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Interest and Academic Performance in Physics of Grade 10 Students amidst Pandemic

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ABSTRAK

Minat siswa sangat penting dalam prestasi akademis mereka dalam Fisika. Namun, karena pandemi, minat dan hasil kinerja mereka masih sangat rendah. Oleh karena itu, penelitian ini menganalisis minat dan prestasi akademik siswa kelas 10 fisika dan dibandingkan dengan jenis kelamin. Penelitian ini juga bertujuan untuk menyelidiki perbedaan yang signifikan dalam minat dan prestasi akademis mereka ketika dikelompokkan berdasarkan jenis kelamin. Penelitian ini menggunakan desain penelitian kuantitatif dengan pendekatan deskriptif, komparatif, dan korelasional. Subjek penelitian yaitu 108 siswa Fisika Kelas 10 yang ditentukan menggunakan convenience sampling. Metode pengumpulan data menggunakan kuesioner dan tes. Instrumen pengumpulan data berupa lembar kusioner dan soal tes. Dalam analisis data, alat statistik yang digunakan adalah mean, standar deviasi, Uji Mann Whitney U, dan Korelasi Rank Spearman. Hasil penelitian menunjukan umumnya siswa cukup tertarik pada Fisika dan tidak memenuhi harapan dalam prestasi akademisnya. Sementara itu, tidak ada perbedaan minat dan prestasi akademik mereka jika dikelompokkan berdasarkan jenis kelamin. Namun, ada hubungan yang signifikan antara minat dan prestasi akademik mereka. Mengingat hasilnya, perbaikan terus-menerus dalam penyampaian konten, strategi, dan penilaian pengajaran diperlukan untuk memastikan minat dan kinerja akademik siswa.

ABSTRACT

Students' interest is significant in their academic performance in Physics. However, due to the pandemic, their interest and performance results still need to be higher. Therefore, this study analyzed the interests and academic achievements of 10th-grade physics students and compared them by gender. This study also investigates significant differences in their academic interests and achievements when grouped by gender. This research uses a quantitative design with a descriptive, comparative, and correlational approach. The research subjects were 108 Class 10 Physics students determined using convenience sampling. Data collection methods use questionnaires and tests. The data collection instruments are questionnaire sheets and test questions. The statistical tools used in data analysis are mean, standard deviation, Mann-Whitney U Test, and Spearman Rank Correlation. The research results show that students are generally interested in physics and do not meet expectations in terms of academic achievement. Meanwhile, there is no difference in their academic interests and achievements when grouped by gender. However, there is a significant relationship between their interests and academic performance. Given the results, continuous improvement in content delivery, teaching strategies, and assessments is necessary to ensure student interest and academic performance.

1. INTRODUCTION

Students' interest is vital in their learning of Physics (Kwarikunda et al., 2020; Rohaeti et al., 2019). When they are interested, they can actively engage towards deeper understanding of the broad and complex principles, terminologies, and approaches of the discipline (Gunawan et al., 2018; Maison et al., 2020). It can also increase their personal and situational grasps of the various phenomena associated with physics learning (Gesú & González, 2020; Gunawan et al., 2018). Additionally, their inclination towards the subject can elicit their analytical mind in conducting investigatory exercises and increases their ability towards solving problems (Gunawan et al., 2018). Besides, their disposition in Physics can result to the improvement of inquiry-based learning which is necessary in the understanding of higher concepts (Fazio et al., 2021; Stefan & Ciomoş, 2010). Also, their interest can establish their habits of mind which include critical thinking and self-regulation which are essential in the successful pursuit of Physics learning (Susilowati et al., 2019). Lastly, it does not only develop their attitude towards the subject but also their academic performance which is a reliable indicator of their academic success (Azhary et al., 2020).

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Meanwhile, the students' academic performance is vital to measure their acquisition of knowledge, skills, and competencies in Physics (Keller et al., 2017; Kwarikunda et al., 2020). With their high performance in academics, it reflects their higher degree of precision and accuracy in confronting various scientific problems with analytical and logical mind (Cleveland et al., 2017; Suana et al., 2020). Also, it manifests their development and acquisition of higher order thinking skills which are critical towards inquiry based learning like Physics (Abaniel, 2017). This also provides them the confidence to delve on numerical calculations which is the nature of the discipline (Abaniel, 2017; Ebora, 2016). Not to mention, this subject indicates the students' mastery of the subject despite its broad and complex ideas and principles (Keller et al., 2017). In the Philippines, the Department of Education included in the curriculum the Physics education for Grade 10. This subject aims to develop among the learners analytical and critical mind to establish an in-depth grasp of the basic principles, laws, and concepts like motion, heat, thermodynamics etc. to solve problems and explain phenomena. However, there are factors that affect the poor interest and academic performance of Filipino students. Undeniably, most students perceive this subject to be difficult given its complex nature comprising of broad concepts, idea, approaches, terminologies, and principles (Corpuz, 2017). It also concerns investigatory and inquiry-based processes which elicit the students' critical and analytical engagement where most find these difficult to comprehend (Brown & Green, 2019). Also, they cannot escape from the complex numerical calculations (Brown & Green, 2019; Diate & Mordeno, 2021). Also. One factor that most perceive to impede the continuity of learning is the spiral progression where topics in Physics are chunked in grade levels (Resurreccion & Adanza, 2015). Not to mention, the pandemic instructional modality which abruptly shifted from conventional face to face to online-modular teaching and learning which most students and teachers were not prepared (Beboso & Bual, 2022; Garcia & Bual, 2022; Margario et al., 2022).

In private schools in Central Philippines, most students in Physics find it difficult to deal with the new teaching modality during this pandemic (Agayon et al., 2022). Most have already find it hard to deal with Physics instruction in the actual set-up how much more in the online-modular teaching and learning where most are at the mercy of the availability of gadgets, connectivity, and the teachers' actual instructions (Agayon et al., 2022; Cuaton, 2020). Not to mention, most were not designed on how to effectively utilize modules for Physics instructions which also jeopardized the reliability of their content acquisition and assessments (Bernardo, 2020). With this new normal instructional set-up, the teaching and learning of the investigatory, calculative, and inquiry-based processes are put to question among these learners (Rotas & Cahapay, 2020). Hence, their interest and academic performance are also compromised (Reyes, 2019). Several studies were conducted globally on students' interest towards Physics learning on the influence of scientists' struggles to the students' interest in Physics, (Hong & Lin-Siegler, 2012), on using experiment activities to stimulate the learners' interest in Physics (Nugroho, 2020), and on cultivating the students' interest in Physics (Djudin, 2018). In Philippines, other research studied on the students' attitude and motivation in learning Physics (Guido, 2018). In academic performance, the academic performance of public school students' in Physic (Ebora, 2016). Dealt on gamification to improve the students' performance in Physics (Roleda, 2018). The students' performance towards Physics in a process-oriented guided inquiry learning, and on using virtual laboratory materials to improve the students' performance in Physics (Bug-os & Caro, 2019; Sabasales, 2018). Given the available studies, there may be various studies on both students' interest and academic performance in Physics but there is a dearth of literature on the correlation of these two constructs especially in Philippine private schools. This is the gap that this study would like to fill in.

Thus, this study assessed the interest of grade 10 students in physics in small schools division in Central Philippines during 2021-2022 when they were taken as a whole and grouped according to sex. Also, it determined their academic performance in the subject. Likewise, it investigated the difference in their interest and academic performance when grouped according to sex. Additionally, it correlated the two variables. The findings may serve as an empirical basis in formulating the proposed instructional materials for the improvement of the physics instruction among private schools. The study theoretically assumed that the students' interest influences their academic performance in Physics. This assumption was anchored on the engagement theory by (Kearsley & Shneiderman, 1999). This theory perceives that when learners engage intellectually, socially, and behaviorally, it can result to their learning enhancement. Elaboratively, it presents the idea that when the students find their tasks meaningful, they will exert interest which shall result to both their active engagement and high performance outcomes. In this study, this theory has something to do with the association of the students' interest towards their academic performance in Physics. Meaning, when they show high levels of interest in Physics, it will result to their higher academic outcomes. Therefore, this study analyzed the interests and academic achievements of 10th-grade physics students and compared them by gender.

2. METHODS

The study utilized the quantitative research design particularly the descriptive, comparative, and correlational approach. The descriptive approach determined the interest and academic performance of students in physics. Meanwhile, the comparative approach compared their interest and academic performance when grouped to sex. The correlational approach investigated the relationship between these two variables. The respondents were the 108 grade 10 students in Physics in small schools division in Central Philippines which were determined using convenience sampling. In assessing the students' interest in physics, a 25- item standardized questionnaire from (Sjøberg & Schreiner, 2005) was employed. Since this questionnaire was already validated, it was subjected to pilot testing to check the fitness of the items in the Philippine context and yielded a reliable Cronbach's Alpha score of 0.91. It was responded using the scale: not interested, fairly interested, interested, and very interested. In academic performance, a validated and reliability tested 46 item researcher-made multiple choice test questionnaire was utilized. It was subjected to the validation and yielded a valid score of 4.89. It was also pilot tested and yielded a reliable score of 0.82 using Kuder-Richardson (KR-20). Their academic performance was interpreted using the scale: did not meet expectations, fairly satisfactory, satisfactory, very satisfactory, and outstanding. In data analysis, the descriptive, comparative, and correlational analyses were employed. The statistical tools used to analyze the descriptive problems were mean and standard deviation. Meanwhile, the Kolmogorov-Smirnov was used to test the normality. The test result for interest [KS=0.080, p=0.082] yielded normal distribution. The test result for academic performance [KS=0.095, p=0.018] yielded not normal distribution. Hence, the use of Mann Whitney U test to compare the interest and academic performance when grouped to sex. Regarding the correlation, Spearman Rank Correlation was employed to analyze the relationship between the two variables. Lastly, the researcher adhered to the ethical standards established by the Philippine Health Research Ethics Board (PHREB) to address the general concepts of respect for persons, beneficence, and justice. Specifically, it addressed the vulnerability, and privacy of the participants, and the confidentiality of the data gathered.

3. RESULT AND DISCUSSION

Results

The students' interest in Physics was rated fairly interested (M=2.83, SD=0.53). When grouped to sex, both male (M=2.87, SD=0.52) and female students (M=2.79, SD=0.55) were also fairly interested. Regarding the academic performance, they were not able to meet the expectations (M=39.37, SD= 8.74). When grouped to sex, both male (M=38.76, SD=9.26) and female (M=40.09, SD=8.13) did not meet expectations. Relative to the difference in their interest [U =1380.500, p =0.668] and academic performance [U=1354.0, p=0.553] when grouped to sex, the results showed no significant differences. Hence, the null hypotheses are accepted. Lastly, in the correlation between their interest and academic performance, it showed a significant relationship [ρ (106) =0.242, p=0.012]. Hence, the null hypothesis is rejected.

First, extent of interest of grade 10 students in physics. Their fair interest in Physics indicates that they demonstrate little engagement towards learning and processing of the concepts and principles. This also shows that they are poorly inclined and disposed towards achieving the discipline's competencies and skills. Additionally, it cannot be denied the need for the responding schools to continuously improve in the delivery of their contents, strategies, and assessments as manifested by not achieving the very interested rating. Hence, the findings imply the essentials of providing the learners with varied strategies to encourage them of the importance of Physics learning. These also signify the need for these schools to improve the instructional delivery in such a way that the students easily comprehend the lessons. Extent of Interest of Students in Physics showed in Table 1.

Table 1. Extent of Interest of Students in Physics

Variables Sex	M	SD	Interpretation
Male	2.87	0.52	Fairly Interested
Female	2.79	0.55	Fairly Interested
Whole	***2.83***	***0.53***	***Fairly Interested***

Note: Fairly interested when the mean range is 2.00-2.90

Second, level of academic performance of grade 10 students in physics. Students' academic performance refers to their acquisition of the competencies of Physics as mandated by the Philippine

Department of Education. By not meeting the expectations, the result indicates that the students struggle to comprehend the fundamental knowledge and skills that include the Physics' concepts, principles, and ideas. This also shows that the learners have not sufficiently acquired the competencies which they must learn. With this result, this clearly signifies the need for the responding schools to improve in the instructional delivery not compromising the contents and assessments to ensure the learners' full acquisition of the competencies and the outstanding academic performance results. Level of Students' Academic Performance in Physics showed in Table 2.

Table 2. Level of Students' Academic Performance in Physics

Variables Sex	M	SD	Interpretation
Male	38.76	9.26	Did not meet expectations
Female	40.09	8.13	Did not meet expectations
Whole	***39.37***	***8.74***	***Did not meet expectations***

Note: Did not meet expectation when the mean is below 75

Third, difference in the extent of interest of students in physics. The no difference in the learners' interest in Physics relative to sex indicates that regardless of whether they are male or female, both have similar perceptions of their inclination towards learning the subject. This means that their sex has nothing to do with their interest as manifested in the absence of the difference. In interest in Physics, there is no difference in sex (Baran, 2016). Meanwhile, given the complex numerical calculative nature of the subject, the result defies the common thinking that computations and higher concepts are for boys only (Anggoro, 2016). Difference in the Students' Interest of Students in Physics showed in Table 3.

Table 3. Difference in the Students' Interest of Students in Physics

Male	Female	U	z	p
2.86 (0.52)	2.79 (0.55)	1380.500	-0.429	0.668

Fourth, difference in the level of academic performance of students in physics. The no difference result indicates that regardless of sex, both male and female students have similar perceptions of their academic performance in Physics. In other words, both have similarly assessed and perceived their performance outcomes as manifested in the absence of the difference. There are studies which congruently support this result that when it comes to the learners' academic performance in Physics, there is no significant difference (Adigun et al., 2015; Nnoli & Okafor, 2017). This negates the common idea that Physics principles, approaches, and computations are for male students as found in (Umaroh & Pujiastuti, 2020). When it comes to academic performance in Physics, literature would say that only male students can deal with the complexity of the lessons (Kurniawan et al., 2022). But in the absence of the difference and reflected in the "did not meet the expectations" rating, these clearly show that both were struggling to learn and acquire the knowledge and competencies. Difference in the Students' Academic Performance in Physics showed in Table 4.

Table 4. Difference in the Students' Academic Performance in Physics

Male	Female	U	z	p
38.76 (9.27)	40.09 (8.14)	1354.000	-0.594	0.553

Fifth, relationship between the students' interest and academic performance in physics. The relationship between these two constructs indicates the positive influence of students' interest in their academic performance. Meaning, it clearly shows the need to develop among the learners their inclination, motivation, and disposition towards Physics learning to improve their performance in the subject. This correlation result showing the essentials of establishing the learners' interest to enhance academically their performance outcomes in Physics (Adekunle & Femi-Adeoye, 2016; Serdyukov, 2017). Relationship Between Students' Interest and Academic Performance in Physics showed in Table 5.

Table 5. Relationship Between Students' Interest and Academic Performance in Physics

Variable	ρ	df	p
Interest x Academic Performance	0.242*	106	0.012

Note: Significant when p≤0.05

Discussion

First, extent of Interest of Grade 10 Students in Physics. Interest refers to the learners' inclination and disposition towards learning and acquiring the competencies of the Physics discipline. The fair interest result could be attributed to the nature of Physics which contains concepts, principles, and terminologies which are difficult to understand. Undeniably, this discipline also deals with numerical calculations which most students are having difficulty. One factor why most students have less interest and motivation in Physics is because of its broad approaches which deals with higher order thinking skills (Djudin, 2018; Rohaeti et al., 2019). Additionally, most common issue regarding their disposition to learn is that they have to deal with numerical computations and problem solving (Reddy & Panacharoensawad, 2017). Also, the manner of delivering the Physics instruction in the country through spiral progression could also be affecting the students' interest. In this instruction, the contents being taught are chunked from various grade levels which also affects the continuity of the students' learning of Physics (Batidor & Casinillo, 2021; Maison et al., 2020). There are also studies which claim that some students would find Physics less interesting because they perceive this to be less essential in their future employment. In fact, the complexity of the lessons in Physics were perceived by the Filipino learners to be less important for future employment unless they wish to become teachers in the field (Mnanka, 2017).

Not to mention, the negative effects of the pandemic which altered the students' disposition and interest towards learning. Physics by nature is already difficult for most students during the conventional instruction. How much more during the pandemic modality which altered the traditional to online-modular teaching-learning (Almianai et al., 2022). Most students during this circumstance were not prepared for this abrupt implementation of this instructional set-up (Alic & Bual, 2021). These students tried to participate but they were at the mercy of their available gadgets and connectivity (Pahilanga et al., 2023; Rios et al., 2023). They were also given modules to accomplish but were used to actual instructions by their teachers which compromised their interest and focus to engage in the process (Cena & Bual, 2021; Kim et al., 2021). This explains that male and female students' garnered fair interest rating since both had to deal with the subject in the online-modular set-up at home (Dorn et al., 2020). Both were also struggling in their acquisition of the contents depending on their available gadgets, instructional materials, and learning management systems (Quirao et al., 2023).

Second, level of academic performance of grade 10 students in physics**.** There are factors which influenced the students' poor academic performance in Physics. This could be attributed to the questionnaire assessment which was responded virtually during the pandemic where the instructional delivery was done through online-modular modality. Undeniably, the acquisition of the knowledge and competencies was compromised since there was an absence of the teacher-student actual interaction (Bual & Madrigal, 2021; Stefan & Ciomoş, 2010). Additionally, though there were instructional materials like modules to cope up with the instruction, it cannot be denied that most were unable to grasp the lessons and acquire the competencies due to the new normal instruction (Bual & Madrigal, 2021). Additionally, assessments were mostly unreliable since these students do these at home without the supervision and feedback by the teachers (Landa et al., 2021). The pandemic instruction had impeded the students' understanding of the difficult terminologies and ambiguous concepts and principles in Physics (Gavrin, 2020). Most during this instructional set-up were also having problems in grasping how to do computations using the learning management systems with poor internet connections (Baticulon et al., 2020; Putu Astri Widikasih et al., 2021). Not to mention, both male and female students did not meet expectations since they encountered similar conditions during the pandemic instruction. Both were struggling on how to cope up with the new normal instruction amid the difficulty of the lessons (Wangchuk et al., 2023; P. A. Widikasih et al., 2021). Lastly, the poor rating could also be ascribed to their poor interest in the subject matter as manifested in their fair interest result. Hence, the findings imply the importance of establishing the students' interest in the subject amid various teaching modalities. This also encourage the schools to improve their instructional delivery of content and assessments to ensure the learners' academic performance in Physics. Third, difference in the extent of interest of students in physics. The no difference in their interest could be attributed to the pandemic modality where both male and female students experience similar difficulty in Physics through online-modular instructional set-up (Aristovnik et al., 2020; Baran, 2016).

Regardless of sex, both were unprepared for the abrupt implementation of the new normal teaching which compromised their interest towards the subject (Aristovnik et al., 2020). Meaning, both were having the difficulty dealing with the teaching-learning processes vis-à-vis the use of online-modular modality since they were used to teachers' actual instructions (Gueta & Janer, 2021). In other words, no matter how performing those learners in the complex concepts and computations, it cannot be denied that regardless of sex, the interest of both was affected due to the difficulty of the new instructional set-up (Arinto, 2016; Aristovnik et al., 2020). The delivery of content, strategies, and assessments was administered across all students regardless of sex. Not to mention, both were also at the mercy of the available gadgets and connectivity which also impede in sustaining their interest towards the subject. Hence, the findings imply the establishment of diverse instructions among the students to introduce the differentiated learning towards Physics learning. Fourth, difference in the level of academic performance of students in physics. The no difference rating could be largely attributed to the online-modular delivery of contents, strategies, and assessments of Physics during the pandemic (Bao, 2020). Both male and female students encounter the same instructional modality in learning the contents during this circumstance (Ihejiamaizu et al., 2017; Margario et al., 2022). Both were also having the difficulty of acquiring the most essential competencies through the availability of their gadgets and connectivity (Margario et al., 2022). Aside from these, both students were also struggling to deal with the instructional modules since they were used to the teachers' actual teaching (Kim et al., 2021). Also, during this circumstance, most assessments were unreliable since these were conducted at the comfort of their homes through modules and gadgets with less supervision (Gutmann et al., 2018). With this, it cannot be questioned if both did not meet the expectations in Physics since the items in the questionnaire were rooted on the competencies and contents taught during pandemic. Hence, the findings imply the importance of reviewing the lessons among the students to encourage their prior knowledge of the subject. It also signifies the significance of assessments to fill in the gaps of their learning.

Fifth, relationship between the students' interest and academic performance in physics. Several studies would also support the argument that by developing the students' interest in Physics, their engagement towards learning the discipline's complex and broad concepts and principles can also be established (Azmidar et al., 2017; Gana et al., 2020). Students' active engagement is vital for them to comprehend the subject's various inquiries and processes as supported by (Dogan, 2015). The students' higher interest in Physics increases their attention which is crucial in the development of higher order thinking skills to critically analyze the diverse Physics problems (Lin & Huang, 2016). The development of the learners' thinking skills in Physics is rooted on their interest to learn the subject (Nugroho, 2020). Meanwhile, when their thinking skills are in place, they can manage to deal with the course's complex processes which can also ensure their higher performance outcomes (D'Alessio et al., 2019). Hence, the findings imply the essentials of establishing among the students their interest to put in place their attention and disposition towards the development of their higher order thinking skills and academic performance. Theoretically, this paper perceived that the students' interest influences their academic performance in Physics. This assumption was anchored on engagement theory by (Kearsley & Shneiderman, 1999). Given the significant relationship result between their interest and academic performance, it validates the veracity of the anchored theory. This means that indeed when the students show high levels of interest in Physics, it will result to their positive academic performance. Hence, the findings imply the importance among these schools to put premium to their students' interest by improving the instructional delivery to ensure their high performance outcomes. However, further studies are encouraged employing this theoretical approach to validate this claim. With the correlation of the two constructs being measured and the validation of the engagement theory, these also imply the establishment of the students' learning interests towards the subject amid its difficulty and complexity of concepts, ideas, and principles to elicit their active engagement and increase their academic performance. Meanwhile, several limitations were found as to method, respondents, demographics, and time element. Perhaps, future researchers are encouraged to conduct further studies using other research designs, taking large samples, employ other demographic variables, and conducting similar studies among post-pandemic students to validate the claims of this paper.

4. CONCLUSION

With the fair interest and did not meet expectation ratings of the students' interest and academic performance in Physics, these imply the importance of improving the schools' delivery of content, strategies, and assessments. Given the effects of the pandemic modality among the learners, the findings also encourage the reviews and feedbacks of the lessons they learned to address the gaps, ensure their prior knowledge of the subject, and acquire the competencies which are expected of them to achieve.

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