

Pharmacy Students' Experiences of Self-regulated Learning through Simulated Virtual Patients

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Abstract

Objective: Virtual patient (VP) cases are a valuable learning tool for students, used to apply classroom knowledge and develop clinical skills. It is unknown whether exposure to multiple VP cases helps students develop self-regulated learning (SRL). We sought to learn more about how students engaged in SRL as they made goals for approaching patient care during repeated exposure to cases.

Methods: Second-year students (N=211) were invited to participate in an online survey. Students were surveyed before and/or after completing three VP cases. Each survey consisted of two open-ended questions. Prior to each case, students were asked "How will you change the sequence of your approach to completing the VP assessment today, if at all?" and after each case, "What more do you have to learn in order to approach similar real-life patient assessments?" A thematic analysis was conducted on open-ended survey responses.

Results: One hundred and seventy pre-case and 242 post-case responses were received. The most common themes identified in pre-case surveys were a need for a more systematic approach and specific strategies for executing the patient care process. Some students had no plans for approaching VP cases. The most common themes identified in post-case surveys were knowledge gaps of medical conditions, therapeutics, and lab tests.

Conclusion: VPs provided students the opportunity to self-identify gaps in knowledge and plan to strengthen their clinical reasoning skills. More research is needed to understand the relationship between VP cases, instructional guidance for supporting SRL and the realities of the intended benefits to students' learning and practice.

Keywords: virtual patients, simulation, self-regulated learning, pharmacy education

Introduction

Virtual patients (VPs) are a simulated technology used to develop the skills needed by students as they transition from classrooms to practice.¹ Our previous research captured students' perspectives on VP utility and implementation, as well as student's views on cases connecting to the curriculum and experiential education.²⁻³ Through our investigations, we found that students valued VP cases and felt engaged while they were enacting them, but results were mixed in terms of how useful students determined them to be.²⁻³ While students indicated that the cases helped develop their clinical reasoning skills, they were not as positive about the impact the cases had on their confidence and thought process.³

Previous explorations led us to be curious about student' use of VP cases to effectively support their learning. Specifically, we drew on the theoretical framework of self-regulated learning

(SRL) to build understanding about how students can benefit from strategically engaging in simulated learning tasks.⁴ SRL has been defined as the "self-generated thoughts, feelings and actions that are planned and cyclically adapted to the attainment of personal goals".⁵ SRL is an expectation of health professions students because their "success depends on how well they can assess and manage their own learning to meet the demands of the contexts in which they work".⁶ Simulation offers the possibility of strengthening SRL, in part, because students are free from adverse clinical realities (eg, patient reactions) to focus on their learning and develop effective learning strategies.⁷ Further, simulation has the potential to later help learners bridge effective forms of SRL to clinical settings in service of ongoing learning in practice.⁸

The purpose of this study was to investigate *how* students approach learning through VP cases and whether students identified gaps in their learning. By investigating students' perceptions about their process of engaging in VP cases, our intention was to build understanding about supporting SRL through simulation-based learning opportunities. Indeed, research that sheds light on students' learning in context can be instructive for educators designing learning activities.⁹

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Statement of the Innovation

During the 2017-18 academic year, VPs were introduced in our E2P PharmD Program using a Virtual Interactive Case (VIC) system (<http://pie.med.utoronto.ca/vic/>), which simulates a patient encounter.² In the 2018 academic year, additional cases were created and implemented at our institution. The first component of the VP cases introduces a chief complaint. The student then completes a patient assessment in which they gather information, and identify and resolve drug therapy problems (DTPs) to optimize medication management. Students have access to multiple sources of information such as: Patient Charts (eg, admission notes, vital signs flow sheet); Orders (eg, medication, diet); Communication; Lab/Test Results; and Diagnostic Imaging. As students access and view the information, they accrue time and financial costs to the 'healthcare system'. Finally, students are asked to identify the patient's therapeutic issues and provide recommendations. Following the assessment, the debriefing component provides feedback to the student on their ability to identify key problems and make appropriate recommendations, as well as the amount of time and costs they accrued through their assessment.² For our program, cases were implemented in different learning settings and focused on different disease states chosen to reflect student learning to date.

Design

Second-year students, who encountered a total of three cases in the 2018 academic year, were invited to participate in the current study to describe their experience in a survey. The Year 2 cases were ungraded and students had access to them throughout the academic year so they could attempt them more than once. Prior to completing VP cases, students were asked a question intended to capture how they were building from prior VP case experiences to approach the current task (Question 1: "Based on your experiences completing virtual patients, how will you change your approach to completing the virtual patient assessment today, if at all?"). After completing the VP case, students were asked a question intended to capture how their experiences of VP cases influenced their learning process as they planned for real-life practice (Question 2: "Based on what you experienced today, what more do you have to learn in order to approach similar real-life patient assessments?").

The study was approved by the Behavioral Research Ethics Board at the University of British Columbia. Surveys were administered online using Qualtrics (Qualtrics, Provo, UT) and were embedded in the learning management system. The pre-case survey was administered twice and the post-case survey three times, with the first survey occurring after the first VP case. All second-year students (N=211) were eligible to participate and were emailed a Letter of Information regarding the study in September 2018. Participation in the surveys were voluntary and results were anonymous.

Two investigators (KM and PS) thematically analyzed the open-ended survey responses using an inductive (ie, emergent) and deductive (ie, informed by theories of SRL) approach.¹⁰ They then engaged in "thematic mapping", which further facilitated revising and defining themes to surface meaning and move to the writing up of findings.¹⁰

In total, 170 pre-case survey responses (from February 15 to March 25, 2019) and 242 post-case survey responses (from September 17, 2018 to March 25, 2019) were received. The pre- and post-case survey responses were analyzed separately. Students were surveyed independently around the three cases with responses varying before and after each case.

Findings

Pre-Case Survey Results

Students described a range of goals they planned to enact during the VP session (Table 1).

Table 1. Most Common Themes from Pre-survey Data

Theme	Number of Responses
More systematic approach	63
No change in their approach	34
Looking at essential information only	22
More thorough assessment	21
Minimize use of resources (tracked by the VIC system via time/cost)	21

In discussing a more systematic approach, students desired to organize their thought process in order to identify therapeutic issues. For example, one student said:

"Before trying and clicking options/buttons, [I will] develop an orderly technique/organized strategy with which to solve the case according to the DTP."

In a subset of these responses, students were very specific about the strategy they planned to use. For example:

"I think it is important to make sure you pay attention to all the details and write down doses as you go because you can't look back at that once you go to submit it."

Interestingly, not all students identified a plan for approaching the VP case. One student stated:

"My prior experiences with VP cases have only been a handful of instances that it is hard for me to judge how I can change my approach in completing the case today."

Another student wrote:

"I cannot really say, but there is nothing at stake. Based on this I hope to learn from my patient case to improve on future skills."

Here the student had an outcome goal (ie, learning from the case) but not a plan for working/learning through the case.

Students also described needing to think critically about what information was relevant, rather than viewing all information available to them. While some students felt they needed to increase efficiency, others indicated a need to be more thorough. For example:

“Based on how I’ve approached it previously, I will try to be more thorough and not be worried about limiting the resources I look at.”

Minimizing use of resources (ie, time/cost) was identified an equal number of times as the need to be more thorough.

Post-VP Case Survey Results

In their post-case responses, students identified a range of knowledge gaps they intended to address as they bridged their VP experience to real-life practice (Table 2)

Table 2. Most Common Themes from Post-survey Data

Theme	Number of Responses
Identification of gaps in knowledge	84
Identification of need to improve specific skills	45
More thorough	26
Increase in efficiency	22
Identification of specific strategies to employ in future cases	18
Need for real-life experience	12

First, they described needing to increase their knowledge about where to find specific resources or how to determine which resources are relevant. For example, one student wrote:

“I have to learn more about where to find specific information inside the patient chart. I think these cases are useful to learn how to navigate through patient charts...it can be confusing as information is documented in many different places.”

Another student expressed confusion:

“I don’t know which notes to look at, which lab results are important, what radiology or scans are important to look at.”

Students also identified needing to know more about therapeutics. For example, one student stated:

“I learned that I need to familiarize myself with the therapeutic choices for various conditions as well as optimal target doses...In the future, especially before practicum, I plan on reviewing all my material beforehand.”

Students also identified needing to know more about specific conditions/diseases, drug/doses, and tests. They also described

needing to review general course content or course material. For example, one student described needing to:

“review material learned previously because patients often present with comorbidities outside of the current module and it becomes time consuming for me to review during the case.”

Second, students perceived a need to improve their skills related to gathering information, understanding which questions are relevant to ask patients, interpreting results, building up their fluency when reading patient charts, and increasing their capacity to collaborate and interact with patients.

As in the pre-survey, students also felt the need to be more thorough in assessing patient information, described a need for increased efficiency when navigating patient information and identified strategies they would employ in future cases, such as checking the dose of each medication and utilizing patient monitoring forms. One student described a need to:

“take notes so I can organize my information properly, like matching the medications to each condition and ensure the clinical presentation and diagnostics are consistent with the medical condition the patient is having.”

Critical Appraisal

Our study contributes to the literature base by investigating students’ articulated engagement in the forethought (ie, goal setting, strategic planning) and self-reflective phases of SRL immediately prior to and following participation in VP sessions.⁵ Our research extends current research on VP cases in pharmacy education by shifting the focus from the educational intervention itself to a focus on the *process* of learning through VP case exposure.

In the pre-survey data we found that thirty-four responded by saying they had no change in their approach for how to approach the VP case based on prior experiences. Currently, research on VP cases is focused largely on impacts for students with less attention focused on understanding processes educators can implement to support students’ self-regulated learning.¹¹ Students were approaching VP cases with variability in terms of the goals they made for their learning suggesting they may have benefitted from explicit supports to SRL (e.g., instructor guidance on how to optimize learning). Future research on embedding SRL supports into VP case experiences is needed.

After completing VP sessions, students identified their learning needs and the practical skills they might be expected to demonstrate when conducting patient assessments in clinical settings. This provides support that VPs offer students a safe environment to self-identify gaps in knowledge, which can be more difficult to do when working with real-life patients.⁸ Our findings extend previous work suggesting that students’ self-evaluations of learning have the potential to impact their later

goal setting and strategic planning⁹ by showing students' direct links between their self-reflections and their plans for future learning. However, more understanding is needed about adjustment of practice beyond simulation in response to identified learning needs.⁸

Our findings further illustrates that students' goals were influenced by features of the VP cases, which may have unintentionally undermined the intended learning. Students made goals to decrease both the time and financial costs associated with the actions they took even though these were not directly relevant to building clinical reasoning skills. A previous systematic review underscored the importance of implementing VP cases in a deliberate manner based on robust educational decisions "as delivery issues can distract from learning".¹¹ In our study, students may have been distracted from focusing on their learning because of the time and financial cost 'counter' that accompanied their actions. When using simulation technology, it is important for educators to take an active role in supporting students to interpret the purpose of the task.¹²

A limitation to this study is that individual baseline characteristics of responses were not collected; even though the survey was made available to the entire second-year student cohort, the overall response rate cannot be determined. Further, individual students may have responded to the survey more than once. Because individual students' responses were not tracked, we were unable to determine how their perceptions changed with repeated VP case exposure. There may have also been selection bias since survey participation was voluntary, and so the themes identified may not be representative of the wider student body. Some of the themes we identified had small numbers of responses, which may limit the generalizability of our analysis. In addition, we did not capture or correlate students' performance with their responses.

Next Steps

Our study points to the need for educators to support simulated learning rather than assume students will know *how* to learn through an activity.⁶ As Brydges & Butler state "self-regulation is fostered not only by establishing environments that expect SRL, but also by assisting individuals to *learn how* to self-regulate their learning".⁶ Their calls for attending to instructor support for SRL processes have been echoed by others citing the need for carefully designing SRL supportive simulated learning experiences.^{6,13}

While our finding that students were able to identify gaps in their knowledge and plans for their future were promising, research is needed to further examine the relationship between how students bridge from VP cases to practicums and early career experiences.

Conflicts of Interest: None

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