

# Using ePortfolio's to Assess Undergraduate Paramedic Students: A Proof of Concept Evaluation

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## Abstract

The ePortfolio presents itself as potentially a highly useful assessment tool for students, encouraging self-reflection and the development of both clinical skills and theoretical knowledge by students identifying strengths and gaps in knowledge. A survey of students after the completion of the inaugural Emergency Health ePortfolio program revealed several strengths and weaknesses of the ePortfolio as an assessment tool of paramedicine students. The ePortfolio format was perceived by many students to encourage reflection and help them recognise areas where improvement was required. Certain students struggled to accurately identify the volume of information and concepts that should be covered while collating the ePortfolio which caused a degree of stress for some. The online format was another point of contention for students, with some enjoying the freedom of online education while others struggled to integrate multimedia components into their ePortfolios. The overarching student response was favourable and encouraged further implementation of the ePortfolio tool into the education of paramedicine students. This paper concludes that the ePortfolio has the potential to be a powerful assessment and more importantly education tool if development of the concept is continued into the future.

**Keywords:** ePortfolio, Graduate attributes, Paramedic

## 1. Introduction

It has become recognised that knowledge and practice within healthcare is an ongoing process that is in a constant state of flux given the changes in health informatics. It is estimated that the volume of medical knowledge doubles approximately every five years (O'Malley, 2008). This level of progression and innovation within healthcare requires university graduates looking to practice within health care disciplines to be aware that their process of learning will be ongoing throughout their career, a process known as lifelong learning (O'Malley, 2008; Rees & Sheard, 2004). Students must also exhibit a capacity to demonstrate the achievement of identified graduate attributes required for employment, rather than simply being able to perform a set of psychomotor skills (Ulfvarson & Oxelmark, 2012).

The purpose of this paper is to briefly examine the concept of ePortfolio's and their use in assessing student paramedics in the Department of Community Emergency Health and Paramedic Practice (DCEHPP) at Monash University. The notion of graduate attributes and their future assessment in the DCEHPP using ePortfolio's will also be considered.

DCEHPP is one of the leading paramedics departments in the world, generating a significant proportion of paramedic-led clinical and educational research. The department offers education programs from Bachelor level to PhD. Its foundational Bachelor degree provides students will potential employment with ambulance services in Australia and around the world. The three-year degree uses a combination of traditional and contemporary approaches to teaching and has close to 600 hours of clinical placements in acute and non-acute healthcare settings. The program is guided by institutional and industry-driven graduate attributes and is accredited by the Council of Ambulance Authorities. It is one of very few paramedic departments in Australia that uses ePortfolio throughout its Bachelor degree.

The nomenclature surrounding the term graduate attributes has many and varied meanings (Williams, Onsmann, & Brown, 2010). For example, James et al. (2004, cited in Williams et al., 2010) suggest that the term is considered

interchangeable with terminology such as ‘generic skills’, ‘core competencies’, ‘capabilities’, and ‘graduate qualities.’ Scanlon (2006 cited in Williams et al., 2010) appropriately describes graduate attributes as the ‘generic skills, knowledge, dispositions and attitudes undergraduates develop during their university studies.’ Moreover, it is critical that discipline-specific graduate attributes are agreed upon between professional, industry and university groups (Williams et al., 2010). A study undertaken in 2012 by Williams and colleagues resulted in the development of a set (n=31) of empirically based graduate attributes for the paramedic discipline (Williams, Onsmann, & Brown, 2012). The 31 attributes were categorised according to 7 constructs. See table 1 for the list of constructs and an example of each.

Table 1. Constructs and paramedic graduate attributes

Construct	Attribute example
Personal behaviour and attitudes	Ability to work independently as well as member of a team
Patient interaction and welfare	Operating within appropriate ethical and legal boundaries
Scientific approach to patient care	Demonstrating critical thinking
Paramedic and society	Culturally sensitive and have an inclusive approach to differences
Commitment to professional health care	Capacity to undertake self-directed approaches to learning
Professional behaviour	Contributing to continuous improvement within health care system
Interaction skills	Providing leadership, mentoring and supervision skills

It is one thing to develop a list of graduate attributes, but how can educators and policymakers be convinced that they are being achieved (Williams et al., 2010)? Despite the importance of assessment, it is noted by Hughes and Barrie (2010) that “the assessment of learning outcomes in general, and of graduate attributes in particular, is a complex and challenging undertaking and one that has often met with limited success” (Hughes & Barrie, 2010). Therefore, choosing the most appropriate assessment approach is critical in demonstrating to prospective employers that students from a particular university have demonstrated the necessary graduate attributes that are espoused by that institution (Cummings, Ho, & Bunic, 1997).

If it is accepted that learning is driven and often defined by assessment, then in order to achieve high-quality learning and high-order graduate attributes, appropriate high-level and high-quality assessment activities should be developed simultaneously (Biggs, 1996). It is through this concept that an assessment strategy has been developed and implemented as a tool to drive learning in University education for paramedics. Because of this, there must be a direct and explicit link between the assessments and graduate attributes (Scanlon, 2006). The authors believe that one such tool is an ePortfolio. The value of ePortfolios in this context has also been recognised by Ferns and Comfort (2014).

In general terms, portfolios have been utilised in tertiary education for many years, with portfolios first being implemented in faculties such as arts and architecture (Timmins & Dunne, 2009). This format allowed for the collation of the artists’ body of work, enabling the artist to present this to potential employers with flexibility (Greenberg, 2004; Patrick-Williams & Bennett, 2010; Timmins & Dunne, 2009). Health care disciplines began to embrace the potential of the portfolio during the 1980’s (Pincombe, McKellae, Weise, Grinter, & Beresford, 2010; Timmins & Dunne, 2009).

Throughout academic literature, portfolios are defined in numerous fashions, such as; a tactile record of a body of work, a collation of personal achievements or variety of samples of an individual’s work that may be presented to peers or potential employers. At its most simplistic, a portfolio has been described as a scrapbook or curriculum vitae; although this definition fails to recognise a portfolio as an opportunity for a student to display the achievement of graduate attributes e.g. communication or team-based skills (Challis, 2005).

### 1.1 What is an ePortfolio?

With the advent of the digital age and widespread access to the internet, the concept of an electronic portfolio or ‘ePortfolio’ has been developed and introduced into the tertiary, vocational and professional sectors (Sweat-Guy & Buzzetto-More, 2007). The push for the implementation of ePortfolio technologies in the Australian higher education sector began in July 2008 with the release of two significant documents by the Australian Information and Communication Technology in Education Committee (AICTEC) (Coffey & Ashford-Rowe, 2014). While both these documents set the scene for collaboration in the use of ePortfolio in Australian higher education, it was the Australian ePortfolio Project (AeP) that provided the necessary guidance and support for users’ (Coffey & Ashford-Rowe, 2014). Funded by the Government through the Australian Learning and Teaching Council (ALTC), and led by ePortfolio experts from Queensland University of Technology (QUT), the AeP produced three reports in 2008, 2009 and 2010

that guided the Australian universities approach to ePortfolio technology, adoption and use (Coffey & Ashford-Rowe, 2014).

### 1.2 What are the Benefits of ePortfolios?

While certain writers view the ePortfolio as simply an electronic version of a paper portfolio; the ePortfolio offers a great deal more than the traditional portfolio through the integration of multimedia applications such as video and audio along with the more traditional text and images (Baston, 2002; Gulbahar & Tinmaz, 2006). This multimedia-rich integration allows for an increased range of student interaction with educators and peers when compared to traditional paper portfolios (Greenberg, 2004). For example, ePortfolios have the capacity to allow students to demonstrate clinical and/or non-technical skills (e.g. insert intravenous catheter, or paramedic-patient interaction) via video, and increase student collaboration through the ability of peers to leave comments and further suggestions for improvement via social media elements within the various ePortfolio programs. (Greenberg, 2004) It is through these developments that the ePortfolio may offer something that has perhaps a greater relevancy to a career as a healthcare professional than a traditional assessment activity.

It has been suggested that an ePortfolio provides students with an opportunity to develop meta-cognition, psychomotor skills, organisational skills and the ability to identify both their strengths and shortcomings through the process of critical thinking and reflection (Jensen, 2011; Ring & Ramirez, 2012). These latter two are notoriously difficult to measure via traditional assessment measures. Depending on how an ePortfolio is used, some additional benefits of portfolio-based assessment (Cooper & Love, 2001; Emmett, 2003; Lambert & Corrin, 2007; Love & Cooper, 2004; Stojcevski & Du, 2008) are listed in table 2.

Table 2. Benefits of ePortfolio-based assessment

Benefits
Promotes self-directed learning, and active learning
Innately develops graduate attributes
Provides clarity and 'richer' picture of what has been learned
Provides capacity to develop peer-supported growth and self-auditing
Aligns instruction and assessment
Personalises graduate attribute development
Provides capacity to collect multiple sources of evidence
Encourages learning about learning
Well suited to the principle of lifelong learning
Used in both formative and summative assessment modes
Easily shared between faculties and industry

Interest in the ePortfolio has also been expressed by employers, with predictions that the ePortfolio may in some way replace the traditional paper-based resume in the near future (O'Malley, 2008; Okoro, Washington, & Cardon, 2011). With the ePortfolio format enabling students to present large amounts of information to employers in a manner that is concise and easy to access, the ePortfolio has a potential to become a useful tool for industry to evaluate and distinguish potential employees based on their core industry attributes or competencies (Okoro et al., 2011). In the context of health care, an ePortfolio provides an employer with an insight into the strengths and weaknesses of the potential employee and how that person acts to continue personal and professional development over time (Okoro et al., 2011).

### 1.3 Different types of ePortfolio software

There is a range of competing ePortfolio software available for use in the implementation of ePortfolio learning and assessment. A number of these include: Drupal ED, Elgg, Epsilon, Exabis, Factline, Fronter, Mahara, Movable Type, PebblePad, Sakai, Taskstream and Wordpress (Himplsl & Baumgartner, 2009). These platforms differ from each other in terms of licensing and the features they offer. Drupal ED, Elgg, Exabis, Mahara, Moveable Type, Sakai and Wordpress are all open-source licensed software, while all other platforms have various commercial licensing schemes. While each ePortfolio platform offers a differing variety of features and is suited to different uses, the ePortfolio is largely student generated with students adding their own artefacts such as text, images, video and on certain platforms, manipulating the layout of the ePortfolio itself (Himplsl & Baumgartner, 2009). In summary, ePortfolio technologies

afford learners with personal space where they can collect, structure and present their content (Coffey & Ashford-Rowe, 2014).

While many Australian universities continue to trial the different ePortfolio options, there has not been a widespread uptake (Coffey & Ashford-Rowe, 2014). This is despite there being a range of support mechanisms available including funded projects, ePortfolio specific conferences and a range of commercial and open software (Coffey & Ashford-Rowe, 2014). The DCEHPP commenced using ePortfolio's (in tandem with other assessment methods) in 2013 in the assessment of clinical units within the Bachelor of Emergency Health (Paramedic) program. The ePortfolio was viewed by staff as an effective way for students to provide evidence that certain attributes or traits had been demonstrated such as: communication and interpersonal skills, clinical skills, industry placements and awards and achievements.

#### 1.4 What did we do?

The software chosen was Mahara™. Mahara™ is an open source e-portfolio system with a flexible display framework. Using Mahara, first year students (total enrolment n=108) were required to establish and maintain a clinical ePortfolio comprising a number of assessments and activities. The specific tasks that were required to be completed and later uploaded as their artefacts, and a brief explanation of each task is summarised in Table 3.

Table 3. Clinical portfolio tasks and explanation

Tasks	Explanation
Skill station	Demonstrate clinical skills in a range of short scenarios e.g. airway management,
Worksheet	Answer questions relating to a case study and medical terminology
Online learning package	Complete short program on hand hygiene and print-out certificate of completion
Video submission #1	Perform clinical assessment of a patient and demonstrate communication skills
Video submission #2	Perform a patient handover and pre-notify hospital

Dates were set for the completion of each task. Each task was assessed using an individual assessment rubric and then allocated a mark. The combined mark for all the clinical portfolio tasks was worth 30% towards the overall mark for the unit. The remaining 70% comprised mid-semester and end of semester theory examinations, and an Objective Structured Clinical Examination (OSCE). Completion of the clinical portfolio was also a hurdle requirement i.e. students were required to achieve an aggregated grade of greater than 15% out of the 30% available for the overall clinical portfolio to pass the unit.

The unit guide (or manual) included information about Mahara; where it could be accessed, and assessment rubrics for each task. A number of information sessions and supporting resources were also made available to students throughout the semester and via the on-line learning platform (Moodle).

## 2. Methods

### 2.1 Study Design

A qualitative narrative design was used including two open-ended questions as part of an evaluation form.

### 2.2 Population and Setting

All students (n=108) enrolled in second year of the BEH studying a unit titled: Paramedic management of cardiovascular conditions were invited to participate. Inclusion criteria for the students were providing consent to take part in the study and being enrolled in the unit of study. At the completion of the trial, students were asked to reflect upon their experience with Mahara.

### 2.3 Instrumentation

A simple 'proof of concept' evaluation tool was created. This evaluation included two open-ended questions i.e. 'what did you enjoy about Mahara' and 'what did you not enjoy about Mahara.' These questions allowed students to provide greater alternative responses.

### 2.4 Ethics Approval

Ethics approval for the study was granted by the Monash University Standing Committee on Ethics in Research Involving Humans. Students were invited to take part in the project by one of the investigators at the conclusion of a lecture. The purpose of the study was explained to students and that their participation in the project was voluntary.

### 3. Results

All students (n=108) enrolled in the course were invited to participate in the study. A total of n=39 students returned their evaluations (this represents a 36% response rate); responses from students ranged across a spectrum from that of undoubtedly positive to significantly negative. The overarching student response was a positive one; albeit with some concern in how the assessment tool was implemented and presented to students.

Many responses included that the strength of the ePortfolio was the ability for the student to have some autonomy and control over their learning. This was supported with responses including that the process of self-reflection upon previous mistakes had contributed to a more developed understanding of previously difficult concepts. Several responses also included that multimedia integration allowed them to become more creative and expressive in their coursework compared to a traditional assessment tool which increased their enjoyment of the assessment task. Sample responses include:

*"I started my Mahara assignment quite early and ended up finishing it well within the timeframe. I ended up finding this assessment task to be much less stressful and more fun than a normal essay. I really enjoyed not having the normal constraints of time limits and specific numbers of references etc. I liked being able to add in pictures and make flow charts."*

*"Cannot stress how much better this was than a 3000 word essay."*

*"As a creative person, this was really down my alley and it was an assignment that I really enjoyed doing."*

*"Was beneficial because it made me realise and think about what I didn't know and what I needed to improve on."*

Negative statements from students ranged from a moderate concern about the educational benefits of the ePortfolio system through to a complete dismissal of any benefit that ePortfolios may offer in their education.

*"I did not learn anything new from doing this assignment as I would have researched a topic to write an essay about."*

*"I wasn't a fan of the idea: I much prefer a structured, clearly defined assessment topic and a written piece. The multimedia side of the assignment did not appeal to me and at all and having to include personal videos and more 'creative' concepts was quite daunting."*

*"There is no way I am going to keep my Mahara and build on it or show it to people later. It's embarrassing seeing myself on video and I'd never show an employer my undergrad work."*

While constructive in nature; a recurring theme throughout student critiques was a concern that the assessment requirements and goals were not clear and easily accessible to students that may not be familiar with 'e-learning' and the ePortfolio concept.

*The only problem I found was that I did not know what was being assessed and what wasn't including whether we were being judged based upon how much life experience we had. It was hard to know exactly what was required from the start."*

*"Mahara was good and fun but at times it was unclear how much information on the pages was enough."*

*"More assistance from people who know about IT. Had trouble uploading video, which was a common problem for a lot of people."*

### 4. Discussion

While student critiques of the ePortfolio program were both dismissive and constructive in nature, the overarching response from students was favourable, and showed a support for the further integration of the ePortfolio into their ongoing paramedic program at Monash University.

A strength of the portfolio based learning system is its ability to encourage active student contribution into the learning process. This is coupled with encouraging students to participate in self-reflection upon their education and clinical experiences (Butler, 2007; Garrett & Jackson, 2006; McMullan et al., 2002). This combination of attributes has been

claimed to strengthen educational links between theory and practice along with critical thinking skills (Garrett & Jackson, 2006; Karsten, 2012). These areas are crucial for the paramedic discipline.

With effectively linking theory and practice being a goal of health care educators (McAllister, Hallam, & Harper, 2008), there is support for the notion that the ePortfolio has the potential to be an important part of this process, and is a learning tool that can continue to gather widespread use in into the future (Pincombe et al., 2010). This is something that Coffey and Ashford-Rowe (2014) allude to when they suggest that ‘as ePortfolio’s continue to emerge as both compelling and effective mechanisms to measure student performance and monitor institutional quality, it is likely that ePortfolio practice will soon become a landmark of the renewed academic curriculum in Australia’ (Coffey & Ashford-Rowe, 2014).

Students commented the ePortfolio program contributed to the consolidation of difficult concepts through reviewing prior work, mistakes in coursework or clinical placements. Through the use of reflective learning, students are aided in developing a sense of awareness about the strengths and weaknesses of their knowledge and clinical skills (McMullan et al., 2002). Participation in reflective learning styles linked to comments about a positive experience in ownership and autonomy over learning show formative links in the development of an awareness of the value of self-reflection. Continued self-reflection shows strong links to the development of the much touted process of life-long learning and potentially, a participation in evidence-based practice throughout the duration of their career (Adamczyk, 2006; Garrett & Jackson, 2006; Murray, Smith, Pellow, & Hennessy, 2006). ePortfolios have the potential to play a part in this process.

In contrast, there appears to be a perceived weakness in the ability for educators to provide a clear explanation of what is required from students and then to effectively assess each individuals ePortfolio (Jasper & Fulton, 2005; McAllister et al., 2008; McMullan et al., 2002; Redman, 1994; Timmins & Dunne, 2009). This weakness in portfolio education was reflected in collected student responses, with many students complaining of a lack of clear assessment guidelines and requirements. Students believed this to be a barrier to effectively completing their assessment task as they did not have a clear understanding of required word limits, type and volume of content, and whether multimedia integration was included in assessment. Students believe that this confusion around assessment requirements caused some degree of stress and detracted from the learning experience of the ePortfolio (Armitage, 2011). Future recommendations should consider: i) clearer instructions and perhaps better pedagogical rationale and, ii) more robust marking rubric that clearly articulates expectations and word limits and length of filming etc.

These problems are detailed throughout literature surrounding that of portfolios. An article by Pincombe et al. (2009) details student ‘confusion’ in the requirements of constructing a portfolio that is considered by assessors to be of a high standard. This confusion may result from the fact that while the concept of what an ePortfolio entails is not difficult to comprehend, it is possible to carry out an accurate summative assessment of a piece that is highly subjective and reflective in nature to the students’ learning (Butler, 2007; Pincombe et al., 2009). While the initial development of the portfolio concept was to demonstrate personal growth and professional development (Mitchell, 1994), the process of transferring the portfolio to a summative assessment tool has not been completely successful as of yet, with the nature of assessment being at odds with pure personal reflection (Butler, 2007; Mitchell, 1994). Mitchell (1994), while employing a paper portfolio format, voiced reports of students acknowledging that rather than reflecting on their own knowledge and clinical experiences, they would tailor their writing to what they believe would garner them the highest mark from an assessor, thus making the portfolio ‘assessment led’ rather than led by personal reflection and development (Mitchell, 1994). This creates a problem whereby rather than assessing a student’s reflection upon their knowledge and clinical experiences, the portfolio is simply assessing their ability to write (Butler, 2007; McMullan et al., 2002).

The integration of an online format requiring a certain level of computer literacy was another point of contention among students. Challis (2005) writes that ePortfolio software must be intuitive in nature for students of all ages and skill levels to use, or this will cause a barrier to student ‘buy-in’ into the assessment tool. Student responses reflected this, with certain students finding it difficult to integrate multimedia and format their ePortfolio causing undue stress and barriers to student learning. A contrast to this however, was other more computer literate students with significant online experience thoroughly enjoying the chance to complete coursework in an online format. Future research should consider a regression-based methodology to investigate this area further. In order to combat this, it is clear that better explanation of how the software functions must be outlined to all students prior to project commencement and on-demand technical support needs to be easily accessible to students. Butler (2007), noted in her review of the AeP Supplementary Report (Hallam, Harper, McAllister, Hauville, & Creagh, 2010) that IT support, among other factors, was as an important success factor to the implementation of any ePortfolio initiative.

Portfolios also need to be customisable in nature in order to provide a fit for each student's technical computer skills and improvement as they become more proficient and comfortable with the software over time (Butler, 2007).

Ultimately, the concept of an ePortfolio will be interpreted differently depending on its intended purpose and application e.g. a digital repository, authentic and diverse evidence, reflection, personal learning space, achievement record. This paper has shown an example of how an ePortfolio has been used in the DCEHPP to assess paramedic students. But as Armitage (2011) points out, in the paramedic profession, ePortfolio should not be relied upon in isolation to determine competence. It should be used in tandem with other methods to ensure a breadth of evidence is obtained.

## 5. Conclusion

While students expressed a favourable view towards the ePortfolio as an assessment tool, it is evident that there are current problems with the use of the ePortfolio concept. The portfolio based learning system however displays many benefits, that if correctly developed, may lead to the ePortfolio becoming a valuable tool in the education of future paramedic professionals. In particular, the ePortfolio has great potential in being able to assess the achievement of graduate attributes.

However, it should be highlighted that paramedic-specific graduate attributes are yet to be agreed upon between professional, industry and university groups. The most important recommendation for future practice is for the implementation of clear learning goals for students, along with students being made aware of the benefits that portfolio based learning possesses have for their education and long-term practice. Given the paucity of available paramedic-based literature, this paper will provide important knowledge in paramedic education.

## Competing Interests

No competing interests.

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