Facilitating Capability: iSAP – A Novel Pedagogical Intervention

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Abstract

This study explores the educational impact, as perceived by students, of an innovative, online context-rich case-based learning assessment and reflection framework known as integrating Science and Practice (iSAP). The study draws on a cross-sectional study conducted from 2018 to 2020 for students in units of study where an iSAP case was used as one assessment method. The voluntary survey was administered via the university's learning management system at the end of each academic year (Semester 2). The 19 self-rating questions were presented as counts and percentages. The difference in item responses between undergraduate and postgraduate students was explored using chi-squared tests. We observed that the majority of students perceived iSAP as a well-rounded framework that helped them apply knowledge and skills to real-life situations, improved their understanding of study material and helped them develop evidence-based reasoning, critical thinking and reflective analysis skills. We also observed that postgraduate students, compared to their undergraduate counterparts, were more likely to agree with statements related to the authenticity of the iSAP case as well as the benefits of iSAP to individual learning, further engagement in research to extend their knowledge and development of their evidence-based reasoning skills and critical thinking skills. We conclude that iSAP is an innovative case-based learning and assessment approach to facilitate preparation for professional and clinical capability. Further research is required to determine the impact of student professional maturity and how this may impact upon students' perception and adaptation of the reflective component of the iSAP framework.

Keywords: case-based learning (CBL), assessment, evidence-based reasoning, critical thinking, reflection, reflective analysis

1. Introduction

Echoing Dewey (1938), the Organisation for Economic Co-operation and Development's (2024, p. 15) Future of Education and Skills 2030 project strongly argues for the development of "transformative competencies" together with the facilitation of skills and attitudes such as adaptability, creativity, curiosity and open-mindedness as a way of mobilising what is already known about the development of new knowledge and approaches to the resolution of societal problems. There is no argument that possession of these qualities of mind is fundamental to the delivery of safe patient- or client-centred care. From the perspective of regulators, professions and governments, entry-level curricula must not only lead to the development of competent practitioners but they must also address social issues and concerns such as racism, climate change, environmental sustainability and family violence. To manage the myriad of competing demands they will experience throughout their working lives, health graduates must be competent and capable. However, the experience of a higher education may not lead to changes in the quality of graduates' their thinking and creativity (Silva et al., 2022). If students are to develop critical thinking capabilities,

they need to experience "non-linear" learning and assessment approaches that explicitly teach them how to address uncertainty, ambiguity and complexity (Fraser & Greenhalgh, 2001).

This paper reports on a novel online case-based learning (CBL) and assessment framework called integrating Science And Practice (iSAP), which is designed to develop student capability in an online learning environment. It is structured so as to teach students how to think critically, self-regulate and use science to inform their professional decision-making. It also provides an insight into students' perceptions of the extent to which iSAP achieves these aims and how engagement with expert feedback, an integrative component of iSAP, supports reflection on learning and impact on future professional practice.

1.1 The Pedagogic Response to the Challenge of Preparing Students to Become Capable Practitioners

iSAP is influenced by Dewey's (1938) assertion that learning is best conceptualised as a continuous spiral of reflection, observation, the reformulation of ideas and their implementation and evaluation. It also acknowledges Schön's (1983) contribution to understanding how professional knowledge develops through reflection-in-action and the earlier work of Argyris and Schön (1974) in relation to double-loop learning, which challenges learners to critically review "the appropriateness and propriety of [their] chosen ends" (Greenwood, 1998, p. 1049). iSAP is an experientially oriented online environment that facilitates inquiry-based and reflective learning through intrinsic feedback and the development of the high-level cognitive skills of exploration, analysis, interpretation and reflection (McInerney & Baird, 2015).

1.2 The iSAP Framework

iSAP is characterised by situated learning experiences that ask students to actively research, apply and reflect on existing and new knowledge to authentic and challenging situations that form part of the realities of the professional workplace. iSAP comprises a 5-step framework (Figure 1). It commences with a case scenario, often developed in partnership with practitioners (Step 1), which serves as a trigger to underlying professional issues and is carefully constructed by setting authentic learning goals that align with the complexity of the task for the purpose of skills development. The professional issues (Step 2) are coupled with a *call to respond*, which may be situated around a clinical or workplace decision to be made. The inquiry-based approach encourages students to explore and draw upon a range of provided and self-identified resources to produce an evidence-informed student response to the professional issues (Step 3). Once students have submitted their response to the virtual learning environment (VLE), they gain access to evidence-informed responses to the case challenges from one or more experts or practitioners (Step 4). Of itself, the provision of expert feedback does not necessarily provoke a "stop and think" moment in the student's mind. Rather, it is Step 5 of the process, the completion of a reflective analysis, which encourages students to reveal what the case has taught them, how the expert response has challenged their previous perceptions and understandings and the impact for their (future) practice (Williams et al., 2017).

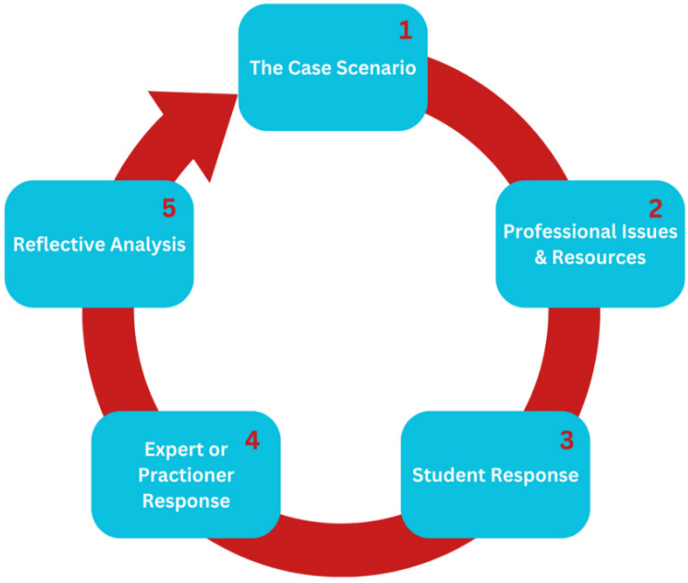

Figure 1. The 5-Step Framework of iSAP

Unlike other case-based pedagogical approaches, the engendering of critical consciousness in relation to the issues embedded in the scenario is not the end point of the process. iSAP is an educational intervention that aims to challenge a student's theory-in-use with its associated values, norms and social positioning whilst at the same time being an instrument with which to potentially transform habitual thinking into critical thinking and appropriate and ethical action. It explicitly facilitates the development of personal capability.

It is the inclusion of the reflective analysis within the framework that is a defining point of difference between iSAP and other CBL approaches. iSAP is pedagogically structured to enable students to explore options and perspectives before the consequences of that exploration result in adverse consequences for clients or patients. It creates a safe place for experimentation and personal and professional growth through reflective practice.

1.3 The Online Design

Using multimedia and integration with the VLE, iSAP immerses students in purposeful cases that stimulate the development of situated knowledge and metacognition. The online design of the iSAP programme takes a consistent approach with bespoke imagery and requirements specific to the discipline, as well as a table of contents for clear navigation through the iSAP e-book and task submission points (Figure 2). Cases open at a welcome page with a summary and requirements of iSAP, coherently identifying cases to the discipline in context. The design of an iSAP case draws upon Gagné's nine events of instruction to provide a consistent framework with which to inform the objectives, gain attention, stimulate prior knowledge and provide guidance to elicit performance and enhance retention through expert feedback combined with a reflective component (Gagné & Briggs, 1991).

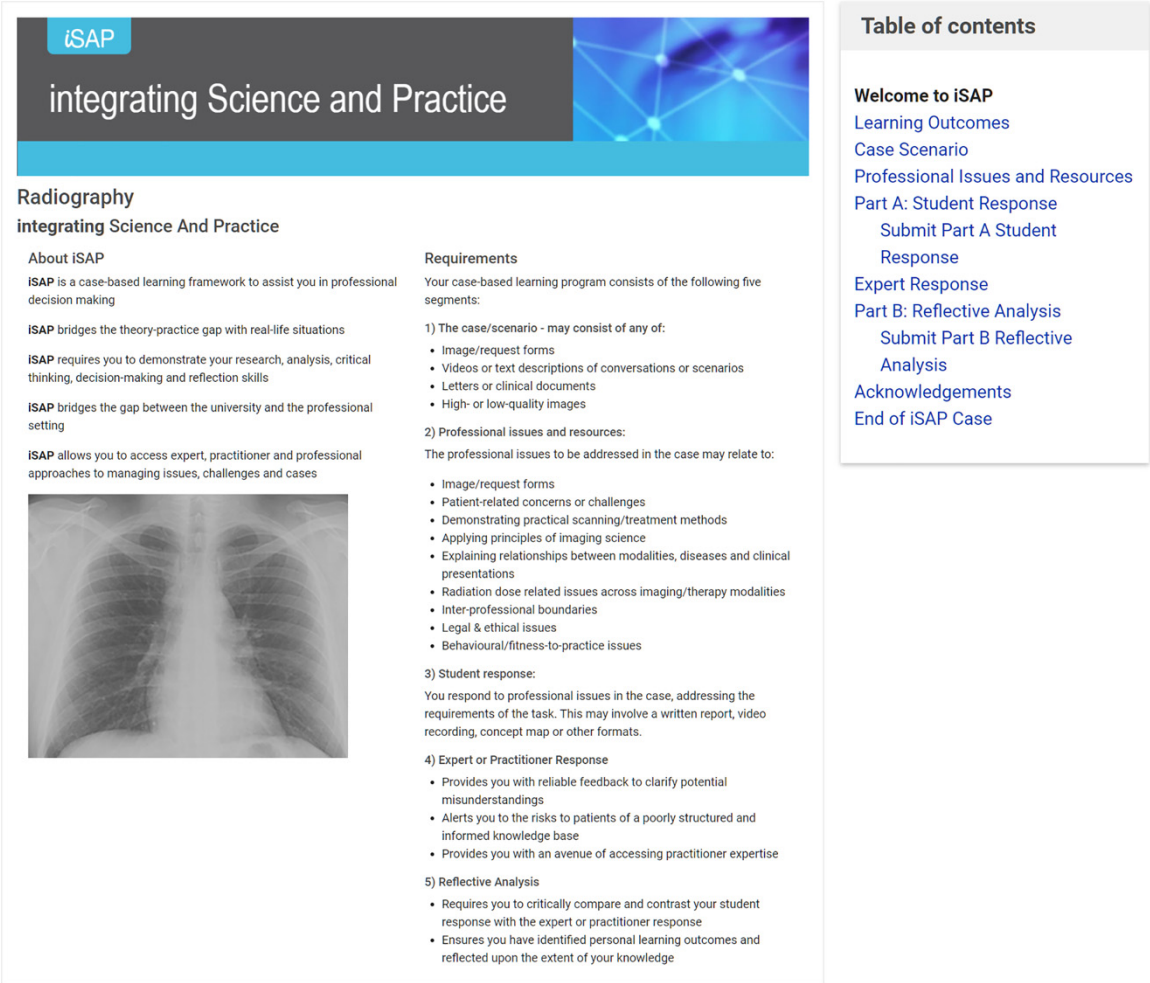

Figure 2. Welcome to iSAP Page for Radiography (left) and Table of Contents in Online E-Book (right)

1.4 Guiding Principles for the Creation of the Cases

iSAP had its origins in an earlier work described by Baird and Wells (2001). Student Oriented Learning About Radiography (SOLAR) focused upon a single health discipline of radiography. Given the reach of radiography across the health sector, there was a need to categorise the cases that would need to be written; for example, cases could be categorised in terms of medical conditions (e.g., respiratory system, gastrointestinal system), medical imaging modalities (e.g., mammography, medical ultrasound, magnetic resonance) or fields of practice (e.g., accident and emergency or mobile imaging or professional practice such as radiation safety, image quality or image interpretation). At the same time, a decision was made that if student interest and fidelity with the clinical context were to be maintained, case scenarios would be in one of five types: a letter or document, a patient scenario, a conversational scenario, a video-based scenario or a procedural scenario. These two principles were adopted into the reimagination of SOLAR as iSAP and expanded to an additional 14 health disciplines within the Faculty of Medicine, Nursing and Health Sciences (MNHS). Assessment in coursework via iSAP cases therefore seeks to develop capability in students that is relevant for professional growth in the delivery of health and care services.

2. Method

By the end of 2020 and continuing into 2021, iSAP had been adopted into 14 discipline areas in MNHS with 8,111 total student engagements and 3,638 unique students (27.8% of MNHS enrolments in 2020) taking at least one iSAP assessment in the academic year. To better understand student perceptions of iSAP, we report on the analysis of an online, anonymous questionnaire conducted between 2018 and 2020, which was undertaken to evaluate the extent to which students believed iSAP was achieving its aims. We hypothesised that there would be no differences in perceptions between students undertaking undergraduate (UG), expert master (EM) and graduate entry master (GEM) studies, and in particular that:

1. Students would have positive perceptions about the iSAP case scenarios and addressing (in their student responses) the workplace situations they triggered; iSAP would be perceived as stimulating the development of problem-solving and critical thinking skills.
2. Students would have positive perceptions about iSAP expert responses and reflective analyses; expert feedback, an integrative component of iSAP, would be perceived as supporting reflection on learning and impacting on future professional practice.

2.1 Participants

An online, anonymous questionnaire was conducted for students undertaking UG, EM and GEM studies in units of study where an iSAP case was used as an assessment task.

GEM programmes differ from typical EM programmes, as they offer students entry to a profession other than their UG qualification. The GEM programmes are designed for students who want to use their bachelor's degree to pursue a health or care professional career. The EM programmes are tailored to practitioners wishing to upskill or change career direction, gain a new professional qualification or pursue a passion.

2.2 Research Design

Items for the questionnaire were refined by the project team in order to establish face validity (Jones & Hunter, 1995). The final questionnaire consisted of 19 items, each requiring participants to provide a self-rating based on a 7-point Likert scale. The questionnaire was made available between 2018 and 2020 to all students who completed an iSAP case as part of their course in Semester 2. Participants were invited to complete the questionnaire via an announcement in the VLE by the coordinating teacher, with responses recorded using Qualtrics XM (Qualtrics, Provo, UT, USA). Student survey responses from 2018 to 2020 are shown in Figure 3. Total unique students are students in units with an iSAP assessment over the entire academic year. Total unique students invited to respond to the survey in Semester 2 are students in units with an iSAP assessment in Semester 2. Valid survey responses were collected from each year and summed into total valid survey responses.

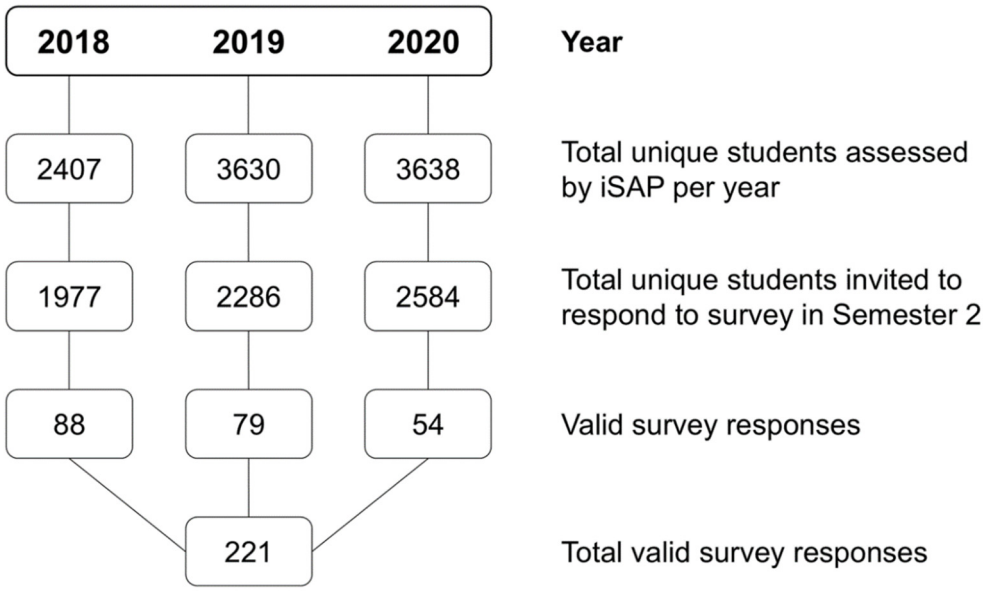

Figure 3. Student Recruitment and Survey Responses for the 3 Years from 2018 to 2020 Showing a Total of 221 Valid Survey Responses Collected

2.3 Data Analysis

All student survey responses were provided on a 7-point Likert scale and presented as counts and percentages, with responses categorised into *agree*, *neither agree nor disagree* (labelled "neutral") or *disagree*. EM and GEM students were collectively referred to as postgraduate (PG) students. The difference in survey responses between UG and PG students was explored using the chi-squared test. Considering that PG students comprise EM and GEM students, sensitivity analyses were performed to explore whether there were any differences in responses between these two groups. Analyses were performed using IBM SPSS Statistics 25 (IBM Corp., Armonk, NY, USA). A p value of < 0.05 was considered statistically significant.

2.4 Ethics Approval

The study was approved by the Monash University Human Research Ethics Committee (Project ID16791).

3. Results

3.1 Student Evaluation of iSAP: UG and PG Students

Student evaluation of the iSAP CBL programme is presented in Table 1. A total of 221 students completed the survey: 219 reported UG, PG or GEM status (72.1% of them UG students). More than 90% of all students reported that the iSAP case represented a real-life scenario, while more than 80% of all students reported that the iSAP case was easy to navigate and thought of the patient or client in the case as a real person.

No difference in perceptions was observed between UG and PG students for those items. Statistically significant differences in perceptions between UG and PG students were observed for several questionnaire items. When compared to UG students, PG students were more likely to agree that the iSAP case is well structured (83.9% vs 76.4%), that the iSAP resources provided were helpful in starting their own research into topics related to the case (87.1% vs 71.3%), that the iSAP case helped them integrate theoretical concepts from the unit with clinical decision-making and/or clinical practice (96.8% vs 74.0%) and that their understanding of the topic increased after reflecting on the expert response (96.7% vs 70.7%).

Table 1. Student Evaluation of iSAP CBL Programme – UG and PG Students

iSAP survey question	Rating	All students (*N* = 221) *n* (%)	UG students (*N* = 157) *n* (%)	PG students (*N* = 62) *n* (%)	*p* value[a]
The iSAP case I just completed represented an authentic, real-life scenario	Agree	207 (93.7)	146 (93.0)	59 (95.2)	0.825
	Neutral	4 (1.8)	3 (1.9)	1 (1.6)	
	Disagree	10 (4.5)	8 (5.1)	2 (3.2)	
I thought of the patient/client in the case as a real person	Agree	186 (84.2)	132 (84.1)	52 (83.9)	0.207
	Neutral	13 (5.8)	7 (4.4)	6 (9.6)	
	Disagree	22 (10.0)	18 (11.5)	4 (6.5)	
The iSAP case was well structured	Agree	174 (78.7)	120 (76.4)	52 (83.9)	0.004
	Neutral	13 (5.9)	6 (3.9)	7 (11.3)	
	Disagree	34 (15.4)	31 (19.7)	3 (4.8)	
The iSAP case was easy to navigate	Agree	179 (81.0)	124 (79.0)	53 (85.5)	0.366
	Neutral	9 (4.1)	6 (3.8)	3 (4.8)	
	Disagree	33 (14.9)	27 (17.2)	6 (9.7)	
The resources provided were helpful in starting my own research into topics related to the case	Agree	168 (76.0)	112 (71.3)	54 (87.1)	0.035
	Neutral	24 (10.9)	19 (12.1)	5 (8.1)	
	Disagree	29 (13.1)	26 (16.6)	3 (4.8)	
The iSAP case has helped me to integrate theoretical concepts from the unit with clinical decision-making and/or clinical practice (*n* = 218)	Agree	176 (80.7)	114 (74.0)	60 (96.8)	0.001
	Neutral	19 (8.7)	19 (12.4)	0 (0.0)	
	Disagree	23 (10.6) *3 missing*	21 (13.6) *3 missing*	2 (3.2)	
The iSAP case was boring (*n* = 220)	Agree	48 (21.8)	39 (25.0)	7 (11.3)	0.052
	Neutral	42 (19.1)	31 (19.9)	11 (17.7)	
	Disagree	130 (59.1) *1 missing*	86 (55.1) *1 missing*	44 (71.0)	
My understanding of the topic increased after reflecting on the expert response (*n* = 220)	Agree	172 (78.2)	111 (70.7)	59 (96.7)	<0.001
	Neutral	14 (6.3)	12 (7.6)	2 (3.3)	
	Disagree	34 (15.5)	34 (21.7)	0 (0.0) *1 missing*	
Preparing a comparative report helped me to identify gaps in my learning	Agree	169 (76.5)	109 (69.4)	58 (93.5)	0.001
	Neutral	12 (5.4)	11 (7.0)	1 (1.7)	
	Disagree	40 (18.1)	37 (23.6)	3 (4.8)	
The comparative report helped me develop reflective practice skills (*n* = 220)	Agree	52 (23.6)	29 (18.5)	22 (35.5)	0.025
	Neutral	86 (39.1)	63 (40.4)	22 (35.5)	
	Disagree	82 (37.3) *1 missing*	64 (41.0) *1 missing*	18 (29.0)	
The expert response gave me a new perspective on my future career (*n* = 220)	Agree	123 (55.9)	78 (50.0)	43 (69.4)	0.014
	Neutral	41 (18.6)	30 (19.2)	11 (17.7)	
	Disagree	56 (25.5) *1 missing*	48 (30.8) *1 missing*	8 (12.9)	
I enjoyed completing this iSAP case (*n* = 220)	Agree	135 (61.4)	89 (57.1)	44 (71.0)	0.029
	Neutral	34 (15.4)	23 (14.7)	11 (17.7	
	Disagree	51 (23.2) *1 missing*	44 (28.2) *1 missing*	7 (11.3)	
I would like to complete more iSAP cases in the future (*n* = 219)	Agree	135 (61.6)	87 (56.1)	46 (74.2)	0.030
	Neutral	42 (19.2)	32 (20.7)	10 (16.1)	
	Disagree	42 (19.2) *2 missing*	36 (23.2) *2 missing*	6 (9.7)	
Overall, I believe that iSAP case-based learning is useful to my studies	Agree	171 (77.7)	116 (74.4)	53 (85.5)	0.008
	Neutral	27 (12.3)	18 (11.5)	9 (14.5)	
	Disagree	22 (10) *1 missing*	22 (14.1) *1 missing*	0 (0.0)	
iSAP got me engaged in investigation and research (*n* = 220)	Agree	166 (75.5)	113 (72.4)	51 (82.3)	0.022
	Neutral	21 (9.5)	13 (8.4)	8 (12.9)	
	Disagree	33 (15.0) *1 missing*	30 (19.2) *1 missing*	3 (4.8)	
iSAP has helped me to develop evidence-based reasoning skills (*n* = 220)	Agree	172 (78.2	119 (76.3)	51 (82.3)	0.031
	Neutral	27 (12.3)	17 (10.9)	10 (16.1)	
	Disagree	21 (9.5) *1 missing*	20 (12.8) *1 missing*	1 (1.6)	
iSAP has helped me to develop critical thinking skills (*n* = 220)	Agree	177 (80.5)	122 (78.2)	53 (85.5)	0.034
	Neutral	22 (10.0)	14 (9.0)	8 (12.9)	
	Disagree	21 (9.5) *1 missing*	20 (12.8) *1 missing*	1 (1.6)	

[a] Differences between UG and PG students explored using chi-squared test.

We observed that PG students, compared to their UG counterparts, were more likely to agree with statements related to the authenticity of the iSAP case as well as its benefits to individual learning, further engagement in research to extend their knowledge and to the development of their evidence-based reasoning skills and critical thinking skills. Compared to UG students, PG students were also more likely to report that they agreed with statements that preparing a comparative report helped them identify gaps in their learning (93.5% vs 69.4%) and helped them develop reflective practice skills (35.5% vs 18.5%), as well as with statements that the expert response gave them a new perspective on their future career (69.4% vs 50.0%). PG students were also more likely to agree more with statements that iSAP engaged them in investigation and research (82.3% vs 72.4%), helped them develop evidence-based reasoning skills (82.3% vs 76.3%) and critical thinking skills (85.5% vs 78.2%). In addition, PG students, compared to UG students, were more likely to agree that they enjoyed completing the iSAP case (71.0% vs 57.1%), that they would like to complete more iSAP cases in the future (74.2% vs 56.1%) and that, overall, they believed that iSAP CBL was useful for their studies (85.5% vs 74.4%).

3.1 Student Evaluation of iSAP: EM and GEM Students

Although CBL is commonly used in both UG and PG educational levels (McLean, 2016), the iSAP approach with immediate feedback via an expert response followed up with a reflective analysis is novel but strangely familiar to practitioners. For example, EM students in the health professions in our study will have experienced case debriefing and multidisciplinary meetings. In addition, the requirement for continuing professional development for many of these health professions is often guided by learning from experience and experts in their field. It was therefore not surprising to find that differences in the survey responses of EM and GEM students were not statistically significant, except for the question of whether the expert response gave them a new perspective on their future career (Table 2). Sensitivity analyses indicated that GEM students, compared to EM students, were more likely to agree that the expert response gave them a new perspective on their future career (85.7% vs 48.1%, $p = 0.004$). No other statistically significant differences in responses were observed between EM and GEM students. GEM students are more likely to be focusing on changing careers, gaining a qualification or pursuing a passion different from their UG discipline, whereas EM students, in our programmes, were more likely to be working professionals seeking an advanced qualification in the same or cognate discipline. Thus, in comparison with EM students, GEM students might perceive the expert as providing insights and information on their targeted profession. Although our numbers are not strong enough to argue that this difference reflects the nature and purpose of the GEM programmes, it was heartening to observe that GEM students identified the expert response as relevant to their career aspiration.

3.3 Online CBL

There are limited studies on using online CBL in the same way that we have scaffolded the integration of theory learned in the class with application and reflection to foster independent learning. Van Dijken et al. (2008) explored the use of a Web-based learning approach to teach pathophysiology. Students in that study agreed that working on the cases online was stimulating and easy to use and a that the interactive discussion session of the cases which followed was highly appreciated. Students also received a subsequent resolution of the cases, regardless of whether they had participated in the initial online step (Van Dijken et al., 2008). In our study, 81% of all students agreed that the iSAP case was easy to navigate, and we observed that more PG students compared to UG students agreed that the iSAP case was well structured. PG students placed a greater value on receiving expert responses, broadening their understanding of the topic, helping them identify gaps in their learning, developing reflective practice skills and providing them with new perspectives on future careers.

3.4 Reflection on Learning

iSAP cases are designed to instruct students on how to evaluate their response in comparison with that of an expert practitioner and, in the process, reflect on their learning and impact on future practice. Reflection draws on the frameworks of reflection based on three questions: “What? So what? and Now what?” (Driscoll, 2007, p. 44). The instructions are broken down into three parts: comparison with the expert (“what”), reflection on learning (“so what”) and implications for future practice (“now what”) and are guided by a rubric for structuring the comparative report which is provided for each case. Despite this, we observed that more than 75% of all students responding to the survey either disagreed (37.3%) or neither agreed nor disagreed (39.1%) with a statement that the comparative report helped them develop reflective practical skills (Table 1). Mann et al. (2009) reported on several variables that may have an influence on developing reflective thinking and, especially in regard to assessments, it may be more deliberatively stimulated by the educational context and thus may need to be more explicitly integrated and communicated as a learning strategy. In a study that investigated the outcomes of CBL with reflection through an interprofessional approach in clinical nursing education, Golaghaie et al. (2019) concluded that this type of teaching

promoted competency and resulted in significantly higher retention of knowledge in the group undertaking the cased-based educational group compared to that in the traditional lecture programme.

Table 2. Student Evaluation of iSAP CBL Programme – Differences between EM and GEM Students

iSAP survey question	Rating	EM students (*N*= 27) *n* (%)	GEM students (*N* = 35) *n* (%)	*p* value[a]
The iSAP case I just completed represented an authentic, real-life scenario	Agree	26 (96.3)	33 (94.3)	0.241
	Neutral	1 (3.7)	0 (0)	
	Disagree	0 (0)	2 (5.7)	
I thought of the patient/client in the case as a real person	Agree	23 (85.2)	29 (82.9)	0.715
	Neutral	3 (11.1)	3 (8.5)	
	Disagree	1 (3.7)	3 (8.6)	
The iSAP case was well structured	Agree	23 (85.2)	29 (82.9)	0.522
	Neutral	2 (7.4)	5 (14.2)	
	Disagree	2 (7.4)	1 (2.9)	
The iSAP case was easy to navigate	Agree	25 (92.6)	28 (80.0)	0.240
	Neutral	0 (0)	3 (8.6)	
	Disagree	2 (7.4)	4 (11.4)	
The resources provided were helpful in starting my own research into topics related to the case	Agree	25 (92.6)	34 (97.1)	0.491
	Neutral	1 (3.7)	4 (11.4)	
	Disagree	1 (3.7)	2 (5.7)	
The iSAP case has helped me to integrate theoretical concepts from the unit with clinical decision-making and/or clinical practice	Agree	29 (96.3)	34 (97.1)	1.000
	Neutral	0 (0)	0 (0)	
	Disagree	1 (3.7)	1 (2.9)	
The iSAP case was boring	Agree	3 (11.1)	4 (11.4)	0.473
	Neutral	3 (11.1)	8 (22.9)	
	Disagree	21 (77.8)	23 (65.7)	
My understanding of the topic increased after reflecting on the expert response	Agree	25 (96.2)	34 (97.1)	0.830
	Neutral	1 (3.8)	1 (2.9)	
	Disagree	0 (0)	0 (0)	
Preparing a comparative report helped me to identify gaps in my learning	Agree	26 (96.3)	32 (91.4)	0.161
	Neutral	1 (3.7)	0 (0)	
	Disagree	0 (0)	3 (8.8)	
The comparative report helped me develop reflective practice skills	Agree	8 (29.6)	14 (40.0)	0.184
	Neutral	13 (48.2)	9 (25.7)	
	Disagree	6 (22.2)	12 (34.3)	
The expert response gave me a new perspective on my future career	Agree	13 (48.1)	30 (85.7)	0.004
	Neutral	9 (33.4)	2 (5.7)	
	Disagree	5 (18.5)	3 (8.6)	
I enjoyed completing this iSAP case	Agree	21 (77.8)	23 (65.8)	0.251
	Neutral	5 (18.5)	6 (17.1)	
	Disagree	1 (3.7)	6 (17.1)	
I would like to complete more iSAP cases in the future	Agree	19 (70.4)	27 (77.1)	0.833
	Neutral	5 (18.5)	5 (14.3)	
	Disagree	3 (11.1)	3 (8.6)	
Overall, I believe that iSAP case-based learning is useful to my studies	Agree	23 (85.2)	30 (85.7)	1.000 [a]
	Neutral	4 (14.8)	5 (14.3)	
	Disagree	0 (0)	0 (0)	
iSAP got me engaged in investigation and research	Agree	22 (81.5)	29 (82.9)	0.679
	Neutral	3 (11.1)	5 (14.2)	
	Disagree	2 (7.4)	1 (2.9)	
iSAP has helped me to develop evidence-based reasoning skills	Agree	22 (81.5)	29 (82.9)	0.509
	Neutral	4 (14.8)	6 (17.1)	
	Disagree	1 (3.7)	0 (0)	
iSAP has helped me to develop critical thinking skills	Agree	22 (81.5)	31 (88.6)	0.467
	Neutral	4 (11.4)	4 (11.4)	
	Disagree	0 (0)	0 (0)	

[a] Differences between EM and GEM students explored using chi-squared test.

4. Discussion

Between 2018 and 2020, more than 200 UG and PG students responded to the invitation to participate in the survey. We observed that most students perceived iSAP as a well-rounded framework that helped them apply knowledge and skills to real-life situations, improved their understanding of study material and helped them develop evidence-based reasoning skills and critical thinking skills.

In a systematic review into the effectiveness of CBL to achieving defined learning outcomes, Thistlethwaite et al. (2012) reported that students enjoy CBL and think it helps them learn better; however, they noted that the empirical data was inconclusive as to the effects of CBL in comparison with other types of learning activities. In contrast, in her 2016 review of the use and application of CBL in medical and health fields worldwide, McLean (2016) found persuasive evidence from 70 studies that CBL can bridge the theory-practice gap and, in specific instances, can promote deeper learning in adult learners. In a study cited by McLean (2016), which sought to measure the extent to which clinicians reported a willingness to change their practice following completion of a series of cases featuring adverse patient events, the investigators found the reflection scores achieved by the physicians were associated with their perceptions of case relevance and even generalisability. In other words, CBL can have an impact upon behavioural change only if the case is realistic and impactful; cases must be capable of promoting a genuine stop-and-think moment on the part of the practitioner. This conclusion is supported by longitudinal research into the impact of university attendance on the development of students' critical and creative thinking skills. As Silva et al. (2022) found, unless students are provided with authentic inquiry-based learning environments that support discussion and mentoring by faculty, creative thinking skills are underdeveloped. Similar responses were observed when we asked whether students found the iSAP case boring, where PG students disagreed more (71%) compared to UG students (55.1%). At one level, the finding that some UG students found cases boring is a surprise given that during the period of greatest uptake of iSAP within the faculty, educational design support was available to academic staff to assist in the creation of quality cases. The construction of a case requires thought and collaboration with those at the coalface to ensure its face validity and that the professional issues students need to explore are challenging and linked to the unit learning outcomes. Nevertheless, there are explanations for this finding in the literature. Engagement in active learning requires considerable cognitive effort; and in the early years of their UG courses, some students struggle to meet the demands associated with active learning, including self-directed learning (Artino & Stephens, 2009). In a study that used a randomised experimental approach to measure students' perception of learning when "active learning alone is toggled on and off", Deslauriers et al. (2019, p. 19251) reported that students felt they learned more in traditional instructor-led classes than when required to engage in active learning. In other words, the cognitive effort required to successfully complete the case potentially caused an "overload" (Sweller, 1994), with students opting out by labelling the case as boring and not worth the effort. Successful online learning does require high levels of motivation and the capacity to self-regulate (Artino & Stephens, 2009). In their comparative analysis of academic motivation and self-regulation between UG and PG students learning online, Artino and Stephens found that UG and graduate students did differ in important ways. Although at that time, graduate students were arguably less familiar with online technologies and learning, their previous university experiences meant they reported greater use of critical thinking strategies and lower levels of procrastination, which are characteristics of effective self-regulation. Also, as Artino and Stephens found, when transitioning UG students to online learning, academics need to pay more attention to the provision of explicit instructional support and scaffolding techniques. Thus, our reactions may be explained by the UG students participating in our survey being more acquainted with, and responsive to, direct instruction in active learning environments compared to PG students, where significant courses are delivered partially or fully online.

Most students, regardless of their degree of study, agreed (93.7%) that the iSAP case represented an authentic, real-life scenario and thought of the patient/client in the case as a real person (84.2%). The difference in agreeing with those questions between PG students compared to their UG counterparts may stem from the fact that the PG students using iSAP are either working professionals who wish to further advance their career or are graduate students who are seeking to change their career direction or gain a new professional qualification via the GEM programmes. Graduate students or working professionals may be more adept at self-directed learning and iSAP may be a supporting tool to help develop students' motivation toward self-directed learning in UG education (Wong et al., 2021). We observed significant differences in UG and PG perceptions on questions relating to critical thinking skills. PG students identified greater with iSAP cases supporting the development of evidence-based practice and the integration of theory and clinical decision-making. As Royce et al. (2019) noted, learners are rarely efficient in their clinical decision-making, citing cognitive biases and reliance on System 1 thinking and decision-making that may give rise to clinical and diagnostic errors. Designing educational strategies for teaching critical thinking skills will

assist the learner in developing the metacognition that is required to make clinical decisions that improve patient outcomes. iSAP is one such strategy that assesses students on their clinical reasoning and decision-making in a safe environment. The model response from the expert facilitates the anchoring of understanding of concepts in context and reflection of student responses and clinical decision-making in comparison, potentially changing their conclusions in light of the expert's reasoning.

In our study, PG students were more likely to view the reflective analysis as an opportunity to develop reflective practice skills; however, students overall did not have a clear opinion on the value of the reflective analysis activity. In a recent investigation into the impact of this element of the iSAP process to engender self-regulation and reflective abilities amongst a group of third-year UG pharmacy students at Monash University, Abeyaratne et al. (2019) found that one-off educational interventions do not have the same impact across the cohort. The study found that on average UG students tended to underestimate their academic performance and that being self-critical is a skill that requires development. Abeyaratne et al.'s study confirmed earlier findings of a study by Steuber et al. (2017) that self-awareness and metacognition require continual practice in order to develop. In that study, Steuber et al. concluded that, with any educational intervention, academics need to commit to providing students with longitudinal and scaffolded feedback, including an explicit expectation that students develop metacognitive skills if students are to become more aware of their own performance and devise a plan for enhancement.

4.1 Limitations

This was a cross-sectional study, so no causation is to be inferred. Longitudinal studies are needed to determine whether students' perceptions as well as the differences in perception between UG and PG students persist or change over time. The small response rate, and lack of demographic data, reduces the generalisability of our results to other PG and UG courses using iSAP or similar authentic assessments. Larger sample sizes, more information about differences in perceptions related to gender or socio-economic status, as well as a greater insight into student perceptions via a mixed methods approach, may have increased generalisability of the study results. A greater sample size from the UG, PG and GEM cohorts in different disciplines will be required to undertake sensitivity analyses, which may help to understand any potential differences in responses between degrees. Similarly, there could be a difference between first- and final-year students; a greater sample size of cohorts in different year levels may help to understand different perceptions of the usefulness of iSAP to student learning and preparation for future practice. Multiple comparisons have been performed, so there is a possibility that some of statistically significant results have occurred by chance.

5. Conclusion

Students from across a range of health disciplines reported positive satisfaction with the iSAP framework, indicating that they perceived iSAP helpful in integrating theoretical knowledge from the unit of study with clinical or professional decision-making and that their understanding of the topic increased after reflecting on the expert response. PG students' perception for much of the survey questions relating to deeper student learning, critical thinking and reflection was statistically significantly more positive compared to UG students, which may be indicative of deeper engagement with the cases by more mature students.

iSAP is a pedagogically sound and coherent learning experience for students. It is faithful to the challenge of constructively aligning learning outcomes, course content and workplace applications. By placing reflective learning at the heart of the experiential CBL paradigm, iSAP leverages learning transfer through modelling via quality feedback from expert practitioners, which is coupled to the reinforcement and remediation opportunity of the reflection in the reflective analysis report. This enables the student to readily understand the connection between the learning content and the application context to identify their individual learning gains and gaps.

6. Future Research Recommendations

This study identified that iSAP is perceived as a learning framework that provides fidelity through the selection of real case scenarios and settings. Future research using crossover studies with students being prepared with or without iSAP for a clinical placement or an objective structured clinical exam could provide insights into how well capability skills developed in the classroom are transferred into the professional practice environment.

Future qualitative research will help determine whether students understand what reflective practice skills are. There may also be a need for educators to clearly explain what reflective practice skills entail and how iSAP contributes to their development in their respective discipline. For example, it is expected that medical radiation practitioners

engage in evidence-based practice and professional learning through application of critical thinking and reflective practice (Medical Radiation Practice Board of Australia, 2020, p. 20). The Australian Association of Social Workers (2020, p. 21) requires graduates to develop over the life of the qualifying programme "personal and professional insight and emotional intelligence for the effective use of self as a professional". The difference between UG and graduate students in understanding the purpose of and need to develop these skills may be akin to findings in a 5-year mixed method study on competency in evidence-based medicine (Ilic & Diug, 2016). iSAP cases are frequently viewed as an alternative to traditional essay-type assessments. Scaffolding student reflective practice skill development through a programme and year level may not be as well articulated as we would like to see. Further work is required to embrace reflection as a learning approach in contextualised learning environments of professional practice.

Further research is required to examine how the type of case (e.g., therapy, diagnostic or prognostic) impacts upon the level of student engagement with the iSAP platform. Further research is also required to determine how the iSAP platform is perceived by educators – does it enable greater authenticity in creating real-world scenarios? Similarly, retrospective analysis from graduates who have had several years in clinical practice would be of value to determine their post-hoc experience of iSAP in preparing them for professional life.

Future research is warranted into understanding the benefits of co-creation of CBL in the context of peer learning. UG radiography students created iSAP cases as final-year capstone projects to close the gaps in UG education they identified from their experiences in clinical placements (Baird et al., 2018). Future co-creation of iSAP cases is an area that we would like to explore further for greater student engagement, deeper learning and conceptual understanding (Doyle et al., 2019). The iSAP framework was adapted to a student-co-designed faculty initiative related to planning authentic palliative care, in a combination of a series of asynchronous online tasks and synchronous online meetings of final-year students to stimulate interprofessional team discharge planning discussions (unpublished data).

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