Structured online vivas for evaluating professional competency in a capstone allied health course: A pilot study.

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Keywords

Structured online viva, authentic assessment, action research, professional competency, medical sonography

Key contributions

- Educators can embed online vivas as high-stakes authentic summative assessments in undergraduate and postgraduate courses if they are developed using a structured approach.
- Higher education students can be assessed for conceptual understanding and communication skills through structured online vivas.
- Educators need to carefully plan and structure the online vivas to assess professional competency.
- Students can have a positive online viva experience, with timely provision of explicit instructions, exemplars, and practice tests.

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Abstract

The aim of this pilot study was to develop structured online vivas as authentic assessments for capstone students enrolled in the medical sonography program in an Australian university. The objective was to evaluate the professional competency of trainee students who were transitioning to graduate as accredited sonographers. Prior to 2020, capstone students, located all over Australia, travelled to South Australia to undertake an on-campus, objective structured clinical examination for practical skills assessment. The interstate travel restrictions imposed by the COVID-19 pandemic resulted in the need for this examination to be conducted in an online mode. The emergency adaptation model employed in 2020 did not assess conceptual understanding and communication skills. To address this gap, structured online vivas were created and implemented through action research with 71 students in November 2021. A response rate of 51% from student feedback and 100% from external examiner feedback helped to enhance future iterations. Structuring of online vivas enabled assessment of professional competency skills, reduced both examiner bias and student anxiety, and promoted academic integrity. Our study discusses the action research process of developing and implementing structured online vivas, student performance, and evaluating student and examiner experiences with online vivas.

Introduction

Competency-based education in the health professions focuses on ensuring that all students reach a defined level of achievement that will enable them to provide safe and effective care. For the professional clinical context, competency can be defined as "the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values and reflection in daily practice for the benefit of the individual and the community being served" (Epstein & Hundert, 2002, p. 226). Competency-based assessment is the assessment of a person's competence against prescribed standards of performance and is the process determining whether a student meets the prescribed standards of performance (Hager et al., 1994). The objective structured clinical examinations (OSCE) used to objectively assess clinical competency and communication through direct observation have been used in health education because they provide assessors with valuable insight into the competencies and clinical knowledge of candidates (Harden, 2016). Structured and well-designed authentic assessments are a key component of this approach

(Yudkowsky et al., 2020), as the decisions made about students during these assessments will impact patient care outcomes.

Authentic assessments are those assessments that reflect real-world challenges or those that require students to apply their acquired knowledge and skills in simulated, safe settings in contexts similar to their future workplace. These assessments require students to apply higher order thinking to solve messy and complex problems from multiple perspectives (Ashford-Rowe et al., 2013; Villarroel et al., 2017). COVID-19 changed the way in which higher education students were assessed. The requirement for educational institutions to assess students online highlighted the need to address an increase in academic integrity breaches and the low-stakes format that resulted from these online assessments (Sotiriadou et al., 2019; Villarroel et al., 2017). The viva voce, or oral examination, used more frequently in doctoral examinations, has more recently gained popularity as an authentic assessment in various undergraduate and postgraduate contexts, such as medicine, nursing, marketing, and finance (Pearce & Lee, 2009; Sutherland et al., 2019).

The viva is defined as an "assessment in which a student's response to the assessment task is verbal, in the sense of being expressed and conveyed by speech instead of writing" (Joughin, 1998, p. 367). It is also defined as a situation in which the candidate gives spoken responses to questions from one or more examiners (Huxham et al., 2012). Vivas have been used in different contexts and disciplines. For example, Kirkland and colleagues (2022) used "debate club" styled viva debates as group authentic assessments for large cohorts to assess competencies related to communication and professionalism in engineering students. They reported enhanced technical understanding and communication skills in students as outcomes. Pearce and Lee (2009) discuss the use of vivas as a capstone summative assessment method for final year marketing students. They reported the viva to be a valid and novel method of assessing learning outcomes, such as deep learning, application of theory to practice, and problem-solving skills. The vivas provided invaluable experience for career interviews for these students. Fabrizio (2012), in a study, reported incorporating vivas as a part of the objective structured practical exam in anatomy courses to provide a greater complexity of questions and reduce overall time required for examinations. On the other hand, Carless (2002) reported the use of formative mini-vivas for 50 bachelor of education students to deliver enhanced feedback. The mini-viva was a group-based post-submission tutorial

where students answered queries about the content of the completed assignments and had an opportunity to clarify or justify their approach and receive feedback. This demonstrates an example of using the viva as an assessment for the purpose of improving student learning and providing timely feedback, rather than merely for purposes of grading.

There is a growing body of evidence suggesting that vivas have the potential to measure students' achievements in course outcomes not restricted to knowledge alone, but also in terms of professionalism, ethics, interpersonal competence, qualities, and the relevance of these to individual workplace setting (Harden, 2016). Okada and Scott (2015), in their study, investigated the use of vivas through a simple online conferencing technology to provide "quality assurance" in the assessment of 12 online postgraduate courses in Law for 20,000 students. They found that when a viva was combined with a written assessment, examiners could probe the students' knowledge of topics not covered well in the written component. Importantly, vivas offered a quality assurance opportunity to ascertain the students' 'ownership' of the submitted work, and to preserve academic integrity.

Although vivas have been used for competency assessment, an unstructured approach has been known to cause examiner bias and anxiety in students (Alcorn & Cheeseman, 2022). Chan and colleagues (2023) found that approximately two-thirds of an unstructured viva were simple recall questions and were not likely to elicit higher-order thinking. The students' confidence level, language, fluency, and appearance can influence the score awarded by the examiners, as opposed to the responses given (Thomas et al., 2014; Yaphe & Street, 2003). Other anticipated problems with online vivas are student anxiety due to unfamiliar format and access issues (Alcorn & Cheeseman, 2022).

Structured vivas

Literature suggests that the above challenges can be combatted by structuring the vivas, or in other words, establishing quality assurance, standards, benchmarks, and performance indicators (Alcorn & Cheeseman, 2022; Imran et al., 2019; Yudkowsky et al., 2020). In a structured viva, each examinee is exposed to the same or equivalent tasks, which are administered under the same conditions, in the same amount of time, and with scoring being as objective as possible (Harden, 2016). This can be achieved by: 1) assembling a series of oral examinations with careful

blueprinting of the examination stations, which refers to alignment of the vivas with course aims and objectives; 2) standardising initial questions; 3) using rubrics for scoring the answers; 4) utilising multiple examiners who have received appropriate training to conduct vivas; 5) using formal standard settings; and 6) carrying out quality assurance (Yudkowsky et al., 2020). Further, adequate guides and practice material should be provided to students to alleviate their stress. Joughin (1998), in a meta-analysis of teacher perspectives on oral assessment in higher education, identified six dimensions of oral assessment, namely: objectives, reciprocity, authenticity, agenda, examiners, and tasks. A study by Imran and colleagues (2019) is one of the very few published studies on structured vivas. They conducted a comparative study to evaluate the structured written theory examination outcome with structured and unstructured viva assessments in third semester MBBS students. They found that structured vivas provided improved objectivity, uniformity, and standardisation of learning outcomes across students, therefore minimising examiner bias and student anxiety.

Vivas in health education

The viva is often used in health education to assess students' deep understanding, skills competency, critical thinking abilities, judgment, and ethics, as well as the ability to express ideas (Hungerford et al., 2015). Therefore, the potential advantage of a viva lies in the examiner's ability to follow up with additional probes that explore the examinee's response, and thereby deepen or broaden the challenge to better define the limits of the examinee's abilities (Yudkowsky et al., 2020). Orrock et al., (2014) in a pilot study involving 30 osteopathy students, reported the use of vivas as summative assessments for assessing clinical reasoning in students. They used a simulated authentic clinical stimulus to elicit responses where the students were required to 'think-aloud' about their approach. Whilst there is an abundance of literature exploring face-to-face vivas, little has been reported on studies undertaken to evaluate the validity and reliability of using online vivas in high stakes assessments (Pettit et al., 2021), especially in health education where practice-based learning is pertinent (Grafton-Clarke et al., 2021).

Online vivas

Assessing student learning, knowledge, and skills in an online environment requires both synchronous and asynchronous resources to ensure that learning is transparent

and observable (Oosterhof et al., 2008). Although most institutions had some form of online teaching, the COVID-19 pandemic saw an increase in shifting both teaching and assessments, originally conducted face-to-face, to a completely online environment (Rahim, 2020). Online vivas can overcome the many challenges associated with organising face-to-face vivas, for example, they can be conducted at a time that is convenient to both students and teachers, irrespective of geographical distance (Okada et al., 2015). Alcorn and colleagues (2022) used technology assistance for remote delivery and recording of the vivas without an assessor, to reduce student anxiety while undertaking the vivas. Results from their study indicated that students preferred to have the assessor's presence, despite it triggering anxiety about performance. Scott and Unsworth (2018) developed digital vivas for nursing capstone students as low stakes assessments, where students recorded videos of their responses to pre-set questions. Although the examiner was unable to ask follow-up questions, this suited the objective of common interview questions. In a systematic review undertaken by Grafton-Clarke et al. (2021), it was found that different online assessment approaches, such as reporting of live radiological investigations, virtual case discussions with the use of archived images, and live image acquisition, were undertaken in health education to assess student knowledge and skills. Despite its several applications, common challenges associated with the face-to-face viva, such as subjective scoring, students' language proficiency, and anxiety, can be significant even in online platforms (Hungerford et al., 2015). It is therefore pertinent that appropriate pedagogy is employed to direct the assessment process so that it not only aligns with the online mode but also adheres to the principles of accessibility, privacy, and academic integrity (Akimov & Malin, 2020).

Context: A pilot study of online viva in a capstone course

The capstone course in the Medical Sonography postgraduate program in the authors' university assesses the vital transition in a student's journey from trainee to accredited sonographer. The course is non-graded, and student learning outcomes are reported as either a non-graded pass or fail. This course is delivered in an external mode with students geographically located all around Australia. It has two offerings annually, with 60 to 100 students enrolled in each offering. Students can be profiled as full- or part-time trainee sonographers working in supervised clinical training in medical imaging departments and studying online part-time. Medical sonography has established entry-level competency standards, which prescribe the standards of performance required of all new graduates (ASAR Standards, 2023).

Assessments in this course are high stakes, in that they impact on students' future careers by determining whether they successfully graduate and gain timely accreditation from the professional governing body. High stakes assessments require every facet of learning to be of extremely high quality, resulting in pass-fail decisions (Yudkowsky et al., 2020). Prior to the pandemic, assessment in the capstone course involved an on-campus, in-person OSCE to objectively assess clinical competency and communication through direct observation.

Interstate travel restrictions during COVID-19 prevented students from attending the on-campus OSCE, however, they were still required to undertake objective competency assessments to meet requirements for timely completion of their degrees. Online video submissions were introduced as a substitute for the on-campus OSCE in 2020, but there was no capacity to evaluate conceptual understanding or interpersonal communication skills, as only student monologue was available in the video assessments. These skills are key aspects of sonography graduate competency requirements (ASAR Standards, 2023). The need to explore approaches to improving assessment of professional competencies, including communication skills and conceptual understanding, resulted in the concept of online vivas as authentic assessments. Online vivas were not administered as high stakes assessments in any of the courses run at the time and there were no existing structured vivas being used for summative assessment. This pilot study was therefore conducted as action research to develop and implement structured online vivas, to report student performance, and to capture feedback on viva experience.

Methodology

Ethics approval was obtained from the Human Research Ethics and Compliance Committee (protocol number 203815). The primary author was the lead of this project and had over eight years of experience as a lecturer in medical sonography and over 20 years of industry clinical experience. The second author was the program director at the time and provided input for conceptualisation and quality assurance. The third author was a senior academic in the teaching innovation unit and was the mentor for this project. An action research process was followed, as it is a method of finding out what works best in ones' own class to improve student learning (Mettetal, 2001). To maximize student learning, an educator in action research finds out what works best in a particular situation. Action research is more systematic and data-based than personal reflection and the results contribute to the knowledge base. The focus is the

practical significance of findings, rather than statistical or theoretical significance (Mettetal, 2001). The action research process in our context consisted of:

a) Literature review to identify a relevant framework and to develop viva structure
b) Information session and seeking input for format and content of vivas
c) Collating key findings and developing resources for student and staff.

This process is elaborated in the following sections.

Literature review to identify a relevant framework and to develop viva structure

The literature review was undertaken by a research assistant to identify a replicable online viva framework that could be employed by educators, not only in sonography, but also in other disciplines. As medical sonography is competency-based, the online vivas needed to ensure that all students could demonstrate a defined level of achievement that would enable them to provide safe and effective patient care. Miller's Pyramid (Witheridge et al., 2019) was identified as the most relevant framework to design the online structured viva questions. Miller's Pyramid "has been used as a framework to guide assessment practice in health professions for the past two decades" (Al-Eraky & Marei, 2016, p. 1253). Miller's Pyramid was introduced by George Miller to address the limitations of traditional assessments that tested solely knowledge, rather than clinical performance This framework is used when designing assessments in health education, as it allows the testing of clinical competence. Miller's Pyramid is categorised into four levels: 1) Knows; 2) Knows how; 3) Shows how; and 4) Does (Al-Eraky & Marei, 2016, p. 1253). Witheridge et al. (2019) suggested that clinical competence in Miller's Pyramid is assessed through different types of assessment design. For example, knowledge is usually assessed by written exams, whilst application of knowledge is assessed by essays, clinical problem-solving exercises, and extended multiple-choice questions. The third level, which is the clinical skills competence, is usually assessed by standardised patient exercises, simulations, and clinical exams. The topmost level is assessed by direct observation in real clinical settings (Mehay & Burns, 2021).

The exploration of literature also identified that a structured approach would be necessary to effectively implement vivas. As discussed earlier, structured viva examination is where each examinee is exposed to equivalent tasks, which are administered under the same conditions, in the same amount of time, with scoring as

being as objective as possible so that different examiners arrive at the same score for the same set of responses, thus improving the reliability of the assessment (Shehata et al., 2021). The structuring of online vivas for our study involved creation of a resource bank of vivas, with careful planning to ensure: (a) alignment with course aims and objectives, a process known as blueprinting (Wass et al., 2001); (b) standardisation of questions; (c) identification of major content areas to be included in each test; (d) consistency in the number of questions in each test; and (e) the use of rubrics for scoring the answers. Questions for the online structured viva in the current study were framed to align to levels three and four of Miller's Pyramid of "shows how" and "does". Requirements relevant for courses that seek accreditation from professional bodies, (such as accessibility, inclusion of formative and summative tasks, and assessment security) were also considered in the assessment design (Akimov & Malin, 2020).

Information session and seeking input for format and content of vivas

An information session was held by the primary author for the program team and external industry supervisors to introduce the assessment and to invite them to provide expert input in relation to the format and content of the structured online viva. A recording of the session was emailed to those who could not attend. Input was sought on: (a) type of viva case scenarios; (b) content assessed, whether the learning being assessed represents application of problem-solving abilities; (c) authenticity, in relation to the extent to which the assessment relates to professional practice; (d) duration of the viva; (e) perceptions towards the online format; (f) opinions on ease of use of online platforms; and (g) requirement for examiner training. A total of 48 external industry supervisors provided valuable input, including a vast range of clinical scenarios to be included in the viva. The de-identified input data is available through the open access database registry (Maranna, 2022).

Collating key findings and developing resources for student and staff

External industry supervisor input was collated to inform the inclusion of authentic real-life case scenarios in the viva that were deemed essential to evaluate students' professional competency and communication skills. This, along with the key findings from the literature review, guided the creation of viva questions. The questions were based on clinical reasoning, eliciting relevant clinical history from patients, real-life case scenarios, knowledge application, image interpretation, and professional and

ethical awareness. A pool of viva questions to align with the learning objectives were created. Each set of viva questions were authentic and unique and deigned in view of maintaining academic integrity. Factors such as the number of examiners required, timing of feedback (whether during, immediately after or at a later stage), and student attention span in a high-pressure setting were considered. The duration of each viva session was tested formatively, and feedback was sought from academics and recent graduates prior to finalising the duration. The Zoom platform was chosen as the online tool for conducting the vivas. Formative online vivas were developed and made available to familiarise students and staff with this form of assessment, to reduce anxiety associated with unfamiliar methods of teaching and learning, and to seek feedback. Mock vivas were created with the help of recently graduated students, who volunteered to assist with the creation of exemplars depicting what the viva involved. Marking rubrics, online viva questions, and the interview format, along with standardisation of initial questions, were finalised, and resource guides for structured online vivas were developed for students and staff. The marking rubric is shown in Table 1. Two further information sessions were held to provide updates and seek feedback for quality assurance.

Table 1

The Grading Rubric Developed for the Online Vivas in the Capstone Course

	Student competent	**Student not competent**
Overall conceptual understanding & application of sonographic theory.	Shows a deep understanding of the topic with a fully developed argument. Demonstrates suitable level of application of learnt sonographic theoretical knowledge. Knowledge is well rounded with critical insight.	Shows superficial understanding of the topic, argument not developed. Fails to demonstrate application of learnt sonographic theoretical knowledge. Knowledge is limited with answers reflecting lack of understanding.
Delivers safe, patient-centered services.	Considers risk assessment and differential diagnosis in the approach. Interprets clinical history and information to determine a suitable provisional diagnosis. Approach is based on theoretical understanding and its practical application.	Fails to consider risk assessment and differential diagnosis in the approach. Fails to interpret clinical history and information to determine a suitable provisional diagnosis. Approach is based solely on a superficial understanding.

Practices within professional & ethical standards.	Consistent references made to ethical and professional practices. Knowledge is relevant to the discussion.	No reference made to ethical and professional practices. Knowledge is erratic and not relevant to the discussion.
Contributes to workplace safety.	Carefully considers safety issues and patient's well-being in decision-making. Aware of ethical implications.	Fails to consider safety issues and patient's well-being in decision-making. Unaware of ethical implications.
Communicates effectively.	Effectively communicates conceptual understanding in a clear and concise manner.	Fails to communicate conceptual understanding. Erratic discussion.

Results and discussion

Effectiveness of the action research process in implementing the structured vivas

Action research is a cyclical process of reflection, planning, actioning, and observing (McNiff & Whitehead, 2012). Five main characteristics of action research are identified as: human flourishing, participation, knowledge-in-action, practical issues, and emergent (Reason & Bradbury, 2008). In our action research project, academic staff members of the university were involved in developing solutions with the support from the teaching innovation unit (participation). The collaborative process combining inquiry, learning, and action was to find solutions around issues that mattered to students, whereby they had to be supported for timely graduation through online capstone assessment in the context of interstate border closures (practical issues). The research purpose was meaningful to students and staff and aimed at developing sustainable authentic assessment practices (human flourishing). The knowledge gained from the research emerged from real practice and interactions with clinical supervisors, students, and examiners (knowledge-in-action). Action research enabled developing new assessment practice embedded in the curriculum and fostered enhancements through reflection and evaluation (emergent). Face and content validity were established for the assessment questions through input from experienced academics in the program team and external clinical supervisors. Cases that were reflective of the typical real-life scenarios that present to Australian sonographer practice were developed as part of the current study. The cases contained information about the patient's presenting complaint, medical history, and sonographic scan findings. This process ensured that the assessment was inclusive of industry needs. It further provided an opportunity of aligning the viva to employer-

based, real-world requirements and asking students to demonstrate meaningful application of essential knowledge and skills.

The results of the action research included implementation of the vivas, feedback, evaluation, and dissemination. All 71 students were enrolled as part-time, with an age range of 24 to 44 years. They were located across five states within Australia. It is to be noted that only 13 students were local to South Australia. During conceptualisation of this project, the lack of interstate travel played a key role in justifying online assessment of competency, so that students could be graduated on time, independent of geographic location. The four examiners chosen were senior, experienced clinical sonographers with more than 10 years of industry experience. The academics and examiners were involved in face-to-face vivas, however, none of them had experience in online vivas prior to this study.

Implementation of structured online viva

The vivas consisted of a single 30-minute session per student, conducted on the Zoom platform with two examiners. This viva format was incorporated as an assessment component of the summative OSCE and was piloted in the capstone course in November 2021. Each viva session had seven questions. The questions covered core knowledge, scanning technique, clinical scenarios, patient safety, ethical practice, and interpersonal communication. Examiner training was provided. Resources, practice tests, mock vivas, and grading rubrics were developed for students. From a student's perspective, undertaking the viva involved choosing a suitable session date and time and attending the chosen session. Accessing the Zoom platform, previewing the mock recording, and doing practice vivas were stated as essential for students. During the viva session, upon logging on to Zoom, students were reminded that the session was recorded for instances where review of performance was requested. Examiners introduced themselves to students and ensured that they could hear and view adequately. Students had to verify their identity by displaying their student ID card or driver's licence. Students were then posed with questions based on real-life case scenarios with patients in various clinical settings that the student would encounter on any working day. Students were given adequate time to respond. If they were unsure, they were encouraged to clarify

with the examiner. If students provided irrelevant or generic answers, they were prompted to guide them in the right direction.

Student performance in online vivas

A total of 71 students were assessed by five examiners (four external examiners and one internal, who is the primary author). The capstone course being non-graded, each student was deemed as competent or non-competent based on their aggregate performance on the online OSCE components. Seven students were assessed as not competent in the vivas and were required to re-sit the assessment. Detailed personalised feedback on the gaps in competencies was provided to all seven students, with recommended strategies offered to help support them to reach the necessary competency levels. Following a second viva assessment, six students were assessed as competent, with the last of those graduating from the cohort in June 2022. One student remained as incompetent for non-attendance.

Evaluation of viva experience

To evaluate the experiences of students and academics with the online vivas, an anonymous survey was administered to garner students' and examiners' perceptions about the structured online vivas. The questions were adopted and modified from the template for quick student feedback (Templates for quick student feedback, n.d.). The data is available through the open access database registry (Maranna, 2022). Students were asked nine questions (see Table 2), with options ranging from 'Poor', 'Below average', 'Average', 'Above average,' to 'Excellent'. Examiners were provided with six questions, with options ranging from 'Poor', 'Below average', 'Average', 'Above average,' to 'Excellent'. Both the student and examiner surveys also included an option for comments on what aspects worked well and what could improve. The Likert scale responses were analysed using descriptive statistics on Microsoft Excel. The free text responses were analysed simplistically by manual deductive themes, derived to inform enhancements to future iterations.

Student feedback on viva experience

An overall response rate of 51% (n = 36) was obtained for the survey from the total of 71 students who undertook the viva pilot. Of these, 20 students used Microsoft Windows laptops or desktops, 14 used Apple Macintosh laptops or desktops and two students logged in via mobile phones to access the assessment. This information

was collected to evaluate the ease of access of the vivas on any online device. Table 2 shows the percentage agreement of the Likert scale questions and responses. Although most students agreed that they had positive online viva assessment experiences, a few students disagreed, mainly around the broad nature of questions, time allocated for responses, and viva scheduling options. The free test responses were analysed by the primary author, simplistically, by manual deductive coding into themes, to inform enhancements to future iterations. The aspects that worked well were: 1) a calm and supportive environment; 2) questions on knowledge application; 3) ease of access; 4) clarity of questions and images; and 5) flexible scheduling options with no interstate travel. Several students conveyed the need for more practice tests. One of the students had a suggestion to improve the assessment through the following comment, “have a backup question on the topic if a student does not know the answer to a particular question”. Another student suggested, “provide brief feedback at the end of the viva session on how we performed”. These suggestions were considered for future iterations.

Table 2

Percentage Agreement of Students’ Likert-Scale Responses on Online Viva Experience

Question	**Student responses (n = 36)**				
	Poor	Below average	**Average**	**Above average**	**Excellent**
Ease of access	3%		3%	3%	91%
Supportive online environment created by examiners	3%		3%	11%	83%
Nature of assessment questions		3%	9%	31%	58%
Choices offered for scheduling viva sessions	3%			6%	91%

Appropriate time allocated to answer in a comfortable pace	3%		9%	88%
Clarity of assessment resources		11%	22%	67%
Clarity of information on assessment process		9%	19%	72%
Details provided to participate in the online viva		11%	9%	80%
Timely provision of viva examples		6%	9%	85%

Examiner feedback on viva experience

All four external examiners provided responses about their experience in conducting the online vivas as summative capstone assessments. They choose the 'Above average' and 'Excellent' response to all the six statements in the survey, which were: 1) ease of access; 2) nature of assessment questions; 3) choices in scheduling of viva sessions; 4) appropriate time allocated to pose the questions in a comfortable pace; 5) clarity of assessment resources; and 6) communication from course coordinator in relation to online vivas**.**

Examiners provided further insights through open text responses on how the online viva worked well and how it could be improved. For example, more practice sessions were provided to students, and sessions were scheduled with adequate breaks for examiners in the subsequent iterations. One examiner suggested that if a student performed poorly in specific areas of the viva, then a supplementary viva, delving deeper into that specific scanning area, could be undertaken. This was taken on board for the students who did not perform to a competent level. Another comment was around the quality of questions in the viva.

> Each session ensured a spectrum of questions, sent to the examiner prior. The alteration in content between students ensured that they would not be able to plagiarize. The content of the questions posed was relevant to expected level of knowledge, with inclusion of basic concepts along with more advanced understanding. This was important as it

> differentiated those students with reduced conceptual understanding. (Examiner 1)

Conclusion

In summary, the structured online viva was an authentic, replicable method for assessing conceptual understanding and communication of capstone medical sonography students. The format facilitated interaction between students and examiners to allow for individual objective assessment. Broadly, the collaborative action research process encouraged collaboration amongst academics, external industry supervisors, and students. Students' feedback indicated that this was a fair and appropriate mode of assessment. Examiners' views provided insights on aspects that need further consideration in future iterations of the assessment. Online structured vivas can be used as sustainable and scalable assessments, which can be adapted to any discipline and customised to suit its objectives. Positive outcomes were linked towards fostering graduate qualities, digital learning objectives, and the university's strategic intent of developing partnerships and meaningful end-user engagement**.** An action research approach was suited to high-quality development work in our pilot study for the interface between teaching, learning, and assessment. Based on student performance and feedback from students and examiners, the online vivas were embedded into future deliveries of the course.

Implications for teaching practice and impact

Based on findings of our pilot study, the OSCE in the capstone course now incorporates online vivas as high stakes assessments, to ensure that professional competency skills are assessed objectively. Academic integrity is preserved, as each student must answer a unique set of questions created in a structured format. In 2022, a further 116 capstone students undertook this assessment. Ability to objectively assess students' individual competencies, such as conceptual understanding and communication, was possible through online vivas, as endorsed by Koeppen and colleagues (2008). Developing and implementing online structured vivas involves collaborative teamwork with online designers, online facilitators, program team, students, and industry. Educators must be provided with necessary training to enable them to support student learning. Structured vivas have potential for broader impact, for example, in scaffolding competency assessment and providing multiple data points that systematically sample the competency to be

assessed. Explicit instruction and ample practice exemplars are essential to reduce the inherent anxiety in students towards the vivas. Implementing online vivas as an assessment strategy has supported student learning and communication skills, while also increasing student confidence and motivation to learn and understand the content.

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