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Abstract: There is a recognised need in higher education to develop authentic evidence of student learning outcomes. In Medical Radiation Science, there is demand for a tool for ongoing course quality assurance and authentic evidence of the capabilities, skill base and knowledge base of graduates, with particular reference to the requirements for professional accreditation and the courses prescribed graduate attributes. The student portfolio is considered here as a potential tool for this purpose.As a formative tool, the Medical Radiation Science student portfolio may benefit industry by delivering highly self motivated, self reflective, professional and competent practitioners with retained deep understanding of theory conceptualised to practice. As a summative tool, the student portfolio would provide authentic evidence of student learning outcomes, graduate quality and attributes, and standards of competence.

A Potential Role for Student Portfolios in the Medical Radiation Sciences.

ABSTRACT

There is a recognised need in higher education to develop authentic evidence of student learning outcomes. In Medical Radiation Science, there is demand for a tool for ongoing course quality assurance and authentic evidence of the capabilities, skill base and knowledge base of graduates, with particular reference to the requirements for professional accreditation and the courses prescribed graduate attributes. The student portfolio is considered here as a potential tool for this purpose.

As a formative tool, the Medical Radiation Science student portfolio may benefit industry by delivering highly self motivated, self reflective, professional and competent practitioners with retained deep understanding of theory conceptualised to practice. As a summative tool, the student portfolio would provide authentic evidence of student learning outcomes, graduate quality and attributes, and standards of competence.

Introduction

The quality of Medical Radiation Science graduates in Australia is maintained at a high international standard as a result of rigorous accreditation processes. The Australian Institute of Radiography (AIR) and the Australia and New Zealand Society of Nuclear Medicine (ANZSNM) play crucial roles as industry 'gate keepers'. University courses graduating Medical Radiation Science students for their professional development year (PDY) require cyclic re-accreditation.

Course re-accreditation places the onus on the institution to prove satisfactory standards for specific criteria. The major draw backs of this type of evaluation is the currency of the competency based standards employed as the benchmark and the difficulty in providing tangible evidence of their satisfaction. Evidence often relies almost entirely on the basis of students passing subjects within the course. Attaining graduate status by successful completion of all coursework subjects, however, does not guarantee these proficiencies are carried into professional practice. In the absence of clear strategies fostering deeper learning and understanding of key concepts reinforced by appropriate assessment strategies, graduation fails to provide concrete evidence for competency based standards. More importantly perhaps is the idea that the PDY plays an important role in solidifying these skills in the novice practitioner prior to full accreditation. Similarly, a near 100% employment rate may be attributed to any number of factors other than satisfaction of required skill development. For example, a chronic shortage of graduates might see all graduates gain employment regardless of standards.

These authors recognised the need to develop authentic evidence of student learning outcomes. A goal was set to develop a tool for ongoing course quality assurance and authentic evidence of the capabilities, skill base and knowledge base of graduates, with particular reference to the requirements for professional accreditation and the courses prescribed graduate attributes. The student portfolio was considered a suitable tool for this purpose. In addition, the student portfolio may foster deeper student learning, bridging undergraduate learning with post graduate competency thereby rendering student graduation a more reliable indicator of standards of competence.

The concept of a portfolio is not new and, for most, the artists or models portfolio is a familiar image. While portfolios are not a new idea in learning, the diversity of fields where portfolios provide an appropriate form of assessment has only recently evolved. Portfolios are common place in teacher education yet are without precedent in the Medical Radiation Sciences. In recent years, student portfolios have gained strong support from educators because they provide authentic evidence of learning and because they provide an attractive alternative to traditional assessment.

Portfolio development is an act of creative self expression whose journey (the process) offers an opportunity for reflection and self development. A portfolio, while not an exhaustive collection of ones work, needs to provide an accurate representation of ones breadth, depth and quality of work. In learning, unlike the photographs in a models portfolio, evidence is most often provided by indirect means. It is not always possible or practical to evaluate student learning directly and, more importantly, it offers little validity to evaluate student learning from either a single perspective (e.g. module examination) or a single experience (e.g. one lecture) (*1*).

The student portfolio is a tool employed to collect and reflect on experiences and achievements and acts as a catalyst to connect knowledge with experiences; academic, clinical, emotional and social. For some, the portfolio may provide a ‘product’ to be used for summative evaluation and decision making while for others, the portfolio is a ‘process’ to be used for formative evaluation, reflection and self development (*2*,*3*).

Defining the portfolio will depend on ones perspective. Portfolios have been defined as a purposeful collection of student work assembled to demonstrate progress and achievement (*4*), an opportunity for multidimensional assessment (*5*) and a tool to enhance course instruction (*6*). The purpose might be expanded to include; ‘engaging students in their learning and helping students develop self evaluation/reflection skills’ (*7*). Portfolio development promotes knowledge construction because the student is challenged to reflect and interpret teaching and learning practices (*8*,*9*).

Student portfolios do, however, fall short of realising this potential when the portfolio implementation program is inadequate. One problem with portfolio development is

that students may allow the evidence at hand to control the direction of the portfolio. The reflection then, is based on the available evidence rather than offering a true reflection of ones underlying philosophy (*10*). The outcome is a portfolio that focuses on 'what' rather than 'why' (*10*) but more importantly, may fall short of contributing to improved student learning, improved student professionalism or improved course management.

Shulman (*11*) suggests that motivations for portfolio development can be diverted with the resultant work representing an exhibition denuded of substance. Dollase (*2*) reported that portfolio development does not necessarily result in increased reflection or quality improvement. The problem, in part, relates to the definition of a portfolio. A portfolio needs to be more than a vestibule of evidence, the portfolio also echoes the attitude of a dynamic process of a broad spectrum of valid evidence over time (*13*). Students may focus too closely on the final product rather than the process and, as a result, the student 'becomes an expert at portfolio development' rather than improving their learning experiences: but only in the absence of effective implementation of a portfolio program. A student portfolio needs to be both strongly self motivated and innovatively promoted and supported by faculty.

There is a broad spectrum of literature aimed at quality improvement, purporting the use of portfolios as a tool for quality improvement, and focussing the portfolio toward a student's strengths and achievements. While there is a demonstrated need for a representative account of ones achievements, there lies a trap in the bias associated with only including ones strengths and accomplishments. Campbell et al. (*14*) indicate that the portfolio must present an honest account of ones capabilities for it to offer a powerful tool. True reflection, one might assume, requires a balanced account of strengths and weaknesses. Moreover, one may have more to gain in terms of quality improvement from honest reflection and evaluation of ones weaknesses and failures. Regardless of the purpose of the portfolio, it should contain a detailed analysis of strengths, weaknesses, opportunity and threats (SWOT analysis). Both summative and formative roles of the student portfolio demand a balanced account of ones learning.

The Role in Medical Radiation Science

The portfolio provides a tool to build on existing holistic, deep and lifelong learning initiatives employed in the undergraduate education of Medical Radiation Science students. Structured and guided portfolio development and reflection may enhance student learning, motivation, retention rates and graduation rates by illuminating connections between the students learning experiences. Moreover, the portfolio may highlight connections between the students learning experiences and their academic and career goals. Thus, the portfolio offers a tool for enhancing deeper learning and fostering life long learning, improving the quality of graduates entering industry and fostering a professional culture of continuing professional development. In addition, it provides authentic evidence of student learning and achievement to enhance post graduate employment prospect. More significantly, this authentic evidence provides a valuable resource for internal course management (e.g. curriculum and pedagogy judgments) and external course review (e.g. course accreditation). Clearly, employing this tool for course quality improvement serves to further improve student learning and success.

Implementation

Students should be advised, guided and instructed through the portfolio development process. The portfolio should be a collective works spanning the duration of a students studies. Students should be instructed that their portfolio:

- consists of relevant material that has been gathered during the course of their studies that provides evidence of their progression towards excellence,
- will build on their current work and may permit them to develop an extract that can be used for resume development and job interviews,
- provides evidence that both subject objectives and graduate attributes have been attained,
- should synthesise the material gathered for the portfolio and reflect on its implication for career development.

There are three pillars for developing a career in the Medical Radiation Sciences; academic, clinical and emotional skills. As such, the portfolio should be broadly divided into the following headings:

- Personal details.
- Academic / theory / knowledge.
- Clinical competence / skills / expertise.
- Emotional skills / competence.

For each of the three pillar headings, students should develop a philosophy or an 'I believe….' Statement and should also indicate achievements in each of the pillars. For each of the pillars, an 'I will…..' statement should also be developed to indicate their goals and objectives. Their statements of philosophy, achievement and goals should be supported by some reflective commentary.

For each subject a student undertakes in a given semester they should reflect on the learning objectives and generic skills of the subject. Were they achieved? How were they achieved? They should also reflect on the contribution of each subject to the graduate attributes of the course as defined by both the University and the accrediting body, however, they need to be aware that not all subjects address all graduate attributes.

Students should reflect on what their degree has given them:

- Clinical skills, knowledge, emotional skills etc.
- How do they feel the degree has placed them for their future career?
- Do they feel they have gained a competitive advantage?
- Do they feel there has been an omission from their education and training?
- Does this omission present as a disadvantage to them?
- Has their time at university provided them with ‘deeper understanding’ of key concepts? How or why not?
- Do they think a philosophy of ‘life long learning’ has been fostered? How or why not?
- Did their degree foster or facilitate a philosophy of ‘pride in workmanship’? How or why not?

Students should document and catalogue their learning experiences throughout the semester, relating this material to the subject objectives and including the distilled synthesis of this in their portfolio. It is important that learning experiences are included from across the semester, so they should view this as an on-going piece of assessment. They should include artefacts in the portfolio where available and appropriate (eg. patient feedback, supervisor feedback, grades, participation in workshops / conferences etc.).

Expected Outcomes

There are a number of opportunities or benefits offered by implementation of an effective student portfolio development program, including (*3,15,16*):

- Allow students to set and meet goals, to show growth, to assess their own work (collect, select and reflect – and project); continuous improvement.
- Encourages accountability by giving students responsibility for quality management in their learning; students become engaged in and take ownership of their learning.
- Provides a tool for more robust evaluation of learning effectiveness and improvement allowing individual students to define themselves; monitoring academic growth.
- Encourages a culture where learning is both valued and continually improved; consistent with lifelong learning philosophy.
- Complements developmentally appropriate curriculum and pedagogy. Portfolios can improve instruction, assessment, communication and professional development.
- Demonstrates significantly more about a student's knowledge, understanding, growth and professionalism than a grade. Grades generally represent a 'snapshot' of student learning.
- Allows assessment of individual learning styles, enhances the ability to communicate about learning and ensures accountability. They enhance the academics awareness of the individual learning needs and academic progress of students.
- Alignment of learning objectives with assessment.
- Consistent with student centred learning environments; associated with improved motivation and engagement in their work.
- Changes the learning culture by promoting intrinsic motivation rather than relying on extrinsic motivators for performance.
- They serve as a tool to evaluate the effectiveness of teaching and teaching materials providing a quality assurance mechanism for course content and delivery.
- Disclose authentic evidence of learning outcomes for course management and decision making.

The benefits outlined above share a common theme; quality improvement

The expected outcomes of student portfolio implementation in the Medical Radiation Sciences includes:

- Provide authentic evidence to support course re-accreditation and ongoing course management.
- Foster deeper learning and understanding.
- Promote student driven integrative learning.

Conclusion

As a formative tool, the Medical Radiation Science student portfolio benefits industry by delivering highly self motivated, self reflective, professional and competent practitioners with retained deep understanding of theory conceptualised to practice. This would contribute positively to the collective knowledge and skills base of the profession, the standard and quality of practice, the professionalism of industry and the status on the international stage. The magnitude of the positive impact will increase if implemented across multiple universities. As a summative tool, the student portfolio provides authentic evidence of graduate quality and attributes. Not only does this evidence provide more effective program quality management (improving graduate quality and competence) but it also provides potential employers of graduates with a tool to make better judgments on recruitment, aligning student goals and capabilities with departmental needs and opportunity. More importantly, however, the portfolio provides authentic evidence of student learning outcomes and standards of competence for the purposes of course re-accreditation (or internal course review).

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