Journal of Positive School Psychology
2022, Vol. 6, No. 3, 6131–6139

Learners' Attitude Towards Science on the Use of Modular Learning

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Abstract

The study determined the Senior High School (SHS) learners' attitude towards Science on the use of modular learning. It also looked into the profile of the respondents and the significant difference in their attitude towards Science in terms of age, sex, track, parents' educational attainment, and parents' monthly income based on engagement, learning gains, motivation, self-efficacy, and views about Science. Descriptive-survey design was utilized and data were gathered online and in-person from 347 SHS students of Siargao Island Division, Surigao del Norte, Philippines. They were treated statistically using weighted mean, standard deviation, and ANOVA. Findings revealed that most of the learners are 16-17 years old coming from parents who earned less than Php 5,000 a month. However, they had a more positive attitude towards science as compared to other age groups and income levels, and students' attitude towards Science on the use of modular learning was influenced by engagement, learning gains, motivation, self-efficacy, and views about Science wherein students' age and parents' monthly income were depicted as significant predictors. It can be concluded that SHS students' attitude on the use of modular learning was generally positive wherein younger ones coming from high-earning parents' manifest attitude towards Science positively. Further, enhancing the students' sense of self-efficacy and motivation consequently results in the development of a more positive attitude towards Science. The findings suggested developing an intervention for integration into the Homeroom Guidance Program for successful implementation.

Keywords— attitude towards science; modular learning; engagement; learning gains; motivation; self-efficacy

I. INTRODUCTION

Students' attitude towards Science remarkably contributes to their achievement, learning experiences, and decision for pursuing a Science-related career. It encompasses a variety of components but in the context of this paper, the term learners' attitude towards Science collectively refers to their engagement in Science, learning gains, motivation for learning Science, self-efficacy in Science, and their views about Science (Lovelace and Brickman, 2013).

According to Godec, King, Archer, Dawson, and Seakins (2018), engagement towards learning Science which is not only construed as enjoyment but also as motivation, has a big impact on learners' attitude. This means that learners' participation in Science and the intensity of such participation greatly affect their attitude. Similarly, learning gains which is depicted as the learners' ability to connect present knowledge to prior knowledge is deemed to be the indirect influence of attitude on their' engagement and motivation (Newell, Tharp, Vogt, & Moreno, 2015).

A linear relationship between self-efficacy and attitude in Science had also been established wherein lessons that develop self-efficacy affect the learners' self-efficacy beliefs (Erdem, 2015). Moreover, studies showed that negative views in learning Science especially girls' images of Science and scientists can affect their attitude towards the subject which in turn

influences their decision in pursuing future careers in Science (Thomson, 2019).

Numerous studies focusing on the factors affecting learners' attitude towards Science are undeniably existing. However, these studies were carried out in times where the students and teachers were still able to freely interact with each other in the classroom setting. Considering that: (1) varying attitudes toward Science had already been observed among the Senior High School learners of General Luna National High School especially among the performing and non-performing ones during the pre-pandemic times, (2) research focusing on learners' attitude towards Science on the use of modular learning is by far lacking, and (3) understanding learners' attitude helps in measuring the effectiveness of specific pedagogical approaches (Almasri, Hewapathirana, Ghaddar, Lee, & Ibrahim, 2021). Hence, this established a sound understanding of the Senior High School learners' attitude towards Science based on students' engagement, learning gains, motivation, self-efficacy, and views about Science. It further intends to develop an intervention program that could significantly address learners' varying attitudes towards Science in the context of modular learning. Specifically, the study sought to: (1) look into the profile of the respondents in terms of age, sex, track, parents' educational attainment, and parents' monthly income; (2) find out the Senior High School learners' attitude towards Science on the use of modular learning as to engagement, learning gains, motivation, self-efficacy, and views about Science; (3) determine the significant difference between students' attitude towards Science on the use of modular learning approach in terms of age, sex, track, parents' educational attainment, and parents' monthly income based on engagement, learning gains, motivation, self-efficacy, and views about Science; and (4) develop an intervention program based on the results.

Problem 3 is hypothesized as there is no significant difference between the learners' attitude towards Science on the use of modular learning approach in terms of age, sex, track, parents' educational attainment and parents' monthly income based on engagement, learning gains, motivation, self-efficacy, and views about Science.

II. METHODS

The study made use of a descriptive-survey research design. It utilized surveys to gather data to describe a phenomenon and its characteristics making it suited for describing the interplay of the variables used in the study. All the nine (9) municipal schools offering Senior High in Siargao Island Division during the Academic Year 2020-2021 were the respondents of the study. The population size was 2,312 whereby a sample of 347 SHS students were randomly selected.

The researcher utilized a 4-point Likert researcher-made questionnaire anchored on the study of Lovelace and Brickman, 2013. It was transformed into Google Forms and was disseminated through Facebook Messenger with the permission of the School Heads and with the help of the SHS advisers. On the other hand, those unable to answer online were conducted in person without compromising the health protocols. The questionnaire was composed of two parts. Part 1 solicited the profile of the respondents like age, sex, track, parents' educational attainment, and parents' monthly income. Part II asked questions related to students' attitude towards Science based on engagement, learning gains, motivation, self-efficacy, and views about Science. The questionnaire was validated by experts and was found to be highly reliable as indicated by the consistency of the Cronbach Alpha for the five (5) indicators: engagement (8.71); learning gains (8.68); motivation (9.15); self-efficacy (9.04); and views about Science (8.99), respectively. Data analysis was done using frequency count, mean and standard, and Analysis of Variance.

III.RESULTS AND DISCUSSIONS

This section presents the findings and discussions of the study.

On the Profile of the Respondents

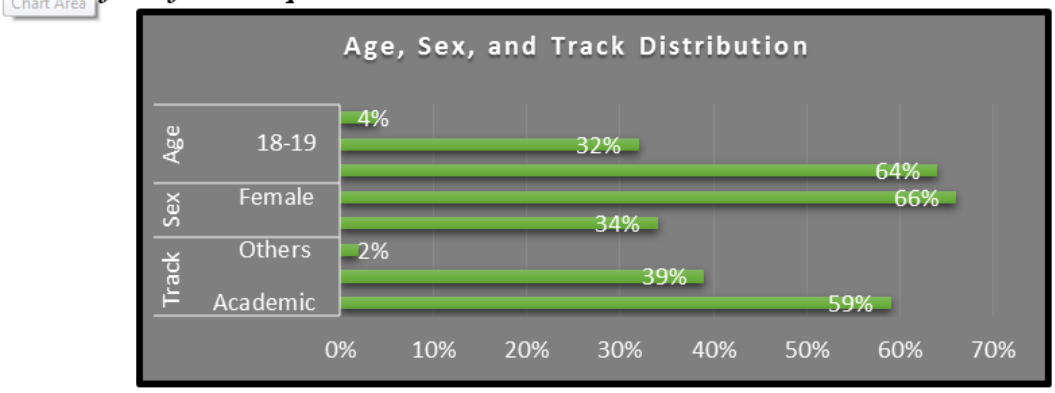

Figure 2. Distribution of respondents by age, sex, and track

The figure presents that in terms of age, sex, and track, 64% of the respondents were aged 16-17 years old and at least 4% aged between 20-21 years old. In terms of sex and track, 66% were females who were either taking Academic, 59%, or Technical-Vocational Livelihood (TVL), 39%, respectively.

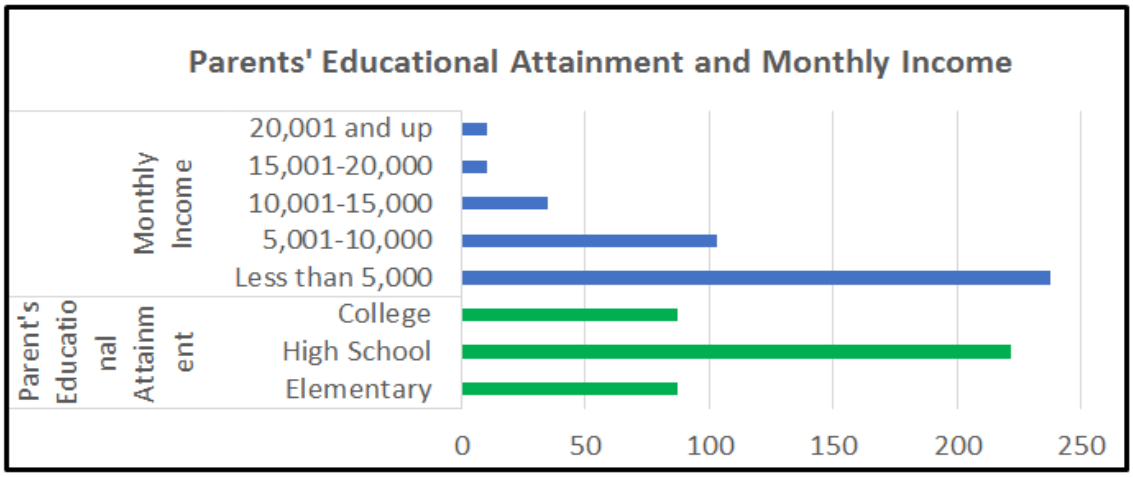

Figure 3. Distribution of Respondents by parents' educational attainment and monthly income

A number of parents of SHS students in Siargao Island, Surigao del Norte, Philippines attained high school only. Such is the reason why they are earning less than Php 5,000.00 a month.

On the Perceived Attitude of Students Towards Science on the Use of Modular Learning

Table 1. Students' attitude towards Science on the use of modular learning as to Engagement

Indicator	Mean	SD	QD
A. Engagement			
1. I make sure to study my Science modules or learning activity sheets on a daily basis.	3.18	0.44	Agree
2. I desire and enjoy reading Science.	3.14	0.54	Agree
3. I find ways to make the concepts in my Science modules or learning activity sheets relevant to my life.	3.15	0.54	Agree
4. I like putting efforts in accomplishing my Science modules or learning activity sheets.	3.25	0.51	Agree
5. I ask questions to my teacher, parents, and/or siblings when I do not understand something in my Science modules or learning activity sheets.	3.32	0.56	Strongly agree

Table 1 reveals that in terms of engagement, indicator 5, *"I ask questions to my teacher, parents, and/or siblings when I do not understand something in my Science modules or learning activity sheets."*, obtained the highest mean response (Mean-3.32, SD-0.56) described qualitatively as "strongly agree". While indicator 2, "*I desire and enjoy reading Science.",* has the lowest mean (M-3.14, SD-0.54) but still qualitatively described as "agree". This implies that the students employ strategies towards learning Science in the context of modular learning and giving them constant home assistance and support greatly contribute to their engagement in the subject. This result conforms with the Department of Education's supposition that in the conduct of modular learning, parents would have an active role by serving as "More Knowledgeable Others" (MKOs) to facilitate learning and guide their children (Lebaste, 2020).

Table 2. Students' attitude towards Science on the use of modular learning as to Learning Gains

Indicator	Mean	SD	QD
B. Learning Gains			
1. I understand the theories and concepts discussed in my Science modules or learning activity sheets.	2.99	0.47	Agree
2. I understand the connections of the theories and concepts in my Science modules or learning activity sheets from the theories and concepts being discussed when I was in the previous grade level.	2.95	0.51	Agree
3. I understand the relevance of the theories and concepts found in my Science modules or learning activity sheets to real life.	2.98	0.47	Agree
4. I can explain what I learned from my Science modules or learning activity sheets to my peers and/or classmates.	3.00	0.54	Agree
5. What I learned in my science modules or learning activity sheets helped me feel part of a scientific community.	3.15	0.57	Agree

Table 2 shows that as to learning gains, indicator 5, *"What I learned in my Science modules or learning activity sheets helped me feel part of a scientific community."*, got the highest mean (M-3.15, SD-0.57) and is qualitatively described as "agree". While Indicator 2, *"I understand the connections of the theories and concepts in my Science modules or learning activity sheets from the theories and concepts being discussed when I was in the previous grade level."*, yield the lowest mean perception (M-2.95, SD-0.51) but still described as "agree". These results suggest that the students were gaining knowledge in Science in the context of modular learning because according to (Dong, Jung, & King 2020) learning can be predicted when students could relate their foundation knowledge from their previous grade to their present grade not just factually but also emotionally.

Table 3. Students' attitude towards Science on the use of modular learning as to Motivation

Indicator	Mean	SD	QD
C. Motivation			
1. I desire to learn and study Science as much as possible.	3.19	0.50	Agree
2. I like to do better than other students when it comes to the activities present in our Science modules or learning activity sheets.	2.90	0.58	Agree
3. I aim of completely mastering my Science modules or learning activity sheets.	3.04	0.54	Agree
4. It is important that I get a high grade in Science.	3.22	0.59	Agree
5. Having a meaningful learning experience in Science matters to me.	3.23	0.50	Agree

Table 3 presents that with respect to motivation, indicator 5, *"Having a meaningful learning experience in Science matters to me."*, acquired the highest mean (M-2.23, SD-0.50) described qualitatively as "agree". Whereas Indicator 2, *"I like to do better than other students when it comes to the activities present in our Science modules or learning activity sheets."*, received the lowest mean response (M-2.90, SD-0.58) but still described as "agree". These results signify that if the Science modules or activity sheets given to the students are stimulating and if teachers use interactive instructional videos along with contextualized and localized Science modules, the students will become more motivated to learn (Wong, 2015). The results further emphasize that continued interest in task, inclination to effort, and competitiveness develop students' motivation intrinsically (Asvio, 2017).

Table 4. Students' attitude towards Science on the use of modular learning as to Learning Self-efficacy

Indicator	Mean	SD	QD
D. Self-efficacy			
1. I am confident that I understand the theories and concepts presented in my Science modules or learning activity sheets.	2.95	0.57	Agree
2. I am confident in my ability to do well in future Science courses.	2.89	0.65	Agree
3. I believe that I master the knowledge and skills in Science as stated in my modules or learning activity sheets.	2.85	0.60	Agree
4. I can earn the highest or better grade in Science.	2.92	0.62	Agree
5. I am confident that I could use a scientific approach to solve my personal problems at home.	2.84	0.58	Agree

Table 4 depicts that in terms of self-efficacy, indicator 1, *"I am confident that I understand the theories and concepts presented in my Science modules or learning activity sheets."*, gained the highest mean perception (M-2.95, SD-0.57), while indicator 5, *"I am confident that I could use a scientific approach to solve my personal problems at home."*, acquired the lowest mean (M-2.84, SD-0.58) but both are still described qualitatively as "agree". These results indicate that while the majority of the students had the positive belief that they acquired the intended learning objectives stated in their modules and they can put such learning into practical application, few of them did not believe so. This implies that the teachers have to use moderately-difficult tasks, allow students to make a decision on how to accomplish such tasks, and give the students encouragement and feedback consistently because doing so positively influences students' self-efficacy (Dupret, 2015).

Table 5. Students' attitude towards Science on the use of modular learning as to Learning Views about Science

Indicator	Mean	SD	QD
E. Views about Science			
1. Science subject to me is very interesting.	3.17	0.55	Agree
2. I feel at ease in Science and Like it very much.	3.03	0.58	Agree
3. I have always enjoyed studying Science at home.	3.00	0.55	Agree
4. Science makes me feel secure as well as stimulating.	3.02	0.52	Agree
5. In general, I have a good feeling towards Science.	3.11	0.48	Agree

Table 5 highlights that with regards to views about Science, indicator 1, *"Science subject to me is very interesting."*, secured the highest mean response (M-3.17, SD-0.55) and is qualitatively described as "agree". While indicator 3, *"I have always enjoyed studying Science at home."*, earned the lowest mean (M-3.00, SD-0.55) but still qualitatively described as "agree". This means that even if the majority of the students loved learning Science, some of them did not find enjoyment in learning it at home. These students could be those who struggled with text-heavy directions and materials, and those who relied on the structure and support of in-person school besides their parents and siblings to help them stay on track in modular learning (Morin, 2020). Hence, they should be given constant assistance and support.

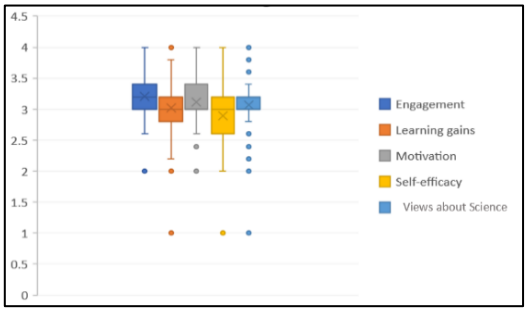

Figure 4. Mean distribution of Students' Attitude Towards Science on the Use of Modular Learning

From the figure, the mark x at each box signifies the perceived attitude of the respondents on the average, wherein they obtained the means, 3.21 (SD=0.37), 3.02(SD=0.38), 3.12(SD=0.4), 2.89(SD=0.48), and 3.07(SD=0.43) in engagement, learning gains, motivation, self-efficacy, and views about Science, respectively. These values indicate that in general, respondents perceived positive attitudes in Science in the aspect of engagement, learning gains, motivation, self-efficacy, and views about science. This implies that engagement in learning (Astalini, Kurniawan, Perdana, & Kurniasari, 2018), gains in content knowledge (Newell et al., 2016), and interest and confidence in accomplishing practical and contextualized modules and activity sheets impact students' attitude towards Science on the use of modular learning positively (Godec et al., 2018).

On the Significant difference in Students' Attitude

Table 6. Significant difference in the students' attitude towards Science on the use of modular learning when grouped according to profile variables

Profile (df)	Science	F	p	Remarks
Sex (1,394)	Engagement	0.1	0.9	Not Significant
	Learning gains	1.8	0.2	Not Significant
	Motivation	1.0	0.4	Not Significant
	Self-efficacy	0.0	1.0	Not Significant
	Views about Science	0.4	0.7	Not Significant
Age (2,393)	Engagement	1.0	0.4	Not Significant
	Learning gains	0.5	0.6	Not Significant
	Motivation	5.4	0.0	Significant
	Self-efficacy	1.2	0.3	Not Significant
	Views about Science	0.2	0.8	Not Significant
Track (2,391)	Engagement	2.0	0.1	Not Significant
	Learning gains	1.7	0.2	Not Significant
	Motivation	0.0	1.0	Not Significant
	Self-efficacy	0.0	1.0	Not Significant
	Views about Science	0.8	0.4	Not Significant
Educational attainment (-2,393)	Engagement	0.3	0.7	Not Significant
	Learning gains	0.1	0.9	Not Significant
	Motivation	1.0	0.4	Not Significant
	Self-efficacy	1.9	0.1	Not Significant
	Views about Science	0.2	0.9	Not Significant
Monthly income (4,391)	Engagement	0.7	0.6	Not Significant
	Learning gains	1.4	0.2	Not Significant
	Motivation	1.6	0.2	Not Significant
	Self-efficacy	2.7	0.0	Significant
	Views about Science	0.6	0.6	Not Significant

The table reveals that the p-values are greater than 0.05 level of significance in engagement, learning gains, motivation, self-efficacy, and views about Science when grouped by sex, track, and educational attainment. This implies that there is no statistically significant difference in the attitude of the students towards Science in the context of modular learning in terms of engagement, learning gains, motivation, self-efficacy, and views about Science based on the respondents' sex, track, and parents' educational attainment. There was also no statistically significant variation in the students' attitude towards Science in terms of engagement, learning gains, self-efficacy, and views about Science based on the respondents' age. This simply suggests that the groups were not large enough to find a statistically significant difference and sex, track, and parents' educational attainment did not matter in determining learners' attitude towards Science.

These results are congruent to the study of Sofiani, Maulida, Fadhillah, & Sihite (2017) who pointed out that there is no significant difference in the students' attitude towards

Science between the female and male students in Indonesia. However, in terms of track and parents' education, these results opposed Fui and Lian (2011) that track position has an effect on students' attitude in Science, and that parental education level affects students' motivation and attitude (Iwaniec, 2018). This is because the study found out that irrespective of the educational attainment of the parents and the track where the students were enrolled, students' attitude towards Science on the use of modular learning did not vary and was still positive.

Interestingly though, while age and parents' income did not matter in other indicators of students' attitude, significant variation was observed in them especially in motivation based on age, $F(2,393)=5.4$, $p=0 < 0.05$ level $F(2,393)=5.4$, $p=0 < 0.05$ level (Table 7), and self-efficacy based on parents' monthly income, $F(4,391)=2.7$, $p=0 < 0.05$ level (Table 8).

Table 7. Variation of the students' attitude in terms of motivation based on their age

		p-value		
Age	Mean	16-17	18-19	20-21
16-17	3.1283	1	0.95	**0.006**
18-19	3.1408	.95	1	**0.01**
20-21	2.8118	**.006**	**0.01**	1

Results showed that at $p=0.006$ which is less than 0.05, the attitude of the groups of age range 16-19 and 20-21 years old as to motivation significantly vary with 16-19 years old having more positive attitude than the group of age 20-21 years old. The same is also true to the varying difference between 18-19 years old and 20-21 years old, $p=0.01 < 0.05$. The difference is seen to be caused by the age gap among the respondents. A 5-year gap is evident between the youngest (16 years old) and the eldest (21 years old) respondents and on that note, it means that as the students grow older, their motivation to learn new things and engage in new activities in Science slowly decreases. This result obviously revealed that age matters in students' attitude based on motivation which is supported by Momanyi, Too, & Simiyu, (2015) who asserted that ages 12 to 15 years had a higher motivation as compared to the 16 to 19 years old among high school students in Kenya. Kapici and Akcay (2016) disclosed that learners' attitude in Science based on motivation is different with respect to age because students' interest in Science decreases as they get older due to the shift in their interest in non-school activities.

Table 8. Variation of the students' attitude in terms of self-efficacy based on their monthly income

		p-value				
Monthly income	Mean	Less than 5,000	5,001-10,000	10,001-15,000	15,001-20,000	20,001 and up
Below 5,000	2.90	1	0.03	0.005	0.02	0.04
5,001-10,000	2.83	0.03	1	0.005	0.02	0.04
10,001-15,000	2.96	0.005	0.005	1	0.02	0.04
15,001-20,000	3.26	0.02	0.02	0.02	1	0.04
20,001 and up	2.68	0.04	0.04	0.04	0.04	1

Based on the p-values obtained in the post hoc test, all groups differ significantly in their attitude towards Science in terms of self-efficacy as indicated by their respective p-values: $p=1$, $p=0.03$, $p=0.005$, $p=0.02$, and $p=0.04$ which are ≤ 0.05. In addition, the group of respondents with a family monthly income of 15,001-20,000 had the most positive attitude ($p=0.02$) in Science as to self-efficacy. It can also be gleaned from the findings that the group with a monthly income of less than 5,000 still had a positive attitude ($M=2.90$) towards Science in terms of self-efficacy but not that positive as compared to the high earning ones. This means that monthly income matters in students' attitude towards Science in the context of modular learning based on self-efficacy. The reason for this is attributed to the support that parents could give to their children in terms of resources such as gadgets, access to the internet, and even personal space in their home. Families with more income are more likely able to provide more resources for their children thereby promoting self-confidence on the part of the latter (Li and Qiu, 2018).

On the Developed Intervention Program for Learners Attitude on the Use of Modular Learning

In accordance to the Expectancy-Value Theory, figure 5 displays the framework for the developed intervention. It shows the aspects as to where motivation should come from for students to believe that they will be successful in accomplishing their modules and learning activity sheet to enhance their attitude towards Science in the context of modular learning. It depicts that positive attitude in modular learning based on motivation and self-efficacy can occur when the three conditions, namely: social influences which are coming from the teachers and parents, feedback and task designs which are outputs of teachers, and goal orientation, are met.

Fig 5. Framework for the Developed Intervention Program

IV. CONCLUSIONS AND RECOMMENDATION

Despite the challenges due to Covid 19, the SHS students exhibited an interest in learning Science via the modular learning platform. Virtual learning is the best alternative to in-person teaching during this time, students of this island though well known as one of the tourist spots of the Philippines can hardly do online due to financial constraints. Students coming from high earning parents' manifest attitude towards Science positively. Further, enhancing the learners' sense of self-efficacy and motivation consequently results in the development of a more positive attitude towards Science. The findings suggested that the development of an intervention program focusing on enhancing learners' attitude towards Science should be integrated into the Homeroom Guidance Program for successful implementation.

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