Blending Formative and Summative Assessment in a Capstone Subject: 'It's not your tools, it's how you use them'

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Abstract

Discussions about the relationships between formative and summative assessment have come full circle after decades of debate. For some time formative assessment with its emphasis on feedback to students was promoted as better practice than traditional summative assessment. Summative assessment practices were broadly criticised as distanced from the learning process. More recently discussions have refocused on the potential complementary characteristics of formative and summative purposes of assessment. However studies on practical designs to link formative and summative assessment in constructive ways are rare. In paramedic education, like many other professional disciplines, strong traditions of summative assessment - assessment 'of' learning - have long dominated. Communities require that a graduate has been judged fit to practice. The assessment redesign described and evaluated in this paper sought to rebalance assessment relationships in a capstone paramedic subject to integrate formative assessment for learning with summative assessment of learning. Assessment was repositioned as a communication process about learning. Through a variety of frequent assessment events, judgement of student performance is accompanied with rich feedback. Each assessment event provides information about learning, unique to each student's needs. Each assessment event shaped subsequent assessment events. Student participants in the formal evaluation of the subject indicated high levels of perceived value and effectiveness on learning across each of the assessment events, with broad agreement also demonstrated relating to student perceptions for preparedness: 'readiness to practice'. Our approach focused on linking assessment events, resulted in assessments providing formative communication to students and summative outcome information to others simultaneously. The formative-summative dichotomy disappeared: all assessment became part of communication about learning.

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Introduction

Designing curriculum that is responsive to broad student learning needs and disciplinary values, as well as to the expectations of graduates' potential future employers, is a constant challenge for educators. This challenge extends to the ways content is provided and learning assessed, enhanced and certified. Of all the key aspects of the learning process, assessment practices remain some of the most contentious. Assessment in higher education has long been the focus of theorising, debate and disagreement. The points of debate encompass the appropriateness and utility of particular assessment methods and instruments; the nature of assessment as "objective" measurement or testing versus subjective judgement; purposes of assessment; and the relationship of assessment to learning (see, for example, Boud 1998; Elton 2004; Elton & Johnson 2002; Knight 2002). The relationship of assessment to learning can be characterised in many ways, as separate and independent, interconnected, integrated and even itself as learning (Dann 2014).

The multiple perspectives on the purposes of assessment and the relationships between sustainable (Boud & Soler 2015), summative and formative assessments together present real, practical dilemmas and challenges for academics as teachers, who are tasked with promoting student learning as well as certifying student performance. A key challenge is accommodating and balancing summative assessment of learning and formative assessment to support future learning beyond the course of study. Paramedic education provides an example of the interplay of these challenges. The body of this paper presents a case study of the redesign and implementation of a final-year paramedic subject; the project was intended to shift the focus of assessment from exclusively assessment for certification of learning to a broader, more balanced perspective integrating formative and summative purposes. The critical component of the redesign was not using different assessment tools – although that did occur – but rather reconceptualising assessment as a communication process about learning.

The next section provides a brief discussion of the debates about assessment and, in particular, perspectives on the relationship between formative and summative assessment. This sets the educational perspective of assessment as a complex communication process about learning that underpinned the design. We then outline the challenges concerning assessment in the context of paramedicine, before providing a detailed description of the new design, which aimed to address those challenges in practice. Student responses to their experience of the design-in-practice gathered through a formal evaluation of the design strongly indicate that students found the design beneficial for their current and future learning. The final section of the paper reflects on the benefits gained by representing assessment as integral to a communication process about learning both within and beyond the subject, with formative and summative assessment purposes working together.

Perspectives on assessment

Student development through learning is a core function of universities. Student entry into the system, progress through subjects, graduation and entry into higher degrees all require the certification of student attainment. Traditional summative assessment is a well-established tool for

documenting and communicating student achievement. Usually linked with the end of a learning experience, such as a subject or course, summative assessment serves to judge the learning achieved by the student (William 2000). For external stakeholders, these summative judgements are seen to offer an indicator of whether a student has "made the grade". However, while there may be a relationship between grades awarded and learning achieved, the former do not always assure the latter. Nevertheless, the traditions of summative assessment practices within higher education are deeply entrenched, despite longstanding, extensive criticism of the assumptions underlying established practices, as well as the practices themselves (Boud 1998; Elton 2004; Knight 2002). Major emphasis continues to be placed upon credentialing student performance in a way that can be interpreted by others external to the educational environment. Knight (2002, p.276) describes summative assessment as serving to "feed out" information on student achievement.

At much the same time as the assumptions, practices and value of summative assessment were being widely questioned, other purposes for and approaches to assessment were being explored. Bearman et al. (2014) identify three distinct purposes: certification of achievement, support of student learning and providing the learner with the skills to judge their own work that they can continue to use beyond their studies. Over recent decades, assessment theorists have increasingly advocated the use of assessment as a tool *for* learning (van der Vleuten et al. 2017; Nicol & McFarlane-Dick 2006). Assessment is seen to have value in helping inform students' learning, instead of just judging how well they have learned up to a given point in time. Formative assessment is broadly synonymous with the notion of assessment for learning. It looks to student future learning that can occur as a result of assessment events, rather than to the outcomes of prior learning (Nicol & McFarlane-Dick 2006). It focuses on feeding back information to students to guide subsequent learning; hence Knight (2002) labels formative assessment as serving a feedback purpose. In summary, formative (feedback) assessment is intended to help students with future learning, whereas summative (feedout) assessment warrants or certifies student achievement to others, including potential employers.

Lau (2016) recounts some developments in assessment thinking and practice that she identifies as contributing to a dichotomy in the assessment literature between formative assessment and summative assessment, including attempts to promote assessment for learning. The terminology of summative and formative assessment traces back to the work of Scriven (Tyler et al. 1967) in educational-program evaluation. He distinguished but linked formative and summative evaluation as processes leading to judgements about opportunities for improvement in ongoing activities and about the worth of a completed activity, respectively. In the late 1960s and early 1970s Bloom introduced the terms "summative" and "formative" into the lexicon of the assessment of student learning. Again, formative assessment was attached to improvement of learning in progress, whereas summative assessment was attached to making judgements about achievement at the end of a course. In a period of increasing external pressure for certification and accountability, the language of summative assessment was adopted, but the connection to formative assessment was lost.

The language and practices of formative and summative/traditional assessment became the key focus of contestation between two contrasting paradigms of learning: the pushback in support of formative assessment and the "new" learning and assessment paradigm created a (false) dichotomy in the literature. That apparent dichotomy continues to impede some contemporary assessment thinking and much practice. Lau (2016, p.523) observes that "it is time to move away from this dichotomy": this observation is supported by a growing body of assessment literature. More actively, Lau (2016, p.510) "invites those in higher education to consider the fundamental idea that

formative and summative assessment need to work in harmony, and should not be seen as contrary to each other".

Knight (2002, p.277) identifies a series of similarities between formative and summative assessment: all assessment looks for evidence of achievement; judgements are made about the match between evidence and criteria; judgements invoke information and communication. A key difference is the intended recipient of the information about learning produced by formative and summative assessment events. Knight suggests that progress can be made by focusing not on the tools and methods of assessment, but rather on "exploring assessment as complex systems of communication, as practices of sense-making and claim-making" (Knight 2002, p.285): in other words, as practices of learning.

If assessment events are positioned as components of complex communication processes for learning, then the focus of attention can be shifted from the tools of assessment to considerations of the qualities and utility of the judgements and information those events produce, and of the communication that flows from them. From a communications perspective, formative and summative assessment are distinguished by the characteristics of the information produced, the communication channel through which the information is transmitted and the main intended recipient/user of that information (Johnson & Johnson 1991; Winstone et al. 2016). Formative assessments provide rich information and judgements about student learning that are mainly fed back into the central dialogue between teachers and learners to inform future student learning. Summative assessment produces representations of highly aggregated information and judgements in the form of grades or marks that are fed out to communicate with other interested parties external to the central dialogue between teachers and learners. Both of these communication processes can begin from the same assessment event: the formative communication channel contributes to sense-making from the event, while the summative channel contributes to claim-making about the event. Seen in this context, the false dichotomy – "formative good, summative bad", as Lau (2016) labels it – dissolves: formative and summative become interdependent, as formative assessment feeds into summative and enhances the quality of information on which final judgements are made and communicated.

In the case described below, framing assessment as integrated with learning in a complex communication process, rather than as a separate testing/measurement process, had multiple benefits for all involved, but particularly for students. This paper adds to the growing body of work, such as that by Broadbent et al. (2017), that illustrates ways to bridge in practice the often-perceived "gulf" to reconnect formative and summative assessment as parts of a communication process about learning.

Assessment challenges in paramedic education

Paramedic education provides a clear example of the interplay of the challenges of balancing and integrating assessment purposes. The broader community assumes that graduates have been certified as having learned enough to practice safe and effective care of emergency/pre-hospital patients. Employers expect that graduates are "road-ready". Paramedic educators expect that graduates can function as critically reflective practitioners in the discipline, able to judge the quality of their own in-field performance and learn from reflection and feedback on their performance. End-of-course assessment needs to provide information that feeds out to other parties to verify that graduates are competent to begin practice, but also feeds forward to help graduates' future learning as reflective practitioners; that is, it needs to serve both summative and

formative purposes. The challenges of accommodating and balancing summative assessment of learning and formative assessment for (future) learning beyond the course of study are particularly evident in subjects scheduled towards the end of a student's study program.

Previous versions of the final-year, final-semester subject that is the focus of this paper had featured exclusively summative assessment at the end of the subject. The final intensive assessment event served as a gatekeeping exercise. Students were required to pass this final hurdle to progress beyond their degree and into the industry. Teaching targeted preparation for this test. However, feedback from both students and external stakeholders confirmed the views of teaching staff that the assessment design was prompting grade-seeking behaviours from students, and that it inhibited, rather than promoted, learning. Moreover, students' grades were not seen as an accurate indication of their learning or capability (Thompson et al. 2015). In response to these criticisms and concerns, the subject was redesigned as a capstone experience, with particular attention given to integrating assessment events of various types into the whole learning experience. Key intentions were to improve the student relationship with assessment while simultaneously satisfying the broader stakeholder interests in graduate capabilities.

The design solution: combining formative and summative assessment events in a capstone experience

The unifying concept behind capstone experiences is the intention to help students look both back and forward as a bridge between theory and practice. Durel (1993, p.223) describes a capstone as:

> coming at the end of a sequence of courses with the specific objective of integrating a body of relatively fragmented knowledge into a unified whole. As a rite of passage, this course provides an experience through which undergraduate students both look back over their undergraduate curriculum in an effort to make sense of that experience, and look forward to a life by building on that experience.

Capstones are a significant personal and professional transitional experience for students as they prepare for their post-graduation lives (Lee & Loton 2013). The challenge of designing capstone subjects is to "bring it all together" for the students. While there are many variants, most share common features of immersing the student into simulated or actual real-world practices that draw upon their earlier curriculum experiences. Those involved with the design of assessment for these subjects are especially challenged: to offer students the detailed feedback and guidance required to help them bring their previous learning together as well as to ready them to face industry or other expectations. They must also provide others beyond the course with assurances of final student learning and achievement.

While the incorporation of capstone experiences is well reported in several disciplines, such as engineering and business, fewer examples exist within the health-education literature. At the time of the initial design of this project, no literature was found on capstone experiences within paramedicine. However, extensive literature highlights the challenges of the theory-practice and student-practitioner gaps between university paramedic education and the industry (Kennedy et al. 2015). To be successful, any design solution would need not just to develop student skills and knowledge in context of their future profession, but also to address the differences between

identifying as a student and identifying as a paramedic. Two key influences were central to re-shaping the subject.

Students as individual learners

First, consideration was given to individual student needs and expectations. It was clear to academic staff that, despite all students having met prerequisite subject outcomes, they were seldom starting the subject from the same place. They held very different levels of understanding and mastery of the prior curriculum, as well as differing levels of confidence and maturity, previous life experiences and prior clinical experiences. Different starting places for students meant that there would also likely be different student expectations and requirements. The redesign needed to invest effort into the specific requirements of each student simultaneously.

Bringing industry practice to the classroom

The long-established teaching formula for the subject comprised lectures, practical classes and tutorials with a final examination. Despite efforts to contextualise content to the pre-hospital industry, classes remained far removed from the day-to-day practices of paramedics. Students experienced assessment events infrequently, which was at odds with actual practice, in which every component of a paramedic's work is potentially scrutinised. Every case paramedics attend has the potential for high-stakes consequences, yet during training, judgement decisions were usually reserved for the completion of a block of study. The subject redesign sought to provide a learning environment that more closely aligned the teaching practices in the university with the practices and standards of the industry. Another unique feature of paramedic work relates to the extremely random and unpredictable case mix. With paramedics having little advanced warning of the cases they are called to, they have no way of fully predicting the skills and knowledge they will need, and at times they have only a few minutes to prepare. University learning and assessments, by comparison, are traditionally clearly forecast, with performance expectations clearly defined and optimal preparation time and support provided. The subject redesign sought to mimic the uncertainty of paramedic practice throughout the subject.

The assessment: Redesigned and redefined

Assessment was at the centre of the design to accommodate the complex of relationships between the students and industry and university expectations. Figure 1 provides an overview of the assessment events and the connections between them. The subject included two parallel streams of assessed learning activities: one focused on broad knowledge and application, the other on developing practical skills and thinking like a paramedic. The text provides a detailed explanation of each event, the information it produces and the relationship to subsequent learning and assessment activities.

Figure 1. Formative: summative assessment relationship

Practical Simulation Assessment: Student & Tutor Partnership
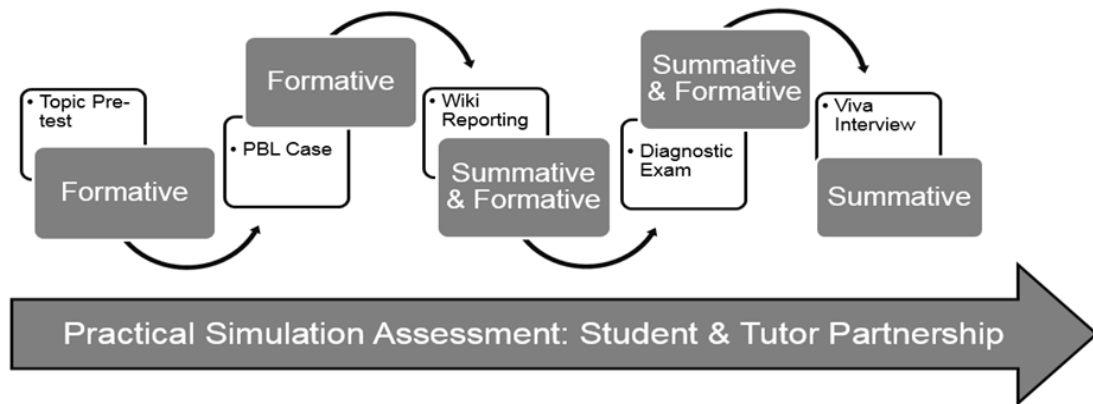
Diagnostic pre-testing (feedback)

Without prior warning, the students' first encounter with the capstone subject is a multiple-choice exam that samples content drawn from across the full prerequisite curriculum. The time-restricted online quiz offers each student diagnostic feedback regarding their readily accessible understanding of curriculum content (as opposed to traditional tests where the student can study in advance). The test is purely formative, offering students insight into their knowledge retention from earlier study, while highlighting gaps in their understanding. The immediate feedback loop to students simultaneously affirms areas of mastery and provides guidance on areas for the student to revisit and consolidate as a solid foundation as they embark on new paths of study.

Problem-based learning and wiki reporting (feedback and feedout)

Problem-based learning (PBL) has a long history of use within health-care education. The hallmark of PBL is students directing classroom enquiry, sharing their existing knowledge as the class attempts to unravel the features of a clinical dilemma or case. With a proven track record in medicine and a student-centric approach to learning, PBL presented an alternative to the former teacher-centric format of the subject examined in this study. The PBL process readily lends itself to the use of authentic paramedic cases, where distinct features of the chronological paramedic process of care (Carter & Thompson 2013) can be applied. However, in contrast to the usual teaching practice of providing clear and prescriptive learning objectives before each session, all information is deliberately withheld from students. Students arrive at class with no information about what curriculum themes are to be explored, or what knowledge is likely to be called upon. This mimics the authentic problem-solving faced by paramedics, who are routinely dispatched to patient cases with very limited information. The broad learning objectives are instead summarised at the end of the PBL session, with an additional list of student-nominated specific learning needs. Through minimising opportunities to prepare or rehearse prior to class, this approach encourages students to become aware of their own working levels of understanding. Student self-directed reading that targets their uniquely identified requirements for learning replaces traditional pre-reading activities.

The reporting component of PBL was also modified. In the traditional PBL format, students leave the class with a selection of self-identified learning topics to research before returning to present what they have learned to their peers. Optimal PBL class sizes, often fewer than 10 students in medicine programs, allow all students to routinely report back to the class. A minimum class size of around 20 students in the paramedic program challenged the viability of inclusive, participatory, in-class reporting. Our solution was to amalgamate the in-class and online environments, with each PBL group being assigned a case wiki. The university-based wiki platform enables the participants to develop and control the content on the page. Students are not constrained by limited face-to-face reporting opportunities, and can continue the process of constructing knowledge within their group beyond the classroom. As controlling authors of the case wiki, they can collaborate through sharing, editing and annotating as they assemble a single document that reflects the contributions and scrutiny of multiple users. Students are assessed on their participation and contributions within both the PBL format and the wiki. As the wiki page is dynamic, it offers both formative and summative assessment opportunities: student contributions are scored, as well as feeding back into and guiding ongoing individual and peer learning.

Practical application: Student-tutor consensus (feedback and feedout)

The ability to make effective judgements and apply a wide range of clinical skills on demand is a constant requirement of paramedic practice. The subject had always featured practical student activities, acknowledging a need for a paramedic graduate to be able to act on their knowledge when needed. However, in contrast to the high stakes and potentially catastrophic consequences linked to every paramedic patient encounter, the subject originally only offered a single summative assessment at the end. Moreover, despite students being expected to achieve the key learning objective of developing critical thinking and reasoning skills, all judgement about how they performed in practical scenarios remained solely with tutors. Now students are assessed by others, but also assess their own performance in each class they attend, contributing to a change in the student relationship with assessment. The development and introduction of a student-tutor consensus marking approach (Thompson, Houston et al. 2016) sought to capture both the summative aspects of how a student performs (as determined by a tutor) and the learning that the student achieves through the assessment event. The assessment has two parts. First, a tutor observes and judges a student performance against set criteria informed by the paramedic process of care (Carter & Thompson 2013). This outcome score constitutes half of the student's result for the assessment. This tutor judgement, however, is initially withheld until the student has critiqued the effectiveness of their own efforts against the same criteria. Where student and tutor reach consensus on the effectiveness of the performance, a score is awarded: disagreements are the focus of "calibrating conversations" to clarify understanding. This encourages students to apply a "paramedic lens" to critique their own work. Rich in feedback and useful as a benchmark for student performance, the student-tutor consensus approach combines formative and summative assessment purposes.

Diagnostic multiple-choice question exams (feedback and feedout)

The capacity of multiple-choice question (MCQ) exams to assess a large amount of knowledge in a short period has made them a popular tool for final summative assessment events. Our capstone methodology includes the use of an MCQ exam at a midpoint in the semester, as a diagnostic tool to evaluate student understanding at this point and a guide for ongoing learning. The material being examined is extracted from the class wikis, which in turn has been informed by the students themselves during the PBL classes. In other words, the students have effectively contributed to the

design of their own exam through indicating what specific areas within the broader curriculum that they need to learn. The MCQ exam feeds back to the student on how effectively this has been achieved.

The exam is divided amongst a number of key themed sections, which correspond directly to each of the PBL events. Students receive a detailed summary of their individual performance, usually within 24 hours of the assessment. The summary includes a learning profile featuring their score within each themed section, as well as key learning topics to review within that theme. Students can readily identify their strengths and weaknesses across the assessed content and recognise the areas of the curriculum requiring their greatest investment for learning. Summative grades are assigned for the MCQ exam, but the personalised student performance profile with specific direction to areas for attention also provides formative feedback to guide learning.

Final oral exam (feedback and feedout)

When graduates apply for a paramedic position, it is common practice within many ambulance services to use a clinical interview, or oral exam, to evaluate a potential employee's clinical knowledge and reasoning.   If the graduate fails to perform at this stage there are clear consequences for their employability.   Previously, no support had been offered to prepare students for this critical milestone. An oral exam was introduced as the final assessment event in response to this need. In an attempt to provide authenticity, student responses are judged by industry partners, with the standard set to their expectations of their paramedic peers. The content examined in the oral exam is again linked to the individual learning requirements of each student, as indicated by the diagnostic exam earlier in the semester. Following the MCQ exam, each student is given a list of topics that directly relate to the area of the exam in which they performed least well. Students have around six weeks to focus their study preparation towards approximately 40 topics on the list, with the knowledge that they will be asked to convince a panel of assessors of their understanding of three topics randomly selected from the list on the day. While students are exposed to the high-pressure environment created through simulated interview conditions, there is complete transparency on how they will be assessed, and on exactly what topics. This is the final summative event in the teaching program; however, the addition of a one-on-one student "exit interview" immediately after the exam gives students formative feedback on their performance and advice for ongoing development beyond the degree.

Transforming assessment relationships

The capstone design is centred around transforming assessment relationships. We have endeavoured to transform the role of assessment of learning within the subject with a series of bridges connecting each assessment event to another; for example, the PBL informs the wiki, which informs the exam, which in turn informs the oral exam (Figure 1). Assessment events provide both formative and summative information. The design shifts the student relationship with assessment from engaging with a single test to immersion in an ongoing assessment as a learning dialogue interwoven with all programmed learning. Further, we have empowered the students to help inform aspects of their own assessment.

Student perceptions of the assessment design

In late 2015 the design was formally evaluated. Students undertaking the subject were informed of the study via email, and invited to participate in the evaluation. They were advised that

participation in the study was entirely voluntary and that they were free to withdraw at any time. Of the class of 92 students, 90 participated. A paper-based survey was administered following the completion of the subject's final assessment event. Participants were asked to rate their level of agreement with a series of statements that were linked to each teaching and assessment item in the subject. The response categories – strongly disagree, disagree, neither agree nor disagree, agree and strongly agree – were consistent with standardised student evaluation tools used in the university, and therefore familiar to the participants. Table 1 summarises the results as percentage responses to each category for each statement.

Table 1. Student responses to the design components.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Diagnostic pre-test					
It encouraged me to review my existing knowledge and understanding	1.1	6.7	23.3	55.6	13.3
PBL – Wiki					
I felt my contributions were valued	1.1	4.5	12.4	58.4	23.6
My knowledge and understanding improved as a result of PBL activities	1.1	4.5	14.6	53.9	25.8
The PBL cases helped to improve my critical thinking	0	2.3	11.4	56.8	29.5
I became more confident with talking in front of my peers	1.1	10.0	18.9	45.6	24.4
Collaborating with other students on the wiki was effective for my learning	1.1	11.1	22.2	47.8	17.8
Reporting on the wiki helped extend my learning outside of the classroom	1.1	6.7	12.2	57.8	22.2
Practical assessments (student-tutor consensus)					
The scenarios effectively combined my knowledge, reasoning and practical skills	0	0	3.3	53.3	43.3
I learned through observing my peers being assessed	0	1.1	4.4	42.2	52.2
Self-assessment is an important skill for paramedics	0	1.1	2.2	34.4	62.2
I found the student-tutor consensus marking format:					
• Was effective for my learning	0	2.2	6.7	57.8	33.3
• Improved my ability to critically analyse my practice	0	1.1	4.4	61.1	33.3
• Helped me to develop skills I can use in my future profession	0	1.1	11.4	51.1	36.4
Diagnostic exam					
The exam content effectively represented the PBL and wiki material	1.1	5.6	27.0	50.0	15.7
The exam mid-way in the semester encouraged me to further develop from the feedback/results	0	2.2	18.0	43.8	36.0
Oral exam					
Preparing for the viva was an intense self-directed learning experience	0	1.1	10.2	42.0	46.6
Encouraging me to focus my learning upon an identified area of learning need was valuable	0	0	9.1	37.5	53.4
This form of assessment encouraged me to improve my understanding of topics	0	1.1	6.8	36.4	55.7
The viva was a useful experience in my preparation for future recruitment events	0	1.1	5.6	40.4	52.8

About 70% of participants agreed (combined "agree" and "strongly agree" responses) that the diagnostic pre-test encouraged them to review their existing knowledge. While a substantial group were neutral about its impact, only 8% disagreed that it achieved its purpose. Respondents viewed this part of the experience least positively, perhaps reflecting its very early placement in the subject, before students had been briefed on the subject design and intent. It is noteworthy that the levels of participant agreement with statements about the intended learning benefits of the assessment events increased for every subsequent component, culminating in over 90% agreement that the oral exam encouraged focused learning (92%) and was useful in preparation for future recruitment events (93%).

Other notable results showed that for 86% of respondents the PBLs helped improve critical thinking, and 80% agreed that the wikis extended their learning beyond the classroom. This response validated the decision to blend PBL and wiki formats. (It is noteworthy that after the subject concluded, participants reported verbally that they were still using the wikis for self-directed study even as graduates attempting work-based exams. This is an indication of the sustainability of this assessment practice.)

Most participants (87%) agreed that the practical assessments served an integrative function. Students recognised the importance of the self-assessment as a valuable skill for paramedics (96% agreement). They also agreed that consensus grading was effective for learning (91%) and fair (94%), and that it helped develop skills for their future profession (87%).

The results paint a comprehensive picture that many participants viewed the delivered and experienced curriculum characterised by rich assessment conversations positively. Summative and formative differences became blurred in this approach. The student relationship with assessment was redefined, with assessment unable to be separated from any of the conventional learning activities: all assessment events were learning opportunities and most learning interactions were assessment events. Most assessments contributed to student credentials and aggregate grades; all assessments also provided feedback on student performance and guided improvement.

Students' engagement is directly influenced by their ability to readily identify a purpose or relevance to their learning tasks. For those students studying paramedicine, the direct feature of being able to see the need for the learning, and to receive both judgement and feedback about both their levels of understanding and ability to perform the tasks, proved a powerful incentive. With our model, each student was always identifiable, and was valued for their contributions towards learning collaborations as they negotiated their own unique study journey through the subject. As all students produced different work in response to different challenges and ultimately sat a unique oral exam, engagement was palpable.

The design offers efficiency to teaching and learning. Students' energies were put to use only upon the areas of greatest need.

Conclusion

Debates about assessment generally concern the learning purpose, process and tools and their relationships to students' actual learning. Some argue that formative and summative assessment are different and separate, and require different tools. The case presented here illustrates that formative and summative assessment are interlinked and interdependent: it is not the tools that

differentiate summative from formative assessment, but rather the way that information and judgements generated by applying the tools are used.

Taras (2005) presents the argument that formative assessment cannot occur except as a consequence of summative assessment: summative assessment that generates feedback becomes formative assessment. This characterisation of the relationship presents formative and summative assessment as interdependent, rather than independent. Summative assessment looks back, while formative looks forward. Taras equates judgement with summative assessment. However, her argument seems to discount one aspect of the summative: formative relationship fundamental to the seminal work of Scriven and Bloom: timing. For them, although both types generate judgements, formative assessment occurs during the learning process, while summative assessment occurs at the end of it. Consequently the presence of judgement is not a useful characteristic for differentiating formative and summative assessment.

We argue, as does Knight (2002), that what fundamentally differentiates formative from summative assessment is the use that is made of assessment-based judgements and information in subsequent communication processes. In our case almost every assessment event contributed to two streams of communication. The first was the ongoing dialog between teachers and students about student learning throughout the subject. This central dialog shaped the personalised learning pathway for each student, noted achievement and sign-posted future learning needs. It began with almost the first learning experience of the subject – the diagnostic exam – and concluded after the final oral assessment event and exit interview. This communication process closely integrated learning experiences, assessment events and detailed information about the ongoing interplay between them. From beginning to end, assessment information fed forward into student learning: the communication was essentially formative.

The second communication process honoured the obligation to the industry, potential employers and others interested in student achievement to provide meaningful representations of student learning. Most assessment events produced an indicator of student achievement – information that contributed to the student's final grade for the subject. Staff involved in teaching and assessing students both before and since the redesign strongly expressed the opinion that the final grade from the redesigned approach provided a usable (and far more valid) verification of student learning as input into communication with others outside the particular learning environment. Virtually all the assessment events contributed to summative judgements and certification of student learning.

Our argument differs from Taras's in one further way: she asserts that "the *process* [italics in original] of formative assessment can only be said to have taken place when feedback has been used to improve the work" (Taras 2005, p.3021). We argue that the process of formative assessment can only be said to be complete when the student has used the feedback to improve multiple aspects of themselves, not just "the work": these aspects include their performance, their ability to judge the quality of their own performance and their ability to regulate their own future learning. The assessment design introduced into the subject seems to have effectively communicated with students to encourage these forms of learning, as well as with others about students' achievement: the artificial dichotomy between summative and formative assessment essentially disappeared, replaced by real interdependence between them.

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