

ICT INTEGRATION, E-PORTFOLIOS, AND LEARNING AS AN ACTIVITY-REFLECTION CYCLE

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ABSTRACT

This paper will outline a practical model of Information and Communication Technology (ICT) integration which further addresses the convergent need for an applied approach to different types of learning in the digital age. The model will be discussed in terms of the connection between two related notions: (a) that the most effective learning with ICT tools or media takes place as some variation of a basic 'activity-reflection' cycle; and (b) that a hypermedia portfolio provides an effective framework for connecting both higher-order and 'competency' modes of the learning process with assessment in both the formative and summative senses. The activity-reflection e-portfolio is conceived as a useful model of student learning and assignment work which might be adapted for various subjects and contexts in different ways. However, its greater significance is that it represents a strategy for ICT integration in education which further promotes active learning in terms of interactive, student-centred, and innovative approaches-in contrast to residual transmission or industrial-age views of learning as basically a process of information delivery and skill acquisition.

KEYWORDS

e-portfolio, ICT integration, activity-reflection learning cycle, assessment, pedagogy design

INTRODUCTION

The concept of electronic portfolios in education is becoming popular in school contexts as a profiling focus for student learning and also teacher staff development (Cambridge, 2001). This paper will go further to discuss a particular model of web-based portfolios as a learning and assessment tool which also has particular application to higher educational contexts. The model outlined below was refined as part of a research project at Singapore's National Institute of Education. In practical trials, it has demonstrated encouraging results for promoting and enhancing ICT integration in education. As well as being applicable to both introductory and advanced courses in ICT literacy, the model also provides a framework for ICT integration in different discipline areas or 'across-the-curriculum'. As Laurillard (2002) suggests in terms of beyond learning as mere content or skills transmission, higher

education needs to rethink teaching in a 'knowledge society'-that is, in terms of the need to integrate new modes of learning and assessment as well as ICTs.

The 'activity-reflection e-portfolio' model represents an exemplary focus for discussing a convergent 'hub' for connecting, implementing, and developing the various constructivist or student-centred implications of new learning technologies (Jonassen et al, 1999). The activity-reflection e-portfolio thus represents a strategy for teaching and learning which is consistent with both Laurillard's dialogical framework for the use of educational technology in university teaching and Schon's (1987) model of reflective practice in professional training and educational design. In place of traditional dichotomies of theory and practice, and also typical delineations of either skill or information acquisition in relation to applied knowledge, it advocates a view of applied knowledge grounded in both initial familiarization or practice and also critical reflection.

The activity-reflection e-portfolio might be approached as both a general strategy and also as a particular educational tool. As a general strategy we define this model as: *a learning and assessment strategy which integrates the tools and processes of ICTs but also at the same time encourages, reflects, and gauges students' progressive learning, self-evaluation and reflective practice*. Put another way, whilst some educators view educational technology primarily in terms of the transmission of content or skills, this model takes a more interactive, student-centered and innovative approach to the promoting of active and applied learning. As a particular teaching and learning tool, this model encourages learners to develop an online or web-based archive of learning artifacts and reflections which: (a) provides a context for integrating ICTs in the learning process; (b) connects practical activities with theoretical, procedural and other conceptual modes of reflective learning; (c) reflects the progress, development, and process of student learning; and (d) represents a presentation, a personal archive, and potentially a shared resource or publication.

E-PORTFOLIOS AND LEARNING AS AN ACTIVITY-REFLECTION CYCLE

In contrast to a traditional *linear* conception of skill acquisition and a *hierarchical* one of information acquisition, the e-portfolio promotes learning as an *activity-reflection cycle* leading to more effective and applied connections between theory or procedures and practice (and various other related top-down vs. bottom-up imperatives of education). By focusing on the use of ICTs in education as a general literacy rather than as a discrete set of skills or processes, the learning and assessment activities which make up the e-portfolio function as a guided but open-ended 'journey' to engage and overcome the initial and inherent 'thresholds of temporary frustration' which are associated with the use of technological tools as well as the engagement with newness and change. In short, ICTs extend oral and verbal literacies of human communication and information access in terms of new digital media which lend themselves to a focus on both lower-order competencies and higher-order generic skills such as problem-solving, collaboration, and transferable applications.

The transformative stages of the activity-reflection cycle further imply a theory of activity-based learning which lends itself to ICT integration as well as more effective learning links between *content* and *process*, *thinking* and *doing*, and also *formal education* and *social context*. Thus, as *Figure 1* indicates, the e-portfolio frames learning in the context of a three-fold process of *initial familiarisation* (naïve/activity phase), *procedural or theoretical explanation* (critical/ reflective phase) and *specific application* (dialogical/transformational phase). *Thinking* is grounded in *doing*, and *content* (i.e. information or skills) is likewise linked to a primary emphasis on *process*. In this way a resulting orientation of 'applied

knowledge' and 'reflective practice' is just as relevant to critical or conceptual modes of learning and theorizing as practical or technical types of learning. Such an understanding represents a dialogue or interplay between individual performance and social knowledge.

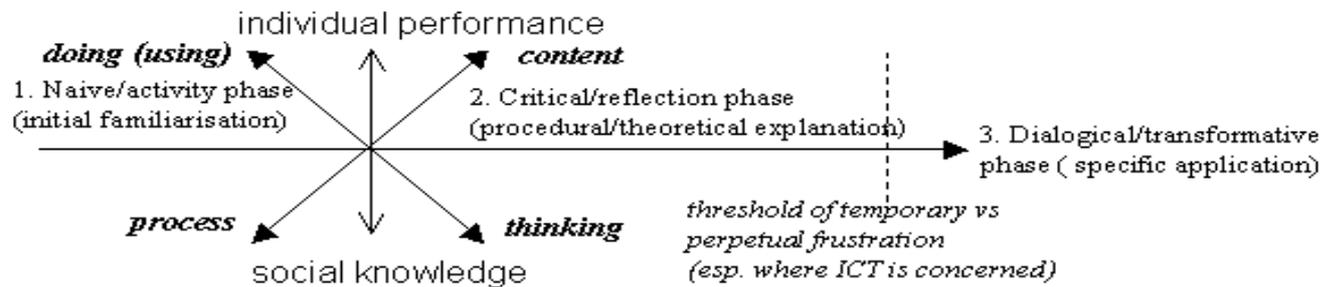


Figure 1. ICT integration and beyond the learning 'threshold of frustration'

The key to effectively designing an e-portfolio as a convergent learning and assessment strategy lies in encouraging effective student interaction with theory, procedures or content in terms of linking this with either hands-on experience or practical contexts of application. Where ICT is concerned, instead of focusing on unique procedures or specialized tools, the learning focus should be on transferable functions and generic applications. Learning activities should be appropriately designed to introduce, integrate and apply ICT skills and knowledge in relation to a curriculum or project purpose. It is also important to design appropriate 'focus questions' for learner reflection which encourage substantial engagement and thinking. The activity-reflection portfolio can be structured and developed in terms of several different types of templates which reflect a spectrum between focusing on the development of ICT literacy as an end in itself (or the primary learning goal) on one hand, and as the basis (i.e. ICT as a mode of literacy) for learning in any content or disciplinary area of knowledge on the other. This continuum is indicated in Figure 2 by the different contexts and generic templates for using e-portfolios as a learning and assessment tool.

1. Introductory or advanced ICT skill and knowledge acquisition:

- Activity focus is typically structured as a competency checklist of skills or knowledge
- Reflection focus is on the learning stages as a transformation which proceeds from basic skill acquisition and effective attitudinal orientation towards goals of confidence, innovation and application.
- Overall e-portfolio learning and assessment objectives goals relate to the general attainment or development of ICT skills and knowledge as an applied 'literacy' and habitual practice

• ICT in education subjects (e-learning; instructional design, educational technology subjects, ICT foundation courses, etc):

- Activity focus in this kinds of courses is more directly on the use of ICTs in terms of various generic skills (problem-solving, collaborative learning, etc), as a 'literacy-across-the-curriculum', and generally in relation to constructivist or student-centred notions of educational design.
- Similarly, the reflection focus here is on more applied contexts and practical issues of

<p>learning with ICTs generally - in short, may include a combination of <i>content</i> and <i>process</i> learning topics and related objectives.</p> <ul style="list-style-type: none"> • The e-portfolios for such courses are mostly concerned with the progression or transformation from 'old learning' (teacher-centred) to 'new learning' (student-centred) in introductory or foundational ways
<p>1. Project-based or problem-based learning approaches:</p> <ul style="list-style-type: none"> • A project or problem focus represents an 'organising activity' rationale here - a context for developing different stages and elements of an overall learning process in terms of various related learning activities using ICTs • The process of development is usually more important than the product (i.e. the direct outcome is merely a focus for a convergence of indirectly related outcomes). Hence, the reflection topics and questions here provide a formative and synthesizing focus for the progressive attainment of an organizing learning purpose or goal. • Overall purposes may range from an applied problem-solving orientation to specific areas of practical or conceptual knowledge on one hand, to the use of project-based learning as a powerful motivational framework for a more general engagement with knowledge - especially in terms of an ICT 'design' focus.
<p>1. Specific subjects or content</p> <ul style="list-style-type: none"> ○ Learning activities here are typically 'thematic' in focus and provide an introductory connection to a specific curricular or disciplinary content ○ Reflective practice here should be based on the kind of substantial and effective engagement with topics of knowledge (also specific procedures or theories) which are encouraged by good 'focus questions' in terms of general issues, particular information, and perhaps also relevant 'readings' (i.e. resources or references). ○ While ICTs need not be used directly for promoting an activity-reflection cycle here, an e-portfolio model nevertheless provides a learning and assessment context for both integrating ICTs as a general literacy lending itself to constructivist or student-centred learning.

Figure 2. Different learning contexts for customizable e-portfolio templates

The activity-reflection e-portfolio might thus be applied to a range of different types of learning. Underpinning the emphasis on reflective practice and the process of learning is a key notion that ICTs represent a mode of literacy with new media or tools of learning. In other words, to be integrated in education an applied orientation is needed towards ICTs which goes beyond the acquisition of a set of discrete skills or information and mere theorizing. The hypermedia interface of the e-portfolio provides a crucial focus for exploring, understanding and practicing ICT literacy as a design-evaluation connection, as an information-communication continuum, and as an interactive process. In short, it is a model which promotes the idea of teachers as 'designers' of effective learning.

<p>Multimedia Project (40%)</p> <ol style="list-style-type: none"> 1. Concept map 2. Flow chart 3. Storyboard 4. Project final product 	<p>Course X: Multimedia Development</p> <p>Developmental Process Reflections (40%)</p> <ol style="list-style-type: none"> 1. Stages and elements of multimedia project development 2. The development of a workable design idea 3. The process of interface design construction 4. Evaluation Phase-Gauging and refining effectiveness of project <p>Other (20%) Seminar presentation, discussion and report</p>
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Figure 3. E-portfolio template for a course lending itself to a project-based approach

Figure 3 outlines the example of an e-portfolio project-based learning template for hyperlinks customized for an actual course focusing on multimedia development. The project final product provides the convergent focus for reflections about the various stages and elements of learning about multimedia tools on one hand, and multimedia design on the other. The organizing focus of (and the idea for) the project itself was developed in the context of a series of *process* elements-concept mapping, flow charting, and storyboarding. Together these were just as important as the final product for assessment purposes since they reflected the process of learning as well as development. While the project and its planning elements were developed in pairs as a collaboration, the reflections and seminar items constituted an 'individual performance' which complemented but could be distinguished from the collaborative element. Likewise, the individual reflections were posted to online webforums as a basis for ongoing sharing and discussion of ideas in the course. This is in contrast to how Web discussion forums often promote vague and opinionated interactions around the online posting of mere content.

THE PEDAGOGICAL DESIGN OF LEARNING ACTIVITIES AND REFLECTIONS IN EDUCATIONAL CONTEXTS OF ICT INTEGRATION

The e-portfolio model outlined here represents a particular convergence between learning as an activity-reflection cycle and the literacy implications of the hypermedia interface. The exemplary instance of a learning and assessment e-portfolio is a website of hypertextual links (reflecting a required template) to activity artifacts and reflections related to the range of different types of learning outlined above. Alternatively, the e-portfolio might be saved to disk (e.g. CD-ROM) and submitted this way. In any case, the process of constructing an e-portfolio can and should be a simple one. An e-portfolio promotes two key related effects. It represents a framework or context for organizing, reflecting and generally enhancing or encouraging the process and outcomes of various modes and elements of either concrete or abstract learning. As a culmination of the learning process, the publication or presentation of learning outcomes or products on the Internet represents an authentic mode of assessment which extends beyond immediate formal learning purposes and the audience of the teacher-marker (e.g. it might remain a useful personal resource or be shared with others). Indeed,

the immediacy and potentially universal access to web publications or presentations are significant and powerfully motivating elements of ICTs as the basis for new literacies of interaction and knowledge.

As epitomized by influential concepts such as flexible delivery and life-long learning, the educational implications of ICTs have been recognized by many as learner-centred or constructivist (e.g. Jonassen, Peck, & Wilson, 1998). The e-portfolio model recognizes that such implications are dependent on the 'pedagogical' design of effective learning in terms of an activity-reflection cycle. The discussion below will provide an initial outline of a framework for teachers in various educational contexts to design effective learning activities, reflections, and contexts which connect with the use of ICT in teaching and learning.

The focus of an activity is on some kind of doing as a prelude to, in conjunction with, or as a culmination of thinking. This is in the context that all learning might be about enhancing reflective practice in some way. An activity may be a self-contained task or an open-ended series of tasks, and it may also be either physical or conceptual and symbolic in nature. It may also be an elaborately structured set of options or procedures, or may simply be a mode of play or the response to a focus question. The typology of activity-based learning outlined in Figure 4 distinguishes between introductory or initial familiarization activities, organizing activities, culminating activities and also reflection activities. Such a typology reflects the continuum as well as stages implicit in the activity-reflection cycle. It also epitomizes how the key challenge of effective activity design is to link the indirect interests, purposes and elements of doing with both an overall learning purpose or goal and some combination of attitudinal skill, process or knowledge learning objectives. In contrast to the model of activity theory proposed by Jonassen and others as a focus for learning with ICT, this version proposes an interactive connection between individual interests and performance and social dialogue and knowledge-and the latter grounded in relation to the former, rather than defined in opposition to it.

1. Introductory or familiarization activities
2. Organizing activities
3. Culminating activities
4. Reflection activities

Figure 4. A typology of activity-based learning

A good example of an activity focus for harnessing the educational resources and implications of the Internet is the model of Webquests (webquest.sdsu.edu/webquest.html). Contexts for searching out, evaluating and making use of authentic information from the Internet may include either an actual real-life situation or a hypothetical scenario, and might further involve role-playing, problem-solving and collaborative team-work in the pursuit of some required outcome or performance such as a report or presentation. Like the use of specific or organizing (e.g. navigational) metaphors in hypermedia design, an 'as if' dimension of imagination or storytelling provides the most effective initial and even on-going basis for encouraging interactive learning and the generation of insights, understanding, and new perspectives. Webquest tasks may involve an initial or on-going task, and also may have a single lesson or longer-term project focus. In relation to some particular context, Webquests might also revolve around the posting of one or more reflection questions.

E-portfolio critical reflections may be either directly or indirectly related to learning activities- as well as constituting a kind of activity in itself. The concept of 'critical reflections' used here is neither a mini-essay nor a short opinionated discussion. It is a semi-formal written response (usually 400-500 words) to relevant focus questions in terms of either practical processes of learning or topics which similarly serve to ground processes of knowledge inquiry (i.e. conceptual probes), self-evaluation, and various kinds of critical analysis in reflective practice. In short, ideas discussed should relate to practical experience and, where also appropriate, be supported by appropriate references and well-informed arguments. In this way, critical reflections represent an applied mode of thinking grounded in practical or ideational 'doing' which goes beyond the learning of mere information or skills. As individual performance, critical reflections may provide the basis for a social construction of knowledge in terms of subsequent dialogue and discussion. Figure 5 outlines the generic modes of critical reflection-the key learning focus for reconciling formative and summative assessment in the e-portfolio model.

<p>1. Critical reflection on a practical activity or about the use of a practical skill or concept</p> <p>An example of a practical activity might be the use of an internet search engine to find relevant links for a chosen and refined topic. Instead of merely re-describing the typical steps in this process, you might relate a 'reflection' discussion about key stages of this process to your actual experience of developing, applying and refining a search strategy - with particular emphasis on how some of the obstacles faced and overcome gave you new and practical insights about the process undertaken.</p>
<p>• Critical reflection on a stage or process of learning development</p> <p>An example of this kind of reflection might relate to either: (a) a developmental stage such as an initial design concept map or a later flow-chart or storyboard; or (b) the collaborative exercise of developing a web page or educational resource. If (a) then you might discuss the possibilities versus limitations of the particular model developed - perhaps with reference to either an initial idea or the projection of a final product. If (b) then perhaps you might compare the advantages and disadvantages of collaborative efforts in terms of actual experiences related to a particular stage or a general process.</p>
<p>• Critical reflection about a topic, concept or issue</p> <p>This kind of reflection may not require connection to first-hand practical experience but asks you to demonstrate an effective effort to think about, to explore and to develop a particular topic, concept or issue. It may be connected to a particular reading provided. If not, then you might yourself make some relevant connection to a particular references or general debate. It may also be useful to refer to relevant examples from common knowledge or someone else's experience or research (as well as your own).</p>

Figure 5. ICT integration and generic modes of critical reflection

CONCLUSION: THE E-PORTFOLIO AS A CONVERGENT HUB OF LEARNING

The kind of delineation between theory and practice which privileges conceptual thinking over applied doing is undercut by the convergent hub of learning represented by the activity-

reflection e-portfolio model. To the extent also that assessment typically drives learning, this model provides a framework for reconciling the process and either the content or outcomes of learning in terms of an interplay of individual performance and the social construction of knowledge. It represents an approach which encourages students to be more active, reflective and innovative learners in potential or actual contexts of application-in contrast to learning as the mere acquisition of information or skills in isolation on one hand, or as privileged abstraction and theorizing on the other. The e-portfolio has further been outlined above as a convergent hub also for a series of related notions linked to a view of the constructivist or learner-centred implications of ICT in education (project-based learning, authentic assessment, collaborative learning, etc.). The key to such a hub of convergence, it has been suggested here, is the pedagogical design of reflective practice in terms of a threefold process of naïve doing, critical thinking, and applied performance and knowledge.

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