

# E-portfolio Assessment in Higher Education

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**Abstract** - The concept of developing e-portfolios is based on the fact that the reflective practice of creating portfolios enables students to document and track their learning; develop an integrated, coherent picture of their learning experiences; and enhance their self-understanding. This process enables the students to plan and proceed towards their future goals and allow them to showcase their skills and knowledge to prospective employers and research supervisors. An assessment tool has been developed and implemented for assessment of learning in the design and development of evidence based e-portfolios. Student participants of this study developed e-portfolios where students' provided critical reflection on the process of learning and supported their statements with appropriate artefacts. The generic tool developed has been used by identifying eportfolios of students majoring in different subject areas. These portfolios included students' skills and competencies in formal and non formal settings as well as their informal learning. Students can evaluate their own learning and therefore, are better prepared to pursue their future career goals. Findings of this study suggest that design and development e-portfolios provide an appropriate platform for integrative learning where students can visualize the links between the different concepts learnt throughout their course of study and beyond.

*Index Terms* – Assessment, integrative education, e-portfolio, Online and Distance Education.

## INTRODUCTION

Portfolios are used in many disciplines and although there are numerous definitions in the literature, in general a portfolio can be described as, “a purposeful compilation and reflection of one’s work, efforts and progress” [1, p.375]. In addition there are different types of portfolio including assessment, employment, learning, and teaching portfolios, the format ultimately depending on the purpose for which it is developed [1].

The learning portfolio is seen as an "authentic" form of assessment [2] by providing the means to assess students' ability to set their own goals, think critically, solve complex problems, work collaboratively and undertake reflective practice [3]. The electronic portfolio or e-portfolio, an adaptation of the original paper-based portfolio in digital format is a more recent phenomenon not only providing students with a repository for collection and presentation of

their work but also a mechanism for documenting growth and achievement of professional knowledge and skills [1], [4].

The e-portfolio [1], [5] makes use of a variety of electronic media as well as links to external sources. While e-portfolios are created through a similar process to print based portfolios, e-portfolios have a number of advantages over print based portfolios including the ability to store, organise and reorder contents quickly and easily; provide opportunities to integrate student course work; their ability to form the basis for collaboration; the potential for development of information management, self organisation, planning, and presentation skills [5-8]. The concept of digital or e-portfolio goes beyond text and still images only. One can incorporate multimedia to demonstrate knowledge and skills. The realm of e-portfolio is extending as new tools and technologies are developed. Therefore, e-portfolio development is not only about “collection” of artefacts as evidence of learning and “reflection” on the process and product of learning but it is also about the “interactions” of learning. In this “networking age” no learning can be labelled as independent and individual. Knowledge is distributed among people and artefacts [5], [7]. Most of the present day e-portfolio platforms provide the option for inclusion of peer review, feedback and discussion. Therefore e-portfolios have the potential to become lifelong learning tools.

E-portfolio has been used successfully in both learning and assessment in a number of disciplines including the Arts, Humanities and Social Sciences. In last few years computer science and engineering education faculty and students have been introduced to the concept of e-portfolios. Students have found the advantages of e-portfolio to showcase their work particularly for employment purposes [8], [9].

However e-portfolios are not without their challenges. [1], [10] identify a number of issues including: the time intensive nature of development; difficulties in mastering the use of the software; and issues of privacy. Perhaps more importantly [3], [11] assert that without a central focus on reflection, e-portfolios are in danger of becoming simply a collection of information rather than a mechanism for the development of meaningful knowledge. In order to determine whether such a process has occurred criteria for the assessment of reflection within the e-portfolio context are needed [12], [13].

In the present research study we have introduced collaborative activities and peer feedback as integral part of the e-portfolio. We have collected data by administering the assessment tool [14], [15] for self assessment, peer assessment and teacher assessment. Triangulation of results provided informative data for future research.

## DESIGN AND DEVELOPMENT OF THE RUBRIC FOR EVALUATION OF EPORTFOLIO

The basic purposes of the e-portfolios discussed in this study are two fold, learning and showcasing. Students collected evidence of their work (the artefacts) and reflected upon their work, which are expected to provide them with directions for lifelong learning. Students were mentored to extract relevant evidence and write reflections to showcase their skills, understanding and learning. These e-portfolios will be useful when applying for employment, both for work experience placements and upon graduation.

Using the literature, graduate profiles, job advertisements, feedback from colleagues and personal experiences, list of skills that are characteristic of lifelong learning skills were identified. By working through accreditation documents and graduate profiles major subject groupings for degree programmes were also identified. We selected the Open Source Portfolio (OSP) system [16] as our eportfolio platform in 2006 and customized it to suit our purpose.

Instead of highlighting subject areas within each discipline we emphasised the contexts of learning, undergraduate and postgraduate studies, employment and outside activities. This setup underlines the importance of learning outside formal tertiary education. It is more flexible as it caters for students at different levels of study and with varied work experience. For example, a mature student with work experience before tertiary study can now emphasise skills learnt in the workplace.

Students created their integrated eportfolios by including their learning from formal, non-formal and informal settings (see Figure 1).

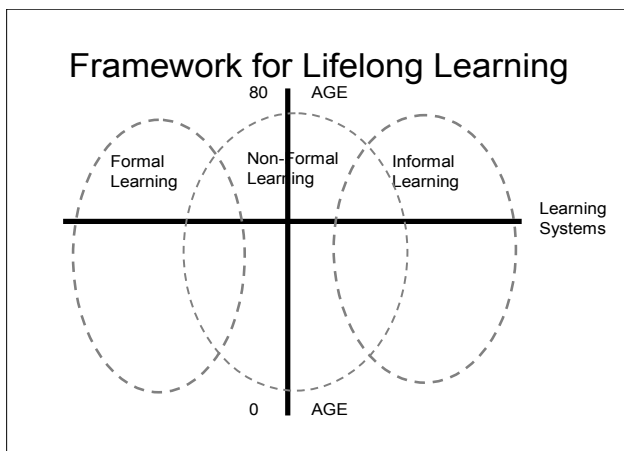


FIGURE 1

INTEGRATIVE LEARNING THROUGH DIFFERENT LEARNING SYSTEMS

**Formal Learning:** A hierarchically structured, chronologically graded, education system running from primary through to tertiary institutions.

**Non-formal Learning:** An organised educational activity outside the established formal education system that is intended to serve an identifiable learning clientele with

identifiable learning objectives – often described as including “Life Skills” development.

**Informal Learning:** A process whereby every individual acquires attitudes, values, skills and knowledge from daily experiences with family, friends, peer groups, the media and other influences and factors in the person’s environment.

Feedback from industry on the value of portfolios to develop and demonstrate lifelong learning skills has been fully congruent with the information we found in the academic literature. The importance of lifelong learning, the types of skills essential for lifelong learning, the value of providing evidence and reflection, and the emphasis on activities outside formal education all match closely.

In our assessment of students’ eportfolios we have concentrated on the assessment of students’ reflections on different artefacts and the process of learning. Initial analysis of students reflections were done by using the matrix shown in Figure 2. This matrix was derived from the attributes of meaningful learning in an earlier research [6], [7].

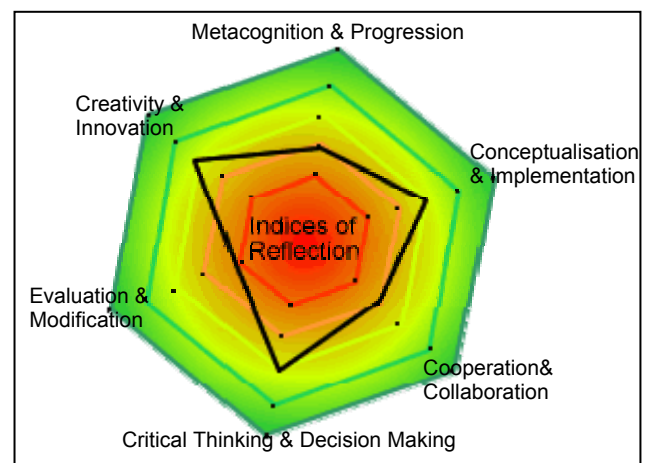


FIGURE 2

RUBRIC FOR ASSESSMENT OF REFLECTION

Detailed ground rules have been developed and validated for the rating scale under each of the six categories [14], [15]. An excerpt from the ground rules document can be found in appendix 1.

Further support for the rubric can be found in the literature on reflection which is seen as encouraging metacognition [12], [17] and critical thinking [15], [18]; can be enhanced by collaboration [19], [20]; involves making sense of events [21]; encourages the examination and evaluation of assumptions and beliefs [22], [23]; has the potential to enhance creativity [24], [25]; and improves cognitive ability by challenging learners with ill-structured material [19], [26].

The mean reflection level achieved for the six categories of the rubric were calculated for each participant and depicted as a hexagonal “cobweb” chart (see Figure 3). Categories in which the student scored well are clearly highlighted as are areas which may require additional support or where the student can be encouraged to reflect using specific guidelines.

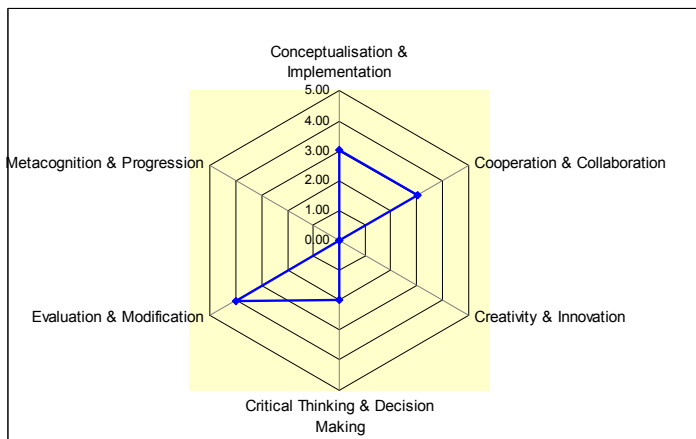


FIGURE 3

PARTICIPANT SELF-REFLECTION RUBRIC RESULTS EXAMPLE

The group aggregate mean reflection level achieved for each category of the rubric were also calculated and provide a clear summary of analysis results (Figure 4).

In addition to investigating the aggregate mean reflection levels by category, the proportion of analysis units coded to each category were also of interest (Figure 5). It is clear from this that students' focus when writing self-reflections concentrated on areas associated with *conceptualisation and implementation*; *critical thinking and decision making* and *evaluation and modification*. This is not surprising given that the demonstration of higher order thinking skills was an integral part of the e-portfolio assessment; and instructions given through the marking rubric for self-reflections asked students to include an evaluation of the learning process.

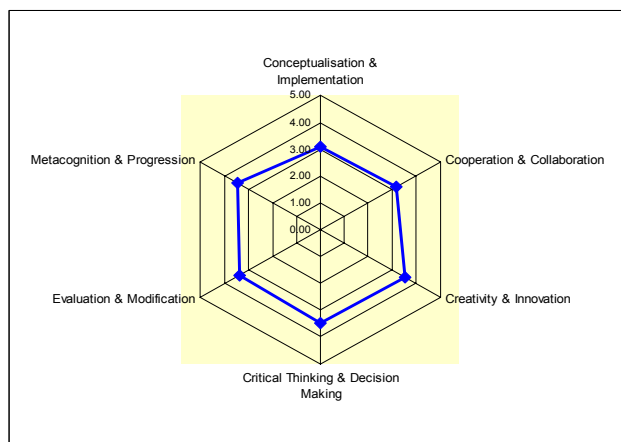


FIGURE 4

AGGREGATE RUBRIC RESULTS FOR SELF-REFLECTIONS

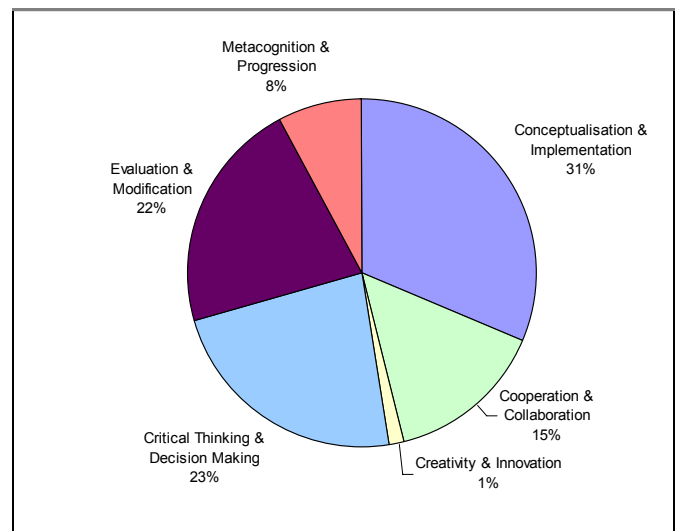


FIGURE 5

SELF-REFLECTION RESULTS BY RUBRIC CATEGORY

Results also show that 21 (15%) of units were coded in the *cooperation and collaboration* category and included responses from 12 of the 14 research participants. Of the 12 who chose to reflect on the collaborative dimension of the assignment, all described positive experiences of working within a group environment. For example:

... through the organisation of regular online chat meetings we were able to have in depth conversations about our topic. This is where most of the action happened, where we asked questions of each other, shared understandings and knowledge, delegated tasks, identified direction, as well as having a good laugh and supporting each other with positive reassurance and guidance.

Reflection on collaboration wasn't just confined to this particular category. Of the analysis units coded to the other categories, a significant number made reference (predominantly positive) to the group or the collaborative nature of the experience while describing their ideas and insights. Specifically *conceptualisation and implementation* (44%); *critical thinking and decision making* (33%); *evaluation and modification* (52%); and *metacognition and progression* (64%) included such references.

This may be a reflection of students adjusting their writing to conform to what they believe was required by the audience [9], [21]. It was noted however that some students were prepared to express what they really thought regardless of the audience:

*We floundered for a good week, and there was no direction from the teacher to pull us back in line again. I, personally, do not think that we received the scaffolding we needed in the early stages.*

Alternatively it may be indicative of the type of students' who agreed to be part of the study; or more likely it is a reflection that the collaborative nature of the learning environment had a significant impact on students' experience. These results offer a solid basis for understanding the effect of the collaborative learning process

### CONCLUSIONS AND FUTURE RESEARCH

The potential of e-portfolio design and development are far reaching. Students once engaged in the creation of e-portfolios continue to work on their portfolios and create communities of learners through exchange of ideas, sharing and online discussions. In the next phase of our study we intend to incorporate blogs, wikis, podcasts and other powerful web tools to enrich students learning experience.

Beyond the rubric's use as an assessment tool in the e-portfolio context, other potential uses include: as a guide for teachers to assist students in learning what constitutes quality reflection thereby encouraging them to become reflective thinkers; as a summative instrument for evaluating student work [21] [27]; and as an aid to assist teachers in supporting student learning particularly in diverse environments [28], [29].

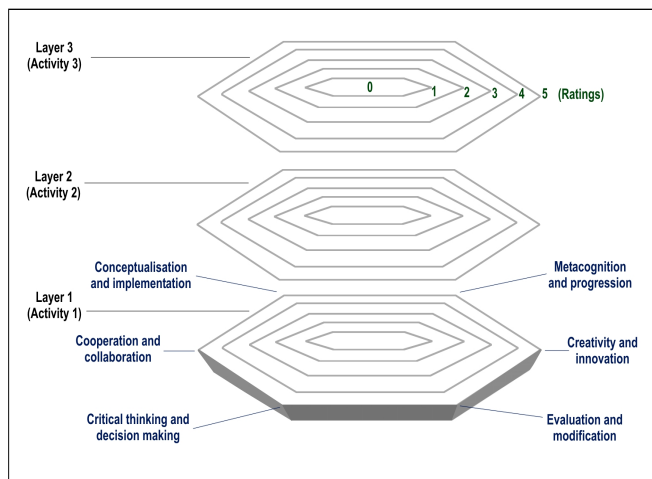


FIGURE 6

BUILDING A INTEGRATED REPRESENTATION/SHAPE OF ASSESSMENT OF 'MEANINGFUL LEARNING' IN TOTALITY FOR E-PORTFOLIO

We have also implemented the rubric for assessing students' progress during the process of learning. The study has been reported in another publication [28]. The model used in that study is the repeated use of the model shown in Figure 2 which provided an overall progression pattern of individual learners (Figure 6).

In future we intend to create a computer based system which will guide students' progression by creating student

profiles from self reflection and peer review data. Presently we are focusing on the instructional design guidelines which will allow us to provide customized learning solutions for diverse groups of students. In this regard e-portfolio could be a promising solution to learning and assessment in a global context by providing the opportunities for freedom of expression.

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Metacognition & Progression					
Strategies & Skills		1	2	3	4
1. Generation of personal cognitive structures/frameworks for understanding information and experiences; recognition of learning difficulties; remedial action sought.	<ul style="list-style-type: none"> <li>▪ Demonstrates a lack of awareness of personal cognitive framework.</li> <li>▪ ----</li> <li>▪ -----</li> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ Recognition of cognitive frameworks with assistance.</li> <li>▪ ---</li> <li>▪ -----</li> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ Awareness and generation of personal cognitive framework enabling recognition of learning difficulties when prompted.</li> <li>▪ ---</li> <li>▪ -----</li> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ Awareness and generation of personal cognitive framework enabling recognition of learning strengths and difficulties when they arise as well as adoption of remedial action.</li> <li>▪ ---</li> <li>▪ -----</li> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ Uses personal cognitive framework with proficiency managing all aspects of learning and effectively resolves difficulties when they arise.</li> <li>▪ ---</li> <li>▪ -----</li> <li>▪ -----</li> </ul>
2. Selection of effective learning strategies for specific tasks.	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>
3. Responsibility for personal learning process.		<ul style="list-style-type: none"> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>
4. Goal setting, planning, organisation of workload, progress monitoring, and adjusting where necessary.				<ul style="list-style-type: none"> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>
Conceptualisation & Implementation					
1. Recognition and application of ideas/concepts to explain an event/behaviour.	<ul style="list-style-type: none"> <li>▪ Describes reports or re-tells with minimal transformation, no added observations or insights.</li> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ Uses the source data in some way, but with little transformation or conceptualisation.</li> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identifies aspects of the data which have personal meaning or which connect with their prior or current experience.</li> <li>▪ ---</li> </ul>	<ul style="list-style-type: none"> <li>▪ Integrates data into an appropriate relationship, e.g. between theory and practice in some depth, personal experience, involving a high level of transformation and conceptualisation.</li> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ Displays a high level of abstract thinking to generalise and/or apply learning.</li> <li>▪ -----</li> </ul>
2. Recognition and application of theory to practise.	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>
3. Evaluation and synthesis of theoretical concepts.	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>
4. Work within time and structural constraints to execute chosen course of action.		<ul style="list-style-type: none"> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>	<ul style="list-style-type: none"> <li>▪ -----</li> </ul>