



Research Article

ATTITUDE OF HIGH SCHOOL STUDENTS TOWARDS SCIENCE USING TWO MEDIA OF INSTRUCTION

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ABSTRACT

The study was conducted to determine the attitude towards Science of high school students. Sixty-eight students from Juan R. Liwag Memorial High School participate in the study. The instrument adapted from the Science Attitude Scale was utilized. The study used Campbell and Stanley's (1966) quasi-experimental design of non-equivalent pretest-posttest control group design. The survey questionnaire was used to determine their attitude towards Science. Mean and standard deviation was computed to assess the attitude of the respondents under two medium of instruction. At the same time, inferential statistical methods such as the T-test for independent samples were obtained to determine the difference in the attitude of students when either Filipino or English is used as a medium of instruction. The study showed that before and after the instruction, the mean attitude scores of the respondents meant that they agreed on the positive beliefs/opinions about Science. The control and experimental groups exhibited a statistically comparable mean in the attitude before and after instruction. The language appeared to not affect the students' attitude on Science. Hence, students taught using English and Filipino had the same attitude towards Science. The research study implied that other factors affect the students' attitudes towards Science. Those factors may help must be identified to uplift the attitude of the students, especially the youth, towards Science, which may offer a solution to improve the country's science education.

Keywords: attitude towards science, two media of instruction, quasi-experimental design.

INTRODUCTION

Attitudes are an enduring thought modifiable by experiences and persuasion as learned rather than innate. It is the central part of human identity. Every day, people love, hate, like, dislike, favor, oppose, agree, and disagree, etc. All these are evaluative responses to an object. Social psychologists have defined attitude as a combination of emotional or affective components (liking or disliking), a cognitive component (beliefs) and a behavioral component (tendencies to act towards these items in various ways) (Child, 2007 and Reid & 2006). The term "attitude towards science" indicates all that an individual feels and thinks about science and scientists. Science is considered a tool that is important to both individuals and the nation as a whole to survive and meet the global economic requirements (Kibet *et al.*, 2012). Aside from explaining the different phenomena in this world, it is also essential because it helps humanity engage with many of the issues confronting contemporary society (Osborne & Dillon, 2008). The basis for invention, discovery, production and even simple logical thinking comes from science and technology. Despite the authorities' efforts to uplift the science learning among the students, the researcher observed that science is still one of the subjects, probably second to Mathematics, where students are having a hard time learning and understanding its concept. One way to solve the given problem in learning science is using an effective medium of instruction. Choosing the English language as a medium of science instruction may result in positive or negative educational outcomes. Osborne *et al.*, (2003) studied student attitude towards science and many factors of influence such as gender, teachers, and curricular, cultural and other variables. It is further supported by the data emerging from the ROSE study (Sjoberg and Schreiner, 2005) and other recent work (Haste, 2004).

Students' attitude towards science varies among the students, depending on several factors. One is associated with the teacher, such as teaching methods, classroom management, and teachers' content knowledge and personality. Others are related to the environment, such as parents' educational background and parental expectations. Others come from students, including achievement, anxiety, extrinsic motivation, and experiences (Debacker *et al.*, 2010). It was observed that the preferred language use as a medium of instruction is also a factor since students often have a difficult time understanding the language used by the teacher and the language used in the learning material and examination (Johnson, 2010). The researcher also observed that students find science difficult and irrelevant to life. Hence, this comparative study about the use of English and the Filipino language as media of instruction was conducted to determine the attitude of high school students in science.

BACKGROUND OF THE STUDY

Medium of Instruction Used in Science Education

Language is defined as a tool for thought and communication. It also provides learners with a rich, powerful and deeply rooted set of images and ideas that can be used to make their world other than it is (Department of Basic Education, 2011). It implies that acquiring language skills allows learners to learn how to learn. The Philippines are a multilingual country, attributing the diversity of its languages to the cultures of its people. Tagalog, one of the Philippines' principal languages, is the Philippines' national language. English users rank second, amounting to around 50% of the Philippine population (Lewis *et al.*, 2014). One obvious feature of the nature of scientific language is that it contains technical words that rarely occur in children's everyday informal spoken interactions (Fang, 2006). Oyoo (2005) maintained that science words form the distinctive body of concepts that mark out science from other subjects or different schools of

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science subjects, such as physics as distinct from biology or chemistry. It is based on the fact that science is a dynamic area of knowledge in which all sorts of discoveries and a large portion of information related to them are found in English (Pembina, 2009). Moreover, Gatmaitan (2012) stated that science and technology in the English language would seriously affect the country's education, economic, and social development because science and technology taught in a foreign language do not reach masses of people. Books and other reading materials can only be understood by a few proficient in English. If Filipino children keep on using a foreign language to understand science concepts, then they can only be at the low level of cognition (factual knowledge) in science—not at the high levels of cognition (conceptual understanding and reasoning and analysis).

Status of Science Education in the Philippines

Experts from the University of Philippines argued that students from the Philippines performed poorly in mathematics and science compared to students from other nations. According to the report by abs-cbnnews.com on June 15, 2011, The Philippines ranks seventh among the nine Southeast Asian nations in education and innovation, Guillermo M. Luz, co-chairman of the National Competitiveness Council (NCC), said.

Attitude towards Science

Research showed that students manifest the highest level of a positive attitude towards science before the age of eleven, which significantly declines over the middle school and high school years (Barmby *et al.*, 2008, George, 2006). Students, particularly at the secondary level, perceive science as irrelevant to life. They feel that advancement in science has generated social and environmental problems. For these reasons, many students do not want to continue studying science (Barmby *et al.*, 2008). Parental and family attitudes towards science in everyday life play an essential role in shaping children's science aspirations (Buday *et al.*, 2012, Maltese and Tai, 2011, Nugent *et al.*, 2015, Rice *et al.*, 2013, and White & Harrison, 2012). Previous research showed that parents serve as the most crucial motivating factor in their children's lives during early childhood age. Previous findings also showed that the parent's level of education has a significant correlation with students' ambition. During early childhood, parents guide their children by developing their skills and observing their academic improvements. Parents provide support by sending their children to tuition classes to improve their science and mathematics achievement during the early education stage (Cridge & Cridge, 2015). Tenenbaum and Leaper (2003) additionally inferred that parental beliefs about science could significantly influence children's interest and motivation in science. The inspirational attitudes towards science among children thus result in expanded enrollment in the science stream and likewise impact science achievement and interest in science careers (Maltese & Tai, 2011). Parents involved in the research conducted by Wang (2013) had positive values toward science and believed that science was a prestigious field and could solve routine life problems. These values are essential in developing motivation to learn science if it is cultivated in children at an early age. The positive values toward science that the parents hold can reduce the challenges and the negative perceptions in learning science (Byars-Winston & Fouad, 2008). The involvement of parents in science activities at home was deemed as good support because, as stated by Maltese and Tai (2011), parents play an essential role in providing early experience to the children in skills development through science-related activities. Thus, parents need to inspire the culture of science at home by helping their children develop skills by conducting simple experiments

at home. Therefore, universities and institutes should take the initiative to create affordable laboratory kits for home use. In addition, informal parental support in encouraging their children to participate in science activities such as visiting science centers was deemed a smart way to cultivate an interest in science. This was because informal science learning not only helps to develop an interest but also provides experience, skills, attitude, and desire to be involved in STEM careers (Archer *et al.*, 2012, Ayar, 2015, Gwen, *et al.*, 2016, Mills & Katzman, 2015, and Sahin *et al.*, 2015). Therefore, informal science education should support parents bringing their children to museums and other informal learning settings. Media such as television, magazines, and science books also need to play crucial roles in promoting the culture of science through programs and appropriate information according to the students and parents (Cavas *et al.*, 2011 and Venville *et al.*, 2013). Hence, parents need to be competent in selecting reading material and programs for their children. This will enable the parents and the children to mutually discuss science topics at home and cultivate a science culture at home. In addition, the government should give more incentive to parents by increasing the tax exemption for spending on science-related materials and books for their children.

Objectives of the Study

The general objective of this study was to determine the effect of English and Filipino as media of instruction in the attitude towards science of high school students.

Specifically, the study aimed to:

- determine the attitude of the respondents under control and experimental groups before and after the use of English and Filipino language as media of instruction in Science; and
- find the difference between the attitude of the respondents in the control group and experimental group before and after the use of English and Filipino as media of instruction in Science.

METHODOLOGY

This chapter presents the operational definition of terms, research design, locale of the study, description of the respondents, sampling and sampling procedure, the instruments used, the process for data collection, and the statistical methods employed.

Operational Definition of Terms

The terms used in this study were operationally defined below to enhance understanding and provide an understanding of their use in the study. **Attitude in Science** is the feeling or opinion of students in Science. This was measured using Likert Scale and the score was described based on the levels of agreement with the corresponding scale.

Strongly Agree	4.21- 5.00
Agree	3.41- 4.20
Neutral/Undecided	2.61- 3.40
Disagree	1.81- 2.60
Strongly Disagree	1.00- 1.80

Control group refers to the group of students who were taught using English.

Experimental group refers to the group of students who were taught using Filipino.

Filipino language is the national language in the Philippines based on Tagalog.

Medium of instruction is the language used by the teacher-researcher inside the classroom which is either English or Filipino.

Respondents of the Study and Sampling Procedure

Purposive sampling was used since only selected sections of Grade 8 were used in the study. The study respondents were the high school students of Juan R. Liwag Memorial High School from two different sections in School Year 2017-2018. The teacher-researcher handled the groups. English as the medium of instruction was used for the control group and Filipino was used for the experimental group.

Table 2. Distribution of the Respondents

Sections	Group	Number of Respondents
8 – Avogadro	Control	33
8 – Bernoulli	Experimental	35
Total		68

RESEARCH DESIGN

The study used Campbell and Stanley’s (1966) quasi-experimental design of non-equivalent pretest-posttest control group design. It used a survey questionnaire to determine their attitude towards Science. An initial and final survey about their attitude towards Science was given to experimental and control groups. The initial survey determined the prior attitude of the students towards Science and the final survey was used to measure their attitude after the formal instruction. Both groups were given the initial survey, were exposed to treatment and were given the final survey. This design was depicted below:

Table 1. Nonequivalent Pretest and Posttest Control Group Design

Pre-response	Treatment	Post-response	Difference
E	O ₁ X	O ₂	O ₂ – O ₁
C	O ₁	O ₂	O ₂ – O ₁

Where:

- E is the experimental group
- C is the control group
- O₁ is the administration of the pretest
- O₂ is the administration of the posttest
- X is the experimental treatment wherein Filipino as medium of instruction was used

The topics discussed were Mitosis and Cell Cycle, Meiosis, Mendelian and Non-Mendelian Genetics.

Instrumentation

Survey questionnaire. This was used to gather the respondents' attitudes towards Science before and after using English and Filipino as the medium of instructions. The researcher used an instrument adapted from the Science Attitude Scale (SAS) developed for the western context (Kind *et al.*, 2007). The original tool has 37 items. A 5-point scale (1 = strongly disagree to 5 = strongly agree) is defined for each item. The format of the tool was retained. However, changes were made in the content to address some contextual needs. Furthermore, an additional dimension of attitude – language use in Science - was included to relate it to the medium of instruction used in teaching Science. Lastly, statements that had the same thought were also deleted and modified. Table 3 summarizes an adapted version of SAS, which contains twenty items.

Table 3. Summary of Science Attitude Scale (SAS)

Category	Scope	Item No.
1. Learning Science in School (LSS)	Learning activities inside the classroom	2, 3, 4, 16
2. Self-concept in Science (SCS)	Based on beliefs about one’s own ability to master school science	7, 8, 9, 17
3. Science Outside School (SOS)	Learning activities outside the classroom	6, 10,14
4. Future Participation in Science (FPS)	Attitude towards involving more with science in the future career	5, 11, 15
5. Importance of Science (IS)	Belief in value of science in a wide social context	1, 12, 13
6. Language Use in Science (LUS)	Attitude towards the medium of instruction used by the teacher in teaching science.	18, 19, 20

Each statement had the following response: 1for strongly disagree; 2 for disagree; 3 for undecided, 4 for agree; and 5 for strongly agree.

Data Gathering Procedure

The first step in the data collection process was to ask permission from the school’s principal. After the approval, the researcher administered the initial survey thru a questionnaire. After the initial survey, the researcher conducted the instruction for 10 sessions, and five topics were discussed using English and the Filipino language. The actual teaching of the lessons in selected topics in Science 8 started on March 8, 2018, and ended on March 21, 2018. After the formal instruction, the final survey was administered to the students. For each group, the difference between the initial and final survey for each student was computed and compared.

Methods of Data Analysis

The following statistical methods were used: mean and standard deviation were utilized to determine their attitude under two medium of instruction, and a T-test for independent samples was utilized to determine the difference in students' attitude when either Filipino or English is used as a medium of instruction. All computations were done using the Statistical Package for the Social Science (SPSS) software.

RESULTS AND DISCUSSION

Attitude of the Respondents Before the Instruction

Table 4. Attitude of Respondents in Science under Control Group and Experimental Group Before the Use of English and Filipino Language as Media of Instruction

Item Statements	Control Group			Experimental Group		
	Mean	SD	D	Mean	SD	D
1. I think Science is important in life.	4.58	0.61	SA	4.80	0.41	SA
2. I like Science	3.73	0.52	A	4.00	0.69	A
3. I enjoy the discussion in Science.	3.79	0.55	A	4.03	0.66	A
4. I find Science interesting.	3.91	0.58	A	4.06	0.73	A
5. I would like to become a scientist.	2.42	1.12	D	2.42	1.12	D
6. I like to do science experiments at home.	3.36	0.99	U	3.86	0.81	A
7. I received good grades in Science.	3.58	0.66	A	3.86	0.65	A
8. I am eager to participate in discussion that involves Science.	3.55	0.67	A	4.06	0.84	A
9. Whether the science content is difficult or easy, I am sure that I can understand it.	3.18	0.53	U	4.03	0.83	A
10. I will enjoy visiting a science museum.	4.18	0.68	A	4.40	0.74	SA

11. I like to study science at the university.	4.06	0.75	A	4.26	0.89	SA
12. Learning science is important in getting a job in the future.	3.76	0.61	A	4.17	0.75	A
13. The science we learn is useful in other subjects.	3.70	0.58	A	4.17	0.92	A
14. I like watching science programs on TV.	3.73	0.72	A	3.91	0.85	A
15. I like to study science in the future.	4.39	0.75	A	4.51	0.70	SA
16. I enjoy hearing the idea of my peers.	3.76	0.83	A	4.14	0.65	A
17. School should have more science lessons.	2.85	0.68	U	3.91	0.82	A
18. I am comfortable in the language used by my teacher in teaching science.	3.91	0.52	A	4.06	0.80	A
19. I understand the medium of instruction used by my teacher in teaching science.	4.06	0.50	A	4.31	0.80	SA
20. I like the medium of instruction used by my teacher in teaching science.	4.00	0.66	A	4.29	0.89	SA
Grand Mean	3.72	0.67	A	4.10	0.78	A

12. Learning science is important in getting a job in the future.	4.06	0.83	A	4.06	0.80	A
13. The science we learn is useful in other subjects.	4.18	0.77	A	4.34	0.68	SA
14. I like watching science programs on TV.	4.30	0.73	SA	3.94	0.87	A
15. I like to study science in the future.	4.67	0.60	SA	4.29	0.96	SA
16. I enjoy hearing the idea of my peers.	4.15	0.67	A	4.23	0.84	SA
17. School should have more science lessons.	3.03	0.77	U	3.80	0.76	A
18. I am comfortable in the language used by my teacher in teaching science.	3.85	0.76	A	3.83	1.07	A
19. I understand the medium of instruction used by my teacher in teaching science.	3.94	0.68	A	4.29	0.52	SA
20. I like the medium of instruction used by my teacher in teaching science.	3.88	0.74	A	4.23	0.55	SA
Grand Mean	3.85	0.74	A	4.02	0.79	A

Legend: SD = Standard Deviation; D = Description; Strongly Agree = SA = 4.21- 5.00; Agree = A = 3.41- 4.20; Undecided = U = 2.61- 3.40; Disagree = D = 1.81- 2.60; Strongly Disagree = SD = 1.00- 1.80

Legend: SD = Standard Deviation; D = Description; Strongly Agree = SA = 4.21- 5.00; Agree = A = 3.41- 4.20; Undecided = U = 2.61- 3.40; Disagree = D = 1.81- 2.60; Strongly Disagree = SD = 1.00- 1.80

Table 4 shows the attitude of the respondents under control and experimental group before the use of two media of instruction in Science. Data showed that before the instruction, the control group had a mean per item ranging from 2.42 to 4.58 with a description from "disagree" to strongly agree, while the experimental group had a mean per item ranging from 2.42 to 4.80 with an inscription from disagree to strongly agree. Results indicate that the respondents in both groups had a positive attitude toward Science before instruction. The grand standard deviation was 0.67 and 0.78, which meant a slight variation in student's responses.

Attitude of the Respondents After the Instruction

Table 5. Attitude of Respondents in Science under Control Group and Experimental Group After the Use of English and Filipino Language as Media of Instruction

Item Statements	Control Group			Experimental Group		
	Mean	SD	D	Mean	SD	D
1. I think Science is important in life.	4.64	0.60	SA	4.74	0.44	SA
2. I like Science	3.85	0.76	A	4.11	0.87	A
3. I enjoy the discussion in Science.	3.61	0.83	A	4.06	0.80	A
4. I find Science interesting.	4.00	0.83	A	4.00	0.84	A
5. I would like to become a scientist.	2.52	1.12	D	3.26	1.09	U
6. I like to do science experiments at home.	3.67	0.45	A	3.40	1.17	U
7. I received good grades in Science.	3.52	0.91	A	3.86	0.65	A
8. I am eager to participate in discussion that involves Science.	3.18	0.73	U	3.69	0.87	A
9. Whether the science content is difficult or easy, I am sure that I can understand it.	3.33	0.82	U	3.69	0.53	A
10. I will enjoy visiting a science museum.	4.42	0.61	SA	4.46	0.78	SA
11. I like to study science at the university.	4.06	0.75	A	4.11	0.76	SA

Table 5 shows the attitude of the respondents under the control group and experimental group after the use of two media of instruction in Science. Data showed that after the instruction, the control group had a mean per item ranging from 2.52 to 4.64 with a description from "disagree" to strongly agree, while the experimental group had a mean per item ranging from 3.26 to 4.74 with an inscription from undecided to strongly agree. It indicates that the respondents in both groups had a positive attitude in Science. The grand standard deviation was 0.74 and 0.79, which meant slight variation in students' responses.

Change in the Attitude of the Respondents

Table 5. Mean Attitude of the Control Group and Experimental Group Before and After the Use of English and Filipino Language as Media of Instruction in Science and the Change in Attitude

Group	Attitude before Instruction		Attitude after Instruction		Change in Attitude	
	Mean	t-value	Mean	t-value	Mean	t-value
Control	3.72	1.37	3.85	0.78	0.13	0.74
Experimental	4.10		4.02		-0.08	

Legend: Strongly Agree = 4.21- 5.00; Agree = 3.41- 4.20; Undecided = 2.61- 3.40; Disagree = 1.81- 2.60; Strongly Disagree = 1.00- 1.80

Before the instruction in Science, the data showed that the control group had obtained a lower mean attitude of 3.72 than the experimental group that acquired a mean attitude of 4.10. Both were described as "Agree." Moreover, data also showed that the control and experimental groups' mean attitudes are comparable. It indicates that the slight difference in favor of the experimental group was not statistically significant since the computed t-value is only 1.37. It only shows that the respondents have a positive attitude toward Science before using English and the Filipino language as media of instruction in Science since they agreed on the positive statements of the attitude tests. This means that the two groups before the instruction have almost the same level of agreement in the statements about their feelings and opinion in Science. After using English and the Filipino language as media of instruction in Science, results revealed

that the control group had obtained a lower mean attitude of 3.85 than the experimental group, which obtained a mean attitude of 4.02 (Table 5). Nevertheless, both were described as "Agree." Furthermore, data also showed that the mean attitude between the control and experimental group do not differ significantly. It indicates that the slight difference in favor of the experimental group was not statistically significant since the computed t-value is only 0.78. It only shows that the respondents have a positive attitude toward Science after using English and the Filipino language as media of instruction in Science since they agreed on the positive statements of the attitude tests. It implied that the control and experimental group had more or less the same attitude towards Science. The overall positive attitude towards selected topics in Science after the instruction is supported by the study of Talisayon *et al.*, (2006), which revealed a positive Science related interest and experiences in Science yields a positive attitude towards science subjects, whatever is the medium of instruction used. In terms of the change in attitude before and after using English and Filipino language as a medium of instruction in Science, the results showed that the control group had a mean attitude of 3.85 after the instruction which is higher than 3.72 before the instruction. Both were described as "Agree." It indicates an increase of 0.13 in the mean attitude of the control group. On the other hand, the experimental group had a mean attitude of 4.02 after the instruction, which is lower than the mean attitude of 4.10 before the instruction. There was a decrease of 0.08 in the mean attitude of the experimental group. In addition, it implied that the change in attitude in Science of the control and experimental group was comparable since the computed t-value is only 1.36. The result was supported by Daquioag (1996) study that significant changes in attitude towards the subject were not observed before and after the experiment period. The students' attitudes will not change even different media of instruction (Daquioag, 1996). In addition, Osborne (2003) studied student attitude towards Science, and there are many factors of influence such as gender, teachers, curricular, cultural, and other variables. This means that both English and Filipino languages as medium of instruction have the same effects; that is, they did not contribute much to the change in the attitude of the students, and it could be that other factors might have an impact to change their attitude. Furthermore, the following was considered by the teacher-researcher as possible reasons in the absence of significant change in attitude among the respondents: (1) The length of time or duration of the study is short to observe the possible changes in their attitude. To change one's attitude may take months or even years. (2) The topics that were discussed were just a portion of biology and it is only a quarter of science subjects. The other topics were chemistry, physics and environmental Science. (3) language use as a medium of instruction is only one factor among the many factors that could influence student's attitude. Since the result of the study is insignificant, therefore there could be other factors that may directly influence their attitude.

CONCLUSIONS

It was concluded that the attitude of the respondents in Science, before and after the instruction, the two groups got mean attitude scores which meant that they agreed on the positive beliefs/opinions about Science. The control and experimental groups had a statistically comparable overall mean in the attitude before and after instruction. Language then appeared to have no effect on the students' attitude in Science. Hence, students taught in English and Filipino had equal attitudes towards Science. Therefore, this only implies that other factors might impact changing the attitude of the respondents.

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