Original Article

Evaluating the Impact of a Video-Based Chest Examination Assignment on Self-Directed Learning and Clinical Skills Development in Second-Year Medical Students at the Nelson Mandela School of Medicine

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ABSTRACT

Background

In undergraduate medical education, fostering self-directed learning (SDL) behaviours and clinical competence is essential yet challenging, particularly in traditional physical examination training, which often lacks opportunities for repeated practice, reflection, and feedback. This study evaluated the impact of a structured, team-based, video-recorded chest examination assignment on second-year medical students' SDL, clinical confidence, and skill development, framed using the Kirkpatrick Model of Learning Evaluation.

Methods

A mixed-methods pre-post intervention study was conducted at the Nelson Mandela School of Medicine in March 2025 with 250 second-year medical students. Students worked in small groups to complete a chest examination video, incorporating peer assessment and final submission. Pre- and post-intervention surveys (n = 99 and n = 150, respectively) measured SDL behaviours and clinical confidence using matched Likert-scale items. OSCE scores were compared between the 2024 (control) and 2025 (intervention) cohorts. Open-ended responses underwent thematic analysis to explore student experiences.

Results

Significant improvements were observed in SDL behaviours ($t(4) = 5.49$, $p = 0.0015$) and clinical confidence ($t(5) = 7.40$, $p = 0.0007$), particularly in goal setting, feedback seeking, procedural accuracy, and communication. Perceived clinical competence and teamwork also improved, though not significantly. OSCE scores remained stable across cohorts (mean = 76%, $p = 1.00$), suggesting enhanced learning behaviours without loss of performance. Thematic analysis revealed four themes - evolving perceptions, learning outcomes, practical challenges, and curricular reflections mapped to Kirkpatrick's four levels: Reaction, Learning, Behaviour, and Results. **Conclusion:** The video-based assignment enhanced SDL behaviours, confidence, and reflective capacity, even without measurable OSCE score changes. Students valued the peer-driven, engaging, and supportive approach for bridging knowledge and clinical application. Video-based peer learning is a scalable strategy to promote reflective, self-directed learning and procedural mastery in early clinical education, aligning with competency-based education and preparing students for lifelong clinical growth.

Keywords

Medical education, video-based learning, self-directed learning, clinical confidence, competency-based education

INTRODUCTION

Clinical skills training is a cornerstone of medical education, equipping students with the essential abilities needed for patient evaluation and management. Conventional teaching methods for physical examination such as live demonstrations, supervised practice, and bedside teaching often restrict opportunities for repeated rehearsal, personalized feedback, and self-reflection, all of which are key to mastering these skills[1,2]. As a result, students frequently face difficulties in achieving competence in physical examination, limited by factors such as restricted practice time, uneven peer support, and anxiety during performance[3].

Self-directed learning (SDL) is increasingly recognized as central to medical training, as it encourages learners to take responsibility for their progress, set goals, identify resources, and engage in ongoing improvement[4]. Building on Knowles' theory of adult learning, SDL promotes deeper understanding by requiring learners to reflect and integrate feedback into their practice[5,6]. Video-based assignments align closely with SDL principles, as they enable autonomy, critical review, and iterative practice

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while encouraging students to refine clinical procedures through experience and reflection.

Chest examination is one of the fundamental skills in early clinical training, requiring systematic use of inspection, palpation, percussion, and auscultation to assess pulmonary function. Research suggests that novice medical students often struggle to perform such examinations with accuracy and structure[7]. Transitioning from passive observation to active practice is therefore critical, and repeated, structured feedback is vital[1]. Video-based tasks help bridge this gap by enabling learners to record and critique their performance, while peer assessment fosters collaboration and strengthens evaluative judgment[8].

Miller's Pyramid of Clinical Competence outlines skill development across four levels: "Knows (knowledge acquisition)," "Knows How (competence in applying knowledge)," "Shows How (demonstration of skills)," and "Does" (performance in clinical practice)[9]. While conventional teaching mostly addresses the earlier levels, video-based assignments encourage demonstration at the "Shows How" level, integrating knowledge, psychomotor skills, and professional behaviours[10]. Similarly, the Kirkpatrick Model of Learning Evaluation provides a lens to examine educational outcomes at multiple levels: student reaction (student engagement and satisfaction), learning gains (knowledge and skill acquisition), behavioural application (application of skills in practice), and broader results (performance outcomes)[11]. Applying these frameworks allows for a holistic evaluation of video-based learning interventions.

Growing evidence supports video-based methods as effective in enhancing procedural skill acquisition, retention, and reflection which are key components of SDL and clinical competency[12,13]. Repeated review of recordings enables learners to identify strengths and areas for improvement, while collaborative peer review aligns with experiential learning principles that emphasize active participation and reflective practice[14,15,16,17,18]. However, despite evidence of effectiveness, little has been published on the use of video-based strategies for physical examination training in undergraduate settings, particularly in resource-constrained environments.

This study addresses that gap by assessing the effect of a structured, team-based chest examination video assignment on SDL behaviours and clinical competence among second-year medical students at the Nelson Mandela School of Medicine. The intervention was introduced in 2025, whereas the 2024 cohort followed the same respiratory system curriculum without a video component. By comparing survey data on SDL behaviours and objective structured clinical examination (OSCE) performance across these cohorts, the study explores whether embedding video-based assignments strengthens procedural competence, student confidence, and engagement in self-directed learning.

METHODS

Context and Setting: This study was conducted in March 2025 at the Clinical Skills Laboratory of the Nelson R Mandela School of Medicine, University of KwaZulu-Natal, as part of the second-year MBChB clinical skills training module. The MBChB pre-clinical program is structured around a body-system-based curriculum that integrates theoretical knowledge with hands-on clinical skills. The study was embedded within the six-week structured Respiratory System theme, a core component of the second-year clinical skills curriculum.

Teaching sessions for clinical skills are facilitated by trained clinical tutors and delivered through a combination of large-group lectures and small-group, hands-on sessions in the clinical skills lab. Physical examination skills, including the chest examination, are taught in small groups of sixteen students. Our instructional approach represents an adapted and contextually modified integration of established models, including the five teaching stages by George and Doto, Peyton's four-step skills acquisition method, and Frank et al.'s competency-based clinical education framework[19,20,21]. Delivered through a blended and flipped classroom strategy, this approach is further enriched by deliberate practice principles to ensure repeated application, feedback, and skill mastery in the clinical setting[22].

In practice, the teaching process follows these structured stages:

1. **Pre-Learning and Relevance Establishment:** Tutors initiate each session by reviewing key concepts covered in online lectures and recommended resources. They create a relevant clinical scenario to illustrate the importance of the physical examination skill (e.g., chest examination) and assess students' prior understanding through quizzes.

2. **Student-Led Demonstration and Initial Practice:** Students are invited to demonstrate the examination skill either individually or in pairs, based on their preparation through self-directed learning. This encourages active participation and responsibility for learning.
3. **Tutor Observation, Feedback, and Remediation:** Tutors observe students' performance, provide immediate and actionable feedback, identify areas for correction, and guide remediation. This step emphasizes psychomotor skill refinement and supports learning through correction and encouragement[23].
4. **Tutor Demonstration with Explanation (Modified Peyton Step):** The tutor demonstrates the correct technique in full, then repeats the skill with step-by-step explanation. This aligns with Peyton's "Demonstrate-Deconstruct-Comprehend-Perform" sequence and reinforces correct execution after initial practice attempts[20].
5. **Deliberate Practice in Small Groups:** Students are divided into groups of 2-3 to engage in repeated practice of the examination skill under tutor and peer supervision. This step encourages deliberate practice, peer learning, and the development of evaluative judgment skills.
6. **Independent Group Practice and Video Assignment:** Following the structured sessions, and for the first time in 2025, students worked in larger subgroups (approximately eight per group) to complete a team-based chest examination video assignment. They were given unrestricted access to the clinical skills lab and required to book sessions for independent practice, peer assessment and video recording. Structured protocols and rubrics were provided to guide both peer assessments and final video submissions (Appendix 1).

This progressive instructional approach ensures that students move from initial exposure and self-assessment to tutor-guided correction, followed by deliberate practice and independent performance. By integrating principles of self-directed learning, formative feedback, and spaced repetition, this model supports the development of procedural competence and clinical reasoning aligned with competency-based education frameworks.

Study Design: This was a mixed-methods study combining quantitative and qualitative approaches to evaluate the impact of a team-based, video-recorded chest examination assignment on self-directed learning (SDL) and clinical skills development in second-year medical students. The study used a pre-post intervention design within the 2025 cohort and a historical comparison with the 2024 cohort. In 2024, the chest examination curriculum did not include the video-based assignment, whereas in 2025, the video-based task was integrated for the first time as part of the Respiratory System theme in the clinical skills module.

The **quantitative component** involved:

- Pre- and post-intervention responses to closed-ended survey items from the 2025 cohort to compare student's self-reported SDL behaviour
- Analysis of end-of-semester OSCE performance in the chest examination station for the 2025 cohort
- Comparison of OSCE chest examination performance between the 2024 (no video assignment) and 2025 (video assignment) cohorts.

The **qualitative component** included:

- Open-ended survey responses collected pre- and post-intervention from the 2025 cohort, exploring students' learning experiences, reflections, and perceptions of the video assignment.

Participants/Sample Size: The sample size in this research was selected based on the number of subjects needed for the findings to be confidently generalizable to the larger population from which it was drawn[24]. For this reason, the research in this study involved the entire cohort of second-year MBChB students enrolled in the clinical skills module at the Nelson R Mandela School of Medicine. All students were invited to participate.

Inclusion Criteria

1. Enrolled as a second-year medical student at UKZN.
2. Willing to participate in the study and provide informed consent.
3. Completed the chest examination practical session prior to participating in the video assignment.

Exclusion Criteria

1. Students who did not provide consent.
2. Students with prior experience in advanced clinical examination training outside the prescribed undergraduate curriculum.

Procedure

1. Pre-Intervention Survey:

Students completed a validated and adapted SDL questionnaire before the intervention to assess their baseline self-directed learning behaviours and confidence in chest examination skills[25]. The online google survey/questionnaire was disseminated via the institutional learning management system (LEARN) and included both open- and closed-ended questions to collect quantitative and qualitative data on students' baseline experiences with chest examination training. The closed-ended questions used Likert scales to assess students' confidence in performing a chest examination, their perceived preparedness for OSCE assessments, and their engagement in self-directed learning. The open-ended questions explored students' prior learning approaches, challenges faced in mastering chest examination skills, and expectations for the video-recorded assignment.

2. Intervention

Within their assigned groups of approximately eight students, participants were expected to complete two major components:

1. Peer assessment of chest examination skills.
2. Submission of a team-based chest examination video.

a. Peer Assessment of Chest Examination Skills

Students worked in small groups of 8 members to practice the chest examination several times. Each student group then engaged in peer assessments of chest examination skills. To facilitate structured peer evaluation, tutors provided chest examination protocol and standardized rubric outlining key performance criteria, including technique, accuracy, patient communication, and professionalism (Appendix 1). Students provided constructive feedback to each other on technique, communication, and clinical accuracy, and was recorded in a logbook based on three key points:

§ What was done well?

§ What needs improvement?

§ How can it be improved?

This helped to refine their technique before recording the video assignment. Peer assessment sessions were conducted in the clinical skills lab, where students could schedule practice sessions as needed.

b. Video-Based Chest Examination Assignment

Following peer assessment, each group produced an 8–10-minute video demonstrating a complete, structured chest examination. The class was provided the following instructions ahead of the video assignment (appendix 2): Use Macleod's Chest Examination video, the institution's recommended teaching and learning resource, as a reference for clinical accuracy and structured demonstration[26]. The video must be well-organized, follow the correct examination sequence, and demonstrate good technique.

The video should include and demonstrate:

- Professional communication and patient interaction
- Proper setting, preparation, and use of equipment
- Focused general examination
- Systematic chest examination covering: Inspection, palpation, percussion, and auscultation (both anterior and posterior chest)
- Thanking the patient and summarizing the findings.
- To ensure good team approach the following instructions also provided: All students must actively participate, and their roles should be listed when submitting the video.
- Suggested roles include:
- **Videographer:** Records the video using a cell phone, ensuring close-up shots of techniques for clarity.
- **Model (Simulated Patient):** Acts as the patient for the demonstration.
- **Director:** Manages the recording process, ensuring smooth coordination, proper timing and adherence to the script.
- **Narrator (optional):** Provides a clear **background voiceover** (similar to Macleod's videos) to explain each step in the examination to enhance clarity.
- **Remaining team members:** Take turns performing different parts of the chest examination seamlessly in a structured method from start to finish. If a separate narrator is not used, they should also verbalize key steps during the examination.

Students were responsible for organizing their recordings, roles, ensuring appropriate patient positioning, lighting, and adherence to clinical examination protocols. Students had access to unlimited

practice sessions in the clinical skills laboratory and were required to book times for recording their final video submissions. The assignment was aimed to promote peer learning, self-directed learning (SDL), and skill reinforcement through self-assessment and peer review. Students were encouraged to critically analyse their recordings, identify areas for improvement, and reflect on their performance. Each group submitted a video demonstrating a comprehensive chest examination. Videos were uploaded to Learn25, the university's online learning platform, for easy assessment and provision of constructive feedback by the tutors. The final video submission was evaluated using the same structured evaluation rubric (Appendix 1), which included components such as examination technique, clinical reasoning, communication, and overall professionalism. The structured rubrics to guide both peer assessments and final video evaluations, ensured consistency and objectivity in grading. Tutors provided detailed feedback on each submission.

3. Post-Intervention Survey

After completing the video assignment, students completed the same SDL questionnaire and provided feedback on their experience. The survey questionnaire with additional questions to assess experiences of the intervention was designed to include both open- and closed-ended questions to gather quantitative and qualitative data. The closed-ended questions included Likert scales to assess aspects such as the perceived effectiveness of the video-based assignment in improving chest examination skills, its impact on self-directed learning, and the usefulness of peer feedback. The open-ended questions were aimed to capture detailed reflections on students' learning, experiences with the assignment, challenges encountered, and suggestions for improving the assignment.

4. OSCE Performance Analysis:

Chest examination OSCE scores from the 2025 cohort were analysed and compared to scores from the 2024 cohort, in which no video-based assignment was implemented. This comparison allowed the study to assess the impact of the team-based video intervention on students' clinical performance.

Data Collection

The data collection strategy was guided by the research questions and the mixed-methods design of the study[24]. Both quantitative and qualitative data were collected to assess the impact of the team-based chest examination video assignment on self-directed learning (SDL) behaviours, clinical confidence, and performance.

1. Pre- and Post-Intervention Surveys (2025 cohort)

Students in the 2025 cohort completed online surveys before and after the intervention. The surveys included both closed- and open-ended items.

- **Closed-ended items** assessed SDL behaviours, confidence in chest examination skills, and perceived preparedness for OSCE's. SDL items were adapted from the Self-Directed Learning Readiness Scale (SDLRS) and the Self-Rating Scale of Self-Directed Learning (SRSSDL)[25]. The Clinical skills confidence items were based on validated tools commonly used in OSCE evaluation studies.
- **Open-ended items** captured students' expectations, reflections on teamwork, perceived learning benefits, challenges encountered, and suggestions for improving the video-based assignment.

2. OSCE Performance Analysis (2024 and 2025 cohorts):

Objective Structured Clinical Examination (OSCE) scores for the chest examination station were analysed to evaluate skill development. A historical comparison was conducted between the 2024 cohort (which did not receive the video-based assignment) and the 2025 cohort (which completed the intervention). In both cohorts, the chest examination OSCE station assessed students' ability to perform a focused, structured chest examination which was evaluated using standard validated OSCE marking rubrics.

Theoretical Framework

The data collection and analysis were guided by the Kirkpatrick Model of Learning Evaluation, a widely used framework for assessing educational interventions across four levels[11]:

1. **Reaction** - Students' perceptions of the team-based, video-recorded chest examination assignment.
2. **Learning** - Changes in self-directed learning (SDL) behaviours and clinical confidence before and after the intervention.

3. **Behaviour** - Changes in observed clinical performance, particularly chest examination technique, as reflected in OSCE scores.
4. **Results** - Broader educational implications for competency-based clinical education and skill retention.

This model provided a structured lens for evaluating the impact of the video-based assignment, aligning students' subjective feedback, learning gains, and objective performance with a multi-level interpretation of educational outcomes.

Data Analysis

1. Quantitative Analysis

Quantitative analysis was conducted on the 2025 cohort's Likert-scale responses from the pre- and post-intervention surveys. Only matched items i.e. survey questions present in both pre- and post-intervention questionnaires, were included in the paired comparison to assess changes in self-directed learning (SDL) behaviours and confidence in clinical skills. Descriptive statistics, including percentages and mean Likert scores, were calculated. Paired sample t-tests and Wilcoxon signed-rank tests were used to determine statistically significant differences between pre- and post-intervention responses. Additional unmatched items from the post-intervention survey were analysed separately to explore students perceived value of the video-based intervention.

1. OSCE Performance Comparison

For the OSCE performance comparison, end-of-semester chest examination OSCE scores from the 2024 cohort (who did not receive the video-based assignment) were compared with those from the 2025 cohort (who participated in the video-based intervention). An independent samples t-test was performed to assess statistically significant differences in clinical performance between the two groups.

2. Qualitative Analysis

Qualitative analysis was based on open-ended responses from the pre- and post-intervention surveys. Responses were analysed thematically using an inductive coding approach. Emerging themes were categorised under headings such as perceived value of the task, learning outcomes, challenges encountered, and suggestions for improvement. Representative student quotations were selected to illustrate each theme and to enrich interpretation of the quantitative results.

Ethics approval and consent to participate:

Ethical approval for this study was granted (HSS/2213/017D) by the University of KwaZulu-Natal's Ethics Committee.

RESULTS

1. Participant Response and Demographics

Out of a total of 250 second-year medical students, 99 students completed the pre-intervention survey, while 150 students completed the post-intervention survey. This represents a response rate of 40% for the pre-intervention phase and 60% for the post-intervention phase. Although not all responses were paired due to voluntary participation, matched survey items across both surveys were used for statistical comparisons. The respondents reflected a diverse mix of age, gender, language background, and academic entry pathway, consistent with previous demographic trends in similar studies at the institution.

2. Overview of Results Framework

The results are presented using the Kirkpatrick Model of Learning Evaluation, which offers a structured, four-level framework: Reaction, Learning, Behaviour, and Results, providing a multi-level lens for evaluating the impact of the team-based video-recorded chest examination assignment[11]. This structure allows for integration of both quantitative survey and OSCE data and qualitative insights from students' open-ended responses, enhancing the coherence of this mixed-methods study. The alignment facilitates a deeper understanding of the educational impact of the video-based chest examination assignment on students' perceptions, learning behaviours, clinical performance, and broader curricular implications.

2.1. Kirkpatrick Level 1: Reaction - Student Perceptions of the Video-Based Assignment

Quantitative Findings:

Unmatched post-intervention items revealed high levels of student satisfaction and perceived usefulness of the video assignment:

- 84.7% agreed that the creating the video reinforced their understanding of the chest examination sequence.
- 77.3% agreed it improved their confidence in performing clinical exams under assessment conditions.
- 70.4% expressed a greater likelihood of using SDL strategies in future clinical training.

Qualitative Integration - Theme 1: Evolving Perceptions and Perceived Value of the Task

Students' initial responses prior to the intervention revealed apprehension, anxiety, and uncertainty about performing under peer observation and video recording:

"I think it will help me practise but I'm worried I might do the steps wrong and get judged by my group."

"I get nervous being recorded, and I'm scared I'll mess up in front of others."

However, after the intervention, many students reflected positively on the process. They noted that the video assignment was a useful and practical tool that helped facilitate their self-awareness and improved their clinical confidence, identify and correct mistakes, and reinforce learning:

- *"Watching myself on video made me realise what I was doing wrong. I actually felt more confident after redoing it."*
- *"Recording ourselves helped me notice mistakes I wouldn't have seen otherwise."*
- *"It really helped me prepare for OSCEs - better than just reading notes or watching videos."*

These reflections confirm a positive emotional and cognitive reaction to the video-based learning strategy, demonstrating the task's relevance, authenticity, and acceptability.

2.2. Kirkpatrick Level 2: Learning - Changes in SDL Behaviours, Clinical Confidence, and Teamwork

2.2.1. Self-Directed Learning (SDL) Behaviours - Quantitative Findings

MATCHED ITEMS ANALYSIS

Five items related to SDL behaviours were matched between the pre- and post-intervention surveys. Using a 5-point Likert scale (5 = Strongly Agree (SA), 1 = Strongly Disagree), mean scores and percentage changes in agreement (Agree or Strongly Agree) were calculated as illustrated in Table 1.

Table 1: Changes in Self-Directed Learning (SDL) Behaviours Pre- and Post-Intervention (Kirkpatrick Level 2: Learning)

SDL Item	Pre-Mean	Post-Mean	Mean Diff	% Agree/SA Pre	% Agree/SA Post	% Change
I take initiative in identifying my own learning needs	3.96	4.08	+0.12	77.3%	87.9%	+10.6%
I actively seek learning beyond formal sessions	3.60	3.98	+0.38	59.1%	80.9%	+21.8%
I set specific learning goals	3.49	3.90	+0.41	48.5%	77.8%	+29.3%
I sought/applied feedback to improve my clinical exam skills	3.67	4.08	+0.41	59.1%	82.8%	+23.7%
I reflect on my learning experiences to improve future performance	3.74	4.01	+0.27	67.7%	82.9%	+15.2%

Statistical Analysis

- Paired t-test: $t(4) = 5.49$, $p = 0.0015$
- Wilcoxon signed-rank test: $W = 0$, $p = 0.0156$

Increases in mean scores and agreement percentages were observed across all items. These findings show a statistically significant improvement in SDL behaviours following the intervention. Notably, the largest gains were observed in students proactively setting learning goals, seeking feedback and learning beyond formal sessions.

Qualitative Integration - Theme 2: Learning Outcomes and Skill Development

Themes from student reflections mirrored these improvements. They described increased clarity and deeper understanding of clinical reasoning:

- *"The repetition of practicing before filming helped me internalize the sequence of the exam."*
- *"It helped me identify gaps in my understanding, especially around percussion."*

- *"I now understand how normal breath sounds sound like and how to explain what I'm doing."*

These statements reinforce the measurable gains in SDL behaviours and deeper metacognitive engagement and learning, suggesting that students moved from superficial memorisation to reflective and strategic learning behaviours.

2.2.2. Confidence in Clinical Skills - Quantitative Findings

Matched Items Analysis

Six matched items evaluated students' confidence in clinical/chest examination, using a 5-point Likert scale (5 = Very Confident (VC) to 1 = Not Confident At All) illustrated in Table 2.

Table 2: Changes in Confidence in Clinical Skills Pre- and Post-Intervention (Kirkpatrick Level 2: Learning)

Confidence Item	Pre-Mean	Post-Mean	Mean Diff	% Confident/VC Pre	% Confident/VC Post	% Change
Performing a focused general exam	2.83	3.58	+0.75	42.4%	62.6%	+20.2%
Systematically performing all chest exam steps	2.56	3.32	+0.76	25.8%	50.5%	+24.7%
Communicating findings effectively	2.49	4.03	+1.54	25.8%	79.8%	+54.0%
Palpate, percuss, auscultate accurately	2.64	3.76	+1.12	33.3%	70.7%	+37.4%
Correctly interpret physical findings	2.55	3.26	+0.71	31.8%	42.9%	+11.1%
Preparedness for OSCE/ assessment	2.22	3.13	+0.91	22.8%	36.7%	+13.9%

Statistical Analysis

- Paired t-test: $t(5) = 7.40$, $p = 0.0007$
- Wilcoxon signed-rank test: $p = 0.0313$

Confidence in clinical examination significantly improved after the video assignment. The most notable increase was seen in students' confidence in communicating findings, followed by procedural accuracy in all aspects of chest examination including palpation, percussion, and auscultation.

Qualitative Support

These quantitative findings were reflected in students' reflections:

- *"Practicing in front of peers and getting their feedback helped me polish my skills."*
- *"It made me take more responsibility for my learning."*

2.2.3. Perceived Clinical Competence and Teamwork - Quantitative Findings

Matched Items Analysis

Four matched items assessed clinical competence and collaborative learning illustrated in Table 3.

Statistical Analysis

- Paired t-test: $t(3) = 1.77$, $p = 0.176$
- Wilcoxon signed-rank test: $p = 0.25$

While improvements were observed in all areas, especially confidence in meeting clinical expectations, the changes were not statistically significant overall. This suggests that while students recognized value in teamwork and skill development, the perception of competence may take longer to consolidate. This may also suggest that students already perceived themselves as relatively competent pre-intervention or that the

Table 3: Changes in Perceived Clinical Competence and Teamwork Pre- and Post-Intervention (Kirkpatrick Level 2: Learning)

Competence/Teamwork Item	Pre-Mean	Post-Mean	Mean Diff	% Agree/SA Pre	% Agree/SA Post	% Change
Comfort working with peers to refine skills	4.09	4.08	–0.01	74.2%	83.9%	+9.7%
Preparedness to assess and give peer feedback	3.62	3.89	+0.27	59.1%	80.6%	+21.5%
Belief that video-based learning enhances skill analysis	3.85	4.17	+0.32	68.2%	84.7%	+16.5%
Confidence that current skill meets clinical expectations	2.82	3.89	+1.07	30.3%	77.3%	+47.0%

intervention had a greater impact on individual skills rather than group/team perceptions.

Qualitative Support – Theme 3: Challenges and Group Dynamics

While teamwork was generally viewed positively, some students highlighted logistical challenges:

"Finding a quiet place to film was the hardest part."
"It was tricky to coordinate with everyone's schedule."

Despite these, others acknowledged the collaborative value. Perceived gains in collaboration and peer learning paralleled the quantitative findings around teamwork and feedback as mentioned by students:

- *"Working in a group helped me improve, but I also realised where I needed to grow."*
- *"It was easier to give feedback once we all got used to being recorded and practising together."*

2.3. Kirkpatrick Level 3: Behaviour - Application of Skills in Practice

OSCE Performance Comparison - Quantitative Findings

To evaluate behavioural outcomes in real clinical assessments, we compared the average class OSCE scores for the chest examination station across two cohorts illustrated in Table 4:

Table 4: Kirkpatrick Level 3: Behaviour - Comparison of Mean Chest Examination OSCE Scores Between 2024 and 2025 Cohorts

Year	Mean Chest Exam OSCE Score
2024 (control/no video assignment)	76%
2025 (intervention/post video assignment)	76%

Statistical Analysis

- Independent samples t-test: $t\ (498) = 0.00$, $p = 1.00$

There was no statistically significant difference in OSCE scores between the 2024 and 2025 cohorts. Although the video-based intervention showed meaningful gains in self-directed learning behaviours and clinical confidence, these improvements did not translate into a measurable difference in average OSCE performance. This parity suggests that the intervention maintained clinical skill levels while enhancing learning behaviours and confidence. It also highlights that OSCE outcomes may be influenced by multiple complex factors beyond the scope of this specific intervention, including examiner variability, time pressure, and examination station logistics. It may also indicate a ceiling effect, where both cohorts performed at a similarly high level regardless of intervention due to baseline curricular strength. Importantly, the benefits of improved SDL and confidence may contribute to long-term skill retention and future clinical competence not captured by a single assessment point.

Qualitative Support

Students however acknowledged the practical nature of the assignment task in preparing for the OSCE and real-life performance:

- *"Doing the task repeatedly helped me feel less nervous during the actual OSCE."*
- *"I knew the order and what to do better than before, even if the OSCE was still stressful."*

2.4. Kirkpatrick Level 4: Results - Broader Educational Implications

Qualitative Support - Theme 4: Reflections and Future Integration

Students expressed strong support for integrating the video-based approach to other clinical areas and hence into the broader curriculum, noting its lasting impact:

- *"This should be done for all the big exams- it helped me more than a lecture."*
- *"We should do something similar for abdominal and neuro exams."*
- *"It made me take more responsibility for my learning."*
- *"Maybe we could get some faculty feedback on the videos next time."*

These reflections point to a positive shift in learning culture, supporting the long-term integration of active, reflective learning methods, peer feedback and procedural mastery in clinical education.

Summary of Results

This mixed-methods study demonstrated statistically significant improvements in students' self-directed learning behaviours and clinical confidence following a video-based chest examination assignment. While OSCE scores remained stable, qualitative feedback underscored increased preparedness, skill awareness, and motivation for future SDL. The Kirkpatrick framework enabled a comprehensive interpretation, confirming that the intervention fostered emotional engagement, cognitive growth, behavioural readiness, and sustained educational value.

DISCUSSION

This mixed-methods study investigated the educational value of a structured, team-based, video-recorded chest examination assignment for second-year medical students, with a focus on self-directed learning (SDL), clinical confidence, and observed clinical performance. Using the Kirkpatrick Model of Learning Evaluation[11] as a guiding lens, the results demonstrate that students became more engaged in their learning, assumed greater responsibility, and developed confidence, benefits that were evident even if not fully captured in OSCE scores.

At the **reaction level**, students reported positive experiences with the assignment. Although initially unfamiliar and somewhat anxiety-provoking, the task became a constructive learning opportunity. Many students described moving from reluctance to appreciation, noting the assignment's ability to reinforce skills and build confidence more effectively than traditional revision. These perceptions align with earlier reports on video-based learning, which emphasize its role in improving satisfaction and active participation[12,15,16].

At the **learning level**, significant improvements were seen in SDL behaviours, such as goal setting, feedback-seeking, and reflective practice. Confidence gains were also clear, particularly in communication, procedural steps, and OSCE readiness. These findings resonate with Knowles' adult learning principles, which highlight autonomy and reflection as essential for deeper learning, and with prior studies by Harden & Laidlaw and Kogan et al., showing that practice in a peer-supportive environment enhances clinical readiness and self-efficacy [1,6,14].

The task also encouraged **teamwork and collaboration**, even though changes in peer-assessment scores were modest. Student feedback suggested that logistical challenges such as time and space for filming were more prominent than content-related concerns, suggesting that the design was practical and achievable. This is consistent with literature showing that structured video-based learning creates a safe space for peer dialogue and reflective practice[13,27].

At the **behavioural level**, no significant differences were observed in OSCE scores between the 2024 and 2025 cohorts. While this might appear as a limitation, OSCEs provide only a short-term snapshot of performance and may not fully capture subtle behavioural or attitudinal gains, particularly in already competent students[1]. Examiner variability and assessment conditions may also contribute to stable scores. The key finding is that improvements in SDL and confidence occurred without compromising OSCE outcomes.

At the **results level**, students expressed interest in extending video-based assignments to other examinations, including abdominal and neurological skills. Their feedback suggests recognition of the broader curricular value and scalability of the approach, which aligns with competency-based medical education (CBME) priorities that emphasize reflection, feedback, and learner-driven progression[21]. The structure of the assignment promoted just that i.e. progressive autonomy, peer learning, and low-stakes opportunities

to refine skills, all key features of CBME aimed at preparing students for lifelong clinical performance[28].

Overall, the intervention supports the idea that video assignments complement Miller's Pyramid by bridging the gap between "knows how" and "shows how"[9]. Unlike OSCEs, which capture performance under pressure, video tasks allow for preparation, reflection, and iterative feedback, reinforcing long-term learning and practical application.

In conclusion, the video-based chest examination assignment offered more than rehearsal: it gave students ownership of their learning, opportunities for reflection, and a platform for peer support. In an evolving healthcare context, cultivating reflective, independent, and collaborative learners is as vital as preparing them for formal assessments.

Implications for Medical Education

This study highlights the pedagogical value of integrating structured, video-based assignments into clinical skills training, not just as a teaching tool, but as a way to empower students to take ownership of their learning. Many students shared how the process helped them build confidence, reflect on their performance, and learn from one another. Their strong endorsement of the assignment suggests that this approach resonates with learners and meets their needs in a practical, engaging way.

What is especially encouraging is that this model is both scalable and cost-effective, making it well-suited to a variety of educational settings, including those with limited resources or faculty availability. By promoting repeated practice, peer feedback, and self-assessment, it reflects core principles of competency-based medical education (CBME) and supports the development of both technical skills and reflective habits.

Expanding this kind of assignment into other clinical areas could help address persistent challenges in early clinical education, like building procedural fluency, improving OSCE preparedness, and fostering lifelong learning skills. As we continue to adapt to the evolving needs of medical students, approaches like this remind us that learning is most powerful when it is active, collaborative, and meaningful.

Limitations

As with all educational interventions, this study has several limitations that warrant careful consideration. Participation in the surveys was voluntary, which may have introduced a degree of self-selection bias. Students who felt more engaged or confident may have been more likely to respond. Additionally, the reliance on self-reported data for measuring self-directed learning behaviours and confidence introduces an element of subjectivity, which may not always reflect actual behavioural change.

While OSCE scores offered a standardised measure of clinical performance, they may not be sensitive enough to detect subtle improvements in reasoning, communication, or confidence, particularly when students already perform at a relatively high level. The cross-sectional comparison of OSCE outcomes also limits our ability to evaluate long-term skill retention or behavioural change over time.

Moreover, the study was conducted at a single institution and involved the introduction of a new intervention for the first time. As such, generalisability may be limited, and future implementations may uncover additional practical or instructional challenges that were not fully captured in this initial iteration.

Recommendations for Future Research

While this study offers encouraging insights, it also opens the door to important future questions. To truly understand the long-term value of video-based learning, future research should consider following students over time to see whether early gains in self-directed learning and confidence translate into sustained performance in the clinical years. Tracking progress with tools like video-based scoring rubrics, direct observation checklists, or entrustable professional activities (EPAs) could help paint a more complete picture of behavioural growth and readiness for real-world practice.

It would also be valuable to explore how faculty experience these kinds of interventions, in terms of what supports or hinders their implementation, how it affects their teaching, and what resources are needed to make it sustainable. Understanding these practical aspects is key to integrating video-based learning meaningfully and equitably across programs.

Lastly, expanding this model to other clinical areas like neurological or abdominal examinations can help us see whether its benefits extend beyond a single skill. There is also exciting potential in adapting the approach for interprofessional learning, where students from different healthcare disciplines work together on

video assignments. Such collaboration could not only enhance teamwork but also strengthen students' sense of professional identity and shared responsibility in patient care.

CONCLUSION

This study offers meaningful insight into how a simple, structured video-based chest examination assignment can make a real difference in students' learning journeys. While the OSCE scores between cohorts did not change, the students themselves changed, becoming more confident, more reflective, and more proactive in directing their own learning. These are the qualities we hope to nurture in every future doctor.

Using the Kirkpatrick Model to frame our findings helped us see that growth is not always captured in exam scores. Students valued the experience, developed critical skills, and began to take greater ownership of their learning, all key goals in competency-based medical education.

Video-based learning does not replace traditional teaching; rather, it enriches it. It offers students the chance to slow down, reflect, learn from one another, and improve in a supportive, low-stakes environment. As we continue shaping future clinicians, these types of experiences can help foster not just competence, but also confidence and curiosity, qualities that truly matter in the practice of medicine.

Compliance with Ethical Standards

Conflict of interest: The author (RA) declares no competing interests.

Ethical clearance: Ethical approval for this study was granted (HSS/2213/017D) by the University of KwaZulu-Natal's Ethics Committee.

Consent for publication: The participants in this study gave their written informed consent to take part in this study and for anonymised findings of this study to be published. The author (RA) has given consent for the manuscript to be published, should it be accepted by the journal.

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