reflect on the strategies I used to achieve my goals.

Strongly disagree	Disagree	Undecided	Agree	Strongly agree

17. I evaluate my own work (I look at my work to see if it is good or needs improvement).

Strongly disagree	Disagree	Undecided	Agree	Strongly agree

18. I know how I am being evaluated.

Strongly disagree	Disagree	Undecided	Agree	Strongly agree

19. I make connections between the amount of time I spend on my work, and my achievement.

Strongly disagree	Disagree	Undecided	Agree	Strongly agree

20. I work well with other students.

Strongly disagree	Disagree	Undecided	Agree	Strongly agree

SECTION 2: ePEARL USE

Please answer this section ONLY if you have used the ePearl software in your class

I liked using ePearl in my class because...

_____
_____
_____
_____

I did not like using ePearl in my class because…

_____
_____
_____
_____

ePearl helped me learn how to…

_____
_____
_____
_____

I would like to use ePearl again next year because…

_____
_____
_____
_____

I do not want to use ePearl again next year because…

_____
_____
_____
_____

What I liked the most about using ePearl is…

_____
_____
_____
_____

What I liked the least about ePearl is…

_____
_____
_____
_____

Thank you again for your collaboration!

Appendix 3

Scoring Rubric for Electronic Process Portfolios
Bures, E. & Bentley, C. (2007)

STEP ONE: The first time you go through the portfolio go through the ''Usability Measure''. If there are not 3 pieces included then we will not analyze it.

STEP TWO: For each category, assign a holistic mark out of 6 along with overall comments (strengths and weaknesses) where:
6 is outstanding (A+), 5 is excellent (A), 4 is very good (B), 3 is acceptable (C), 2 is below expectations (C-), 1 is well below expectations (D or F).

To assign the holistic mark, use the ''Overall Comments'' sheet and mark down comments on the key aspects of the portfolio which you notice as you peruse the portfolio (for example, you might find a salient example of a piece of evidence, and then forget later where it was). This works as a type of map of the portfolio to help direct the evaluation of the portfolio and makes it easier to assign the holistic marks.

You can make reference to the examples “Examples Holistic Scores.”

STEP THREE: Fill out the rubric. **Do not revisit the holistic marks.**

ADDITIONAL NOTES FOR CODEBOOK:

1) To judge whether the student has revised his/her work, if there are very few errors in spelling and so forth then we can infer at this level that the student did do revisions even though we do not see them externalized.

2) To assign a level, choose the box that best describes the student’s portfolio. If you are wavering between two levels, assign the student the higher level (give the student the benefit of the doubt).

3) If a student has not been given feedback, then use the category not applicable. This goes for any criteria. Make a note that is it not applicable.

4) Language use: Sometimes it is obvious that the student is making second-language user errors. When these errors do not impede the conveyance of meaning, try to ignore these. For example, in Quebec this could be francophone or allophone students writing in English or Anglophone or allophone students writing in French. Another example could be recent Asian immigrants writing in English as a second language in British Columbia. If you are having problems understanding the meaning, then do not ignore these errors.

5) At this age group, always assume that the students were 'told' to make the entries they did (i.e. if there is a random piece of writing, you can assume it was a 'free write' assigned by the teacher.)

6) Free writes usually are only used to judge writing, but can be used to judge comprehension in so far as understanding of a topic is displayed (or not displayed). Skill in the mechanics of writing (grammar understanding and all that) should not be part of comprehension of a subject area (topic).

7) Growth refers to the changes in understanding a student makes as relative to themselves and not to the external standards of any province or school. This means that students who achieve well do not necessarily make as much progress as students who are achieving less well; indeed, the contrary should ideally be found.

8) Make sure you look at all pieces in workspace and portfolio. Sometimes students do some directly into portfolio and also place pieces in the workspace. Similarly, if you cannot read the attachments, please let Caitlin know and she will send a version that is readable to you. This is important because otherwise we will be in effect analyzing different portfolios.

Usability: Implementation Fidelity
Name
Class

- **You should not have to look beyond the first screen where it shows the portfolio contents to fill out this measure.**

1. Pieces of work:
How many pieces of work does the portfolio (showcase) include? (Do not include multiple versions as their own "pieces")

3 or less
4 or more

2. Goal Setting:
2a. Are there general or global goals?
Yes
No

2b. Are there goals stated explicitly in the box?
Yes
No
Comments on goal setting:

3. Reflecting:
Is the reflection tool used?
Never
Sometimes
Often

Comments on reflecting:

4. **Collaborating:**
Are there comments made by the teacher, parents and/or peers?
Yes
No

Comments on collaborating:

Overall Reactions/Other Comments:
Did you notice anything interesting about this tool (EPearl) or portfolio while going through this electronic portfolio?

Holistic Marks and Overall Comments (Strengths and Weaknesses):

Name:
Class:
User Name:

Holistic Mark on 6 categories:

Self-regulatory skills
Writing
Comprehension
Presentation
Level of critical thinking
Progress

For each category give a holistic mark out of 6 where:
6 is outstanding (A+), 5 is excellent (A), 4 is very good (B), 3 is acceptable (C), 2 is below expectations (C-), 1 is well below expectations (D or F)

In some cases, students will not 'do well' in a specific category because of the way the portfolio was used in his/her classroom. So for example, if the teacher had the students do the portfolios all in one day at the last minute, those students do not have much opportunity usually to demonstrate growth or to present the portfolio very well. WE are conscious of this, and these marks would not be used for teaching purposes unless it was appropriate to the teaching context at hand. This is a research measure to evaluate the portfolios.

- ***Writing***
  MARK OVERALL: /6

Comments

- ***Comprehension***
  MARK OVERALL: /6

Comments

- ***Self-Regulatory skills***
  MARK OVERALL: /6

Comments

- ***Level of Critical Thinking***
  MARK OVERALL: /6

Comments

- ***Presentation***
  MARK OVERALL: /6

Comments

- ***Progress***
  Holistic Mark: /6

Comments

Rubric to Evaluate E-Portfolio for Research Purposes

Writing	GREAT	VERY GOOD	COULD BE IMPROVED	KEEP TRYING
Conveyance of central ideas	○ Writing is very understandable and reflects a profound understanding of audience, suggesting an understanding that different perspectives may exist (i.e. word choice is very effective)	○ Writing is understandable and reflects an understanding and consciousness of the audience (i.e. word choice is effective)	○ Writing is difficult to grasp; writing demonstrates a lack of understanding of the audience (i.e. poor word choice)	○ Writing is incoherent and demonstrates no awareness of an audience (i.e. very poor word choice)
Use of conventional structures	○ Student applies rules of conventional structures very effectively (i.e. first word of each sentence is capitalized, punctuation is grammatically correct consistently, and there are few spelling errors)	○ Student applies rules of conventional structures effectively (i.e. first word of each sentence is often capitalized, punctuation is grammatically correct consistently, and there are some spelling errors)	○ Student applies rules of conventional structures ineffectively (i.e. first word of each sentence is sometimes or rarely capitalized, punctuation is grammatically correct rarely and there are frequent spelling errors)	○ Student applies rules of conventional structures very ineffectively (i.e. first word of each sentence is hardly ever capitalized, punctuation is grammatically correct hardly ever, and there are ubiquitous spelling errors)
Application of strategies to convey meaning	○ Student extremely effectively applies variety of strategies to convey meaning (Writing fits the type of writing extremely well, there is evidence of thoughtful editing and revising, and relevant	○ Student effectively applies variety of strategies to convey meaning (Writing fits the type of writing, there is evidence of editing and revising, and relevant personal experiences may be	○ Student ineffectively applies variety of strategies to convey meaning (Writing does not fit the type of writing, there is little or no evidence of editing and revising, and relevant personal experiences are	○ Student fails to apply variety of strategies to convey meaning (Writing does not fit the type of writing at all, there is no evidence of editing and revising, and relevant personal experiences are not drawn on)

	personal experiences may be effectively incorporated)	incorporated)	drawn on only incoherently at best)	
Creativity and imagination	○ Text(s) are very interesting and demonstrate creativity, including lateral thinking	○ Texts are interesting and demonstrate creativity	○ Texts generally lack creativity and momentum	○ Texts indicate very little creativity or momentum
Comments				

Comprehension	GREAT	VERY GOOD	COULD BE IMPROVED	KEEP TRYING
Students' ability to understand texts or other sources	○ Consistently demonstrates profound understanding of salient concepts or ideas as presented in texts or other sources, making well-supported meaningful predictions or inferences ○ Student never directly copies (plagiarizes) texts or other media	○ Consistently describes details or ideas of a text or other sources, making meaningful predictions or inferences ○ Student may sometimes directly copy (plagiarize) texts or other sources	○ With some inconsistencies describes details or ideas of a text or other sources, making forced or irrelevant predictions or inferences ○ Student may sometimes directly copy (plagiarize) texts or other sources	○ Illogically describes details or ideas of a text or other sources, and any predictions or inferences are incomprehensible and irrelevant ○ Student may frequently directly copy (plagiarize) texts or other sources
Makes connections and links to the world around them through the text or other sources	○ Goes profoundly beyond the text or other source, forming his/her opinions by drawing profoundly on his/her own experience and	○ Goes beyond the text or other source, forming his/her opinions by drawing meaningfully on his/her own experience and thoughtfully	Forms his/her opinions by drawing superficially on his/her own experience and making forced or uncertain connections with issues beyond the text	○ Does not go beyond the text or other source - does not draw on his/her own experience or make at best irrelevant connections with issues

	values and profoundly making connections with issues beyond the text/source ○ May very effectively compare and contrast situations, perspectives and/or ideas using evidence from the text or other sources (and beyond)	making connections with issues beyond the text or other source ○ May effectively compare and contrast situations/perspectives/ideas with some evidence from the text or other source	Does not effectively compare and contrast situations/perspectives/ideas	beyond the text or other source ○ Does not compare situations/perspectives/ideas from the text
Use of appropriate strategies to interpret meaning (from texts or other media)	○ Profoundly expresses interpretations in a variety of media to conceptualize meaning profoundly (for example, student may draw pictures, charts or use other forms to conceptualize meaning) ○ If student uses recordings, student reads aloud fluently in recordings	○ Thoughtfully expresses interpretations in a variety of media to conceptualize meaning thoughtfully (for example, student may draw pictures, charts or use other forms to conceptualize meaning) ○ If student uses recordings, student sounds out words aloud fluently in recordings	○ With some clarity expresses interpretations in a variety of media to conceptualize meaning (for example, student may draw pictures, charts or use other forms to conceptualize meaning) ○ If student uses recordings, student pauses frequently while reading in recordings	○ Haphazardly expresses interpretations in a variety of media to conceptualize meaning profoundly (for example, student may draw pictures, charts or use other forms to conceptualize meaning) ○ If student uses recordings, student does not read aloud fluently in recordings
Understanding of concepts	○ Consistently demonstrates profound understanding of salient concepts or ideas	○ Consistently describes details or ideas of a text or other sources	○ With some inconsistencies describes concepts or ideas	○ Illogically describes details or ideas
Comments				

Overall comments:

Self-regulatory skills	GREAT	VERY GOOD	COULD BE IMPROVED	KEEP TRYING
Setting of outcome goals	○ Sets reasonable, thoughtful and specific goals which relate very well to personal enjoyment and indicate a profound desire to learn	○ Sets his/her own specific goals but goals appear forced and do not relate very well to personal enjoyment	○ Goals set are parroted, do not relate to personal enjoyment and are not necessarily specific	○ If goals are stated, they are not clear, they are not specific, they do not generally relate to personal enjoyment and they do not indicate a desire to learn
Setting of process goals	○ Sets reasonable and thoughtful strategies	○ Sets his/her own strategies but strategies appear forced	○ Strategies set are parroted	○ If strategies are stated, they are not clear
Monitoring of progress toward goals	○ Consistently profoundly articulates what is expected of them and thoroughly documents the processes he/she use when working on tasks	○ Articulates what is expected of them and documents the processes he/she use when working on tasks	○ Forced explanations offered of what is expected of them and inconsistently documents the processes he/she use when working on tasks	○ Does not articulate what is expected of them and fails to document the processes he/she use when working on tasks
Revised work	○ Showed evidence of revising work very thoughtfully	○ Showed evidence of revising work thoughtfully	○ Revisions were not thoughtful	○ No revisions appeared to be done
Help-seeking behaviour (from teacher, parents, and/or peers)	○ When thoughtful feedback is provided by teachers, parents or peers, student thoughtfully uses feedback to improve on his/her work	○ When thoughtful feedback is provided by teacher, parents or peers, student uses feedback to improve on his/her work	○ When thoughtful feedback is provided by teacher, parents or peers, student ineffectively tries to use feedback to improve on	○ When thoughtful feedback is provided by teacher, parents or peers, student does not use feedback to improve on his/her work

			his/her work	
Justification of work to include in portfolio	○ Student explains profoundly why he/she chose to include pieces in portfolio	○ Student explains thoughtfully why he/she chose to include pieces in portfolio	○ Student offers forced or superficial explanations of why he/she chose certain pieces	○ Student offers no or incoherent explanations of why he/she chose certain pieces
Student's reflections on learning	○ Very effectively reflects on strategies used, process of work, or outcome of work	○ Effectively reflects on strategies used, process of work, or outcome of work	○ Reflects on strategies used, process of work, or outcome of work but reflections are forced	○ If student reflects on strategies used, process of work, or outcome of work, reflections are incoherent
Student's self-assessment of quality of work	○ Very effectively evaluates the quality of his/her work	○ Effectively evaluates the quality of his/her work	○ Evaluates the quality of his/her work rather ineffectively	○ Provides no or poor evaluations of his/her work.
Comments				

Presentation	GREAT	VERY GOOD	COULD BE IMPROVED	KEEP TRYING
Choice of material (this will often be N/A)	○ Choice of works to include in portfolio is outstanding.	○ Effect choice of works to include in portfolio	○ Ineffective choice of works to include in portfolio	○ Very ineffective choice of works to include in portfolio
Use of features including multi-media elements	○ Portfolio very effectively incorporates a variety of features such as folders, pictures and/or voice	○ Portfolio effectively incorporates the use of folders, pictures and/or voice	○ Portfolio incorporates minimal use of the features such as folders, pictures, and/or voice	○ Portfolio inadequately incorporates the use of a variety of features
Organization of portfolio	○ Student very effectively organizes portfolio conceptually or chronologically usually through folders	○ Student coherently organizes portfolio conceptually or chronologically usually through folders	○ Student tries to organize portfolio conceptually or chronologically usually through folders, but portfolio is hard to follow	○ Student does not appear to try to organize portfolio -- portfolio appears to be a random collection of pieces
Effort	Content and organization of portfolio displays a	Content and organization of portfolio displays	Content and organization of portfolio displays	Content and organization of portfolio displays

	significant engagement in learning	some engagement in learning	inconsistent engagement in learning	little to no engagement in learning
Comments				

	GREAT	VERY GOOD	COULD BE IMPROVED	KEEP TRYING
Progress*				
growth and change in understanding	Work over time demonstrates significant increases in understanding of teaching material (i.e. understanding of a science concept or skill in conveying meaning). If multiple versions of work are created, they show significant increases in understanding.	Work over time demonstrates expected increases in understanding of teaching material (i.e. understanding of a science concept or skill in conveying meaning). In particular, if multiple versions of work are created, they show expected increases in understanding.	Work over time indicates limited improvement in understanding of teaching material (i.e. understanding of a science concept or skill in conveying meaning). In particular, if multiple versions of work are created, they show limited increases in understanding	Work over time indicates very limited improvement in understanding of teaching material (i.e. understanding of a science concept or skill in conveying meaning). In particular, if multiple versions of work are created, they generally do not indicate improvement over time.
Comments • Very helpful to list artefacts by date (click on date)				