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Attributes Of Students Towards Problem Solving In Physics: A Step Towards Students' Capacity Building

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Abstract

Solving problems in Physics is challenging and perceived to be difficult. Thus, the aim of this study is to evaluate the experienced attributes of the students in solving Physics problem sets. All fifty students from different year levels of the College of Education taking Bachelor of Secondary Education major in science participated in the study. A survey questionnaire and a follow-up interview were accomplished to probe more into the result of the survey. Respondents in every year level were given a lecture and problem set in their corresponding physics subjects. The students were asked to accomplish the questionnaire at the end of the week. The result shows there is a higher percentage of females than males in the group. Also, there are more students in their 20th and 21st years of age. Meanwhile, the first-year level dominates the science group. In terms of the attributes, Anxiety and Motivation are largely experienced by the students. Furthermore, overall Confidence and Self-Learning Techniques are moderately experienced by the respondents. In correlation, the age and year-level of the respondents is negatively correlated to Anxiety but are positively correlated with their Confidence, Motivation, and Self-Learning techniques. This implies that the anxiety experienced by the students decreases as they get older and are promoted to the next year's level while building Confidence, Motivation, and Self-Learning techniques.

Keywords: Physics, Problem-Solving, Anxiety, Confidence, Motivation, Self-Learning Techniques

INTRODUCTION

Problem-solving is known as a process to entail the systematic observation and critical reasoning to identify a workable approach or path to the intended outcome. It involves two frameworks which are observation and critical thinking. Senses are utilized in observation to gather data and create an evident decision. Meanwhile, critical thinking involves conceptualization until arriving to a solution (Rahman, 2019).

Physics is a subject that entails a lot of problem-solving. It includes problem sets that require mathematical analysis and solutions (Mibourne & Bennett, 2017). Understanding the universe through mathematical equations is what physics is all about. In fact, this is the reason why Physics is perceived to be one of the most difficult subjects (Sarabi & Gafoor, 2018). In a study conducted in the Philippines shows that test scores in Physics reveal satisfactory results but not outstanding (Edbora, 2016). Also, the PISA result reveals that the Philippines ranked below average in mathematics and science (Department of Education, 2019). This is because students encounter, poor mathematical skills, lack of motivation, and confusion, among others in solving problems according to Reddy and Panacharoensawad (2017). Meanwhile in the part of the teacher, the poor academic performance is revealed in students' perception and schema in Physics. Most of the students negatively perceived the teachers' interest,

teachers' lack of motivation, the importance of physics, and the appropriateness of learning aid in teaching (Dah, 2022).

Although academic performance in Physics is broad and is affected by different factors. Meanwhile, students' attitude plays an important role in learning. Positive attitudes of the students encourage motivation and convey a higher academic performance (Cruz & Cruz, 2022). Furthermore, negative attitudes also lead to a negative influence on the accomplishment of the students (Astalini et al., 2019). In the study of Andomon and Tan (2018), it is evident that the positive attitudes of the grade 7 respondents shows also a high academic performance in math (Andamon & Tan, 2018).

Motivation and Interest. Apart from attitudes, studies show that motivation is important in learning physics because it is linked to interest (Kwarikunda et al., 2020). Motivation also improves academic performance (Adamma et al., 2018). Evidently, the study of Ran (2022) conveys that motivation increases as well with the students' academic performance. Also, poor mathematical analysis and motivation are the key difficulties in dealing with Physics (Adianto & Rusli, 2021). In contrast with motivation, anxiety has a negative impact on the academic performance of students. Specifically, mathematical anxiety is notably higher in senior students than elementary pupils, and usually, the strong negative links appears in problem-solving assessment (Zhang et al., 2019). Meanwhile, mathematical anxiety was known to be an effect of internal and external factors such as family, siblings, self-efficacy, learning culture and environment, and even friends (Prahmana et al., 2019) . However, anxiety was known to be reduced by giving formative assessments (Molin et al., 2019).

Confidence. Students' basic mind-setting patterns comprise ideas and assumptions on abilities, assessment tasks, and a variety of certain other concepts. Many thoughts which arise in students' minds get the ability to influence performance (Moreno et al., 2021). Confidence was shown to be positively connected with academic achievement; however the strength of the association was limited due to inhibition influence exerted by sex differences. Males exhibited worse academic achievement than their female counterparts, whereas they had higher confidence in judging one's individual performance. The findings extend earlier research by investigating the possible influence of confidence on academic achievement. It also illustrates the contrasts and similarities in cognitive and non-cognitive task performance (Tabe, 2019). Also,confidence in problem-solving when students were given the correct answers.

Learning styles. In the study conducted by Valli Jayanthi et al. (2014), there is an association of learning styles with academic performance. It is also proven by Gokalp (2013 that learning styles of the students improved their scores and thus, the students studied effectively. Furthermore, Anderson (2016) states that finding the preferred learning style will help the students to optimize their learning chances. Learning styles also aid pupils in understanding their learning type benefits and areas for improvement. On the part of the teacher, identified learning styles can be used in discovering other aligned activities that can be done in a classroom.

While most studies focus on the difficulties in mathematics and Physics, the attributes of the students in solving problems in Physics have not yet been studied. Thus, this research examines the attributes of the students in solving physics problems with the purpose of developing a capacity building of the students in the various physics fields as stipulated in figure 1.

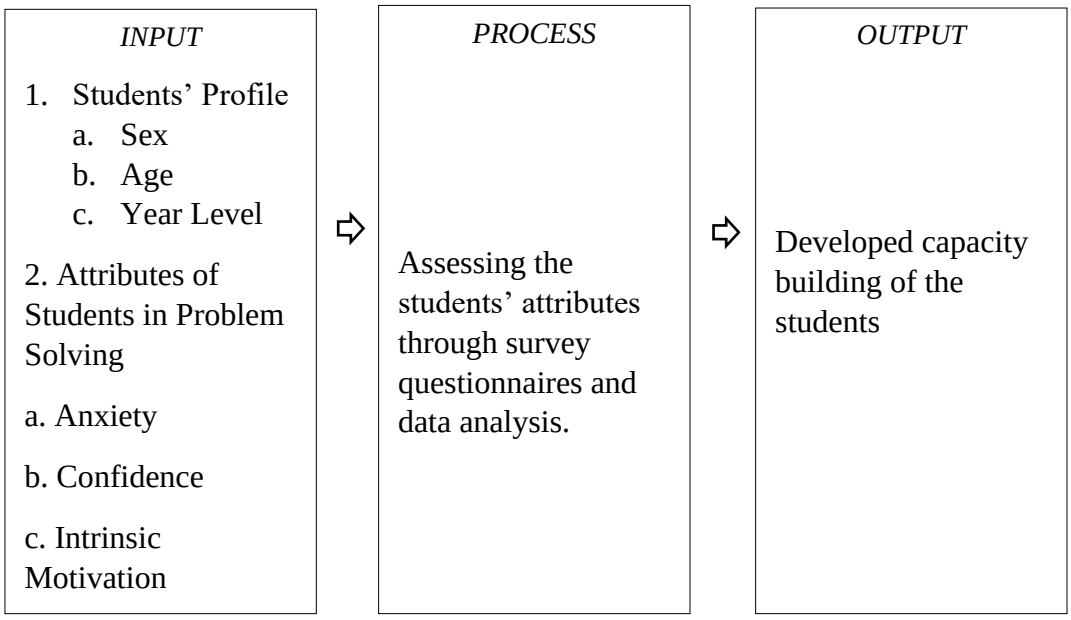

Figure 1. Paradigm of the study

OBJECTIVES OF THE STUDY

The main objective of the study is to evaluate the attributes of the students in problem-solving in Physics as a basis for an intervention activity plan. Specifically, it aims to 1) determine the demographic profile of the students in terms of Sex, Age, and Year level; 2) determine the attributes of the respondents in solving the problem in physics;3) determine the significant relationship of each students' problem-solving attributes with age and year level; 4) develop a students' development plan.

HYPOTHESIS OF THE STUDY

1. There is no significant relationship between students' problem-solving attributes with age and year level.

METHODOLOGY

This study uses descriptive and correlational methods and qualitative methods of research. The descriptive method is a process of learning and giving pertinent information about existing situations. Information with respect to the variables was collected using a descriptive design. Also, the qualitative part served as triangulation with the answers of the respondents in the survey questionnaire.

The research is conducted at Ifugao State University – Potia Campus, College of Education. The respondents of the study are the students at the College of Education, specifically, those who are taking up a Bachelor in Secondary Education (BSED) major in Science course. Considering the deviation in the number of students, all the BSED Science students were chosen as respondents in this study. Thus, the total enumeration technique of the universal sampling method was used.

The research questionnaire was adopted from the study of Giannoulas and Stampoltzis (2021). Originally, the research instrument was intended for mathematics hence, this study repurposed the questionnaire to be aligned with Physics. Part A of the instrument determines the demographic profile of the respondents. Also, Part B determines the attributes experienced by the students in solving physics. Prior to the final crafting of questionnaires, pilot testing was administered then the questionnaire's internal consistency was checked using Cronbach alpha and found to be at the acceptable level (above .70)

The researcher prepared a draft of the questionnaire based on the purpose of the study.

The questionnaire was validated by the experts. Final corrections and suggestions from the experts were incorporated before the reproduction of the final copy.

The study was subjected to certain ethical issues. Prior to the conduct of the study, a request letter was given to the College Dean and Campus Executive Director where the study was conducted. Participants were informed about the objectives of this study and reassured that their identity would be confidential and that the result will be used only for academic purposes. More importantly, informed consent was obtained from all the participants, this is meant for clinical studies only.

Then upon approval, respondents were categorized according to their year level. Respondents in every year level were given a lecture and problem set in their corresponding physics subjects for two weeks as shown in Table 1. The students were asked to accomplish the questionnaire at the end of the week.

Table 1. List of Physics subjects per year level in the College of Education (2nd Semester)

Course and Year	Subject
1st Year	Fluid Mechanics
2nd Year	Electricity and Magnetism
3rd Year	Modern Physics
4th Year	Course Audit (Physics)

After administering the survey questionnaire, the researcher retrieved the questionnaire. Further, from the accomplished questionnaires, the data were tallied, classified, organized, and presented in a tabular form to facilitate in-depth analysis and interpretation of data. For the qualitative part, a sample of students from the different year levels was invited to participate in the face-to-face/ interview session or any zoom conference by the researcher. The discussion was held at the assigned venue/ link for approximately less than one (1) hour. A semi-structured interview was done to probe, clarify and confirm responses from the questionnaire. Responses were recorded, transcribed, translated then thematized. For the quantitative part, results were interpreted using the rating scale below:

Range	Adjectival Interpretation
4.21 - 5.00	- Very Largely Experienced
3.41 – 4.20	- Largely experienced
2.61 – 3.40	-Moderately Experienced
1.81 – 2.60	- Low experienced
1.00 – 1.80	- Not experienced

For statistical analysis, objectives 1&2 utilized the frequency and percentage distribution. Meanwhile, an independent T-Test was used in objective 3. Also, in problem 4 ANOVA was utilized.

RESULTS AND DISCUSSION

I. The demographic profile of the respondents

Sex. Figure 1 presents the percentage of science students when grouped according to Sex. From the figure, 34.0% were male while 66.0% are female. This comprises the total population of the BSED Science students from the first year to the fourth year. From the given data, this implies that females are more prominent in taking up BSED Science Education than males.

OECD Education and Skills Today (2017) explains that there are more women who want to become a teacher due to gender imbalance where women need to participate in the labor market. Moreover, teaching as a vocation (calling) associated with the virtues of caring, giving, and assisting has also been shown to be highly helpful. These are behaviors associated with female habitus throughout the early phases of socialization (Tašner, et al. 2017).

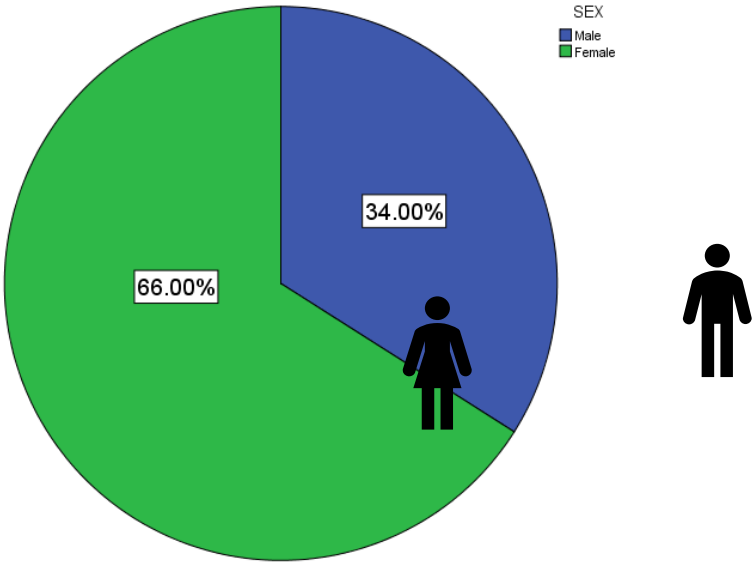

Figure 2. Percentage of BSEd Science when Grouped According to Sex

Age. Table 2 presents the frequency and percentage of the age of students taking Bachelor in Secondary Education major in science. Students with 20 years of age have the highest frequency (24%) followed by 21 years old students (20%) and then 19 years old students with 14% frequency. Next, 22- and 18-year students have the same frequency of 12 percent followed by 23, 25-, and 26-years old students with 10,6, and 2 percent of the frequency, respectively. Meanwhile, no students have 24 years of age. Results imply that there are more students in Science Education who are in their 20th and 21st (Mean = 20.78±1.97).

Table 2. Frequency distribution of BSED science students in terms of age

Age	Frequency	Percent	Cumulative Percent
18	6	12.0	12.0
19	7	14.0	26.0
20	12	24.0	50.0
21	10	20.0	70.0
22	6	12.0	82.0
23	5	10.0	92.0
25	3	6.0	98.0
26	1	2.0	100.0

Total	50	100.0

Year Level. Figure 2 presents the distribution of BSED Science students in terms of their year level. Data shows that First Year has the highest population (34%) and then the second year (30%) followed by the fourth-year students (22%). The year level with the least population is the third-year students (14%). The highest population is the first-year level while the fourth year has the lowest population.

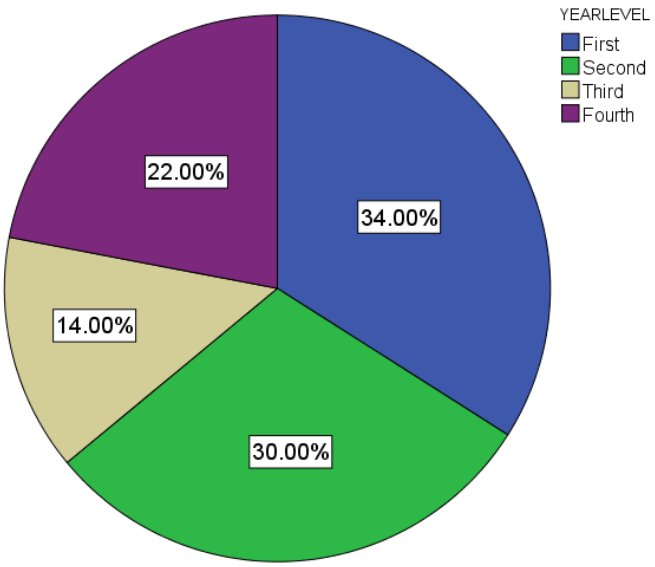

Figure 3. Percentage Distribution of BSED Science in Terms of Year Level

II. Attributes of the students in solving-problems in Physics

Anxiety. Table 3 shows that overall students are largely experiencing anxiety towards problem-solving in physics (x=3.42 ±.73). This means that students largely experience anxiety. Moreover, the indicators confirmed that students commonly experience anxiety where "I get very anxious when my instructors have Physics lectures on solving problems" was the most Largely experienced attribute (x = 32.64). In contrast, the "I often feel that it will be tough for me to be present at any Physics quizzes that involve calculations" indicator was the least moderately experienced attribute of the respondents (x=3.14).

Table 3. Experienced anxiety towards problem-solving in physics.

Anxiety Indicators	Mean	SD	Qualitative Description
1. I feel to have difficulty understanding concepts related to Physics specifically problem-solving.	3.36	.83	Moderately Experienced
2. I feel uneasy about calculating problems in Physics.	3.40	.86	Moderately Experienced
3. I get very anxious when my instructors have Physics lectures on solving problems.	3.64	.94	Largely experienced

4. I often feel that it will be tough for me to be present at any Physics quizzes that involve calculations.	3.14	1.05	Moderately Experienced
5. I often feel that I am helpless when I try to solve problems in Physics	3.52	.99	Largely experienced
6. Solving problems in Physics makes me feel uneasy and confused.	3.48	1.05	Largely experienced
7. When I learn something new in Physics, I am afraid that something I do not understand will appear in the problem-solving.	3.50	.91	Largely experienced
ANXIETY	3.42	.73	Largely experienced

The result implies that anxiety is one of the most students are commonly experiencing anxiety when solving problems in Physics. When the students were asked about the reasons for their anxieties, themes came out such as Time Constraints and Lesson Unpreparedness.

Time Constraints. Students feel that their time is not enough in answering the problem- solving. Often, the limited time makes them feel worried that they may not finish the problem set in the given period. Student Rose states,

" I think my time is not enough in solving the problems. I always look at the clock."

Meanwhile, Student Dhalia agrees,

"My time is not enough in answering the problem. That makes me feel anxious".

Lesson Unpreparedness. Preparedness in problem-solving is necessary. Students agree that unpreparedness makes their anxiety be triggered. Student Daisy declares,

"I don't recall the formula because I didn't review my lesson."

Also, Student Mark recalls,

"I feel worried that my answers might be wrong because I don't know the concept."

As one of the attributes, anxiety is one of the problems experienced by the students. Results imply that anxiety are suffered by the students specifically in solving problems in Physics. Moreover, according to studies Physics anxiety is correlated with the vocabulary utilized in Physics. Moreover, anxiety is believed to have contributed to solving mathematical problems simultaneously. Meanwhile, the feeling of anxiety of students could have negative side effects as they graduate such that it has an impact on self-efficacy and preparedness.

Confidence. Table 4 shows that overall students moderately experienced confidence in problem-solving in physics (x=2.73±54). Furthermore, respondents moderately experienced confidence in getting good scores after solving problems in physics (x=2.88) while having confidence in solving problems in Physics was rarely experienced (x=2.50). Meanwhile, all other indicators are moderately experienced by the students.

Table 4. Students' expereince of confidence in solving Physics problems.

Confidence Indicators	Mean	SD	Qualitative Description
1. I learn problem-solving Physics quickly.	2.7	.89	Moderately Experienced
2. I feel confident when I solve the problems in Physics.	2.50	.97	Rarely experienced

3. I can get a good score after solving the problems in physics.	2.88	.77	Moderately Experienced
4. I feel that my answers are correct after solving the problems.	2.86	1.09	Moderately Experienced
5. I usually feel at ease doing Physics problems.	2.70	.91	Moderately Experienced
CONFIDENCE	2.73	.54	Moderately Experienced

The result reveals that the students taking physics subjects seldom have confidence in solving problems in Physics. The students were asked why their confidence is quite moderately experienced, single theme arise from their response which is Lack of Mastery.

Lack of Mastery. Students' lack of mastery in the concept arises as one culprit in lowering the confidence of the students in problem-solving. Respondents believe that their confidence was affected by their conceptual knowledge regarding the subject.

Student Luke simply confirmed, " I don't feel confident because simply I do not have the idea." Student Anthurium also replied, " Comprehension of the problem set is difficult that makes me uncomfortable".

This implies that mastery of the subject causes the student to lose confidence in solving the problems. Studies show that confidence makes students more courageous and is correlated with motivation (Afjar and Syukri, 2020). It is known that high level of confidence in learning improves mastery in academics (Jufrida et al., 2019). Moreover, collaborative problem-based learning physics improves the learning confidence of students (Prahani et al., 2018).

Motivation. Table 5 presents the motivations as experienced by the students in solving the problem in Physics. Results show that the "I can solve problems if I believe in myself" indicator was the most largely experienced attribute by the students (x=3.74). Moreover, the students' motivation in achieving the final answers they follow the instruction was the lowest (x=3.40). The result implies that intrinsic motivation was largely experienced by the students as an attribute in solving problem-solving in physics. Motivation plays a role in the academic performance of students in physics. In fact, intrinsic motivation has been shown to predict the academic achievements of students in Physics (Gana et al., 2019) and mathematics (Yarin et al., 2022). Also, the students' motivation to practice a lot is necessary to improve problem-solving skills.

Table 5. Experienced extrinsic motivation of the students in solving Physics problems.

Motivation Indicators	Mean	SD	Qualitative Description

1. I can achieve the final answers if I follow the instruction.	3.40	.88	Moderately Experienced
2. I can solve problems if I believe in myself.	3.68	.98	Largely experienced
3. I can improve my problem-solving skills if I practice a lot.	3.74	.85	Largely experienced
4. I can solve problem if I listen and attend lectures.	3.63	.87	Largely Experienced
5. I can master the techniques in problem-solving if I use some educational technology tools (YouTube, Simulations, etc.)	3.70	.80	Largely Experienced
Intrinsic Motivation	3.60	.72	Largely experienced

When the students were asked about the reasons why they have large experience in motivation, most of their answers fall under extrinsic rather than intrinsic motivation. For extrinsic motivation, students believe that they wanted to learn physics and its art on problem-solving due to Family expectations. Their family expects that they will finish the course in the given study period. For the students, the family gives them the motivation to learn. Maria replied,
"My father wants me to finish the degree in 4 years and graduate on time. No incomplete or failing grade."
In terms of intrinsic motivation, students are motivated to solve problems in physics because they simply believe they could do it if they did their best and studied hard. Academic Pursuance leads them to venture on different platforms to learn apart from the discussion of the teacher.

Prada states, "Prior to the quiz, I know that I can solve the problem because I watch the recorded discussion again and again."

Also, Rose believes, "The problem given was very hard but I know I can solve it because it was given as an example by the teacher."

Self-Learning Techniques. Table 6 shows the experienced learning techniques of the students as an attribute in solving problems in Physics. The most largely experienced indicator (x=3.52) is "when presented with a Physics task that I cannot immediately complete, I increase my efforts". Also, "I give up when I don't immediately find a solution to a Physics problem" was the least moderately experienced indicator in terms of students' approach (x=2.72). Overall, the students moderately experienced the indicators in terms of their learning techniques in Physics (x=3.24).

Table 6. Self-Learning Techniques experienced by the students in solving physics problems.

Self-Learning Techniques Indicators	Mean	SD	Qualitative Description
1. When given a problem solving, I recall the steps presented by the teacher to arrive at the correct answer.	3.50	.80	Largely Experienced

2. When presented with a Physics task that I cannot immediately complete, I increase my efforts.	3.52	.84	Largely Experienced
3. When presented with a Physics task that I cannot immediately complete, I change strategy.	3.22	.82	Moderately Experienced
4. I give up when I don't immediately find a solution to a Physics problem.	2.72	1.14	Moderately Experienced
Approach	3.24	.601	Moderately Experienced

The students were asked why increasing their effort and recalling teacher's process in arriving with solution was largely experienced learning techniques. Their answers focuses on perseverance.

Perseverance. This means that students mostly increase their efforts to achieve the challenging tasks in Physics while giving up is the least of their options. Zeny replied,

" I am aware that if I study hard and focuses on the teacher's discussion, I will get good score during quizzes."

Also, Mary agreed,

" My favorite motto is "Increased effort is a Doubled gain". I do not give up until I arrived to what I think is the best answer."

Also, students' learning technique was moderately experienced as attributes in problem-solving in Physics. This indicates that perseverance to learn is common among the students. According to the study by Wolters and Hussain (2014), perseverance predicts the academic achievement of the students and also reduces stress (Lee. 2017).

III. Relationship of students' attributes and year level

Table 7 presents the significant relationship of the attributes towards each other including year level. Results show that Age has a highly significant positive relationship with Confidence ($r=.426$, $p<0.01$), Intrinsic Motivation ($r=.470$, $p<0.01$), and a significant relationship with Learning Techniques ($r=.346$, $p<0.05$) while Anxiety ($r=-.284<0.05$) has a negative relationship. Furthermore, Year Level has a highly significant positive relationship with Intrinsic Motivation ($r=.357$, $p<0.01$), a significant positive relationship with Confidence ($r=.357$, $p<0.05$), and Learning Techniques ($r=.353$, $p<0.05$) and a significant negative relationship with Anxiety ($r=-.284$, $p<0.05$). Also, there is a highly significant positive correlation between Age and Year Level ($r=.904$, $p<0.001$). Meanwhile, no significant relationship is noted between each attribute.

The result implies that as the students proceed to a higher year level and grow older with their age, students experience an increase in their confidence, intrinsic motivation, and learning techniques while having a lower experience of anxiety. This can be explained by the fact that students learning in Physics is improved as they proceed to the higher year level and as they mature. In support, more mature students are more creative in mathematics, and grade level affects academic performance and creativity in mathematics. Also, logical thinking in mathematics progresses with age.

Table 7. Relationship of the demographic profile and attributes of the students.

		Anxiety	Confidence	Motivation	Self-Learning Techniques	Age
Confidence	Pearson Correlation	-.047	1			

	Sig. (2-tailed)	.746				
Intrinsic	Pearson Correlation	-.203	.205	1		
Motivation	Sig. (2-tailed)	.157	.153			
Learning	Pearson Correlation	-.144	.197	.157	1	
Techniques	Sig. (2-tailed)	.318	.171	.276		
AGE	Pearson Correlation	**-.284***	**.426****	**.470****	**.346***	1
	Sig. (2-tailed)	.046	.002	.001	.014	
	Pearson Correlation	**-.318***	**.357***	**.566****	**.353***	**.904****
YEAR LEVEL	Sig. (2-tailed)	.025	.011	.000	.012	.000

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

CONCLUSION

The aim of the study is to evaluate the attributes of the students in solving physics. The findings show that there are more females than men in the group. There are also more students in their 20s and 21st years. Meanwhile, the scientific group is dominated by first-year students. In terms of characteristics, students are mostly affected by anxiety and motivation. Furthermore, responders have a modest level of general confidence and self-learning techniques. In terms of correlation, the respondents' age and year level are negatively connected with Anxiety but favorably correlated with their Confidence, Motivation, and Self-Learning approaches. This means that students' anxiety diminishes as they become older and are promoted to the following year's level while developing Confidence, Motivation, and Self-Learning skills.

DECLARATION OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

REFERENCES

1. Adamma, O. N., Ekwutosim, O. P., & Unamba, E. C. (2018). Influence of Extrinsic and Intrinsic Motivation on Pupils Academic Performance in Mathematics. SJME (Supremum Journal of Mathematics Education), 2(2), 52–59. https://doi.org/10.35706/sjme.v2i2.1322
2. Adianto, T., & Rusli, M. A. (2021). Analysis of Student's Difficulties in Solving Physics Problem: Impulse and Momentum Topics. Unnes Science Education Journal, 10(1), 24-33.
3. Afjar, A. M., & Syukri, M. (2020, February). Attention, relevance, confidence, satisfaction (ARCS) model on students' motivation and learning outcomes in learning physics. In Journal of Physics: Conference Series (Vol. 1460, No. 1, p. 012119). IOP Publishing.
4. AlKandari, N. Y. (2020). Students anxiety experiences in higher education institutions. In Anxiety Disorders-The New Achievements. IntechOpen.
5. Andamon, J. C., & Tan, D. A. (2018). Conceptual understanding, attitude and performance in mathematics of grade 7 students. International Journal of Scientific & Technology Research, 7(8), 96-105.
6. Anderson, I. (2016). Identifying different learning styles to enhance the learning experience. Nursing Standard, 31(7).
7. Astalini, A., Kurniawan, D. A., Sari, D. K., & Kurniawan, W. (2019).

Description of Scientific Normality, Attitudes of Investigation and Interested Career On Physics in Senior High School. JIPF (Jurnal Ilmu Pendidikan Fisika), 4(2), 56. https://doi.org/10.26737/jipf.v4i2.885

8. Cruz, D. T. L. D., & Cruz, D. D. D. (2022). Teaching Behaviors, Students'learning Attitudes And Academic Performance: Basis For An Action Plan. Journal Of Positive School Psychology, 419-431.
9. Dah, M. (2022). Students' Perception of Their Physics Teachers' Classroom Practices. Asian Journal of Research and Reviews in Physics, 16–24. https://doi.org/10.9734/ajr2p/2022/v6i230180
10. Department of Education. (2019). Statement on the Philippines' ranking in the 2018 PISA results. Retrieved August 2, 2022, from https://www.deped.gov.ph/2019/12/04/statement-on-the-philippines-ranking-in-the-2018-pisa-results/
11. Ebora, A. (2016). Academic performance in physics of fourth year high school students in one public high school in Batangas City, Philippines. Asia Pacific Journal of Education, Arts and Sciences, 3(3), 36-40.
12. Erdem, E.D., & Soylu, Y.E. (2017). Age- and Gender-Related Change in Mathematical Reasoning Ability and Some Educational Suggestions. Journal of Education and Practice, 8, 116-127.
13. Gana, C. S., Christian, S. U., & Terpase, A. A. (2019). Students' psychological predictors of academic achievement in physics.
14. Gokalp, M. (2013). The effect of students' learning styles to their academic success. Creative education, 4(10), 627.
15. Haavold, P. Y. (2018). An Investigation of the Relationship between Age, Achievement, and Creativity in Mathematics. The Journal of Creative Behavior, 54(3), 555–566. https://doi.org/10.1002/jocb.390
16. Irhamna, I., Amry, Z., & Syahputra, H. (2020). Contribution of mathematical anxiety, learning motivation and self-confidence to student's mathematical problem solving. Budapest International Research and Critics in Linguistics and Education (BirLE) Journal, 3(4), 1759-1772.
17. Jufrida, J., Kurniawan, W., Astalini, A., Darmaji, D., Kurniawan, D. A., & Maya, W. A. (2019). Students' Attitude and Motivation in Mathematical Physics. International Journal of Evaluation and Research in Education, 8(3), 401-408.
18. Kwarikunda, D., Schiefele, U., Ssenyonga, J., & Muwonge, C. M. (2020). The Relationship between Motivation for, and Interest in, Learning Physics among Lower Secondary School Students in Uganda. African Journal of Research in Mathematics, Science and Technology Education, 24(3), 435–446. https://doi.org/10.1080/18117295.2020.1841961
19. Lee, S., Choi, Y. I., & Kim, S. W. (2021). Roles of emotions induced by immediate feedback in a physics problem-solving activity. International Journal of Science Education, 43(10), 1525–1553. https://doi.org/10.1080/09500693.2021.1922778
20. Lee, W. W. S. (2017, September 5). Relationships among grit, academic performance, perceived academic failure, and stress in associate degree students. Journal of Adolescence, 60(1), 148–152. https://doi.org/10.1016/j.adolescence.2017.08.006
21. Liu, T. (2019). Learning Difficulties in Theoretical Physics and Teaching

Reform Strategies. Modern Applied Science, 13(11), 97-102.

22. Martin, R. D., & Naziruddin, Z. (2020). Systematic review of student anxiety and performance during objective structured clinical examinations. Currents in Pharmacy Teaching and Learning, 12(12), 1491-1497.
23. Milbourne, J., & Bennett, J. (2017). Research Projects in Physics: A Mechanism for Teaching Ill-Structured Problem Solving. The Physics Teacher, 55(7), 418–421. https://doi.org/10.1119/1.5003743
24. Molin, F., Cabus, S., Haelermans, C., & Groot, W. (2019). Toward Reducing Anxiety and Increasing Performance in Physics Education: Evidence from a Randomized Experiment. Research in Science Education, 51(S1), 233–249. https://doi.org/10.1007/s11165-019-9845-9
25. Moreno, L., Briñol, P., & Petty, R. E. (2021). Metacognitive Confidence Can Increase but Also Decrease Performance in Academic Settings. Metacognition and Learning, 17(1), 139–165. https://doi.org/10.1007/s11409-021-09270-y
26. Prahani, B. K., Suprapto, N., Lestari, N. A., Jauhariyah, M. N. R., Admoko, S., & Wahyuni, S. (2018, March). The effectiveness of collaborative problem based physics learning (CPBPL) model to improve student's self-confidence on physics learning. In Journal of Physics: Conference Series (Vol. 997, No. 1, p. 012008). IOP Publishing.
27. Prahmana, R. C. I., Sutanti, T., Wibawa, A. P., & Diponegoro, A. M. (2019). Mathematical anxiety among engineering students. Infinity Journal, 8(2), 179-188.
28. Rahman, M. (2019). 21st century skill'problem solving': Defining the concept. Rahman, MM (2019). 21st Century Skill "Problem Solving": Defining the Concept. Asian Journal of Interdisciplinary Research, 2(1), 64-74.
29. Ran, Y. (2022). The Influence of Smartphone Addiction, Personality Traits, Achievement Motivation on Problem-solving Ability of University Students. Journal of Psychology and Behavior Studies, 2(1), 05–16. https://doi.org/10.32996/jpbs.2022.2.1
30. Reddy, M., & Panacharoensawad, B. (2017). Students Problem-Solving Difficulties and Implications in Physics: An Empirical Study on Influencing Factors. Journal of Education and Practice, 8(14), 59-62.
31. Sarabi, M. K., & Gafoor, K. A. (2018). Student Perception on Nature of Subjects: Impact on Difficulties in Learning High School Physics, Chemistry and Biology. Online Submission, 8(1), 42-55.
32. Tabe, A. (2019). Confidence as a Predictor of Academic Success (Doctoral dissertation).
33. Taibu, R., & Ferrari-Bridgers, F. (2020). Physics language anxiety among students in introductory physics course. EURASIA Journal of Mathematics, Science and Technology Education, 16(4), em1835
34. Valli Jayanthi, S., Balakrishnan, S., Lim Siok Ching, A., Aaqilah Abdul Latiff, N., & Nasirudeen, A. (2014). Factors Contributing to Academic Performance of Students in a Tertiary Institution in Singapore. American Journal of Educational Research, 2(9), 752–758. https://doi.org/10.12691/education-2-9-8
35. Wolters, C. A., & Hussain, M. (2014, November 18). Investigating grit and its relations with college students' self-regulated learning and academic achievement. Metacognition and Learning, 10(3), 293–311.

https://doi.org/10.1007/s11409-014-9128-9

36. Yarin, A. J., Encalada, I. A., Elias, J. W., Surichaqui, A. A., Sulca, R. E., & Pozo, F. (2022). Relationship between Motivation and Academic Performance in Peruvian Undergraduate Students in the Subject Mathematics. Education Research International, 2022.
37. Zhang, J., Zhao, N., & Kong, Q. P. (2019). The relationship between math anxiety and math performance: A meta-analytic investigation. Frontiers in psychology, 10, 1613.