

Mapping University Skills labs in Radiography: Students' Perspectives

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Keywords

Radiography, Skills Lab, Clinical placement, Equipment.

Abstract

Background: Establishing an effective theory and practice relationship is necessary for every radiography student. The effectiveness of a Skills Lab is paramount to ensure that student radiographers are prepared for Clinical Placement (CP). The aim of this study is to map the perspectives of radiography students regarding the university Skills Lab.

Methods: This study is mainly quantitative, with one qualitative element. A paper-based questionnaire was administered to 26 radiography students from seven different countries that were participating in the Optimax summer school. The questionnaire comprised 3 closed questions concerning demographics, 6 closed questions regarding the SL of their university, 3 of which were Likert Scale questions, and 1 open question about how SL could be enhanced, according to the students.

Results: Students indicated a competent lab tutor, smaller group size and simulated patient interaction to be important factors in the SL. In addition, environmental factors (light, temperature) were less important. Students mentioned that their equipment is of a lower standard than CP, but they also said that they feel well prepared for CP. Students found modern equipment not hugely important.

Conclusion: Students indicate that theoretical and practical skills labs prepare them well for CP. However, they suggest that a competent lab tutor and additional time are important factors in the SL.

Introduction

The role of the radiographer, from its genesis over 100 years ago, has changed constantly. The same can be said about radiographic education¹. While teaching practices vary between universities in different countries, they each possess the fundamental system of combining theoretical and practical components¹. Radiography universities across Europe operate on the assumption that a Skills Lab is an intermediate step in closing the gap between theory and practice². Establishing an effective theory and practice relationship is important for every radiography student¹. The effectiveness of practical sessions in an active learning environment is paramount to ensure student radiographers are prepared for clinical placement³.

In the literature, several criteria were identified as possible conditions to maximize learning in a Skills

Lab. A Skills Lab should be designed in a way that most accurately portrays a genuine hospital environment⁴. A study conducted by C. Haraldseid et al⁴ noted that nursing students seemed to be practicing with outdated equipment, which created a Skills Lab not on par with genuine working conditions in a hospital. With regards to radiographers specifically, insufficiencies in the quality or lack of updated equipment being used were noted in the practical learning rooms for students¹. These studies may suggest that modern, hospital relevant equipment would certainly benefit (radiography) students learning in a Skills Lab.

Group size certainly has an effect on the educational benefits of the Skills Lab¹. J. Monks et al⁵ claim that with larger student to teacher ratios, problems arise such as lack of clarity, less preparation, on top of less effective teaching methods and also less enthusiasm.

This study indicates that smaller group sizes may be more beneficial to student learning. This is further compounded by R. Pal⁶, as his study indicates that smaller group sizes are considered more effective, as the material is covered more comprehensively.

Conditions that affect a learning environment include temperature and brightness of the Skills Lab, time of practical session and size of the learning group⁷. Temperature (20 degrees Celsius approx.) has a positive impact on students' academic performance¹. C. Barkmann et al⁸ noted that cool lights also improved concentration levels in students¹⁵.

Problem Based Learning (PBL), which includes simulation-based learning experiences, is defined as a teaching method that is based on the idea of learning from cognitive and social interactions in a problem-centred environment and is effectively utilised by medical schools¹. Noted benefits include students feel this technique better prepares them for the clinical environment.⁴ A realistic learning environment inspires students to work harder, as they receive a real insight into the working world of their profession, something which this teaching technique can provide, as long as the simulated scenario is an accurate representation of a genuine clinical occurrence⁸.

According to A.Kong et al¹¹, tutors are a vital component of simulated learning activities, as

they may add to the fidelity of the scenario, as well as provide instant feedback. This adds to the aforementioned benefits of a realistic simulated environment. Furthermore, skills labs can provide a reflective component via recorded lab sessions allowing students to obtain instant feedback. This is something which students appreciate¹¹.

As described above, several factors have been described that could possibly enhance a Skills Lab for various disciplines such as medicine. However, whether these factors also account for the ideal Skills Lab for radiography students, remains unclear. The aim of this study is to identify what radiography students believe to be an effective Skills Lab.

Method

A study using a multi-item closed-response questionnaire with one open-response question (Appendix A) was used to ask radiography students attending an international summer school (Optimax) about their opinion of a Skills Lab. Students from a cohort of countries including Ireland, The Netherlands, Switzerland, Norway, South Africa, Canada and Brazil were involved.

The questionnaire design was based on themes found in a literature review.

- Part A of the questionnaire elucidated demographic data from the participants.

- Part B sought student opinion on various aspects of a Skills Lab detailing student experience, important teaching aspects and how well these prepared students for CP.
- Part C was an open-ended question where the students gave qualitative free text comments on how to improve the Skills Lab.

To optimize the quality of the questionnaire, a pilot study was conducted by surveying five randomly chosen Optimax students. Based on the pilot, no alterations were needed to adjust the questionnaire before the main study and thus, the results from the pilot were included in the main study. The questionnaire was distributed to the remaining Optimax students. At the beginning of the questionnaire, there was text explaining the aim of the study including a definition of a Skills Lab. The

term PLE (Practical Learning Environment) was used in the questionnaire; this term is interchangeable with Skills Lab. No identifiable information was obtained from the students. The data collected from the survey was compiled in an Excel spreadsheet. The students' suggestions gathered from the open-ended question were compared to find common themes. Excel, together with OneDrive, was chosen for its ease of cooperation.

Ethical exemption was granted for the study by the Undergraduate Research Ethical Committee (UREC) at UCD.

Results

Twenty-six students of 7 different nationalities were given the questionnaire, with a response rate of 100% (Table 1).

<i>Country of study</i>	Ireland	6 (23.1)
	Switzerland	5 (19.2)
	The Netherlands	5 (19.2)
	Norway	6 (23.1)
	Canada	1 (3.9)
	South Africa	2 (7.7)
	Brazil	1 (3.9)
<i>Year of study</i>	First year	3 (11.5)
	Second year	19 (38.5)
	Third year	11 (42.3)
	Fourth year	2 (7.7)
<i>Duration of study</i>	3 years	11 (42.3)
	4 years	15 (57.7)

Table 1 Demographics

The Skills Lab is part of all participating student's radiographic education. 16 students (61%) found that the theory covered before their Skills Lab sessions was appropriate.

38.5% of students believe the Skills Lab does not prepare them well for the use of RIS/PACS/Administration in clinical and only 3.9% of students believe the training they received in regards to RIS/PACS/Administration use prepared them very well (Figure 1). The data was further analysed and it was

discovered that students from particular countries had different opinions on positioning patients, occupational hazards, communication with patients and use of RIS/PACS. Students from Ireland and Switzerland regarded their work with positioning patients in the Skills Lab quite effective responding with "very well" and "well" respectively, while students from Norway considered their work only "adequate". Yet overall, students were of the opinion that positioning patients in the Skills Lab served them well for CP, with 65.4% responding with "well" and "very well" (Figure 2).

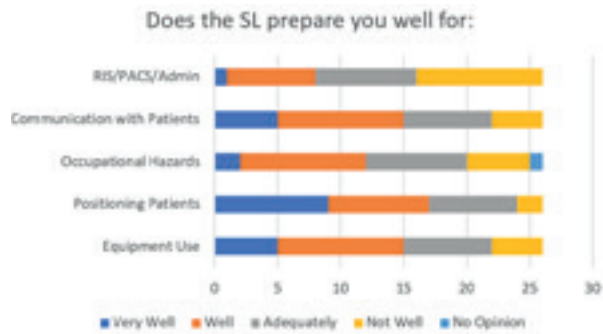


Fig. 1 student perception of preparation by Skills Lab (SL)

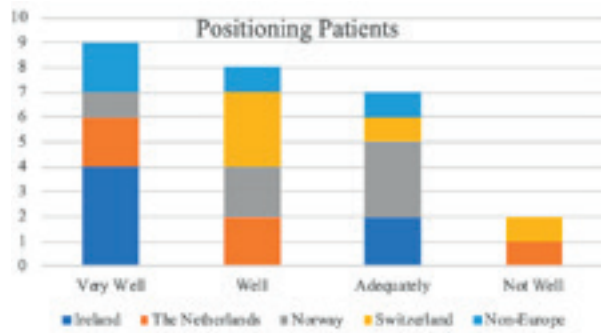


Fig. 2 Country-specific preparation by the Skills Lab on positioning patients

Furthermore, with regard to occupational risk hazards students from both Ireland and Norway agreed that they felt “well” equipped by the Skills Lab, but students from Switzerland believed that they were “not well” prepared by the Skills Lab. Furthermore, students from South-Africa felt the most prepared concerning occupational risk hazards, responding “very well” to this question. Moreover, both students from Norway and Switzerland felt that they were “not well” prepared for the use of RIS/PACS/Administration in CP by the Skills Lab. This data corresponds with the 38.5% of overall students (See Figure 1).

14 students (53.9%) answered that the equipment in the Skills Lab was of a lower standard than that found in their CP and 9 students (34.6%) found the standard was equal in both situations. Students from Ireland, Norway and Non-European countries were of the

opinion that their Skills Lab was of a lower standard than their CP, while students from The Netherlands and Switzerland observed that their Skills Lab was equal to that of their CP.

Figure 3 shows what students consider to be important factors in the Skills Lab. Their answers varied with regards to the standard of the equipment and the gap in content between lecture and lab material. However, students reached more of a consensus on the issue of the Skills Lab environment and the competency of the lab tutor. Again, further analysis of the data further showed that students from Norway felt that modern equipment was quite necessary for the Skills Lab, while students from Switzerland did not see this to be relevantly important. Similarly, students from Ireland and the Netherlands disagreed with students from Norway

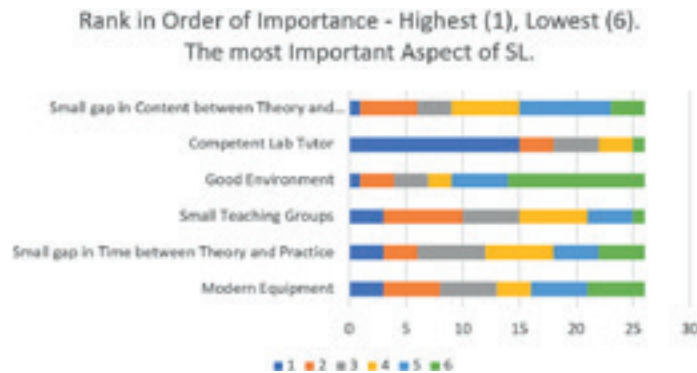


Fig. 3 Most important aspect of the Skills Lab (SL)

and Switzerland on the significance of the content gap between lecture and lab material. Conversely, students from Ireland, Norway and non-European countries agreed that a good environment was not the most important aspect of the Skills Lab. The environmental factors affecting the lab were ranked the lowest with 19 (65.2%) (Figure 3). Students from Ireland, Norway and Switzerland agreed that a competent lab tutor was the most essential aspect of the Skills Lab with 15 (57.7%).

Self-study, a competent lab tutor and filming labs for feedback findings were substantial teaching aspects (Figure 4). On closer examination it was identified that students from the Netherlands rated self-study more necessary than students from Norway and Switzerland. Yet, students from The Netherlands rated a competent lab tutor equally necessary for an

effective Skills Lab. The majority of students (53.9%) believe a competent lab tutor is the most important aspect of the Skills Lab (Figure 4). Having a simulated patient interaction was found to be the second most important aspect of teaching in the Skills Lab by most students (30.8%) (Figure 4). Students from all 7 countries reported filming labs for feedback inessential, with 61.5% rating it lowest in importance for effective teaching.

Students were asked to suggest ways they wished to enhance their Skills Lab, through an open question which solicited free text remarks. Results stated that 8 students (30.9%) would like to have better equipment, 7 students (26.9%) would like to receive more time practicing in labs and 4 students (15.4%) proposed that small groups would be beneficial. The remaining 7 students gave no feedback.

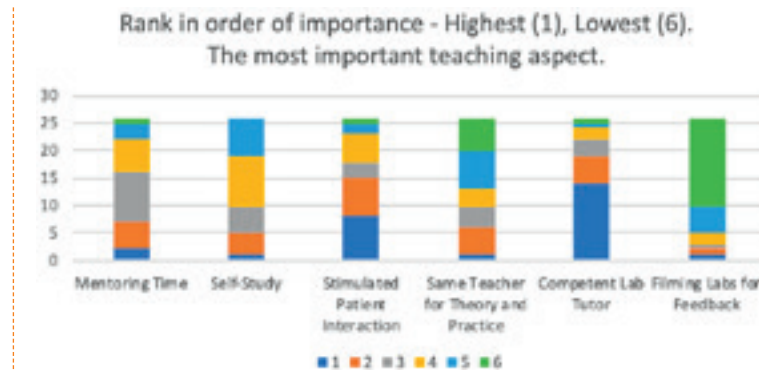


Fig. 4 Most important teaching aspect

Discussion

This study examined radiography students' perception of a radiography Skills Lab. 26 radiography students, all participating in the Optimax Summer school, answered a questionnaire and the resulting data was compiled and analysed. As suggested by K. Kyei et al², the Skills Lab is an effective way to reduce the gap between theory and practical learning and it was found that according to the students, the main factors that influence learning in the Skills Lab are reduced group sizes, competent teacher and simulation.

15 (57%) students agreed that a competent lab tutor is the most important part of a Skills Lab and 14 (53%) ranked a competent lab tutor as the most important teaching aspect. These findings are vital as it demonstrated that having a competent lab tutor could enhance the Skills Lab and perhaps help reduce the theory and practice gap¹¹. According to Almohiy et al¹¹, competent tutors who are comfortable clinically are necessary to allow students to practise radiography skills and hence foster a deeper understanding of the topic. This draws parallels with the results regarding students from all countries, including The Netherlands who believe that a competent lab tutor is just as important as self-study.

Students indicated that they wanted to spend more time in the Skills Lab. Yet, as there are differences in

radiography education programmes¹ and our students are at different stages of their bachelor or master programs, it was difficult to quantify this aspect. However, it must be considered that additional time is desired. It is possible that students need extra time in the Skills Lab because their program contains large numbers of students and so an individual's time to learn skills is reduced³. According to Kyei et al², a combination of limited resources and an overabundance of students contributes to an ineffective Skills Lab. This study is consistent with our results detailing the need for smaller groups in the Skills Lab. Our results showed that small student groups (less than 6 students) in labs was identified as the second most important aspect of an enhanced learning experience in the Skills Lab with 7 out of 26 students (26%). This agrees with the literature, where a smaller teacher-to-student ratio enhances the Skills Lab⁵. According to Monks et al⁵, a larger group size leads to a lack of clarity from the tutor, a lack of enthusiasm from students and a reduced completion of course outcomes. Hence, students may need small numbers in their Skills Lab for lessons to be effective.

Our study showed that most students found the equipment in their Skills Lab of a lower standard compared to the equipment in the clinical environment. This finding involves students from Ireland, Norway and non-European countries. Students from Ireland, Norway, Switzerland and

Non-European countries (38.5%) also answered that better equipment would enhance the Skills Lab. These opinions support the Haraldseid et al⁵ view concluding that old or outdated equipment results in an inadequate training situation. However, the data collected was not overwhelmingly substantial which suggests the standard equipment is not the first priority of students. Students seem to be more concerned with the availability of equipment relative to group size rather than the standard³. This aligns with both results from our and other studies^{2,4}.

Our study shows that students are of the opinion that simulated patient interaction is one of the most important aspects of the Skills Lab. According to Bate et al⁶, a simulation allows students to activate their knowledge and reflect on their task which in turn fosters a deeper understanding of the topic. This simulation can encompass communication with the patient, use of the equipment and positioning the patient. The majority of students indicated that their Skills Lab prepared them well for the clinical placement, concerning the communication with patient and patient positioning. However, with regards to the use of the software equipment (RIS/PACS/ADMIN), 10 students believe that they were not very well prepared for the clinical environment by their Skills Lab. It was found that students from Norway and Switzerland in particular did not feel well prepared with using software technology. This is an

important finding as part of our research and would suggest improvements must take place concerning the practical application of software manipulation in preparation for CP. It must be noted, however, that software technology differs from site to site, from location to location and hence formalised training in relation to software technology might be hard to standardise.

Most students were of the opinion that the Skills Lab prepares them best for positioning patients. This implies that most time spent in the Skills Lab is focused on technique rather than the simulation of a real clinical experience, which would include communication with patients and use of software. This relates to the results concerning students from Ireland, who felt very prepared for clinical placement concerning patient positioning, but did not feel as prepared for the other aspects of the Skills Lab. Hence, a PBL approach may work at incorporating all elements of simulation and better prepare students for CP. Overall, PBL students prove to be more efficient, more prepared with regards to their interpersonal skills as better problem solvers, according to the literature reviewed^{8,9,10}. This agrees with the results of our study suggesting that simulation of the clinical setting such as PBL is needed to give students a heightened sense of self-efficacy and improves their attitude towards clinical placement⁹.

Despite the benefits of filmed lab sessions recorded in our reviewed literature³, 61.5% of Optimax students listed filmed labs the least important option in comparison to the other mentioned teaching aspects. This may indicate that students would prefer sacrificing reflective and critical thinking skills in favour of traditional teaching aspects.

Within the literature¹, it was found that temperature (approx. 20 degrees Celsius) may have a positive impact on the performance of students. Our study showed that the environment was the least important aspect in the Skills Lab. However, students nowadays may expect a certain standard from their Skills Lab and hence have taken for granted the role environmental factors play on their learning ability.

There are some limitations to our study. These include the small number of students (n=26), the fact that some countries were represented by 5-6 students and others by just 1 or 2 students and how the CP experience of the students was difficult to compare. Possibly, if more open questions were used, answers would allow a better understanding of student choices.

Conclusion

There were a number of notable findings in our study. Firstly, students believe that a competent lab tutor and additional hours in the Skills Lab are some of the most important aspects of a useful Skills Lab. Furthermore,

we deduced that students are more concerned with the availability of equipment relative to group size rather than the standard of the equipment. We also noted the need for simulated scenarios in the Skills Lab and how this better prepares students for CP. Lastly, we discovered how the training of RIS/PACS/Admin for CP is insufficient for students, observing a high percentage of students from most participating countries highlighting a lack of knowledge in this area. However, students respond that overall theoretical classes and SL sessions prepare them well for CP.

Recommendations

We wish to encourage more research based on the Skills Lab in radiography. Our findings can be the basis for further investigation and elaboration concerning the radiography Skills Lab where a more in-depth analysis can be performed about students from different countries. We hope that further research could eventually lead to a framework of an ideal effective standard of a Skills Lab, which can be used universally. Other potential studies could be conducted on the opinions of lab tutor and their perception of the radiography Skills Lab.

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Appendix A: Enhancing a radiography practical learning environment

Our study aims to observe how the practical learning environment (lab sessions) for radiography students are designed and what are the possibilities to improve them. Practical learning environment is a practical lab session, where time is dedicated to learn practical skills, such as manipulating x-ray tube, practicing radiography positioning and exposing phantoms.

The questionnaire is composed of 3 parts.

Ethical exemption was granted for the study by the Undergraduate Research Ethical Committee (UREC) and by the Dean of Diagnostic Imaging at UCD.

Participation is voluntary and anonymous, therefore by participating you grant consent for the data to be used in the study.

Thank you for your help.

Part A:

1. In which country are you studying your Radiography degree?

- Ireland
- Switzerland
- The Netherlands
- Norway
- Canada
- South Africa
- Brazil

2. What year are you currently in your radiography study?

- First year
- Second year
- Third year
- Fourth year
- Post-graduated

3. What is the duration of your study?

- 2 years
- 3 years
- 4 years
- 5 years

Part B:

4. Is practical learning environment part of your radiography education program?

- Yes
- No

5. Do the theoretical materials taught in lectures prepare you for practical learning environment sessions?

- Very well
- Well
- Adequately
- Not well
- No opinion

6. Does the practical learning environment prepare you well for:

7. Is the equipment in your practice learning environment of the same standard seen in your clinical placement?

- Higher standard
- Equal standard
- Lower standard
- No opinion

8. Rank in order of importance (1) strongest, (6) lowest. The most important aspect to practical learning environment.

- Modern equipment (x-ray tube, detectors, phantoms etc.)
- Small gap of time from theoretical lecture to practical learning session
- Small teaching groups (less than 6)
- Good environment (Temperature, light)
- Competent lab tutor
- Small gap in content between lecture material an lab material

	Very well	Well	Adequately	Not well	No opinion
Equipment use					
Positioning patients					
Occupational risk hazards (needle sticks, infection)					
Communication with patients					
RIS/PACS/ administration					

9. Rank in order of importance (1) strongest, (6) lowest.

The most important teaching aspects.

- Mentoring time
- Self-study
- Simulated patient interaction
- Same teacher for lectures as well as labs
- Competent lab tutors
- Filming labs for feedback

Part C:

10. In the space provided please suggest some ways you wish your practical learning environment was enhanced.