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Nurse Education in Practice

journal homepage: www.elsevier.com/locate/nepr

Original research

Evaluation of a collaborative testing approach to objective structured clinical examination (OSCE) in undergraduate nurse education: A survey study

Annette Saunders^{a,*,1}, Richard Say^{b,1}, Denis Visentin^b, Damhnat McCann^a^a School of Health Sciences, University of Tasmania, Launceston, Tasmania, 7250, Australia^b School of Health Sciences, University of Tasmania, Sydney, NSW, 2015, Australia

1. Background

Objective Structured Clinical Examinations (OSCEs) have been widely used in the assessment of health professionals since the 1970s (Merriman and Westcott, 2010) utilising a structured approach to assess competence (Harden, 1988). They assess students' capacity to complete and demonstrate specific skills and behaviours in simulated clinical settings on standardised patients or manikins against an objective marking checklist (Bartfay et al., 2004; Major, 2005). OSCEs play an important role as part of a wider nursing curriculum to produce safe nursing graduates (Mitchell et al., 2009).

OSCEs are positively regarded for their pedagogical rigour. When well-constructed, they direct learning by communicating relevant, authentic learning needs, and provide a framework for timely formative feedback (Mitchell and Jeffrey, 2013; Tanner, 2006). As a summative assessment, they act as a mechanism to measure clinical skills competence and 'fitness for practice' (Mitchell and Jeffrey, 2013).

The efficacy of the OSCE in assessing knowledge application and clinical skills is well supported (Martensson and Lofmark, 2013; Rushforth, 2007; Walsh et al., 2009). OSCEs have a higher propensity for objectivity than assessment of competence in clinical practice, they motivate students to learn, and are generally accepted as reliable and valid assessment tools (Bartfay et al., 2004; Schuwirth and Van der Vleuten, 2003). However, there are documented challenges associated with this form of assessment. OSCEs are associated with high levels of student stress and anxiety (Brosnan et al., 2006; Muldoon et al., 2014). Furthermore, OSCEs are a costly approach to assessment (Kenny and Kendall, 2001; Zayyan, 2011), with staffing the most expensive element (Brown et al., 2015).

A *collaborative testing* approach, where students are examined together and share the subsequent result, may mitigate some of the challenges associated with OSCEs. Unlike peer assessment, which involves students evaluating the work of other students (Topping, 1998),

collaborative testing involves the completion of a test or exam by two or more students, which is assessed by educators (Slusser and Erickson, 2006; Zimbardo et al., 2003). Collaborative testing has been used predominantly in summative quizzes and is associated with superior performance, reduced test anxiety, increased course satisfaction and increased confidence (Molsbee, 2013; Zimbardo et al., 2003). Additionally, by assessing two students at once, collaborative testing may reduce staffing and equipment resources. However, no study has yet observed the benefits of collaborative testing in OSCEs, which are traditionally undertaken individually.

An important benefit of collaborative testing is that it can promote peer learning as students prepare collaboratively. Peer learning is the attainment of knowledge and skills through the support and assistance of peers, where students act as both teacher and learner (Topping, 2005). It develops critical thinking skills, and enhances knowledge and understanding (Falchikov, 2001; Roberts, 2006). A collaborative testing approach can encourage students to engage in peer learning by monitoring each other's progress against specific criteria as they prepare for summative assessment - a key formative assessment strategy (Black and Wiliam, 1998; Sadler, 1989). Assessment approaches that facilitate peer feedback supports students to develop their own learning strategies and prepares them as lifelong learners (Nicol and Macfarlane-Dick, 2006).

This paper reports a unique OSCE design that used collaborative testing in response to concerns around the performance and lack of peer learning in a first-year Bachelor of Nursing (BN) cohort. Along with collaborative testing, the OSCE included a checklist, example videos and random allocation of students to one examined skill. The primary aim of this study was to measure student satisfaction with a collaboratively tested OSCE. A secondary aim was to report students' perceptions of strengths and weaknesses of the OSCE design.

* Corresponding author. School of Health Sciences, University of Tasmania, Locked bag 1322, Launceston, Tasmania, 7250, Australia.

E-mail addresses: Annette.Saunders@utas.edu.au (A. Saunders), Richard.Say@utas.edu.au (R. Say), Denis.Visentin@utas.edu.au (D. Visentin), Damhnat.McCann@utas.edu.au (D. McCann).

¹ Equally contributing authors.

2. Design

This was a cross-sectional survey study to evaluate an OSCE intervention.

Students were required to undertake an OSCE worth 40% of their overall grade at the end of semester. At the beginning of semester, students were advised they would be:

- assessed in pairs on one of four skills: basic life support with use of defibrillator, oral medication administration, manual handling or simple wound dressing
- only informed of which skill they would be performing upon entering the exam room
- randomly allocated to the role of 'lead' (performing the skill) or 'support'
- assessed against a step-by-step best-practice checklist, available from the beginning of semester
- given unlimited prior access to videos demonstrating each skill aligned with the checklist

During the course of the semester, students had a face-to-face laboratory session for each skill. While this was the only practical instruction they received from faculty, students were encouraged to practice regularly with their self-selected partner, and were offered unsupervised, voluntary 'open laboratory' sessions. Students had free access to the best-practice checklist of each skill which clearly detailed the assessment criteria for the OSCE. Students were encouraged to use the checklists and videos as supportive learning strategies to guide correct performance of each skill. The students did not have access to the checklist during the OSCE. As per collaborative testing design, students could discuss the skill during the OSCE and offer each other verbal support without penalty. Both students received the same mark.

3. Participants

This study involved a convenience sample of BN students undertaking their first-year nursing practice subject, on four campuses at an Australian university. The subject was taught using a blend of online learning resource preparation and face-to-face practicums with an aim to prepare students for success in their first clinical placement.

4. Methods

4.1. Data collection

There was no existing survey tool that could be adapted for use in this study. A survey tool was therefore developed specifically for the study, containing statements and open-ended questions. Participants were asked to rate their agreement with each of the six statements (Table 1) on a five point Likert-type scale ('Strongly Disagree' to 'Strongly Agree') and complete two open-ended questions focussed on the 'strengths' of the OSCE and areas they would 'like to see improved'.

The survey was reviewed by four nursing academics for face and content validity, and their feedback was incorporated into the final version.

Table 1
Response to questions on the five point Likert-type scale.

| Question | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|--|----------------|-------------|------------|-----------|-------------------|
| Q1 I was satisfied with the design of the OSCE | 141 (42.5%) | 168 (50.6%) | 15 (4.5%) | 2 (0.6%) | 6 (1.8%) |
| Q2 I was satisfied doing the OSCE with another student | 200 (60.4%) | 106 (32.0%) | 15 (4.5%) | 4 (1.2%) | 6 (1.8%) |
| Q3 I think the OSCE enabled me to master clinical skills effectively | 157 (47.4%) | 139 (42.0%) | 27 (8.2%) | 4 (1.2%) | 4 (1.2%) |
| Q4 I did more practical skills because I was with a partner | 143 (43.3%) | 106 (32.1%) | 46 (13.9%) | 28 (8.5%) | 7 (2.1%) |
| Q5 Doing the OSCE encouraged me to work with others | 177 (53.5%) | 123 (37.2%) | 22 (6.6%) | 6 (1.8%) | 3 (0.9%) |
| Q6 During the OSCE I felt comfortable to give feedback to my partner | 190 (57.2%) | 122 (36.7%) | 13 (3.9%) | 3 (0.9%) | 4 (1.2%) |

4.2. Ethics and recruitment

Ethics approval was received from the Tasmanian Social Sciences Human Research Ethics Committee (H0014469). The study abided by the National Health and Medical Research Council's *National Statement on Ethical Conduct in Human Research* (2015). All survey responses were anonymous and voluntary.

In the weeks prior to the OSCE, all students enrolled in the subject (n = 503) were invited by email to participate in the study. The survey was provided to all students who attended the OSCE on the four campuses immediately after completing the OSCE. As the OSCE is a compulsory assessment in the subject, this constituted all students engaged in the subject. A drop box was provided in a room separate to the examination for students to submit completed surveys. The survey did not distinguish whether students were allocated to the 'lead' or 'support' role.

Anonymity of participants and confidentiality of data was maintained through the absence of any identifying information within the survey. These strategies were implemented to address the naturally occurring unequal power distribution which exist between educators and their students, and the subsequent risk of perceived or actual coercion resulting in students feeling pressured to complete the survey (Bradbury-Jones and Alcock, 2010; Ferguson et al., 2004).

4.3. Data analysis

Microsoft Excel 2016 (Microsoft Corporation) was used to generate descriptive statistics on the Likert-type data.

Responses to the open-ended questions were entered into an Excel spreadsheet. Thematic analysis was used to identify, analyse and describe the themes occurring in the qualitative data in order to examine the perspectives of the different participants, and highlight similarities and differences in their responses to questions (Braun and Clarke, 2006). The analysis was undertaken independently by three authors (AS, RS and DV) to ensure rigour and trustworthiness (Nowell et al., 2017). Six key themes were consensually developed: Collaborative testing; OSCE learning tools; Clinical relevance; Opportunity to practice; One skill assessed; Skill allocation.

5. Results

The overall survey response rate was 66% (n = 332). Response rates varied across campuses ranging from 41% (n = 27) to 80% (n = 160). The majority of students responded positively (either 'Agree' or 'Strongly Agree') with all statements on the Likert-type scale (Table 1). A very small proportion of students responded negatively (either 'Disagree' or 'Strongly Disagree').

Responses to the open-ended questions about strengths of the OSCE design were received from 211 (63.5%) participants.

Table 2 provides examples of themes and sub-themes, with illustrative quotes. The majority of students responded positively to the collaborative testing design, reporting that working and being tested in pairs improved their clinical skills, communication and teamwork. This improvement was frequently attributed to the feedback given by peers:

Table 2
Themes derived from open-ended questions: OSCE Strengths.

| Theme | Sub-Themes | Illustrative Quotes |
|-----------------------|--|---|
| Collaborative Testing | Motivation | <i>It helped to motivate us to study more, being with a partner it also ... encouraged us to do better</i> |
| | Reduced Anxiety | <i>It was much less nerve racking which enabled us to focus more</i> |
| | Responsibility for mark of peer | <i>Doing it with a partner reduced my stress and allowed me to fully engage in the experience</i> |
| | Feedback | <i>Having to study hard to ensure I didn't let the other student down</i> <i>Working together with another student that corrects me and reminds me of what I am missing</i> <i>It is great to have the experience of teamwork & positive feedback</i> |
| | Development of teamwork skills | <i>The combination of team member skills and strengths. Teamwork which we need is best point of OSCE</i> |
| Improved performance | | <i>Practicing the skills in pairs ... great to get feedback as you were practicing you were able to get it right from the word go rather than learning the wrong thing</i> |
| | Enhanced communication skills | <i>Working with another person helps with communication skills and ... another person's input and perspective is useful to identify any learning gaps</i> |
| OSCE Learning Tools | Videos | <i>Having demonstrative videos and clear steps given in the OSCE assessment sheets.</i> |
| Clinical Relevance | Teamwork | <i>Working as a team which replicates nursing environment. It replicates an actual clinical setting by working with another student = teamwork!!</i> |
| | Competence in relevant practice skills | <i>Has made me really learn all the four techniques and am now comfortable to perform them on practice [clinical placement]</i> |

'Learning the skills with my OSCE partner was easier to understand and grasp the technique than it would have been to do it alone'

Students also reported that working in pairs reduced their anxiety and increased their sense of responsibility and motivation, noting that it 'strengthened my self confidence' and 'encourages you to excel so you don't let your partner down.'

The students highlighted the relevance of the four skills to 'real life' clinical settings, and the link between the assessable skills and the performance expectations in their first clinical placement, enabling them to '... really learn all the four techniques' and become 'comfortable to perform them on practice' [clinical placement]. The students also recognised that the ability to work in a team was a key expectation of clinical practice, and that the OSCEs provided good preparation for this, 'being able to rely on each other like we would in a real health care setting.'

Students felt supported in their preparation for the OSCE, for which a 'no tricks, no surprises' approach was used and highlighted the value of the demonstration videos and checklists in supporting their learning.

'The assessment tool sheets were very effective. Knowing the checklist/steps'

Responses to the open-ended questions about suggested areas of improvement for the OSCE design were received from 126 (37.9%) participants. No feature of the OSCE design was overwhelmingly identified as a weakness. Themes identified included the need for 'more time to practice with our partners', both during class and outside of tutorial times, a preference to 'test more than one skill', and an opportunity for individual rather than paired assessment. By only assessing one skill, participants felt they missed the opportunity to demonstrate their ability. This was particularly the case if the student was allocated a 'support' rather than a lead role. Table 3 provides examples of themes and sub-themes, with illustrative quotes.

Table 3
Themes derived from open-ended questions: OSCE Areas to Improve.

| Theme | Key Categories | Examples |
|-------------------------|--|--|
| Opportunity to Practice | More practice time in tutorials | <i>More preparation in class. Perhaps a tutorial focused on OSCE.</i> |
| | More Practice time with partner – in open labs | <i>More practice time and time to master skills.</i> <i>More days available in the lab for practice.</i> |
| One OSCE skill assessed | Prefer more than one skill assessed | <i>Maybe we should be assessed on all 4 skills.</i> |
| | | <i>Let us choose what skill</i> |
| | Student preference | <i>Letting us choose who does what</i> |
| | | <i>Know skill before OSCE</i> |
| Skill allocation | Prefer individual assessment/grade | <i>May be individual rather than group so we can show our own skills.</i> <i>I don't think it's necessary to be in pairs. It was helpful for prompting but individual assessment is good.</i> |
| | Two skills with alternate student lead | <i>Both partners perform skills to earn adequate marks, show strengths and improve ability.</i> |
| | More of a shared role | <i>If the OSCE is partner activity then both students should EQUALLY participate!!</i> |

6. Discussion

To our knowledge, this is the first study that has reported on the implementation of a collaborative testing design for the delivery of an OSCE. The key findings from this study indicate that students were overwhelmingly satisfied with the collaborative testing design. Students appreciated the support provided by the checklists and videos. The majority of students viewed the random allocation of skill and roles as a strength of the OSCE design, although a minority identified this as a negative feature. The students predominantly agreed that the OSCE design encouraged peer learning and attainment of key learning outcomes, and reduced the anxiety traditionally associated with OSCEs. Collaborative testing and random allocation of skills reduced resource requirements.

6.1. Collaborative testing

A strong theme that emerged from the data was the reduction in assessment related anxiety experienced, as a result of students undertaking the OSCE collaboratively. OSCEs are typically associated with high levels of anxiety compared to other forms of assessment (Brand and Schoonheim-Klein, 2009; Selim et al., 2012). Although some anxiety can be conducive to learning, many studies have demonstrated the negative impact of anxiety on student performance (Brosnan et al., 2006; Cassidy and Johnson, 2002; Chapell et al., 2005; Culler and Holahan, 1980). Additionally, stress and anxiety make it more difficult for students to link performance to clinical practice (Cazzell and Rodriguez, 2011). Previous authors have called on the importance of 'reducing student stress/nerves and novel ways of ensuring that the OSCE is clinically meaningful' for nursing students (Muldoon et al., 2014, p. 473). Removing this anxiety from OSCEs is challenging, even with extra practice and feedback sessions (Nulty et al., 2011).

Therefore, the reduction of OSCE related anxiety identified by students in this study is a key achievement of the collaborative testing approach we used.

Students noted the relaxed atmosphere and reduced stress during the OSCE. This is commensurate with findings from [Zimbardo et al. \(2003\)](#) who demonstrated a reduction in student anxiety through the use of collaborative testing in a paper-based exam. Reduced anxiety has been identified as essential for optimal performance ([Zimbardo et al., 2003](#)). OSCEs are used as learning and assessment tools in preparation for clinical practice and therefore, the reduction in stress and anxiety identified by students in our study may have implications for clinical performance.

Collaborative testing motivates students to engage in peer learning as they prepare for the OSCE together. Just as isolation is associated with disengagement ([Kim, 2009](#)), the interaction experienced through peer learning increases engagement and motivation ([Boyle and Nicol, 2003](#)). Students in this study found peer work encouraging and in particular, were motivated by the responsibility to perform well for their partner. This motivation to perform well resulted in increased preparation with their partner, and is arguably where the real power of collaborative testing lies. [Haberyan and Barnett \(2010\)](#) showed no significant increase in academic performance when using collaborative testing in written exams, if students chose not to study with their peers. In comparison, a similar study noted significant improvement in academic performance when students prepared for collaboratively tested exams with their partner ([Zimbardo et al., 2003](#)). While not formally measured in this study, students were observed spending time preparing with their partner and this was reflected in the attendance at open laboratory sessions.

The OSCE described in this paper was a high-stakes (40%) summative assessment. However, in the sense that students prepared collaboratively to close a performance gap through ongoing peer evaluation and provision of feedback, this OSCE design promoted principles of formative assessment ([Solheim et al., 2017](#); [Wiliam and Black, 1996](#)). Theorists on formative assessment emphasise the power and importance of peer assessment as a strategy towards effective self-evaluation and self-regulation ([Black and Wiliam, 1998](#); [Nicol and Macfarlane-Dick, 2006](#); [Sadler, 1989](#)).

While the majority of students identified working in pairs as advantageous, a very small number of students described it as a negative aspect of the exam design, primarily owing to poor performance or work ethic of their partner. A limitation of the design of this OSCE was the potential for ‘social loafing’ (where one student relies on the other for a ‘free ride’), which has been identified as a pitfall of collaborative testing ([Haberyan and Barnett, 2010](#); [Zimbardo et al., 2003](#)). Social loafing is also a concern from an educator’s perspective. Students could perform very well in the OSCE with minimal preparation if their partner performed well. This has practice implications when using OSCEs for fundamental skills and needs to be considered when implementing this design, particularly at the end of a course. However, [Zimbardo et al. \(2003\)](#) suggest that there is little empirical evidence of social loafing occurring when collaborative testing is used. Our results go some way to supporting this observation in that only a very small percentage of respondents raised concern with regards to their partner’s work ethic.

Unlike a number of other studies looking at collaborative testing for exams, forming partnerships was compulsory for this exam and this may have contributed to a small number of negative responses to the design. Collaborative testing may not suit all personality types, with extraverted students more likely to prefer this design ([Haberyan and Barnett, 2010](#)). However, in a profession embedded in principles of teamwork and collaboration, conceding educational approaches to learning preferences should be done with caution.

Universities have a responsibility to provide graduate nurses who are effective communicators, in particular giving and receiving constructive feedback around performance in practice in order to promote safety and quality in health care ([Chant et al., 2002](#)). The students

identified the link between the soft skills (for example teamwork and communication) developed in preparation for the OSCE, and their practice in clinical environments. Respondents to the survey felt comfortable giving feedback to their partner, describing enhanced communication skills and understanding of teamwork. Similarly, [Zimbardo et al. \(2003\)](#) noted that collaborative testing for a multiple choice exam improved students’ negotiation skills and promoted sharing of knowledge. The results of this study indicate that a collaboratively tested OSCE introduced early in the BN may be effective in enhancing a culture of peer learning and constructive feedback.

6.2. Skills allocation

In addition to pedagogical considerations, the high resource implications of using an OSCE with a large number of students across four campuses was a key factor behind this OSCE design. Two design features were instrumental in reducing the resourcing requirements. Firstly, students were assessed in pairs. Secondly, students were required to prepare for four skills, but only assessed on one randomly allocated skill. These features significantly reduced costs by decreasing time and staff requirements, as well as room and consumable use. This allocation method was used in the *Bart’s Nursing OSCE* ([Nicol and Freeth, 1998](#)). While the economic benefits are clear, the response of students to this approach in an OSCE setting have not previously been reported.

Participants responded positively to learning and practicing the four skills, which they reported increased their confidence in the clinical environment. The perceived relevance of clinical skills, and how they reflect the real world are highly valued by OSCE examinees ([Mitchell et al., 2015](#)). However, a theme that emerged from the data was dissatisfaction with being assessed on only one skill. Students expressed a desire to demonstrate their mastery of skills for which they had invested considerable time, particularly students who were allocated a ‘support’ role. Nevertheless, a number of participants identified the benefits of practicing all four skills and the resulting allocation process as a strength, reflected in the high satisfaction with the overall OSCE design.

6.3. Preparatory resources

A strength of the OSCE design underpinning this project was the scaffolding and support given to students, ensuring consistency with teaching across campuses. The students responded positively to the use of the videos demonstrating the perfect performance of each OSCE skill, echoing findings from previous studies ([Barratt, 2010](#); [Jang and Kim, 2014](#); [Massey et al., 2017](#)). The interaction between pairs may have also contributed to the positive response. [Jang and Kim \(2014\)](#) emphasised the importance of facilitating interaction with others in conjunction with OSCE video use.

Step-by-step checklists were used to promote explicit alignment with the videos. Using Bloom’s taxonomy as a reference point ([Anderson et al., 2001](#)), *remembering* and *applying* are appropriate first steps of engaging with unfamiliar skills, as was the case for our novice nursing students. Higher cognitive clinical reasoning may be developed once the steps of a skill are learnt. Students frequently commented on the checklist tool as a strength of the overall OSCE design, particularly the alignment with videos. Explicit alignment is supported by deliberate practice theory. Deliberate practice is characterised by well-defined tasks, trial and error through the opportunity of repetition and feedback ([Anders Ericsson, 2008](#)). Its effective utilisation in clinical skill development has been well-demonstrated ([McGaghie et al., 2011](#)) and would appear ideal for novices to achieve outcomes through a step-by-step process.

Step-by-step checklists enable focussed skill acquisition through deliberate practice, reducing the cognitive load during practice and allowing direct application to the assessment task ([Torcasio and Sweller, 2010](#)). Reducing cognitive load has been shown to be an

important strategy for the effective delivery of nursing simulation (Josephsen, 2015). We hypothesise that the 'no-tricks', 'no-surprises' approach reassured students that time invested in practicing skills would contribute to higher grades, improving their engagement with the task. Despite the high attendance at non-compulsory weekly open laboratory sessions, and dedicated practice time in mandatory laboratory sessions, the prominent feedback in response to how the OSCE design could be improved related to more time for practice.

6.4. Limitations

In order to maintain participant anonymity, no identifiers apart from campus were collected. Given the large participant response, demographic measures (age, gender, cultural background) and OSCE performance would have allowed for subgroup analyses and determination of predictors.

This study explored student reaction to the OSCE design and clinical relevance of the skills. Future research that measures the impact of a collaboratively tested OSCE on behavioural outcomes, and the translation of knowledge and skills to practice, is recommended. A model such as Kirkpatrick's training evaluation framework (Kirkpatrick, 1975) would be well suited to measuring such outcomes.

The issue of social loafing was reported by a very small number of students. An amendment implemented post evaluation of this OSCE was the introduction of a theory test related to the skill just completed. Students would independently complete the test related to the skill just completed. If they failed the test, they were required to immediately undertake the same OSCE skill by themselves. The effectiveness of this intervention has not yet been evaluated.

7. Conclusion

This study aimed to measure student satisfaction with a collaboratively tested OSCE and report students' perceptions of strengths and weaknesses of the OSCE design. Responses from the students indicated the collaboratively tested OSCE encouraged student engagement and learning. Students reported reduced anxiety, improved confidence in undertaking key clinical skills, and promotion of authentic practice activities such as communication and teamwork.

The use of a collaboratively tested OSCE model has teaching and administrative benefits. Traditionally, OSCEs are expensive and resource intensive, particularly in the context of high student numbers and cross-campus teaching. The decision to assess only one skill was driven by these constraints. However, the quality of the assessment task was maintained by ensuring that students had to master four fundamental clinical skills. This encouraged students to practice key learning content with their peers to achieve mastery without the usual requirement of intensive resources, particularly in terms of number of assessors, venues and time. Students appreciated the preparation support and the benefits of learning four skills, but also expressed the need for more practice time and a desire to demonstrate their mastery of more than one skill. This feedback from students highlights the tension between the need to enhance students' professional learning within organisational constraints, particularly resourcing. While only reported by a small number of students, the potential for social loafing should be considered when administering a collaboratively tested OSCE and is an area which can be explored further. Further research is also recommended to explore whether the learning benefits afforded by a collaboratively tested OSCE translate to improved performance in the clinical environment.

Conflicts of interest

There are no conflicts of interest.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Acknowledgements

We would like to sincerely thank the students for taking the time to complete the survey.

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