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Supporting and promoting reflective thinking processes in an undergraduate Medical Imaging program

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Notions of reflective practice are now well-accepted in many health professions. For those involved in professional, clinical practice education, reflective practice is becoming a central component. Much research is required as to how to help students develop their reflective writing processes, rather than just using writing as a tool to assess their understandings, or as a mechanistic process. In particular, there is little consideration in the literature of effective strategies for first-year student health professionals. The authors are involved in a Medical Imaging program at Curtin University, and participate in an ongoing research project designed to explore the curriculum development, teaching and assessment of students’ reflective writing.

Medical Imaging students are introduced to reflective writing in their first semester of studies through a strategy that incorporates theoretical knowledge, writing practice and comprehensive feedback. Academic staff from the Medical Imaging discipline work in partnership with academic literacies staff to support students in developing their reflective processes. The strategy implemented for Curtin University Medical Imaging students during the first semester of first year has been found to support students to develop and progress their understanding and skills in reflective practice and reflective writing.

Keywords: reflective thinking, Medical Imaging, first-year students

Reflective practice and the reflective practitioner are now well-established and well-accepted in many health professions, where reflection is considered a vital element of critical thinking, professional development, learning and professional self-regulation (Argyris & Schön, 1974; Asselin, 2011; Baird & Winter, 2005; Boud, Keogh, & Walker, 1985; Johns, 1994; Schön, 1983; Smith, 2011). The work of authors such as Schön (1983), Habermas (1974) and Johns (1994), amongst many others, built upon the foundations of Dewey (1933) to promulgate notions of the development of professional knowledge as a conscious process involving continuous active reflection on and in action.

For those involved in professional, clinical practice education, reflective practice is becoming a central component (Baird & Winter, 2005; Forneris & Peden-McAlpine, 2007; Lincoln, Stockhausen, & Maloney, 1997; Sefton, Gass, & Forrester, 1999). How this is managed across
the length of a program is important in determining how students can advance their reflective capabilities to support the development of their intrinsic, professional knowledge. Research still is required as to how to help students develop their reflective writing processes, rather than just using reflective writing as a tool to assess understandings, or as a mechanistic process.

We contend that how reflective writing is managed throughout a program is important in determining how students can advance their reflective capabilities, and thus develop their professional understandings and thinking processes. The novice-to-expert continuum (Benner, 1984) is often used as an example for the development process in such programs, with undergraduates usually expected to reach the stage of advanced learner by the time they first join the clinical workforce. Whether this outcome is gauged, and if or how students are encouraged to meet it, are open to discussion.

Many health care programs focus students on the reflective process only within their professional area. This can mean starting the process at a later stage of the program, when they have the clinical experience to reflect upon. Starting at an early stage of the program requires the understanding that a student’s health care knowledge is that of a member of the public, rather than a health care professional. The identification of effective strategies to support the development of reflective thinking in this context is complicated by a lack of published evidence that considers first-year or beginning students. The Medical Imaging program at Curtin University embeds reflective writing into the program from students’ first semester, through the core unit Introduction to Medical Imaging Science. A component has been introduced into this unit that is taught by academic literacies specialists and focuses on teaching students about reflective thinking and developing their reflective writing. Increasing collaboration between the Medical Imaging team and academic literacies specialists has helped to develop a coherent progress from this more generic starting point to the later discipline-based units. This paper describes the strategies employed to support students to develop reflective writing ability in the commencing semester of their studies in the Introduction to Medical Imaging Science unit and present findings based upon experiences with the initial cohort of students in 2011.

The Curtin University Medical Imaging context

Students enrolled in the Introduction to Medical Imaging Science unit are in the first semester of their first year of Medical Imaging studies. Most are newly graduated from high school with no previous tertiary education experience. Not only are these students beginning learner practitioners, they are also novices in thinking and writing at the level expected at university. Their experience in structured reflection is commonly limited or non-existent. Nevertheless, these same students will soon be expected to engage in reflective practice during their clinical practicum late in the first year of the program and progressively throughout all their units of study, with the intention that they will develop strong reflective habits for their professional lifetime. With an appreciation of this context, it becomes apparent that the establishment of a sound understanding of and capability in reflective thinking and writing is vital to their development as reflective professionals.

Introduction to Medical Imaging Science introduces reflective practice to the students within a broad context, encouraging them to reflect on themselves as students and on institutional expectations and practices. It uses close feedback and modelling to help students understand reflective writing, and to deepen their responses; this provides a springboard from which discipline-based teachers can work. The discipline-based unit in the following semester uses that
foundation for students to write a reflective piece on their observations of a clinical workplace, and expects these early responses to be those of a lay person. From then on, the students provide reflective reports from all of their clinical units, with the complexity of the cases they discuss increasing with their increasing experience. Their final report asks them to reflect on how their perspectives have changed over the four years of their studies.

In the Introduction to Medical Imaging Science unit, students engage in three thirty-minute lectures focused on reflection, reflective practice and reflective writing. The lecture content incorporates theoretical concepts relating to reflection, examples of practical application of theoretical models, and hints and tips to prompt reflective thought. The lectures occur in approximately the fourth, seventh and tenth weeks of the first semester of studies.

Following each lecture, students prepare a written reflective piece broadly themed around their reasons for choosing to study at university, and in this instance Medical Imaging, and their responses to their studies to date. As the focus of these activities is to support development of reflective thought and writing, the specific content or structure of the written submission is of limited consideration, so students are free to choose the length, structure and writing approach of their submission. Submissions are posted by students to the Curtin University i-Portfolio within two weeks of each lecture. The i-Portfolio provides an easily accessible platform for submission and feedback, and allows the student and assessor to easily refer to previous submissions to facilitate ongoing commentary and identification of trends or improvements in the student’s development.

Each submission is assessed for evidence of reflective thought, and expressly not for content, grammar or “correctness”. Students receive a global rating of their reflective development from the performance level scale (see Table 1) and personalised feedback that identifies the strengths currently demonstrated in their reflective writing, and one or two strategies they might employ in subsequent submissions to progress their development. During the second and third lectures, the student group is provided with broad, generally applicable feedback and suggestions to improve their written submissions.

The marking scale used was developed by Kember et al. (2008), based upon the outcomes of a major project on developing reflective learning abilities in health care students, and incorporating an extensive review of the literature. A questionnaire provided empirical evidence that using a four-category scale was the most viable scheme. The four categories include: habitual action/non-reflection, understanding, reflection and critical reflection. A performance rating is assigned based upon the highest level of reflective thinking demonstrated in the submission, and ratings representing transition between two performance levels may be used. The marking scale was further assessed as to its validity and reliability. This scale has been used extensively through the program when assessing students’ reflective assignments, and will be used for marking the future reflective assignments for these students.

Nevertheless, it is necessary to acknowledge that some limitations exist in applying this marking scale. Students are assigned a performance rating based upon the highest demonstrated performance within their submission, yet they may not demonstrate reflective thinking with consistency throughout a single submission. In theory, a student who provides a single critically reflective insight within a predominantly non-reflective submission may be assigned the same performance rating as one who provides a submission rich with critical reflective writing. Care must be taken to identify both quality in reflective expression and consistency in reflective thinking expression. More broadly, consideration must be given to the risk that assessing reflection may constrain students in expressing their thoughts and experiences honestly, or
encourage them to write for the assessor rather than to genuinely support their own learning. These issues have been managed in this program through regular reinforcement of the value of reflective thinking as underpinning their current learning and their future practice as Medical Imaging professionals, and through constructive written feedback about their assessment submissions.

Table 1: Performance level scale, from Kember et al. (2008)

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-reflection</td>
<td>• The answer shows no evidence of the student attempting to reach an understanding of the concept or theory which underpins the topic.</td>
</tr>
<tr>
<td></td>
<td>• Material has been placed into an essay without the student thinking seriously about it, trying to interpret the material, or forming a view.</td>
</tr>
<tr>
<td></td>
<td>• Largely reproduction, with or without adaptation, of the work of others.</td>
</tr>
<tr>
<td>Understanding</td>
<td>• Evidence of understanding of a concept or topic.</td>
</tr>
<tr>
<td></td>
<td>• Material is confined to theory.</td>
</tr>
<tr>
<td></td>
<td>• Reliance upon what was in the textbook or the lecture notes.</td>
</tr>
<tr>
<td></td>
<td>• Theory is not related to personal experiences, real life applications or to practical situations.</td>
</tr>
<tr>
<td>Reflection</td>
<td>• Theory is applied to practical situations</td>
</tr>
<tr>
<td></td>
<td>• Situations encountered in practice will be considered and successfully discussed in relationship to what has been taught. There will be personal insights which go beyond book theory.</td>
</tr>
<tr>
<td>Critical Reflection</td>
<td>• Evidence of a change in perspective over a fundamental belief of the understanding of a key concept or phenomenon.</td>
</tr>
<tr>
<td></td>
<td>• Critical reflection is unlikely to occur frequently.</td>
</tr>
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</table>

As this is the first semester of their studies in Medical Imaging and, for many, their first tertiary education experience, it is not expected that students will necessarily demonstrate strong reflective abilities. The work of King and Kitchener (1994) underpins much current research in how students develop their reflective thinking. They distinguish seven levels of reflective thought, of which only the last two are described as truly reflective. They identify a spurt in reflective thinking between the ages of 18 and 20 among those who are attending college, but conclude that Levels 6 and 7 are generally attained only by senior and graduate students. The first-year Medical Imaging students’ reflective writing supports these findings: most of them demonstrate hesitant and inconsistent evidence of reflection. It is therefore essential that they receive strong support in their first semester, and that the focus on their developing reflective thinking continues throughout their undergraduate studies in order to support their ongoing development:

… the ability to think reflectively does not emerge fully formed but develops in a sequential fashion, with earlier stages building on prior stages and laying the foundation for subsequent stages. (King & Kitchener, 1994, p. 152)

By receiving personalised feedback and a rating reflecting current performance, students have the opportunity to respond to guidance tailored to their demonstrated reflective thinking processes. This assessment strategy provides, therefore, three opportunities for students to obtain guidance
in developing their reflective thinking processes: by reviewing the expectations for the next level of achievement on the performance level scale; by considering the personalised written feedback received from the assessor; and by considering the generic feedback provided to the whole group during the second and third lectures.

**Findings and discussion**

A total of 66 students were initially enrolled in the Introduction to Medical Imaging Science unit in 2011. Of these students, seven failed to submit all three of the reflective writing pieces and are therefore excluded from this summary of findings.

A key challenge for teachers in health professional programmes is to define an initial expectation for performance in reflective practice, thinking and writing. These students are, predominantly, newly graduated from high school; most are in their late teens; they originate from different locations and backgrounds; and they enter the Medical Imaging program based upon their academic performance without any specific benchmarking of their reflective thinking processes. On that basis, the underpinning assumption for this cohort was that students would be beginning reflectors, lacking in knowledge and performing initially at the level of Non-reflection. As the lectures and submissions progressed, it was anticipated that most of the students would progress from Non-reflection to Understanding.

After the first lecture and written submission, 57.6% of students (n=34) were assessed at the Non-reflection level (see Figure 1). By the third submission, this number had decreased to 18.6% of students (n=11). Overall, improvement in student performance was greater between the second and third lecture and submission, compared with between the first and second: of the students who improved, 65.4% did so between the second and third lectures and submissions. No student performed at the level of Critical Reflection.

![Figure 1: Trend in cohort results](image)
Over the course of the reflective writing activities, 26 students (44.1%) improved by one assessment level rating (see Figure 2). Almost all of these (n=25) moved from Non-reflection to Understanding. One student improved from Understanding to Reflection. One student’s assessed performance decreased from Understanding to Non-reflection.

![Figure 2: Trend in student development](image)

The cohort of students demonstrated a distinct improvement in their understanding of reflective writing. After the first lecture, almost two-thirds of students failed to convincingly demonstrate their understanding and application of reflection, with 57.6% achieving a Non-reflection rating for their first reflective submission. Further practice in reflective writing was supported by opportunities to develop their knowledge through the second and third lectures. Additionally, students were guided by the personalised structured feedback for each submission and the more general group feedback, providing them with ideas, re-explanation and direction to support their development. Assisted by this practice, development and guidance, more than 80% of the cohort achieved an Understanding or Reflection rating for their final reflective submission.

Only two students in the cohort demonstrated an initial performance rating of Reflection. It may be noteworthy that both of these students are mature students aged over 50. This supports the work of King and Kitchener (1994), who suggest that reflective thinking is uncommon among younger students. As indicated in the literature, it is likely that these students have gained life and professional experience that has allowed them to develop reflective abilities greater than those of their current student peers. Given the small numbers in this cohort, and the much smaller number of higher performing students, care must be taken not to draw inappropriate assumptions. The relative performance of mature-aged students should be observed with interest in the future.

As might be reasonably expected in any assessment, it is necessary that the assessors are familiar with the assessment expectations and marking schema. The marking scale employed has been used across the program for several years, so assessors have considerable experience in its application. Workload constraints prevented double-marking which may have increased confidence in the observed results.
The trends in performance at an individual level reveal the need for further development of the teaching and learning strategy. This strategy of practice, development and guidance supported 44.1% of students to improve their performance in reflective writing by one performance level. In all except one case, this improvement was progress from Non-reflection to Understanding. While it is satisfying that this group in the cohort demonstrated improvement, it remains that over half of the cohort did not progress their overall performance rating, albeit that this does not preclude that they may have continued to advance their knowledge and thinking processes within the performance band. Understanding what might underpin this apparent lack of demonstrated progress is complex. It may be that the strategy adopted supports only certain learning approaches or personalities. The nature or quality of the learning activity may be lacking in some way such that particular individuals are unwilling or unable to engage, particularly those students who tend to adopt surface responses to learning or who reject more active learning methods (Balasooriya, Toohey, & Hughes, 2009). Further investigation is warranted in the future.

One student demonstrated a drop in performance at the third submission from Understanding to Non-reflection. It is noted that, in the final submission, this student indicated feelings of being overwhelmed by their study workload and their frustration at recent late submissions for numerous assessments. It is unclear whether the reflective learning strategy failed to support or engage this particular student, or whether the final submission coincided with issues this student encountered in managing workload.

Care must be taken to ensure that students who demonstrate higher levels of reflective ability are provided with opportunities to further develop and challenge themselves. In the cohort considered in this paper, neither of the two students who achieved an initial performance level of Reflection demonstrated progression in the subsequent two submissions to the level of Critical Reflection. This is not to suggest that their submissions were not richly reflective, simply that there was no compelling evidence of progress to a higher level of performance. While Critical Reflection is not an expected level of performance for students in this unit, the learning strategies employed could be further developed to extend higher performing students appropriately (King & Kitchener, 1994).

This notion of challenging and extending applies, too, to those students who initially demonstrate reflective ability at an Understanding level. In this cohort, more than one-third (35.5%) achieved a rating of Understanding in all three reflective submissions. Such performance, in the context of this particular unit, is considered to be satisfactory as these students are demonstrating an adequate level of knowledge and ability for their stage in the Medical Imaging program. Focus is necessary to ensure that these students engage in learning activities to provide them with opportunities to continue to develop their reflective thinking processes. These learning activities must be sufficiently intellectually challenging to engage and interest students.

While students were free to choose the style and structure of their written submission, all except two students opted for first-person style and most wrote in an informal, conversational style. Many students adopted an approach where they identified questions they considered important; however, comparatively few considered possible answers to their questions, resulting in numerous submissions that contained lengthy lists of questions. Such writing patterns occurred most commonly in the first written submission.

Due to the very broad topic for the written activities, students addressed an enormous range of themes. In the majority of cases, the student’s key theme was unique and bore little or no similarity to the themes of others. Students focused their reflective writing in pragmatic areas (e.g. managing part-time employment, avoiding on-campus parking fines), in areas concerning...
interpersonal relationships (e.g. experiencing lack of understanding from spouse, coping with pressure from parents and friends), in areas relating to academic life (e.g. prioritising assessment workload, dissatisfaction with lecturers), and in areas that might be considered as professionally/occupationally related (e.g. fear of interacting with patients or clinical professionals, concerns about radiation safety). Despite this diversity of themes, there were a number of general elements that regularly appeared in the 177 written submissions and did not appear to be related to the timing of the written submission. Students commonly questioned their interest or desire to remain in the Medical Imaging program, and their ability to manage their finances, relationships or time during their studies; expressed difficulty in committing in writing their personal thoughts or feelings; expressed lack of understanding, objection or irritation at the reflective writing activities; expressed concerns or irritation about various lecturers, learning activities, assessments or student colleagues; and expressed concerns about distraction from their studies by technology, television and social activities. These themes and elements are the subject of ongoing analysis for future presentation.

As these students are, predominantly, experiencing their first months of tertiary education, it is of particular interest to consider how reflective thinking processes and reflective writing might support their transition to university. Pavlovich (2007) indicates that there has been little examination of tertiary students’ reflections with respect to how they learn to learn, and how they learn about self. Of particular interest in this case is the way in which Medical Imaging students use their reflective writing to think about perplexities and discomforts as they make the transition to university student life – and work.

It is true what they say about the usual aspects that could happen to you at the first semester: feeling sick, the sleepless nights spent contemplating followed by weakness and tiredness, the abdominal cramps, and even more worst, the food, which tastes and smells different since I came from different culture. What they do not mention is that this period is also a cheerful and life-changing experience and similarly my experiences in Perth and Curtin University have had this first semester aspects. But the symptoms are slowly fading as I go further in this semester. (Student 1)

Seriously, my golden year, the year of being 18, of partying sooooo hard that I can’t even wake up in the morning.. I feel like I’m missing out on one of the best years of my life so I can go to uni and study. (Student 10)

Of relevance to this paper are students’ perspectives on the activities associated with learning to think and write reflectively. A number of students expressed negative emotions toward the reflective learning activities.

To be totally honest I think this reflective writing piece is another unnessaray piece of work that is just added more stress to my already stressful workload. (Student 14)

With all due respect I find that foolish, why would a person prolong the path to the answer by concentrating on methods of finding an answer or the possibility of other answers rather than simply finding an answer and proving its validity. (Student 19)

So if I take it that reflective writing is designed to help you reflect on your work or others work, tease out a problem, and think about other possible solutions, but that is all something that I would normally do internally in my head, then what is the point of it? (Student 34)

These expressions were similar to the themes of reluctance, unwillingness and perceived
lack of value identified variously by others (Vivekananda-Schmidt et al., 2011). A pleasing aspect of these comments is that students felt comfortable to express their honest objection to, or frustration about, the reflective writing activities without risk of penalty. Some students expressed positive feelings toward the reflective writing activities. Most satisfyingly, and reflecting the experiences of other authors (Rusche & Jason, 2011), some of the students who had earlier commented negatively about the reflective activities indicated that their feelings were changing or had changed as they progressed through the lectures and submissions.

...reading it back now it actually kind of surprised me at how depressing and whiny I sounded. To reflect on the first piece of writing, to analyse and tease it out it seems like im my own psychologist, delving into the depths of my own mind and sourcing out the reasons for why im in the place that I am. I look back now almost 3 weeks ago to when i sat down and hurriedly wrote something that would be OK because i just needed it out of the way so that i could focus my attention on everything else that i needed to do for the week, so OK was good enough for me. I don’t really no why i settled for just OK. (Student 14)

I honestly don’t like having to write my thoughts down because i have trouble putting them into words others will understand, but slowly this will get easier with practice, and I know will get some benefit in the long run, I just have to work out my own way how. (Student 35)

In preparing their reflective submissions, students were free to write about any aspect of themselves as students, their experiences in deciding to and commencing their Medical Imaging studies, their experiences of their studies to date, or their hopes and expectations for their studies. No students indicated in their submissions that they had encountered difficulty in knowing or deciding what to write their submission about. As their Medical Imaging studies progress, students will focus much of their reflective writing about particular aspects of their experiences during their clinical practicum placements. It will be of interest to observe whether these more specific topics will enable students to write in a more focused way.

**Conclusion and future development**

The strategy implemented for Curtin University Medical Imaging students during the first semester of first year has been found to support some to develop and progress their understanding and skills in reflective practice and reflective writing. This is evidenced both in terms of student performance according to the assessment ratings and from comments from students themselves. The development of understanding of reflection and ability in reflective writing is critical for students’ performance in clinical practicum and other units of study from later stages in the program, all of which provide the foundation for reflective practice following graduation as Medical Imaging professionals. It also allows them to think through very significant transition and orientation issues that might be hampering their abilities to succeed in their studies.

The success of this strategy, while modest, is very encouraging, not least because it has been implemented at low material or time cost. Reflection and reflective writing is embedded throughout the four-year Medical Imaging program: this cohort of students will complete reflective thinking activities of varying types and increasing complexity in each semester of the program, and each assessment activity will be assessed using the same marking scale, providing a degree of consistency and familiarity with expectations.
Future development of the reflective writing strategy may include an initial benchmarking activity to evaluate each student’s “start point”, in addition to consideration of broadening and refining the individual activities to further promote engagement and challenge to higher performing students. Since the implementation of this initiative, the program has undergone a degree of restructure to the first year to accommodate a number of units of study delivered in common with other health profession students. First-year Medical Imaging students will receive a basic introduction to reflective thinking in first semester and complete the learning activities under discussion towards the middle of second semester. As a result, future students may engage with the reflective writing activities with an increased understanding and greater experience than the 2011 cohort.

References


