

Physics Attitude in Pre-Health Professions Students Upon Connecting Physics to the Medical Field

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Abstract

Collegiate physics professors have long been familiar with the issue of students' attitudes towards the subject material. This is especially prevalent in pre-health professional students - non-majors - who are often required to take the introductory physics sequence as a part of entrance into a medical graduate program. This pilot study used a modified version of the Physics Attitude Scale (PAS) and modified questions from the Colorado Learning Attitudes about Science Survey (CLASS) to examine the attitudes of students going into a health-professions career. The objective of this study was to investigate if connecting physics to medical fields would result in a better attitude for pre-health professional students. The students were given the PAS survey to determine baseline attitude towards physics. One month later, a follow up was conducted. The students were given medical scenarios connecting physics with the medical field. Immediately after, the PAS survey was repeated to see if their attitudes would be different in pre- and post-survey. The findings indicate improvement in student attitudes towards physics upon connecting the discipline of physics to health professions.

Introduction

- It is common knowledge that students' attitudes towards physics have been negative and this is similar in the case of health professional majors that are required to take a general physics course for their major or graduate school admission.
- According to Sahin et al study students felt that after taking a general physics course the topics presented within the course were weakly connected to one another (2009). However, when a physics professor was asked about the topics within their general physics course their response is that all topics covered build on one another over the course (Sahin, 2009).
- Many studies are conducted within the general population of students taking a physics, this does not consider the attitudes of students that will be going into the health professions, such as physical therapy, medical doctors, or any other health profession that requires physics as a prerequisite for their programs.
- There is little research within this particular group of individuals, making it difficult to discern their attitudes towards physics. However, there has been some research into pre-health professional students' attitudes towards mathematics, in particular statistics. Within a research study conducted by Hanigan, Hearty, and McGrath, they found that pre-health professions students only 24% of students would take a statistics course if the decision was theirs to make (2014).
- There is a cross-over between this study and that of a physics attitudes due to the correlation between math used in mathematics and physics. This begins to get at the true attitudes of pre-health professional students towards the discipline of physics, and it seems that most students' attitudes are negative.
- Within this pilot study it was our goal to determine if students were shown a connection between physics, of physics in health professions, and that of various health professions that utilize physics research to better help treat and diagnose health outcomes in the various health fields.



Participants



- Majority of participants were female.
 - 100% of participants were pre-health professional students.
 - Nursing, Exercise Science, Biology, Pre-Med, and other students who fit the health criteria.
- Participants of the Pre- and Post-survey
- Students were recruited via email, and all students were from Northwestern.
 - Northwestern is a small, private, mid-western rural campus.
 - 22 students took part in the surveys.
- Participants of the General Survey
- Students were recruited via email at Northwestern and the survey was also placed online to recruit other students from different institutions.
 - This survey was targeted pre-health professional students.

Methods

- The study utilized a pretest posttest quasi-experimental design. For the pre-survey, students were asked a series of questions from both the PAS and CLASS surveys (Kaur & Zhao, 2017; Adams et al., 2006).
- There were general demographic questions that the students were required to answer at the beginning of each survey. These same groups of students were also asked to take a post-survey, which was taken a month after the pre-survey.
- We used a modified version of the PAS (Physics Attitude Scale) to determine the attitudes of pre-health science students towards the discipline of physics (Kaur & Zhao, 2017).
- We took out the questions that have to do with physics teachers and questions that pertained to students currently enrolled in a physics course. This was to prevent bias of the researchers and to get at the true attitudes towards physics without the external factor of attitude towards a physics teacher influencing responses.
- This left 41 questions of the original 60 questions for students to answer in both the general survey and the pre/post surveys.
- The PAS question set was chosen because it shows the attitudes of students towards physics, many of the other surveys did not have the breadth of questions needed to get to the students' true feelings about only the physics discipline.
- We then used ten questions from the CLASS survey to get a better understanding of the students' attitudes (Adams et al., 2006). In the original CLASS survey there were a total of 42 statements. This survey utilized the 10 statements that helped to get a better understanding of students' attitudes when paired with the modified PAS.
- All participants were provided with a series of scenarios to look over to see the practical application of physics in the real world. In the four scenarios, the students are asked to read through the short summaries of articles.
 - The first article consists of advancements in medicine due to the addition of physics research into radiology in European Medical Practices (Kalender & Quick, 2011).
 - The second article was a summary of proper running mechanics and how to improve running form to prevent injury (Reenalda, Maartens, Homan, & Buurke, 2016).
 - In the third article the students read it summarized proper biomechanics of the shoulder in youth baseball pitchers (Sabick, Kim, Torry, Keirns, & Hawkins, 2005).
 - The last summary the students read was based on the use of physics in the treatment of cancer and the future research being conducted in to cancer diagnostics and treatments (Solomon, 2002).
 - In the general survey, participants read the scenarios immediately after completing the pre-intervention questions. In the pre/post survey, participants completed the pre-survey in one sitting and the scenarios followed by the post survey in another sitting, which was roughly a month later.
- The order of scenarios was randomized in both surveys to reduce order effects.

Results/Analysis

Pre- and Post Survey

- There was a significant difference in interest in taking physics between the pre and post score, $t(15) = -2.15$, $p = .04$, with participants reporting more interest after the intervention ($M = 2.75$, $SD = 1.07$) than before ($M = 2.31$, $SD = 1.14$).
- There was a significant difference in sense of career relatedness between the pre and post score, $t(15) = 3.22$, $p = .01$, with participants reporting a greater sense of relatedness after the intervention ($M = 2.38$, $SD = 1.15$) than before ($M = 3.13$, $SD = 1.26$).
- The results of the paired samples t test indicate a non-significant difference in the pre anxiety scores ($M = 3.75$, $SD = .93$) and the post anxiety scores ($M = 3.88$, $SD = .81$); $t(15) = -.81$, $p = .42$.
- There were no significant results from the general survey



Results from the Pre/Post Group

	Pretest Score	Posttest Score	P value
Interest Score	2.31	2.31	0.4
Career Relatedness	3.13	2.38	0.1
Anxiety	3.75	3.88	.41

Conclusions

- In the pre- and post scenarios there was a significant difference in attitudes between after students were given scenarios when compared to pre-attitudes.
- The general survey showed no significant results, however, due to the results of the pre- and post-scenarios we feel that a larger study should be conducted.
- With this being a pilot study with a small body of students used, there is greater importance to expand the study to other schools to get a better grasp of pre-health students' attitudes towards physics.
- Incorporating health scenarios that utilize physics research for the betterment of patients, can possibly improve students' attitudes towards physics.



Sources

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