

# Exploring the links between Physics and Astronomy education teaching and learning in the Philippines

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**Abstract.** Students consider physics to be one of the most prevalent and troublesome topics since they find physics to be a challenging course in high school and become more deceptive when they have it as an undergraduate course. The Rizal Technological University (RTU) in the Philippines offers undergraduate and graduate academic programs in astronomy. The university utilizes physics diagnostic tests to classify students' suitability towards the course as RTU houses the Philippines' most advanced optical telescopes and the Center for Astronomy Research and Development. The latter was established through the Department of Science and Technology to promote a research hub in the field of astronomy and space science, as well as providing support for research funding and scholarships. The study performed causal-comparative research design and correlational analytics toward students' attitude and motivation, study habits, learning styles, professor factors, social factors, and academic grades in physics and astronomy. The study explored the links between physics and astronomy and revealed their faith in their study habits in both astronomy and physics. The findings of this study provide evidence of the link of physics and astronomy education in students' academic programs and its value from the previous learnings of students and teaching of teachers as a critical role in predicting student performance. The increased enrolment in the academic program demonstrates the validity of the above-mentioned statements, as it enticed students to pursue astronomy as their scientific career. Other efforts are discussed in detail in this paper.

## 1. Introduction

This study delves into the associations for both physics and astronomy education teaching and learning in the Philippines. Many students avoid studying physics since it is often viewed as a difficult subject. For most students, physics was seen as the most challenging course in high school, and this perception has never changed since then [1,2]. The learning of physics in the Philippines presents a significant puzzling effect specifically for the undergraduate course.

Gifted and bright students in both the sciences and mathematics have a true understanding of physics in their daily life. Physics lecturers will often use humor and entertainment to help the students understand the lesson very well. When teaching physics, several teaching techniques can be employed to achieve that goal [3].

In the Philippines, astronomy has been always taught as a component of the general education subject at the basic education level. The University of the Philippines – National Institute of Physics (NIP) elevated the teaching of astronomy through the offering of “Physics and Astronomy for Pedestrians” in 2002 [4,5], which explored the introductory of physics and astronomy, from inception to their contemporary advances.

In 2005, the RTU made a significant breakthrough in the history of Philippine education by pioneering the offering of the Master of Science in Astronomy program [4,5]. Furthermore, RTU has made another step forth into its unwavering lead in astronomy education by offering the Bachelor of Science in Astronomy Technology in 2007. RTU has the most advanced observational astronomy equipment in the Philippines [5]. It is equipped with the most sophisticated optical astronomy equipment, allowing it to provide high competitive astronomy academics and research [6]. Despite its urban location, the university has embraced the issues of light pollution in the metropolis and launched the country’s first light pollution research project.

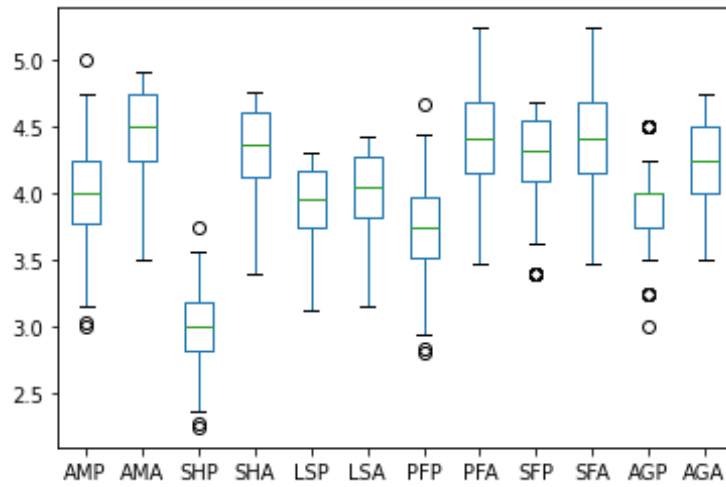
With these assertions, the researchers wanted to seek the links between physics and astronomy education teaching and learning in the Philippines. The following are the study’s measurements that were used to establish the connection between physics and astronomy: Attitudes and Motivation in Astronomy (AMA), and Attitudes and Motivation in Physics (AMP); Study Habits in Astronomy (SHA), and Study Habits in Physics (SHP); Learning Styles in Astronomy (LSA), and Learning Styles in Physics (LSP); Professor Factor in Astronomy (PFA), and Professor Factor in Physics (PFP); Social Factor in Astronomy (SFA), and Social Factor in Physics (SFP); Academic Grade in Astronomy (AGA), Academic Grade in Physics (AGP).

## **2. Methodology**

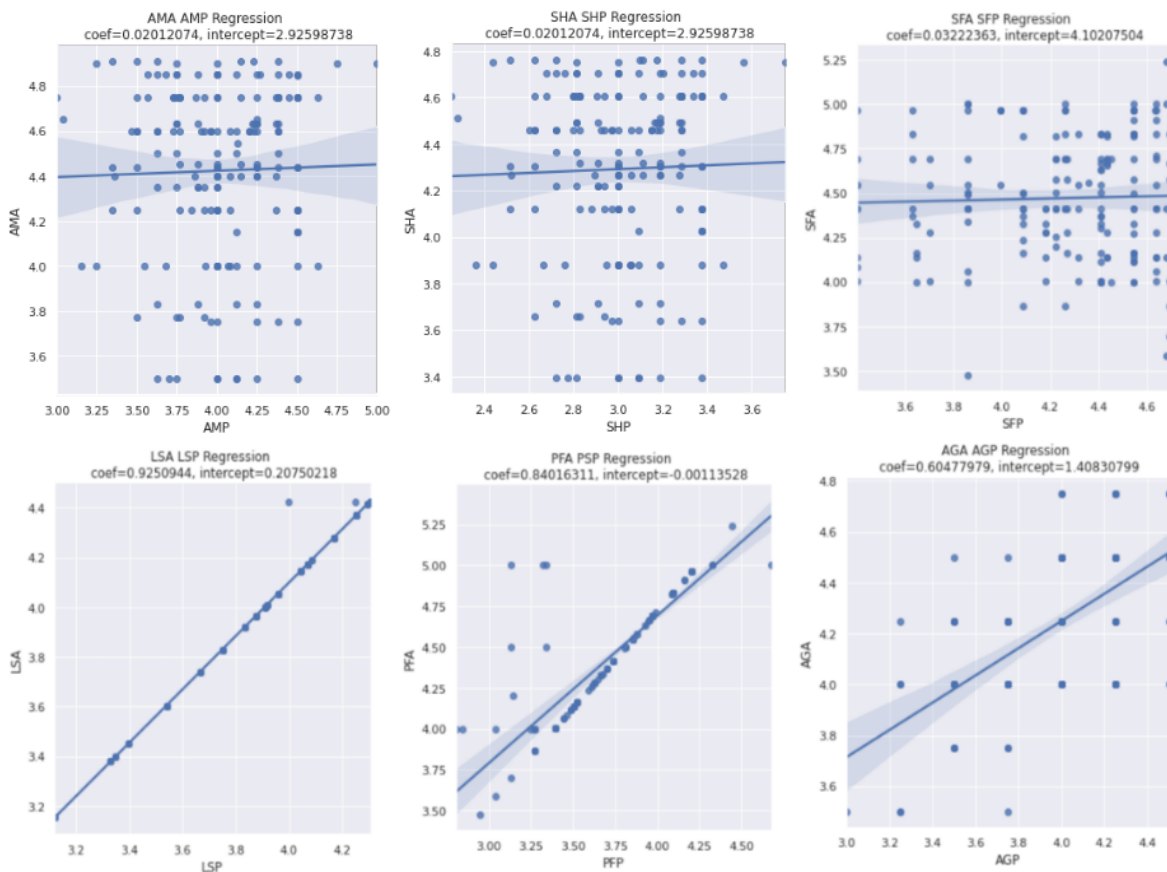
The study purports the links between physics and astronomy through a validated questionnaire. The questionnaire has been utilized in the previous studies [1-3] and have had undergone the validation process. A survey technique causal-comparative research design was used in this study. The samples consisted of 177 BS Astronomy students from RTU who took co-requisite physics and astronomy courses. The instrument used was a researcher-made questionnaire to measure the responses of students on the factors such as study habits, learning styles, professor factors, social factors. This was validated by the different licensed professionals and experts in the field. Moreover, the Attitude Inventory Test and Achievement Motivation Scale was used to determine the links between physics and astronomy attitudes, and physics and astronomy achievement motivation. Also, the links between physics and astronomy grades were explored using their final grades in the courses. Data were processed through regression analysis and correlation to determine the apparent links between physics and astronomy based on the students’ responses.

## **3. Results**

Figure 1 shows the significant responses of the students specifically about SHP which falls among the other criteria. This signifies that students have the least median response in their study habits in physics. Moreover, a higher median response was evident in AMA rather than in AMP which reveals that students are well motivated to study astronomy rather than physics. Also, it reflects that students received mean higher grades in astronomy rather than in physics, and have shown desirable results in PFA rather than in PFP.



**Figure 1.** Mean boxplot of student responses between physics and astronomy.



**Figure 2.** Regression analysis of factors between physics and astronomy (a) AMA and AMP, (b) SHA and SHP, (c) SFA and SFP, (d) LSA and LSP, (e) PFA and PFP, (f) AGA and AGP.

Figure 2 (a) shows the regression analysis of the factors which shows that AMA and AMP have a correlation value of  $r = 0.025700$  which implies a negligible correlation. Also, (b) SHA and SHP show

a negligible correlation of  $r = 0.028621$ , and (c) SFA and SFP have a correlation of  $r = 0.031167$  which all reflects negligible correlation. The students may have different measures of association for physics and astronomy with these factors as they have perceived astronomy and physics as different entities. It reflected different perspectives on their attitudes and motivation, study habits, and social factors.

A significant relationship was established in (d) LSA and LSP, (e) PFA and PFP, and (f) AGA and AGP with correlation values  $r = 0.99740$  very high correlation,  $r = 0.870502$  high correlation, and  $r = 0.568871$  moderate correlation, respectively. With these factors, it shows that students establish connections between physics and astronomy as they see it to as a single criterion to which they treat it as one. Students have the same learning styles in physics and astronomy as it poses the same context of learning, computation, principles, and concepts. Astronomy and physics have different topics and discussion contexts. The similarity between the two discloses problem-solving/computational reinforcement, scientific critical thinking, and both are under the realm of physical science. Additionally, it demonstrates that professor factors in physics and astronomy are identically treated by students. The reflection of responses might have come from the teaching styles of the teachers, as most of the astronomy professors were also physics graduates or with physics backgrounds which reflect having the same teaching styles, and classroom management strategies.

#### 4. Conclusion

The findings of the study appear that students are confident in their study habits in astronomy, their attitudes and motivation in astronomy, and their professors in astronomy. This also confirms that a relationship exists between students' learning styles, professor factors, and their academic grades in physics and astronomy.

This study shows that physics and astronomy have links and differences. While the Philippines is starting to elevate astronomy, it is imperative the fact that physics and astronomy are interrelated with each other. However, researchers foresee that delineation can be seen between physics and astronomy education teaching and learning in the Philippines.

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