Title:

Development of a phenomenologically-derived method to assess affective learning in student journals following impactful educational experiences

Short title:

Assessing affective learning in student journals

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Abstract:

Background

Assessment of affective learning (AL) is difficult but important, particularly for health professional students, where it is intimately linked to the development of professional values. This study originally aimed to determine whether an emotionally-impactive, extended, multimethod, interprofessional simulation experience enhanced the AL of senior medical students, compared to conventional seminars and workshops alone. This necessitated the development of a method to assess for the presence and quality of AL.

Methods

We developed a 'double hermeneutic' method, derived from Smith's Interpretative Phenomenological Analysis, to identify examples of AL, according to Krathwohl's hierarchy ('receiving', 'responding', 'valuing', 'organisation', 'characterisation'), in the journals of students from each arm of a randomised educational trial. Three assessors rated the highest level of AL seen in each journal and then we compared ratings from the two study arms.

Results

135 journals were available for assessment (81 Intervention, 54 Control). The method proved to be effective in identifying and characterising examples of uniprofessional and interprofessional AL. The median level identified in Intervention journals ('valuing') was significantly higher than Control journals ('responding', $P < 0.0001$).

Conclusion

The method described provides a means to assess affective learning among health professional students. An extended, immersive simulation experience appears to enhance affective learning.

Introduction

The conceptual division of learning into three principal domains: psychomotor, cognitive and affective, first suggested by Benjamin Bloom and collaborators in 1956 (Bloom 1956), continues to resonate deeply for many health professional educators sixty years on. The detailed characterisation of the affective domain by David Krathwohl, with Bloom and Bertram Masia (1964), also retains a commonsense appeal that is easily grasped by students and neophyte educators, despite the later appearance of complementary but more complex theorisations in this area, such as Mezirow's 'transformative learning' (Mezirow 1975). Although considerable attention has focused on understanding the learning and the assessment of 'professionalism' in the health professions in the last twenty years (Aguilar et al. 2011, Brown et al. 2001, Howe 2002, Kekre 2012, Lynch et al. 2004, Relman 2007, Wilkinson 2009), the connection between this construct and the idea of affective learning, which Bloom's group originally described as 'changes in interest, attitudes, and values, and the development of appreciations and adequate adjustment', (Bloom et al, 1956, p7) has only occasionally been recognised (Brown, et al. 2001, Buissink-Smith et al. 2011, Einhellig et al. 2015, Lay Leng 2009).

In the field of general education, practitioners have appeared squeamish about assessing values-based learning outcomes, fearing that it was somehow inappropriate to grade 'an individual's private and personal affective behaviour' (Bloom et al. 1971). In the context of the health professions however, we would contend that the social contract (Cruess and Cruess 2006, Cruess and Cruess 2008, Cruess et al. 2010, Cruess et al. 2004) mandates that one of the tasks of training to enter a profession is acquisition of the values (and consequent behaviours) that society is entitled to expect of the profession's members. This includes the values required for effective interprofessional practice. Indeed, the 2010 consensus statement on the assessment of professionalism from the global Ottawa Conference (Hodges et al. 2011), drawing on work by Jha et al (2006) and Ajzen (1991), underlined the concerns of many that 'measures of observed behaviours, self-reports and single attributes are not ... adequate' (p 357) for the community to assure itself that these values have been acquired. The statement points to a perceived need 'to develop measures of values and attitudes' (p 357) to this end.

One of the reasons that the assessment of professionalism is being seen as a 'wicked problem' (Varpio et al. 2017) may be that attention to date has focused only on the intended *outcome* – the learner or practitioner who behaves professionally – with little attention given so far to

verifying the occurrence of the *process* through which professional values are acquired, namely affective learning.

Despite its importance across the full spectrum of educational settings, affective learning has itself proven difficult to assess (Buissink-Smith, et al. 2011, Pierre and Oughton 2007, Wilkinson 2009), particularly if the educator seeks a modality more sophisticated than self-report (Bucher 1991) that might be resistant to ‘faking’ and thus applicable for summative purposes as part of a programmatic assessment approach (Schuwirth and van der Vleuten 2011).

In 2010-11 we conducted a randomised trial to evaluate the educational effectiveness of an extended, immersive, multimethod, interprofessional simulation program for senior medical students, undertaken over two separate weeks, one each in the penultimate and final year of our MD program. We were able to show that, compared with the associated workshops and seminars alone, contextualisation of the learning through the simulation methodology (known as Clinical Learning through Extended Immersion in Medical [or Multimethod] Simulation, [CLEIMS]) improved acquisition of knowledge, clinical reasoning ability, resuscitation and prescribing skills, with the prescribing outcome persisting for at least nine months (Rogers, McConnell, Jones de Rooy, Ellem, & Lombard 2014). We were also, however, vitally interested in the potential for such intensive and realistic simulated clinical experiences, parts of which were undertaken interprofessionally with pharmacy student colleagues, to bring about affective learning that would better prepare participants for their coming professional roles as junior doctors. To this end, we asked participants in both the Intervention (full simulation methodology, together with ‘just-in-time’ workshops and seminars) and Control (workshops and seminars only) arms of the trial to write short reflective journals after each day of the program.

The original aim of this part of study was to identify whether exposure to simulated patients and realistic extended clinical scenarios engendered affective learning and promoted the development of professionalism among medical students, when compared to workshops and seminars alone. As we sought to achieve this aim however, we realised that we needed to develop a method to assess the process of affective learning and that might have broader application. This became a second, and ultimately more important, aim of the work.

Methods

The study design

The general methodology for the CLEIMS study has been described elsewhere (Rogers et al. 2014). In summary, it utilised a randomised, controlled design in which students allocated to the Intervention arm undertook two, week-long, extended simulations of junior doctor practice (one in each of their penultimate and final years of the medical program) utilising simulated patients and realistic clinical scenarios. These were supported by ‘just-in-time’ seminars and workshops on topics such as prescribing, wound management, relationship counselling and cardiopulmonary resuscitation that had arisen in course of the simulation. Participants in the control arm undertook the workshops and seminars alone, without the contextualising extended simulations. In the first year (2010), the study took place over six timeframes (referred to as *rotations*), with the first rotation in the week starting February 8th and the final in the week starting October 18th. Thus, a participant who completed the study in rotation one (of their third year in the medical program) would have had less experience in clinical settings than a student who participated in rotation six. In the second year of the study (2011) there were three timeframes, with the first rotation commencing February 28th and the final delivered in the week beginning May 23rd. The timeframes are numbered consecutively for the two years of the study (2010 = Rotations 1 – 6 in the penultimate year of the MD, 2011 = Rotations 7 – 9 in the final year). In 2010, Intervention group (in their teams) managed one patient over the course of the week, while in 2011 they managed eight patients with interlocking stories.

Participants were asked to produce a textual journal entry of around 300 words each evening from Monday to Thursday of each of their two participation weeks and an entry of around 500 words soon after the conclusion of each week. They were asked to describe what happened in their learning experiences, ‘what it made [them] think about and how it made [them] feel’. They were asked to appraise their ‘strengths and weaknesses’ and give an account of their development in relation to the experiences, as well as how they planned to develop themselves further in the light of any insights they had gained. They were not explicitly educated on the concept of affective learning or given information about the analytical method to be employed. It is important to note that within each arm, students were subdivided into smaller working teams of up to five and were assigned a role of either *intern* or *registrar* (notional leader of the simulated junior doctor team, one per group). The same students were enrolled longitudinally across the third and fourth years of their four-year graduate-entry medical program and remained in the same arm for the entire study.

The impacts of the intervention in the cognitive and psychomotor domains were assessed with a range of tests, followed by statistical comparison of the results of participants in each arm (Rogers et al 2014). In order to examine any impact on learning in the affective domain, however, we needed first to develop a method to identify accounts of affective learning in participants' journals and to rate its quality.

Development of a method for the assessment of affective learning

Krathwohl's group classified the emotionally-driven, values-focused, affective domain of learning according to a progressive hierarchy (Krathwohl, et al. 1964). The most limited level involves merely being willing to attend to stimulating experiences and is termed 'receiving'. The second level, 'responding', involves a more active process, where the learner reflects on the experience and identifies their own intellectual and emotional responses to it. At the third, 'valuing', level, the learner begins to appreciate that the experience has enabled them to learn something about themselves that they see as valuable or important, while at the fourth level ('organisation') the learner is bringing together newly acquired values and existing elements of their value system to compare and synthesise a new perspective. At Krathwohl's highest level of affective learning, 'characterization by a value or value complex', the newly-learned values have been incorporated into the learner's world-view and characteristic value system, where they can influence their subsequent observable behaviour. The process that Krathwohl and colleagues described, we would argue, authentically characterises the process of acquisition of the values of the profession that we aim to facilitate in our students and is at the very heart of the construct of 'professionalism'.

To identify evidence of affective learning, we needed to employ a method of analysis that would enable us to interpret participants' reflective accounts of their learning experiences. Phenomenology is a philosophy and a broad group of analytical methods derived from the work of Edmund Husserl, which 'studies conscious experience as experienced from the subjective or first-person point of view' (Smith, 2013). Thus, it would appear to be well suited to the task of identifying and characterising the affective learning effects of impactful experiences. We looked particularly to the technique of Interpretative Phenomenological Analysis (IPA), which pairs a broadly phenomenological perspective with notions of interpretation, or 'meaning making', derived from the philosophy of symbolic interactionism elaborated by George Herbert Mead and John Dewey, as well as Heidegger's phenomenological writing, in the first

half of the Twentieth Century (Smith 1996). Jonathan Smith originally developed IPA as a tool to identify the meanings derived from the experience of people with chronic or serious illness, in the field of health psychology. He proposed that the researcher apply a ‘double hermeneutic’ process to interview transcripts or written accounts (Smith and Osborne 2008, p 53). In this approach, the analyst first studies the way in which the participant describes having made sense of the experience they have described (the first hermeneutic) and then goes a step deeper to look behind the words and make sense of that sense-making in psychological terms (the second hermeneutic, see Figure 1). As Smith and Osborne (2008) put it:

... this chain of connection is complicated – people struggle to express what they are thinking and feeling, there may be reasons why they do not wish to self-disclose, and the researcher has to interpret people’s mental and emotional state from what they say. (p54)

We postulated that a focus on experience and the application of Smith’s double hermeneutic technique would enable us to uncover the internal processes of affective learning in the journals of our students. As Smith and Osborne (2008), also observed:

One is trying to get close to the participant’s personal world, to take ... an ‘insider’s perspective’, but one cannot do this directly or completely. Access depends on, and is complicated by, the researcher’s own conceptions; indeed, these are required in order to make sense of that other personal world through a process of interpretative activity. (p53)

Thus, although IPA is primarily an inductive analytical method, it recognises that the process of interpretation will inevitably have a quasi-deductive element, as the analyst draws on prior formulations in the sense-making process. We took Krathwohl and colleagues’ theorised levels of affective learning (1964) as our ‘conceptions’ for our ‘process of interpretative activity’. We did this, not with the intention of *imposing* this theory on our data but rather to see whether the interpretations that we were able to make resonated with the affective learning construct.

According to Hopkins, Regehr and Pratt’s recent and very useful ‘3.1’ framework for ‘positioning’ phenomenological inquiry (2016), our approach is thus situated towards the ‘reflexivity’ end of their ‘reduction-reflexivity axis’ and the ‘interpretative’ end of their

‘description-interpretation axis’. On their third axis (‘general-particular’), the initial process of our technique is clearly at the ‘particular’ or ‘ideographic’ end, since it focuses on the learning experience of each individual student, but the drawing of inferences about the general effectiveness of a particular learning activity for bringing about affective learning requires a shift toward the ‘general’ end of the axis, as Hopkins’ group recommends.

The journal entries of participants in the two arms of the CLEIMS study were closely analysed by each of the authors independently, utilising Smith’s ‘double hermeneutic’ method (2008) and Krathwohl’s levels of affective learning (1964) as our ‘conceptions’ framework (see Figure 1). Examples of the application of the method at each Krathwohl level are provided in Table 1.

INSERT FIGURE 1 AND TABLE 1 ABOUT HERE

In addition to conducting traditional IPA, wherever we felt that we had identified an example of affective learning in a journal entry, we each attempted to characterise the Krathwohl level of that learning independently, utilising an extension of the double hermeneutic technique to make a judgement about the affective authenticity of the account. ~~and~~ We then discussed our interpretations to come to an agreement. At this point we clearly departed from IPA, and even from a wholly qualitative methodology, introducing a form of quantification to what had hitherto been undertaken in a human science paradigm (van Manen 1990), in an example of the methodological flexibility that is so often required of health professional education practitioners.

Quantitative analysis

In order to fulfil our original aim of determining whether the CLEIMS learning approach enhanced affective learning, once we had reached agreement, we assigned a score to each journal that represented the *highest* level of affective learning for which we could see evidence within it. We then utilised simple quantitative methods to compare the median level score for this single ordinal ‘scale’ for all of the available journals from each arm of the study, using the Mann-Whitney test.

Two of the three assessors (GDR and PCC) were blinded to the arm from which the journal was derived, but it should be recognised that, sometimes, the content of the journal gave clues

as to the study arm of its author. We did not formally assess the initial concordance of our assessments but we found that, in general, there was little dissent between the three of us about the level that each example represented.

Results

Of the 85 participants who commenced the study, 45 were randomised (by coin toss) to the Intervention group and 40 to the Control group. In the first year of the study, a total of 81 participants (n = 45 Intervention, n = 36 Control) submitted journals in which they reflected upon at least one day of their experience. In the second year, the journals of total of 54 participants (n = 36 Intervention, n = 18 Control) were available. It is important to note that the journal entries of participants allocated to both arms in rotation 9 in second year of the study were lost and consequently fewer journals were available for assessment. Below, we will provide examples of affective learning at each of Krathwohl's levels, as characterised by our double hermeneutic process. The example quotations have been coded to indicate whether: the participant was allocated to the Intervention (I) or Control (C) group; the journal was written in the penultimate year (Y3) or final year (Y4) of their medical program: the rotation (R), followed by a number (1 – 9) to indicate the timing of the participation; followed by an underscore (_) and a two digit assigned participant number (01 – 84); then a letter to indicate whether their simulated role was 'intern' (i) or 'registrar' (r).

Receiving

Krathwohl's lowest level requires only that the learner provide evidence of attention to experiences or an awareness of information being received that might bring about affective learning. For learners in both arms of the study, journal entries categorised only to have reached the *receiving* level of affective learning were mainly focused on the gaining of technical knowledge and skills. For some, learning appeared to be motivated by the desire to pass summative assessments:

We covered immediate pharmacological management and I was pleased that we were able to see how the different types [of drugs] are packaged, what they look like, how to assemble them, and how they're administered. I was also doubly pleased that we were able to practise priming fluids for fluid resuscitation as I didn't perform too well on this station in last year's OSCE. CY3R1_14i

Being able to see, touch and practice using medical equipment such as the intravenous fluid administration kit and the ophthalmoscope, as well as being able to practice performing procedures such eye examination, suturing and resuscitation, were reported to contribute to the development of technical skills:

It was useful to be able to get [instructions] on how to use the fundoscope and the different components of the scope itself. IY3R3_36i

For one learner, gaining of new skills, as well as first-hand experience of the effect of anticholinergic eye drops, piqued their interest:

The workshop was fun in that we got to dilate one of our eyes in order to visualise the optic disc and this provided much entertainment throughout the day. IY3R6-75i

Learners at the receiving level in both arms evaluated the learning experiences positively but any possibly affective content in their accounts was at a very superficial level, utilising terms such as ‘I was pleased’, the experience ‘was very beneficial’ or it ‘was fun’. The accounts contained no clear evidence of conscious recognition of an emotional response or even a coherent intellectual response to the experiences.

Responding

Affective learning at the responding level requires learners to have reflected on the described experience and identified their own intellectual and, especially, emotional response to it. The drug information and prescribing workshops (undertaken by participants in both arms of the study) were commonly reflected upon in participants’ journals that evidenced affective learning at this level.

In their accounts of a seminar focused on drug interaction, many participants assessed their existing knowledge to be inadequate. On application of the second hermeneutic, one gains a sense of frustration and fear, both in relation to their progress within the medical program and their practice beyond:

The first seminar of the day on that subject really overwhelmed me, and I find myself now having to go over the materials and research it further to grasp the concepts covered. CY3R1-12i

Learners also recognised a lack of familiarity with the prescription forms and other documents used within hospital settings, such as fluid order forms. Thus, being able to practice charting medication and receiving practical guidance on how to complete forms and how to access information important to prescribing appeared to enhance confidence:

Writing up charts was a great thing to practice. It had never been explained in such a step by step manor (sic). I will also try to write up charts at the hospital. I find that the interns are too busy to explain step by step.
CY3R4_58i

Although the quotation above might, at first glance, appear to convey a planned behavior change and perhaps suggest high-level affective learning, the absence of any convincing sense of an emotional impact of the learning experience or a changed world view in the second hermeneutic precludes this possibility.

The clinical skills seminars that included resuscitation, wound management and ophthalmology were commonly reflected upon by participants in both arms of study who evidenced affective learning at the responding level. These activities provided learners with the opportunity to gain theoretical knowledge as well as to see, touch and practice technical aspects of patient care under the guidance of expert clinicians. While learners had, at varying levels, existing theoretical knowledge that had been reinforced by information delivered in seminars, for many, the wound management and emergency medicine workshops were the first time they had been presented with the opportunity to practice wound repair and to perform resuscitation. With regard to wound management, learners' reflection on their experience highlighted a preconceived belief that suturing was an easy skill to master. This belief appeared to be influenced by their experience of seeing the procedure routinely performed with ease by clinicians in practice and demonstrated by clinical facilitators. In addition, there appeared to be a commonly-held expectation that, as medical students, they would inherently possess the required skills. For many, their first attempt was sufficient to highlight their misconceptions about suturing on all accounts:

It was actually a lot more complicated than I thought. From observing doctors in ED the process of suturing a wound seems so much quicker, but I guess that comes with practice and having to operate at a fast pace. CY3R2-31r

Learners in the Intervention arm noted that they had had very little, if any, prior exposure to medical emergencies where they themselves, assumed the role of the responsible doctor:

The first task as an emergency department intern attending to a motor vehicle patient required that I draw on skills I hadn't used in a clinical setting. I knew the ABCD method of emergency patient management however was forced to think quickly on my feet and adapt to the clinical scenario. I felt responsible for the care of the patient and had to make informed decisions about her treatment and management. IY3R1-01i

Reflections on experience that provided evidence of affective learning at the responding level extended to include participants' emotional reaction when they self-assessed that they possessed inadequate skills or when they gained skills through active participation. When placed in an emergency situation, many reflected on instances where their emotions impacted negatively on their performance, but at this level did not go the step further to learn something more general about their own affective responses:

Again, we were stunned and my mind went blank. It took a moment to realise what we were meant to be doing. IY3R1_03r

Participation in human patient simulation was an important factor in affective learning, at the responding level and higher. For learners in the Intervention arm only, initial exposure to the patient appeared to elicit self-doubt among learners, despite having confidence in their theoretical knowledge. In this account, the student appears to have been caught off guard by the presentation of the patient:

Thrust into the ED, our patient soaked in blood and in a C-spine collar. I think the phrase 'like a deer in headlights' best describes how I felt at that moment.

IY3R4_48i

Participation in the simulation required learners to feel confident in their own understandings of technical issues in order to counsel simulated patients effectively. In this account, the learner appears to have felt deeply embarrassed when a lack of medication knowledge was exposed. The experience served to generate a self-questioning of ability that extended beyond the particular learning situation:

I was all over the place. Some of the other students stopped me to try and explain it better. I was very much out of my depth. In fact, this [simulation] week has shown me how very behind everyone else I am in my knowledge. IY3R1-10i

Being 'on call' as part of the simulation was also commonly reported to elicit a high level of discomfort. The following account describes a live after-hours telephone call from a facilitator playing the part of a patient's ward nurse. The resulting emotional response appeared to generate a 'curiosity gap' (Lowenstein 1994) and an immediate drive to gain cognitive-domain understanding, in exactly the manner that we had predicted theoretically when the CLEIMS program was developed (Rogers et al. 2014):

Although I was stressed out massively because I couldn't give the appropriate answer, it made me get off the phone and ... study DVT and treatment more than I would have ever normally! IY3R1-05i

Another thematic area that evidenced affective learning at the responding level was 'the team'. Learners' comments reflected recognition that working together as a cohesive team was required to achieve the desired outcome, while those reporting a lack of cohesion also reported less desirable results. An affective appreciation for the value of teamwork begins to come through in the second hermeneutic of the following Control-arm account of learning cardiopulmonary resuscitation (despite the explicit language going no further emotionally than 'enjoyed' and 'found useful') and suggests the potential for transition towards higher levels of affective learning with appropriate learning experiences:

At first our group seemed to be a little bit disorganised and we were a little bit slow to get started, however once our nerves eased, we all settled into our roles well. I think our group functioned well together. We all thought about things and consulted with each other before we launched into an activity. This helped us to make sure we had covered anything and also prevented us from doubling up on certain tasks. I really enjoyed and found the practical aspect of the scenario very useful. It was also very helpful to have the experience of working in and being an active member of a team rather than just observing in emergency situations which is what I have been doing in hospital. CY3R3_34i

Valuing

Reflection indicating that an emotionally-impactive experience has enabled the learner to gain affective insights about themselves and their future role as junior doctors that they see as valuable or important, describes affective learning at the *valuing* level. Accounts that evidenced affective learning at this level encompassed medication errors, clinical and patient counselling skills, all of which resonated a sense responsibility towards optimising outcomes for their patients.

Seminars covering medication errors sometimes gave rise to valuing-level accounts, though this was much more often associated with emotionally-impactive experiences during simulation in the Intervention arm. Some learners reflected on how easily errors can occur during the prescribing process, eliciting fear about potential negative consequences and enabling them to recognise that they can either be part of this problem or part of the solution. In the following account, the learner appears to recognise aspects of their previous approach that were at variance with the value of ‘care in prescribing’ identified as important by the learning activity:

I tend to think of a couple of options, and if one of them is half decent then I will immediately pick that option and start to ponder my next move rather than continue and explore options. This means that sometimes I make an above average choice, but miss the blatantly obvious simply because I thought of the other first. Not the best way to practice medicine. IY3R2-83i

For learners in the Intervention arm, being presented with a (simulated) patient with whom they were expected to engage was reported to generate high levels of discomfort. These experiences often helped participants to understand their own affective functioning with potential benefit for future practice:

It was good to practice my communication skills as the actors make you think more carefully about the words you use because they go off if you get it wrong. I think I am too timid sometimes – I think it comes from not having enough background knowledge. So hopefully when I actually understand what I am doing I might become more forward. IY3R1-10i

Likewise, gaining an awareness of their characteristic emotional response in an emergency situation, which might impact negatively on clinical performance, enabled this learner to recognise that they were already gaining skills to address the issue:

I'm coming to realise that when faced with an emergency situation my first instinct is to freeze up, try to blend in with the furniture and hope someone more experienced and knowledgeable will take over. I think it's good that I can recognise that now and today (after a few deep breaths) I managed to collect myself quickly instead of just going 'oh my god, oh my god I don't want to be here, I can't handle this'. IY3R2-20i

For another participant, the emotional impact of the simulation facilitated recognition of the personal affective origin of potentially problematic teamwork behaviour:

My tendency to control things would have [made me] less than a good team player. I guess expecting a lot from myself makes me more prone to expect a lot from other people and I think that is one of my weaknesses. I appreciate gracious help when I need it, and so I should be the same with others. I don't believe I come across as belligerent and have been told that I teach and play well with others, but sometimes I struggle to contain my impatience. IY3R2-83i

Organisation

Affective learning at the *organisation* level goes beyond simply learning about an aspect of one's own affective functioning and connects the new insight with the learner's broader value system. Even in the Control arm, a small proportion of learners appeared to have experienced a significant change in their world view in association with the learning activities, which appeared authentic on the second hermeneutic:

Today we learnt about prescribing. In particular, we explored the effects of medication error, open disclosure and the technicalities of writing up a medication chart. I was surprised to hear the first-hand experiences of other doctors talking about medication errors that had resulted in patient deaths. Hearing how much these incidents had affected the doctors and nurses was very powerful. It made me quite scared about the daunting task of prescribing in our intern year and into our careers as doctors. It was great to practise writing up the charts. Even though I had read many medication charts, when I went to write up my fake chart I realised how many little details I didn't really know how to write. I was able to write one up, but it made me think about how much more study I want to do this year on common medications, their interactions, doses and adverse effects CY3R3-45i

This learner, similarly, was able to contextualise their immediate learnings within a broader view of junior doctor practice:

If mistakes aren't corrected now I feel I will just go on doing it incorrectly in my future medical practice like so many interns before me. CY3R4-55i

For learners in the Intervention arm, the extended simulation brought about a greater recognition of professional responsibilities, which included the need to be accountable for one's decisions and a need to be able to work independently, as well as recognition of the role and contribution of members of other health professions in caring for the patient. In this account, the simulation experience appears to have had a clear impact on the learner's fundamental appreciation of the need for experience-based judgement and synthesis of the evidence base in order to meet the needs of a particular patient:

... a lot of decisions in medicine are based on a person's clinical experience. You cannot always refer to an evidence based medicine source or other text. There just aren't 'text-book' answers for every question asked. Furthermore, different texts have different perspectives. IY3R1-02i

For this learner, the experience of being required to take responsibility for their decisions in relation to the care of a patient, albeit in a simulated setting, appears to have had a clear impact on their value system in relation to the tension between deferring to one's superiors and doing what is best for the patient:

I think as medical students and soon to be interns if we can be confident and proactive in the medical setting we should go a long way. Not being afraid of retribution from senior staff for querying methods or processes could save future adverse outcomes. The whole medical system is about the patient, hence at all times, we must be striving for the best result for the patient even if it means stepping out of our comfort zone. IY3R1-02i

Characterisation

Krathwohl's highest level of affective learning is achieved when the experience has changed the learners' view about aspects of their practice so much so that they have either expressed a resolution to change their practice or actually implemented such a change. The resolution to change also needs to be specific (as opposed to a mere expression of a general need to do better) and to appear to be values-driven in the double hermeneutic process in order to be categorised as 'characterisation'. Examples of this level of affective learning were absent in the control arm and unusual even in the intervention group.

In this account, the learner exhibits what appears to be a deep and authentic understanding of the grief experienced by bereaved family members and recognises that the traditional medical drive 'to make things better' is a potential barrier to providing human comfort and support:

It was an emotionally difficult ward round because of the events of Thursday. It highlighted the difficulties with comforting a grieving family which is something I haven't had much experience with. As doctors, we try to make everything better, but in situations with grieving families, there is not much that we can do.

We know that with time, the pain will become less intense, but for now they need comfort. I personally find this very difficult, because although I can empathise with them, I never know what to do to comfort them, but I am sure I will become better over time. IY4R7-03i

When characterisation-level affective learning was seen, participants exhibited a profound and emotionally authentic sense of changed understanding of their future responsibilities resulting in a changed view of their planned practice. The following quote details the writer's changed conception of how therapeutic decisions weigh on practitioners' thought processes and a recognition that the complexity of medical practice is such that even the highest levels of diligence will not always ensure good outcomes. On the second hermeneutic one gains a sense of recognition that such uncertainty needs to be tolerated and managed if one is to be of any benefit at all to one's patients:

I feel that the therapeutic dilemmas introduced by the presented scenarios allowed me to understand the dilemmas faced by doctors every day. It also forced me to utilize appropriate resources to reach an evidence based decision by weighing up the benefits vs risks of treatment options. This week also showed me that even if you do all the appropriate research regarding treatment decisions, you can still have poor outcomes and it is important to understand this not take these situations to heart if you do have a poor outcome. IY3R3-39i

Among the aspects of our medical student participants' value systems on which we found particular impact was their appreciation for the roles and capabilities of other health professionals. This account of the experience of a part of the simulation undertaken with students from the pharmacy program (whom the writer describes, in the spirit of simulation, as 'pharmacists') demonstrates a distinct shift in the learner's professional world view towards interprofessional values:

It was good to have some guidance from the pharmacists at this point as a drug interaction would have been a lot lower on my list of differentials than it should have been ... I enjoyed being able to interact with the pharmacists today and liked that they were all very encouraging of us contacting them. I think

today helped me to realise that we are not alone and that, in general, pharmacists don't mind helping us out if we aren't sure on things. I think I will definitely be using them as a resource when I'm an intern. IY3R3_34i

Although the emotional language in the forgoing quotation appears on first glance to be relatively superficial ('it was good', 'enjoyed'), on the second hermeneutic there is a clearly emotional tone ('than it should have been', 'helped me to realise that we are not alone') that lends authenticity to the planned practice change in the last sentence.

Affective learning impact of CLEIMS

Quantitative analysis of the highest level of affective learning identified in journals from each arm of the randomised trial is presented in Table 2 and illustrated in Figure 2. The median level in the Intervention arm (valuing) was significantly higher than in the Control arm (responding, $P < 0.0001$ by the Mann-Whitney test).

INSERT TABLE 2 AND FIGURE 2 ABOUT HERE

Discussion

Professionalism, and particularly the assessment of this cluster of capabilities in health care students in order to safeguard patients, clients and communities, remains a vexed issue in health professional education. Krathwohl and Bloom's time-honoured construct of affective learning (Bloom et al. 1964) offers a way to examine at least the process (and to some extent the outcomes) of learning for professionalism, but it too has traditionally proven difficult to assess.

A randomised educational trial to determine the effectiveness of an immersive, extended, multimethod simulation program provided us with the opportunity to develop a methodology for assessing evidence of affective learning in the journals of health professional students who have engaged in emotionally-impactive learning experiences. In our case, they were experiences in simulation, but there does not appear to be any reason to believe that the method would be less effective for reflections on real practice learning experiences. We utilised a 'double hermeneutic' technique derived from Smith's IPA (2008) to analyse accounts of affective learning and rate their quality according to Krathwohl's hierarchy (1964).

Through our sense making of the learning experiences reflected upon by study participants, we have demonstrated that affective learning at the lower levels of *receiving* and *responding* appears generally to be focused on benefit to the learner themselves. That is, at the lower level, learners framed their experiences as resulting in personal gain such as finding something interesting or enjoyable and enhancing knowledge and skills would enable them to perform better in formal assessments. Affective learning at the higher levels of *organisation* and *characterisation*, on the other hand, involves complex thought processes, decisions and actions that incorporate both intellectual and emotional components and lead to a shift in the learner's value system toward a focus on professional responsibility, interprofessionalism and the primacy of patient or client welfare. Our study suggests that the pivotal point at which learners' horizons broaden beyond a focus entirely on themselves in a student role lies in their *valuing* what they are learning, according to Krathwohl's hierarchy, and connecting that learning to their future professional purpose. Our findings therefore, resonate with the construct of 'transformative learning' (Mezirow 1975), which embeds the core elements of 'professionalism' into the thoughts and actions of health professional students, ultimately leading to adoption of, or at least commitment to, practices that embody the role of the health practitioner. This suggests that the ability to learn affectively at, at least, the *valuing* level may be a required capability for health professional students to develop professional values and then continue to refine them through ongoing reflection on their clinical life experience.

Importantly, we have demonstrated the utility of an analytical method, informed by IPA (Smith and Osborne 2008), as a means to identify and characterise affective learning among health professional students. If utilised as part of a programmatic approach to assessment (Schuwirth and van der Vleuten 2011), it may contribute to solving the 'wicked problem' of the assessment of the acquisition of professional values among health students (Varpio et al. 2017).

Within our own team, the method appears to be robust but clearly further work will be required in order to develop it into an assessment tool that others can be trained to use and that can be evaluated for its reliability for summative application. Work in that direction is already underway.

In addition, the method appears to be a useful means for identifying the process of acquisition of specifically interprofessional values, potentially fulfilling a formerly unmet need alluded to

in the recent international consensus statement on the assessment of interprofessional learning (Rogers et al. 2017).

Utilising the method, we have also found evidence to suggest that the CLEIMS extended, immersive, multimethod simulation approach is effective in facilitating higher order affective learning that might ultimately lead to improved professionalism. These findings complement our earlier paper, which demonstrated the effectiveness of CLEIMS in enhancing the knowledge and clinical skills of medical students (Rogers et al. 2014).

There are some important limitations to this study. Firstly, technical changes in the University's data management system resulted in the loss of the reflective journals submitted by students allocated to both arms in rotation 9. It is possible that these journals might have contained evidence of higher order affective learning in the Control arm. However, our evaluation of the journals at hand demonstrated a consistent pattern of difference between the two arms across all of the available rotations and it seems unlikely that the missing journals would have varied from this tendency.

The assignment of a highest level of affective learning to each journal is clearly a subjective process and there is a risk that we might have unconsciously inflated the level of learning in journals from the Intervention arm. We attempted to compensate for this possibility by blinding two of the three assessors (GDR and PCC) to all of the information about the origin of the journal. Interestingly, we found few disagreements about the maximal observable level in particular journals between the assessors and these were easily resolved through consensus discussion (with the blinded assessors remaining blinded during this period).

A potential limitation to the usefulness of the method developed in the study lies in its reliance on written journaling. In the course of our analysis, we have developed some concerns that participants for whom English was not their first language may have had more difficulty in expressing their reflections as effectively, which might bias our assessment of their affective learning adversely. Furthermore, at the time of the study, students in the medical program did not undertake specific prior learning activities on reflective writing and this may also have biased our assessments in a negative direction. Since that time, we have instituted a scaffolded program of reflective writing training, beginning with simulated patient communication workshops in the first year, in order to overcome this concern. The randomised study design

ensured that the potential of these factors to impact the quality of journals was equal for both arms but these concerns would need to be addressed in any broader application of the method.

This work might be considered highly transgressive since it draws on both human science (the phenomenological foundations of the technique) and positivism (quantification – or at least ordinalisation – of the level of affective learning). We would contend, however, that the ability to work nimbly in the borderlands between paradigms that have traditionally been thought of as in opposition is a critical capability for effective health professional educators.

Future research could consider the use of qualitative interviews, either individually or in groups, utilising our phenomenologically-informed analytical approach, as a means for assessing the presence and extent of affective learning associated with particularly impactful experiences.

Finally, we wondered whether, if the method were to be used more broadly, it might be useful to differentiate, within the characterisation level, between evidence of *intention* to change practice and accounts that practice had *already* changed by the time of writing (where possible) as a result of learning from the experience. This might necessitate the articulation of an additional level in the hierarchy if a practical tool for the utilisation of this method is to be developed.

Conclusions

This study has demonstrated that a method, derived from IPA, appears on first examination to be effective and robust for assessing for evidence of the presence and quality of affective learning among medical students who have written about emotionally-impactful practice experiences. Findings from the randomised study support the contention that extended, immersive, multimethod simulated experiences of future practice are more likely to bring about affective learning, of higher level, as measured by the method, when compared with related conventional seminars and workshops alone.

Practice points

- Affective learning is a time-honoured construct that is intimately associated with the acquisition of professional values among health professional students
- Affective learning has traditionally been regarded as extremely difficult to measure
- This paper describes a method that appears to be effective for the assessment of the presence and quality of affective learning in the journals of students who have undergone emotionally-impactive learning experiences
- Extended, immersive, multimethod simulated practice experiences appear to enhance affective learning among medical students.

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Disclosure statement

The authors report that they have no conflicts of interest related to this publication.

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Table 1: Krathwohl's levels affective learning as identified by IPA

Level	Description	Example	1 st Interpretation	2 nd Interpretation
Receiving	Evidence that the student has at least noticed some aspects of the experience that might ultimately lead to affective learning. For example, a report of something the student found novel or interesting but no discussion of the emotions that the experience has engendered in them.	<i>The lecture was there to educate us about heparin and how to write up the heparin charts. The lecturer was quite enthusiastic and was a very good teacher. The heparin chart had a lot of information on it and was quite confusing so it was good for her to clear things up with us and show us how to calculate and chart the dosages.</i> CY3R5-70i	The learner experienced the education session, noticed that some of the content was 'complex and confusing' and evaluated the lecturer positively.	There is little to suggest that the learner had examined any emotional response to the experience ('confusing' appears to be used in a largely intellectual sense) or that significant affective learning had occurred.
Responding	Evidence that the student has reflected on some of the experiences and has identified their own intellectual and, especially emotional reactions to them.	<i>I found myself struggling to concentrate during the first lecture. Whilst the presenter was quite good, it was the content that I struggled with. I recognise the importance of the drug interactions, however I felt that a lot of the information was directed at pharmaceutical students and that I would not have any chance of remembering the lists of substrates, inducers etc.</i> CY3R1-23i	The learner experienced the educational activity as challenging and characterised the content as complex.	There is evidence that the learner was frustrated by the complexity of the material and was to some extent aware of that emotional response (two references to an internal 'struggle'). However, this discomfort is rationalised by critiquing the focus of the presenter ('directed at [pharmacy] students') rather than bringing about new affective learning concerning the responsibility of doctors to prevent drug interaction errors.
Valuing	Evidence that the student has gone beyond just recognition of the personal impact of an experience or appreciation that the experience has enabled them to learn something about themselves as a person that they see as valuable or important .	<i>... when we found our patient unresponsive I thought first to another drug reaction and brain injury was further down my list. My team found the blown pupil and I am worried I may have missed it had I examined her eyes or not attributed enough significance to it. Sometimes if I do an exam, I initially believe abnormal physical findings are a result of incorrect or inexperienced technique and I would have likely tried for a longer trying to make the eye [constrict] to convince myself it was a true sign.</i> IY3R4-49i	The learner became aware of a tendency to miss significant physical signs through attributing apparent abnormalities to lack of skill in assessment technique	This experience elicited a definite emotional response that the learner recognised ('I am worried'). This appears to have led to a recognition of a potentially dangerous characteristic practice pattern and a need to modify this by trusting their own ability to find important abnormalities on physical examination.
Organisation	Evidence that the experiences have had a significant impact on the student's value system or world view in relation to an aspect of future practice.	<i>The case is progressing with twists and turns, which catch us very off guard ... it forces me to think on my feet and take responsibility for my decisions. Sticking to a systematic approach is essential, or you just end up going off track ... I am beginning to understand just how much responsibility ... will be placed on us, and how much we have to think about in managing a patient. It daunts me, and yet at the same time I feel even more excited about my future career as a doctor.</i> IY3R6-77i	The learner made sense of the learning experience in relation to their value system and view of their professional role explicitly ('just how much responsibility')	The emotional content of the quote appears authentic and provides a sense ('beginning to understand', 'how much we have to think about', 'daunts') of a small but 'seismic' shift in their world view in relation to their future professional role.
Characterisation	Evidence that the student's value system in relation to an important area of practice has changed or is in the process of changing their professional behaviour .	<i>Making good clinical decisions and making sure to include all the relevant details is a difficult task at the best of times. With sleep loss in amongst it all, I feel I am an impaired practitioner today! I believe to be a good doctor it is prudent to have instantaneous responses to what needs to be done ... I also think we need an ability to look into things and admit when it is time to ask a person higher up than ourselves. It is OK to ask for help, look things up and make sure of the right decisions before making them.</i> IY3T1-09i	The learner made sense of the experience in terms of their professional responsibility and the primacy of patient welfare. They then went further to translate this changed appreciation into planned practice behaviour.	The emotional content of the account appears authentic ('admit when it's time', 'it is OK') and conveys a sense of consolidation of affective learning that is rapidly translated into planned behaviour.

Figure 1: Phenomenologically-informed analysis of students' reflective journal entries

Figure 2: Frequency distribution of highest affective learning level achieved in journals from each study arm

Table 2: Quantitative analysis of highest identified affective learning level in journals from each arm

Krathwohl level	Intervention	Control
Receiving	1 (1%)	7 (12%)
Responding	19 (24%)	23 (45%)
Valuing	31 (38%)	16 (30%)
Organisation	20 (25%)	8 (16%)
Characterisation	10 (12%)	0 (0%)
Total journals	81	54
Median level	Valuing	Responding
Mann-Whitney U	1301.00	
Significance (2-tailed)	< 0.0001	