Senior High School Learners' Academic Engagement in Learning General Physics

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Abstract – *This study determined the academic engagement of public STEM* senior high school (SHS) learners in General Physics across different schools in Pangasinan, Philippines. Utilizing a quantitative correlational research design, it further investigated the relationship of academic engagement across certain profile variables, levels of engagement, dimensions of engagement and academic performance. It was found that learners had a moderate academic engagement and was influenced by but not correlated with their academic performance. The learners had high behavioral and emotional academic engagement towards their co-learners and was both found to be correlated to each other respectively. However, behavioral and emotional academic engagement towards school as a whole did only have a significantly moderate positive correlation in which draws to the conclusion that behavior could either or neither be more or less likely directed with positive emotionality in engaging with school science activities and facilities. A suggestive scheme in increasing the academic engagement was develop proposed. it is also recommended to evaluate assessment practices in teaching General Physics in order to be enlightened with the differing learners' reports across academic performance.*

Keywords: Academic Engagement, Academic Performance, General Physics, STEM

INTRODUCTION

Students' academic engagement has increasingly concerned educators and researchers for the past few years since the onset of the 21st century. The attention being focused on this field of inquiry is due to its significance as an intervening function in elevating academic success, reducing school drop-outs and institutionally engaging status among educational system (Viega et al., 2012).

Citing reviews and conceptualizations on student engagement, Alrashidi, Phan, and Ngu (2016) offered literature on student engagement suggesting that student's motivation and social factors should be fostered in order for them to be proactively engaged in school and academic-related activities. Student engagement could be summarized as follows as it was culled by Trowler (2010) from her review, "Student engagement is concerned with the interaction between the time, effort and other relevant resources invested by both students and their institutions intended to optimise the student experience and enhance the learning outcomes and development of students and the performance, and reputation of the institution."

As a significant factor in improving the academic performance of students and educational institutions' effectiveness, several countries such as United States of America (USA), Canada, Australia, New Zealand, South Africa (pilot implementation), and China (under development) have generated their own respective national standardized survey instruments in measuring student academic engagement. In the case of USA and Canada, the National Survey of Student Engagement or NSSE is being used to report the status of engagement of students in their

respective universities and schools. Another well-known national survey is considered to be the Australasian Survey of Student Engagement or AUSSE for the Australia and New Zealand. This standardization resulted to proliferation of literature on student engagement heavily found in the USA and Australia while having very meager literature based in United Kingdom (Trowler, 2010).

Academic engagement arose as a multidimensional construct from diverse equivocal literature that describes the student's behavior in a school setting which commonly encompasses behavior, cognition and emotion as conceptualized in the review of Fredricks, Blumenfeld, and Paris (2004 as cited by Trowler, 2010; Viega et al. 2012; and, Alrashidi, Phan and Ngu 2016).

From a historical perspective dating 1989-2011, behavioral engagement often refers to observable performance, action and participation in classroom and school activities—be it academic or non-academic. However, emotional engagement usually refers to positive and negative reaction to peers, teachers and schools or the state of having a sense of belongingness in school and valuing learning outcomes. On the other side, cognitive engagement refers to beliefs and perceptions related to self, school, teachers and peers (Alrashidi, Phan, & Ngu, 2016).

Academic engagement was also seen as related to personal and social contexts which enable students to be academically engaged.

In a review by Veiga, et al. (2012), personal and contextual variables were found to be related to the development of academic engagement among students. Furthermore, they have reviewed that personal variables mostly include self-efficacy and self-concept while contextual variables include peers, school, and family.

Studies also suggested that contextual variables highly influence the academic engagement and academic success of students. In one study, Ganotice and King (2013) assessed the social support received by Filipino students from their parents, teachers and peers and linked it to academic engagement and science achievement. The study found that students with high level of perception of support from parents, teachers and peers were more academically engaged and had higher scores in a standardized science achievement test. Kraft and Dougherty's (2012) findings also conformed to a result that teacher-family communication increased student engagement. Furthermore, they found out certain mechanisms that will more likely influence the engagement of several public middle and high school students of Boston, Massachusetts such as stronger teacher-student relationships, expanded parental involvement, and increased student motivation.

In the Philippines, study on student engagement was considered to be scanty (Cinches, et al., 2017). However, findings from few studies were considerable. Confirmatory findings of Francisco, Gonzales, and Vargas (2015) showed that motivational factors from teachers and peers were linked to student academic engagement, specifically, (a) future aspirations, (b) identification with school, and (c) perceived relevance of schoolwork.

In Cinches, et al.'s (2017) study, the assumption that student engagement is central to student quality was considered. They found out that the teacher's effectiveness was a very significant predictor of student engagement. Therefore, since it was also assumed that teacher quality is an important predictor of student quality, teachers have a role to provide a learning experience that promotes student engagement. Thus, the study conveyed that teachers have an accountability to the level of academic engagement of their students.

Relating academic engagement to learning Physics, studies have similarities in suggesting that it is linked to student's interests and teaching strategies (González & Paoloni, 2015; Petričević et al., 2017), and, having personal meaning in learning it (Geller, Turpen, & Crouch, 2018).

In summation, implications of student engagement fall on the domain four (Curriculum and Planning) of the August 2017 Philippine Professional Standards for Teachers

(PPST). Domain four encompasses teachers' ability to translate curriculum content into learning activities that are relevant to the learners and based on the principles of effective teaching and learning. This also expect teachers to communicate learning goals to support learner's participation, understanding and achievement.

OBJECTIVES OF THE STUDY

This study aims to determine the Senior High School learners' academic engagement in learning General Physics in the public high schools of District II Pangasinan during the school year 2018-2019.

MATERIALS AND METHODS

This study employed the descriptive research design for finding the relationship between academic engagement, academic performance and certain profile variables. The academic engagement towards teacher, towards co-student, and towards the school of the senior high school learners in General Physics were examined if they were linked to academic performance.

This study was conducted in public senior high schools in District II of the province of Pangasinan which are under the supervision of the Department of Education.

District II is one of the six districts of the province of Pangasinan. The District is primarily agricultural which includes plains for crops, freshwaters and sea waters for fisheries, and few mountains. The citizens either speak Pangasinan or Ilocano as their language. District II is being represented in the Congress by one elected official.

The schools in District II that were the subject of this study came from the municipalities of Lingayen, Mangatarem, Urbiztondo and Basista. Figure 1 shows the graphic representation of the location of the municipalities.

Figure 2: Map of Pangasinan District II
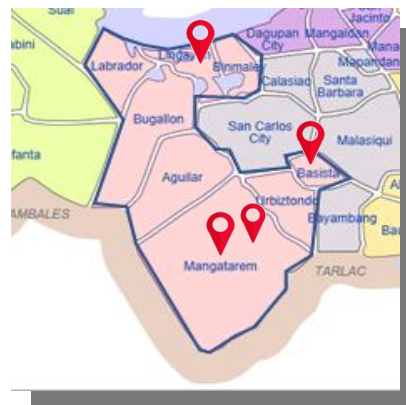
Comprising the municipalities in District II of the province of Pangasinan, the public high school learners in Pangasinan National high School (PNHS), Mangatarem National High School (MNHS), Urbiztondo National High School (UNHS) and Basista National High School (BNHS) who are enrolled in the senior high school program of the Department of Education (DepEd) were the respondents of the study. Total number of SHS STEM learners included in the study is shown back in Table 1 along with their respective schools and municipalities. They were chosen through the convenient sampling method whereas actual population at a certain time of the study becomes the subject of the study. Fraenkel and Warren (2010) write that the aforementioned sampling method appropriate to the researcher's convenience and that it can be used to counter the time constraints during study.

Table 1: List of Schools offering STEM and its Population

Municipalities (School)	Total STEM Population	Actual Number of Respondent
Lingayen (PNHS)	94	75
Mangatarem (MNHS)	46	32
Urbiztondo (UNHS)	10	10

Basista (BNHS)	11	10
Total	161	127

The questionnaire was the main instrument in gathering data for this study. It was utilized so as to determine the academic engagement and its relationship with certain profiles of the students in this study. The researcher has developed and tested the reliability and validity of the Student Academic Engagement Instrument (SAEIns). SAEIns underwent series of minor revisions through the suggestions of experts and experiences from the pre-survey,

SAEIns was pre-tested from two class sections of STEM at the University of Luzon, Dagupan City on September 10, 2018.

Furthermore, the data that were obtained from the schools was secured with approved letters and permission so as to serve solely for this study and not of any extraneous interests. Communication and approval letters were secured both in University of Luzon for the initial testing of the SAEIns and in public senior high schools that offers STEM track in Pangasinan District II.

After securing an endorsement from DepEd Pangasinan Division I and letters to the school principals—first from MNHS, through UNHS, BNHS, and lastly, PNHS—the researcher and his assistant has personally administered the SAEIns on October 1, 2018 with the consent of the respective principal, headteacher, subject teacher and adviser.

Learners were given a brief description of the study and were asked to respond to the SAEIns in 15-20 minutes. The present learners during the day were all included in the study. Late and absent learners during the study were not included. Learners' quarterly grades were requested from their subject teacher or their adviser.

Microsoft Excel 2013 was the primary computing device for this study in order to arrive at precise conclusions. The utilization of the Microsoft Excel was highly endorsed for data processing apparently proposed by growing massive publication of statistical analysis in Excel.

RESULTS AND DISCUSSION
The profile of the respondents includes the age, sex, inclusion to Pantawid Pamilyang Pilipinong Program (4Ps) of the government, school being attended and their academic performance. A brief tabular presentation of the profile of the respondents is presented in Table 2.

Table 2. Profile of the Learners according to Age, Sex, 4Ps Inclusion, School and Academic Performance

Profile	Frequency	Percentage
Age		
17 years and below	104	81.89
18 years and above	23	18.11
Total	**127**	**100**
Sex		
Male	68	53.54
Female	59	46.46
Total	**127**	**100**
4P's Inclusion		
Included	30	23.62
Not Included	97	76.38
Total	**127**	**100**
Academic Performance		
Advance	9	7.08
Proficient	27	21.26
Approaching Proficiency	48	37.80
Developing	40	31.50
Beginning	3	2.36
Total	**127**	**100**
School		
MNHS	32	25.20
UNHS	10	7.87
BNHS	10	7.87
PNHS	75	59.06
Total	**127**	**100**

There are 140 or 24.6 per cent of Bachelor in Industrial Technology students are enrolled in Bachelor in Industrial Technology

program major in Electrical Technology in School Year 2015-2016, 116 or 20.4 per cent Bachelor in Industrial Technology students are enrolled in Automotive Technology, and 112 or 19.7 students are enrolled in Foods Technology major. The high percentage of Bachelor in Industrial Technology students enrolled in the Electrical Technology could be attributed to the popularity of the specialization.

As to the year level, there are 169 or 29.8 per cent second year Bachelor in Industrial Technology students in SY 2015-2016, 139 or 24.5 per cent are first year, 137 or 24.1 per cent are fourth year, and 123 or 21.7 per cent are third year. This could be attributed to the high enrolment of Bachelor in Industrial Technology students during the S. Y. 2014-2015. Based from the records of the Registrars Office, the enrolment for S.Y. 2014-2015 was 718.

The academic performance of Bachelor in Industrial Technology students of Pangasinan State University Lingayen Campus enrolled in First Semester of School Year 2015-2016 is shown in succeeding tables.

Table 2. Academic Performance of Bachelor in Industrial Technology Students major in Automotive Technology

Year level	GPA Technical	GPA Non-technical	Overall GPA
First year	2.50	2.25	2.25
Second year	2.00	2.25	2.00
Third year	2.25	2.25	2.25
Fourth year	1.75	-	1.75
Overall GPA			2.00

The fourth year Bachelor in Industrial Technology major in Automotive Technology students got the highest overall GPA of 1.75 while the first year and third year students got the lowest overall GPA of 2.25. The slightly lower over GPA of lower year levels could be attributed to their readiness in class activities as compared to much older or higher year level wherein they made adjustments and have familiarity in terms of their study habit, time management, social aspect and teaching

strategies of faculty members and campus activities.

Table 3. Academic Performance of Bachelor in Industrial Technology Students major in Mechanical Technology

Year level	GPA Technical	GPA Non-technical	Overall GPA
First year	2.25	2.50	2.25
Second year	2.00	3.00	2.50
Third year	2.25	2.50	2.25
Fourth year	1.75	-	1.75
Overall GPA			2.25

The fourth year Bachelor in Industrial Technology major in Mechanical Technology students got the highest overall GPA of 1.75 while the second year students have the lowest overall GPA of 2.50 for the first semester of School Year 2015-2016. This suggests that much older or higher level students have made some adjustments in their college life making their academic performance more manageable as compared to lower year levels that are just starting to know the teaching strategies of teachers, the campus activities, and the style of teachers' assessment of student performance.

Table 4. Academic Performance of Bachelor in Industrial Technology Students major in Civil Technology

Year level	GPA Technical	GPA Non-technical	Overall GPA
First year	1.75	2.25	2.00
Second year	1.00	1.25	1.00
Third year	2.25	2.5	2.25
Fourth year	-	-	-
Overall GPA			1.75

The second year Bachelor in Industrial Technology major in Civil Technology students got the highest overall GPA of 1.00 while the third year has the lowest overall GPA of 2.25 for the first semester of School Year 2015-2016. The results suggest that sophomore students major in Civil Technology have already

familiarized the teaching strategies and student assessment styles of their faculty members that lead to more confidence and competence in studying the technical and non-technical courses. This supports a previous study wherein self-confidence was found to be significantly related to the performance of students. Other non-academic variables that significantly affected the performance of students are gender, physical equity, study habit and interest on Science subject [1].

Table 5. Academic Performance of Bachelor in Industrial Technology Students major in Garments Technology

Year level	GPA Technical	GPA Non-technical	Overall GPA
First year	2.50	2.00	2.25
Second year	2.25	2.25	2.25
Third year	2.25	2.50	2.25
Fourth year	2.00	-	2.00
Overall GPA			2.25

The fourth year Bachelor in Industrial Technology major in Garments Technology students got the highest overall GPA of 2.00 while the rest of the year levels garnered the same overall GPA of 2.25. This suggests that graduating students are more confident and competent in dealing with their technical courses. The non-enrolment of non-technical courses for graduating students could also be a factor. There might be non-technical courses that the lower year level students find them difficult, thus having an effect on their overall GPA. In mathematics, for example, the weaknesses of pupils were application of the four fundamental operation or fractions and in solving word problems [5]. In a separate study, Grade V pupils are very weak in addition and subtraction of dissimilar fractions, reduction of fractions, converting one unit of measurement to another, problem solving involving conversion of measurement units, identifying names of polygons, and problem solving involving areas and volumes of polygon [6]. Moreover, the common errors committed by high school students at Saint Louis School-Aurora Hill were combination of terms, improper distribution, cancellation, removing grouping symbols and sign errors [7].

Table 6. Academic Performance of Bachelor in Industrial Technology Students major in Electrical Technology

Year level	GPA Technical	GPA Non-technical	Overall GPA
First year	2.00	2.50	2.25
Second year	2.25	2.50	2.25
Third year	2.75	2.25	2.50
Fourth year	1.75	-	1.75
Overall GPA			2.25

The fourth year Bachelor in Industrial Technology major in Electrical Technology students has the highest overall GPA of 1.75 while the third year students got the lowest overall GPA of 2.50. This suggests that third year students major in Electrical Technology found both their technical and non-technical courses difficult. For technical courses, more advanced topics and class requirements are needed. This could lead to lower scores in class activities.

Table 7. Academic Performance of Bachelor in Industrial Technology Students major in Drafting Technology

Year level	GPA Technical	GPA Non-technical	Overall GPA
First year	2.50	2.25	2.25
Second year	2.00	2.50	2.25
Third year	2.50	2.00	2.25
Fourth year	1.50	-	1.50
Overall GPA			2.00

The fourth year Bachelor in Industrial Technology Drafting Technology students got the highest overall GPA for the first semester of School Year 2015-2016 while other year levels have the same overall GPA of 2.25. This implies that graduating students are more confident and capable of earning high scores in class activities.

Familiarity with the teaching and assessment styles of faculty members might be a factor on better managing of studies.

Table 8. Academic Performance of Bachelor in Industrial Technology Students major in Ceramics Technology

Year level	GPA Technical	GPA Non-technical	Overall GPA
First year	1.75	2.50	2.00
Second year	1.75	2.50	2.00
Third year	2.25	2.50	2.25
Fourth year	1.75	-	1.75
Overall GPA			2.00

The fourth year Bachelor in Industrial Technology major in Ceramics Technology students got the highest overall GPA of 1.75 while the third year students garnered the lowest overall GPA of 2.25. The advanced courses and projects as requirements to pass all the courses might be a factor for low performance of third year students. As to the graduating students, the reason for their high performance could be their concentration to technical courses as well as their familiarity to teaching, assessment and evaluation styles of faculty members.

Table 9. Academic Performance of Bachelor in Industrial Technology Students major in Food Technology

Year level	GPA Technical	GPA Non-technical	Overall GPA
First year	2.25	2.50	2.25
Second year	2.25	2.50	2.25
Third year	2.25	2.50	2.25
Fourth year	1.50	-	1.50
Overall GPA			2.00

The fourth year Bachelor in Industrial Technology major in Food Technology students garnered the highest overall GPA of 1.50 while the rest of the year levels got an overall GPA of 2.25. This suggests that graduating students managed to earn high scores in their courses as compared to other year levels. The non-inclusion of non-technical courses as well as the familiarity with their faculty members might lead to their higher academic performance.

Table 10. Academic Performance of Bachelor in Industrial Technology Students major in Electronics Technology

Year level	GPA Technical	GPA Non-technical	Overall GPA
First year	2.25	2.25	2.25
Second year	2.25	2.25	2.25
Third year	2.00	2.00	2.00
Fourth year	2.00	-	2.00
Overall GPA			2.00

The third year and fourth year Bachelor in Industrial Technology major in Electronics Technology students got the highest overall GPA of 2.00 for first semester of School Year 2015-2016 while the other lower year levels garnered the low overall GPA of 2.25. This suggests that the lower year level students found their courses difficult.

CONCLUSION AND RECOMMENDATION

Based on the findings of the study, it could be inferred that Electrical Technology, Automotive Technology and Food Technology are popular specialization in the Bachelor in Industrial Technology program. The enrolment in these specializations could also attribute to the booming industries of food and car manufacturing. When it comes to the academic performance of Bachelor in Industrial Technology students, the fourth year students are well adjusted in terms of familiarity with the teaching, evaluation and assessment styles of faculty members as compared to the first year students.

It is recommended that the Bachelor in Industrial Technology faculty members with the assistance of the guidance counselors and in-charge of student admission to market the Bachelor in Industrial Technology specializations with less number of students like Civil Technology, Garments Technology and Ceramics Technology. A massive campaign to

public and private secondary schools is needed to increase the number of enrollees on these specializations. For the academic performance of Bachelor in Industrial Technology students, orientation on grading system, resource or library facilities and materials, and evaluation and assessment is needed for first year students is needed. This is to familiarize the students about the things they need to do to motivate them and have high scores in all classroom activities and eventually earned high academic performance. Utilization of varied instructional strategies appropriate to the subject matter and the background knowledge of the students is also recommended.

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