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Experiences in Teaching and Learning

Assessment of critical thinking skills progression in a pre-pharmacy curriculum

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ABSTRACT

Objective: To evaluate changes in different components of students' critical thinking skills through a sequential series of assignments in pre-pharmacy courses.*Methods:* For 3 years, two cohorts of pre-pharmacy students completed an annual ethics-related critical thinking assignment. Progressive, 3-item rubrics (considering context, problem-solving, and innovative thinking) were used to evaluate critical thinking skills on a four-point Likert-type scale (0=not present, 3=mastery) for each year. Rubrics were designed in such a way that equivalent or higher scores indicated advancement in critical thinking skills. Longitudinal changes were assessed using the Friedman test.*Results:* Students' ($n = 44$) innovative thinking scores remained the same ($p = 0.21$), problem-solving scores increased ($p < 0.001$), and considering context scores regressed ($p = 0.01$) throughout the three years. Total critical thinking scores also remained the same ($p = 0.53$).*Conclusions:* Students began to formulate new ideas and implement a multifaceted approach when solving problems but remained limited in considering contexts. Thus, students need further education regarding the impact of recognizing multiple perspectives on solving problems.

Background and Purpose

The evolving nature of our health care system necessitates clinicians who are capable of going beyond their initial knowledge capacity to think critically in patient care situations.^{1,2} Critical thinking is often conceptualized as a form of higher-order thinking that involves a variety of skills, including the process of interpretation, analysis, evaluation, inference, explanation, and self-regulation throughout different contexts.^{3–5} Although a standardized definition for the term “critical thinking” is lacking, critical thinking is assumed to be “good thinking” that solves problems and involves creativity and innovation.^{3,6} The Association of American College and Universities defines critical thinking as “a habit of mind characterized by the comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating an opinion or conclusion.”⁷

This form of thinking goes beyond simply accepting what is being said at face value; rather the critical thinker develops an attitude of inquiry to determine the reason and evidence for a conclusion. Critical thinking requires knowledge and the ability to logically determine valid inferences that can be applied to real-world situations. In the context of patient care, practitioners should utilize evidence-based practice with sound clinical judgment through the process of critical thinking—the ability to question why certain recommendations are being made, the desire to probe alternative treatment options, and ultimately the need to investigate

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the most appropriate decisions for the patient's best interest.¹

As health care increasingly utilizes evidence-based decision making through interprofessional teams that include medicine, pharmacy, nursing, and others, the need for providers to critically think is important for optimizing and improving patient outcomes.^{2,8–11} In addition to the importance of critical thinking skills in the context of patient care, these skills are a strong predictor of success in pharmacy School¹² as well as innovations in practice.¹³ The Accreditation Council for Pharmacy Education (ACPE) agrees that critical thinking is an essential outcome in pharmacy education and encourages instructional methods to “stimulate higher-order thinking, problem-solving, and clinical-reasoning skills” in their 2016 accreditation standards. Additionally, ACPE requires pharmacy schools to provide “... [o]utcome data from assessments of student achievement of problem-solving and critical-thinking capabilities.”¹⁴ Therefore, pharmacy education should continue to foster students' growth in critical thinking, including how to problem-solve, formulate novel ideas, and recognize multiple perspectives and contexts within various situations.³

Although critical thinking is a strong predictor of success in academic programs and in practice, the identification and development of these skills has proven to be challenging.¹² In the past, pharmacy educators have been encouraged to improve upon their graduates' critical thinking and problem-solving skills.^{2,3} Some even suggest building those skills within the pre-pharmacy curriculum and including assessments of these skills in admissions criteria.¹⁵ Both grade-point average (GPA) and Pharmacy College Admission Test (PCAT) scores have been shown to assist in the early identification of academically at-risk pre-pharmacy students.^{16,17} Some schools have replaced traditional lecture formats with innovative learning methods in order to better develop these skills within the professional program, including problem-based learning (PBL), team-based learning (TBL), and simulation games.³ Despite these efforts, there is still a sense of uncertainty as to whether or not pharmacy education is appropriately developing pharmacy students' critical thinking skills.¹⁸ Therefore, the objective of this research project was to evaluate changes in different components of students' critical thinking skills (identifying and considering context, problem solving, and innovative thinking) through a sequential series of assignments in pre-pharmacy courses.

Educational Activity and Setting

Curricular integration

Cedarville University accepts students into the professional program who have either completed a three-year pre-pharmacy curriculum at Cedarville or who have completed similar coursework or a Bachelor's degree (and all pre-requisites). All pre-pharmacy and transfer students must complete a series of courses taught by the School of Pharmacy. Three pre-pharmacy courses (one from each academic level, including freshman, sophomore, and junior) were selected for integration of a critical thinking ethics-related assignment. As a part of the assignments, students were asked to write a reflective essay discussing three questions. The questions varied slightly from year-to-year, reflecting the differences in the corresponding assignments. However, they were derived from the same three principles: 1) the first questions address the importance or reason as to why the issue may be occurring, 2) the second questions address the perspective of others regarding the issue, and 3) the third questions address what the student would do in a similar situation.

Students received feedback on their assignment as part of normal classroom assessment procedures.

Freshmen pre-pharmacy majors took PPHR 1011: Profession of Pharmacy – History and Issues which covered the history of pharmacy. In this course, a faculty member gave a one-hour lecture with active learning on history and issues in pharmacy practice research. This lecture included historical examples of ethical issues in research and integrated discussion questions. After the lecture, students were asked to review the Centers for Disease Control and Prevention (CDC) website regarding the Tuskegee Syphilis Study and then complete a minimum two-page reflective essay discussing: 1) the importance of ethical treatment of patients in research from a faith-based perspective, 2) reasons why researchers may rationalize performing unethical research, and 3) what steps they would take, as a researcher, to safeguard against unethical research. They were asked to incorporate course content and the Tuskegee study as part of the essay.

In the sophomore year, pre-pharmacy majors took PPHR 2013: Profession of Pharmacy – Careers which covered careers in pharmacy. Pharmacists from different careers shared their experiences during the class sessions. They were encouraged to discuss different ethical dilemmas they faced and how they navigated those issues. Additionally, videos showing two ethical dilemmas were created. The first scenario was an encounter between a physician and pharmacist discussing whether to fully inform a patient with a mental disorder about the side effects of the medication, since the patient may opt not to take the needed medication. The second scenario was an encounter regarding whether to respect the wishes of a patient to only receive palliative care versus continuing with potentially life-saving treatment. Undergraduate theater students were recruited to act out the scenarios. Pre-pharmacy students were required to view the videos and complete a reflective essay (two-page minimum) discussing (1) the importance of ethical treatment of patients in pharmacy practice from a faith-based perspective, (2) reasons why pharmacists may rationalize treating patients unethically or allowing unethical practices, and (3) what steps they would take, as a pharmacist, to prevent unethical practices. They also were asked to incorporate course content, speaker discussions, and videos as part of the essay.

In their junior year, pre-pharmacy students took PPHR 3200: Pharmacy Calculations, which covered pharmacy calculations and career planning. Students were asked to read a series of articles found in the literature regarding (1) the sale of alcohol and tobacco products in the community pharmacy setting as well as (2) whether the government should regulate health and safety practices. After completing the readings, students were asked to write a reflective essay discussing 1) reasons why business owners may choose to sell alcohol and tobacco products in the pharmacy, 2) whether or not the government should assume responsibility for health and safety, and 3) their personal faith-based decision on what they would do if they owned a community pharmacy. They also were asked

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