Is there an SOP for this? Using Simulation to Assess the Implementation of a Laboratory Information System in Medical Laboratory Science Education

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Introduction

- Laboratory Information System (LIS) software is used to record, manage, and store clinical information
- LIS competency is necessary for medical laboratory technologists as it is involved in nearly every step of the laboratory workflow
- The Division of Medical Laboratory Science (MLS) at the University of Alberta developed and implemented several simulation scenarios for the first-year student curriculum that incorporated various functions of an LIS

Research Question: How effective is simulation for practice and application of LIS and other transferable skills?

Objectives

- Creation and implementation of several moderate-to-high fidelity simulation scenarios
- Development of rubrics to monitor student performance and simulation effectiveness

Study Design

1. Broad early exposure and objective development → Standard Operating Procedures (SOPs) available
2. Creation of scenarios and data collection tools → Several moderate-to-high fidelity scenarios
3. Piloting of the simulated scenarios → Observe weaknesses and limitations
4. Implementation of the simulations → 25 first-year MLS students participated
5. Evaluation of collected data → Mixed-method approach

Simulation Scenarios

Pre-brief → Scenario → Debrief

Learning Objectives:
- Practice and become familiar with basic LIS functions
- Follow instructions in SOP manuals efficiently and effectively
- Demonstrate effective communication skills
- Practice appropriate data and specimen handling and processing
- Manage and share workload with team members

Required Tasks:
- Data entry of laboratory testing orders
- Manual results entry and reporting

Potential Distractors:
- Case #1: Cancelling an insufficient sample
- Case #2: Cancelling a physician's test order
- Case #3: Checking previous order for a unit phone-in

Evaluation Tools

MLS-LIS Simulation Rubric
- Facilitator evaluation of students' specific skills, behaviours, and overall simulation performance
- Included various LIS functionalities, SOP use, communication, safe work practices, professionalism, and critical-thinking
- Based on LIS SOPs and general CSMLS competencies

MLS Simulation Thinking Category
- Assigned based on student's cognitive approach to the scenario
- Four categories: sensorimotor, preoperational, concrete, and formal

MLS Simulation Evaluation Survey
- Student evaluation of the simulation design and process
- Covered pre-brief, scenario, debrief, and overall simulation
- Agreement based on a 5-point Likert scale

Student Performance

LIS competency:
- 74% successful data entry
- 84% successful results entry

Students struggled with accessioning and documentation

SOP Use:
- 76% efficient use
- 68% accurate use

First-time exposure to multiple SOPs without assistance

Communication and Teamwork:
- 84% effective communication with peers

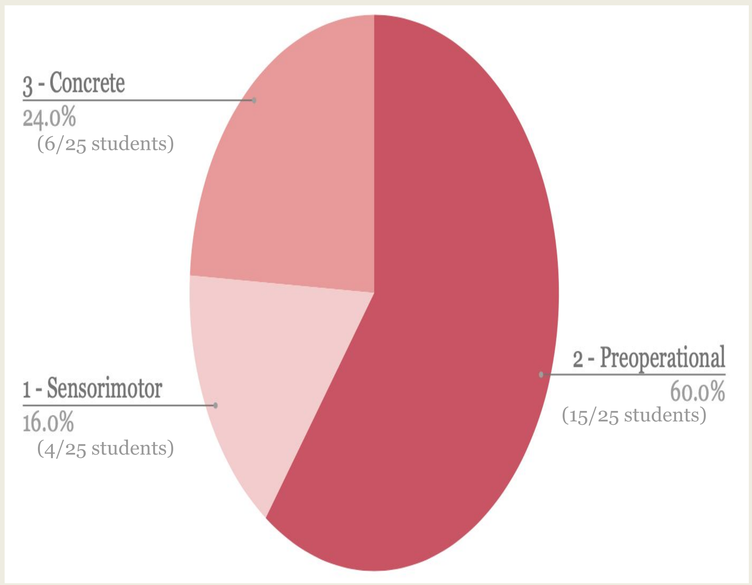
Lack of proper phone etiquette

Professionalism and Safety:
- 92% proper safety measures

Students frequently and consistently performed clerical checks

Need for further practice with task prioritization

Simulation Thinking Category



Sensorimotor	Preoperational	Concrete	Formal
Begins to read through provided SOP but gets distracted. Does not address errors appropriately Requires an unusually long period of time to complete tasks.	Relies heavily on SOP. May skip or miss important steps. Task completion is slow and halted.	Moderate use of SOP. Some error but corrects for them. Performs tasks efficiently with some confidence.	Minimal referral to SOP and reading 2-3 steps ahead. Accurate, no errors made. Tasks performed efficiently with confidence.

Simulation Design

Scenario Design:
- 96% felt simulations were realistic and relevant to the clinical lab

Student Focus:
- 100% were able to analyze their behaviour in the scenario

Skill Practice:
- 99% were able to practice troubleshooting, technical, critical-thinking, and other transferable skills

Teamwork:
- 88% perceived effective teamwork in their group

Student comment:

"Understanding the laboratory workflow in terms of communication, efficiency, and work order"

Areas for improvement:
- Adequacy of resources
- Length of scenario

Discussion

- Student performance reflected the limited prior clinical exposure of these early learners
- Findings justify the training the students are receiving in the program and opportunities for improvement
- Simulation provides an opportunity for practice technical and relevant transferable skills
- Changes to timing of curriculum are needed to enhance students' simulation experience

Limitations

- Minimal clinical experience of first-year MLS students limited complexity of scenarios
- Need for standardization and validation of simulation scenarios and evaluation tools to allow for comparison between simulations

Conclusion

- Simulation in an MLS program is an effective way for students to practise LIS and other transferable skills
- Early use of evaluation tools can help monitor student progression in the program

Future Directions

- Continuous use and refinement of scenarios and evaluation tools
- Advanced LIS simulations for year two students
- Incorporation of LIS into existing MLS simulations
- Earlier professional communication sessions in the MLS curriculum

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