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The Effects of Interactive Science Notebook on Student Teachers' Achievement, Study Habits, Test Anxiety, and Attitudes towards Physics

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ABSTRACT

This study aimed to examine the impacts of using Interactive Science Notebook on students' achievement, study habits, test anxiety levels, and attitudes towards physics. An interactive notebooking strategy was introduced to student teachers, who were enrolled to a local university. The participants comprised of 37 sophomore student teachers taking General Physics 2 (Electricity & Magnetism). To collect data, their profiles were gathered using survey questionnaires that measure students' learning style, study habit, test anxiety, and attitude towards physics as well as a physics achievement test. Through a pre-experimental research design, descriptive statistics and appropriate statistical analyses were conducted. The results indicated that the use of Interactive Science Notebook significantly improved student teachers' physics achievement levels. It was also found out that their study habits, test anxiety levels and attitudes towards physics significantly predicted their physics achievement levels.

Keywords: Achievement, attitude in science, interactive science notebook, learning style, physics, pre-service science teachers.

INTRODUCTION

To meet the demands of science-based careers in the future, worldwide governments have purposed to improve their science education. However, this issue has painted a vague picture for undeveloped and developing countries. Conversely, the Philippines has also been facing such a challenge for Science Education.

This is evident on Philippine students' performance levels in national standardized tests and international surveys such as TIMMS in 2003 (Orleans, 2007) and in TIMMS 2008

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(Ogena Laña, & Sasota, 2010). Huge numbers of students, who do not have basic skills and scientific (content) knowledge, may be seen as an indicator of their received education levels (Sinaga, Kaniawati, & Setiawan, 2017). This becomes an issue since a globalized demand requests to equip students with qualified human resources (i.e., higher-order thinking skills) (Zubaidah, Fuad, Mahanal, & Suarsini, 2017).

Physics education unfortunately encounters the same fate with science education. Students find physical sciences (i.e., physics, chemistry and astronomy) difficult (Osborne, Simon, & Collins, 2003) and often have low interest in school subjects (Kapucu, 2016) because of their low mathematics knowledge/skills. A lack of well-trained teachers, who teach the subject via the nature of the course, makes physics learning less attractive for students that resulted to the unpopularity of physics courses among students. In the Philippines, seeing a Filipino who holds a doctoral degree in Physics, is literally a-one-in a million chance of a lifetime.

Aim

The main aim of the study was to determine the impacts of using Interactive Science Notebook on student teachers' achievement levels and attitudes towards physics. Specifically, the following research questions guided the current study:

1. What are the student teachers' demographic profiles (i.e., age, gender, learning style and study habits)?
2. What are the effects of the Interactive Science Notebook (ISN) on the student teachers' physics achievement levels, learning styles, study habits, test anxiety levels and attitudes towards physics?
3. Which of these variables (e.g., learning style, study habits, test anxiety level, attitude towards Physics) influence their physics achievement levels?

An Overview of Literature

A country needs scientifically literate society to achieve any development. Science process skills help citizens make a sound judgment and function of science or scientific knowledge. This calls a need for producing a scientific populace in many countries (International Council for Science (ICSU), 2011). Moreover, a scientifically literate person is able to use basic scientific knowledge and apply it to everyday life (Çepni, Ülger, & Ormanci, 2017). Indeed, research studies showed a positive correlation between scientific literacy and level of general education attained (China Association for Science and Technology (CAST), 2004). The higher level of scientific understanding develops, the more citizens aspire for the quality of higher education. This fact goes along with knowledge since a country's development is dependent on the quality of graduates. On the other hand, teachers play a major role in inspiring and mentoring science enthusiast. When science teachers are equipped with pedagogical and subject knowledge, this can surely affect their students' performances. Investments in the quality of teachers may also improve student performance (Darling-Hammond, 2000). In addition, qualified teachers greatly help low ability students (Stronge *et al.*, 2007). Same studies suggested that there was a close link between an effective teacher and student achievement. Unfortunately, students are lured away because of a lack of an attractive instructional preparation. Since some teachers even lack a sound understanding of the scientific concepts and mathematical skills, they may negatively contribute to science enthusiasts.

Brain-based strategies (Ozden & Gultekin, 2013), inquiry-based teaching strategies (Rosenshine, 2012) and research-based principles (Ambrose, DiPietro, & Norman, 2010 ; (Dunn *et al*., 2009) were found to be effective in improving students' performances and learning styles. Much more attention should also be given to acquire positive attitudes towards science. Most of science classrooms focuses on transitive knowledge acquisition, while less attention is given to teaching style and activity engagement (Osborne *et al*., 2003). To develop positive attitudes towards science requires to employ proper measurement tools (Brossard *et al.*, 2005). Positive attitudes towards physics, good study habits and grades in English and Mathematics are directly correlated to students' performances (Boado, 2013). The different proponents of the learning models emphasize the importance of proper assessment of students' learning styles, which play a crucial role in improving students' performances Hawk, & Shah, (2007). Dunn *et al.*, (2009) stated that knowing the different learning styles enabled teachers to develop suitable instructions responding to students' needs. Felder (1998) attributed a poor performance, professorial frustrations and a loss of many potentially excellent engineers to mismatched learning styles. Hence, this issue needs to match learning styles with teaching. Test anxiety is another factor that affects student's performance. Studies suggest that students' test anxiety levels have negative effect on students' performance (Credé & Kuncel, 2008) and good study habits, which account for a small measurable contribution (Derossis, Da Rosa, , Schwartz, Hauge, & Bordage, 2004). Developing positive attitudes towards the subject may increase students' motivation levels and drive to a fear leading to anxiety (Oludipe, 2009). To make physics learning more meaningful and rich, teachers use interactive science notebooks in their classes. This will make learning more appealing and put students into a process of making sense and knowledge acquisition (Jaladanki & Bhattacharya, 2014); (Jaladanki, 2015). Multiple Intelligence Theory released by Howard Gardner also underpins the interactive science notebook (Madden, 2001). Studies have shown that these science notebooks help students correctly develop conceptual understanding (Ruiz-Primo *et al*, 2004; Butler *et al*., 2010).

Use of Interactive Notebooks can be traced back to the Advancement via Individual Determination (AVID) launched in 2007 Waldman, & Crippen, (2009). Interactive notebooks are designed to consider the brain's way for information process. An ordinary notebook is divided into left and right pages. In the left page, student get in and out the activity phase (Waldman *et al.*, 2009). Students are also asked to write, draw and answer the prompted question in the left page. Students write their thoughts in different modes, which provide opportunities for creativity and showcase of individual understanding in many unique ways. The right page requires students to take down notes from teacher's lecture, react to the watched videos and the process using the Cornell Note Taking Method (Faber *et al*., 2010). The Cornell method, as a notetaking strategy, affords students to write notes in class using a two-column with unequal width format. Students write their notes to the 6-inch second column. While students write questions at varied levels to the first column, which is about 2 inches and smaller than the second one. At the bottom of the page, students are asked to write a brief summary about what they have learned (Faber *et al.*, 2010). When science notebooks are used properly, learning difficulties resulting from lectures less likely occurs. Thereby, science notebooks lead to improve student performance (Quintus *et al.*, 2012).

Conceptual Framework

The researchers hypothesized that students' achievement and attitudes towards physics would mediate as interrelated factors. Some of them are inherent to students' skills and experiences, along with related external learning factors.

In this study, the researchers looked into the effects of using the interactive science notebook on students' study habits, test anxiety levels, and attitudes towards physics that in hand affect students' performances. Figure 1 shows the relationship(s) between the variables in the study.

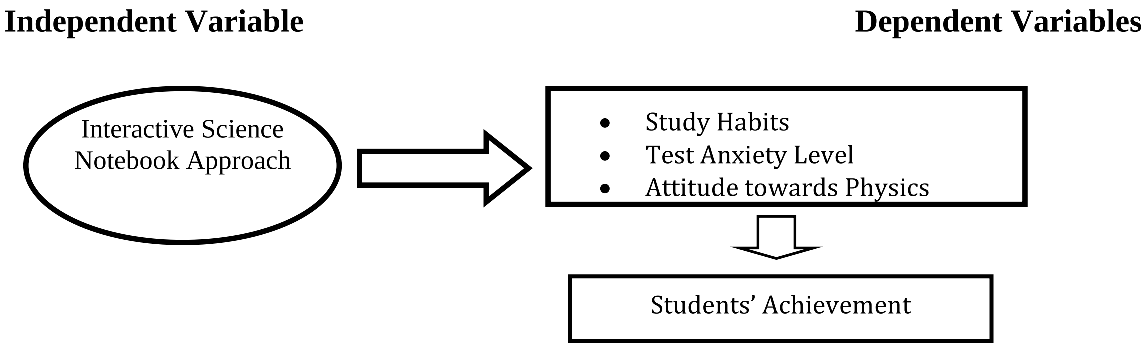

Figure 1. A flowchart showing the relationship(s) between the variables in the study.

METHOD

Interactive Science Notebooks (ISN) were used for every meeting while the lecture progressed in a regular schedule. Students were taught on how the notebook was set up. Two (2) meetings were allocated to discuss this note booking strategy and prepare the students. A large notebook would be applicable to allow more space for writing. Students used the notebook to write their answers to the physics tasks or activities given by the teacher, and record their notes during the lectures. Interactive Science Notebook not only promoted students to actively engage in learning process but also encouraged them to copy all science concepts as an output and excellent reference or review material.

The researchers adopted the existing three (3) phases of learning design to develop students' interactive notebooks. Each of a three-phase learning session, which constituted a class period, asked students to do *In-through-Out* activities (Waldman , 2009). The interactive nature of using the notebook helped students to interact with their classmates, learning materials, and their teachers through discussion. Hence, this process allowed them to engage in learning.

Every class period started with an *"In-Activity"*, and followed the second phase constituting a *through activity* as a teacher input. The third phase named *"out activity"* was done before the end of the session. The impacts of the ISN on students' achievement levels and attitudes towards science were then determined using the results of pre-test and post-test. Questions on the use of interactive notebooks were also asked to students through reflective writing activities and random interviews.

Research Design

Even though the researchers had originally planned to have the experimental and control groups, only one class was opened at Bachelor of Science in Secondary Education major in Physical Sciences in the local university. Hence, this specific case drove the researchers to follow a pre-experimental research design (a one-group pre-test-post-test design). Pre-tests were administered to measure students' attitudes towards the physics, test anxiety levels, physics (Electricity) achievement levels, and learning styles. The participants were then exposed to the use of interactive science notebook. Finally, the effect of this strategy on the aforementioned dependent variables were tested with post-tests.

Instruments

Index of Learning Style Questionnaire (ILS). A 44 item questionnaire used to assess preferences on four dimensions of a learning style model. This instrument was validated by

Litzinger, Lee, Wise, & Felder (2007). Its test-retest correlation coefficients were found to be 0.7 -0.9 (Felder & Spurlin, 2005) and 0.55-0.77 (Litzinger *et al.*, 2007).

Study Habit Questionnaire. The researchers developed a 50-item questionnaire within seven sub-factors (Concentration, Remembering, Organizing Time, Studying a Chapter, Listening and Taking Notes, Taking tests and Motivation). Its Cronbach alpha coefficient was found to be 0.78, which is higher than the acceptable value (0.70) for the measurement of preference or attitude.

Test Anxiety Questionnaire (TAQ). The 5-point questionnaire included 36 items. It was originally developed by Suinn (1969) and revised in 2002, and can be accessed thru the Student Learning Assistance Center (SLAC), Texas University-San Marcos. This questionnaire was validated, tested and used in a local study. Its reliability was calculated to be 0.88.

Students Attitude towards Physics Questionnaire. The questionnaire consisted of 20 questions. Its Cronbach's alpha value was found to be 0.80.

Physics Attitude Scale. This scale comprising of 30 Likert-type items measured students' feelings about Physics. The scale included positive and negative statements. Its Cronbach's alpha co-efficient was counted to be 0.83.

Achievement Test in Physics. The 30-multiple choice test was developed to determine students' learning and retention levels in calculus-based courses on electricity and magnetism before and after the treatment. . This test was pilot-studied with the students, who had previously taken the course. Hence, the pilot study enhanced its validity. Also, its reliability value was found to be 0.86.

Data Collection

The study involved the use of a prepared interactive science module used by the teacher and students. The activities supplemental to a two-month topic were covered in a regular physics class. These science activities took the students' multiple intelligences and learning styles into account. That is, instead of teacher-centered instruction, students actively participated in various science activities. Hence, student-centered learning environment specifically engaged them in learning various science concepts in a lecture room.

A group of three experts validated this interactive science module. The module was then used in the class as an instructional material. Its impacts on the students' achievement levels and attitudes towards physics were determined using the Index of Learning Style Questionnaire, Study Habits Questionnaire, Test Anxiety Questionnaire, Attitudes towards Physics Questionnaire, and Electricity Achievement Test. The electricity achievement test was developed and validated to measure the effect of using this module on the students' physics learning levels.

Treatment of Data

To describe the participants' profiles (i.e., age, gender, learning style, anxiety level, study habits, and average grades in science including physics and chemistry, and average grades in mathematics), descriptive statistics were used. Wilcoxon signed-rank test was conducted to determine the effect of using the ISN on the students' attitudes towards science. Paired-samples t-test was carried out to measure the effect of using the ISN on students' physics learning/achievement levels. Multiple regression analysis was used to identify which of the foregoing variables would influence their learning performances towards science.

RESULTS AND DISCUSSION

Table 1. *The student teachers' profiles of gender*

Gender	f	Percentages (%)
Female	28	75.68
Male	9	24.32
Total	**37**	**100**

As seen in Table 1, majority of the student teachers in Department of Physical Sciences was female. This trend is very common for different teacher education programs in the institution.

Table 2 presents their learning styles of the use of Interactive Science Notebook (ISN). Students' learning styles were assessed using Felder Learning Style Index (Soloman, & Felder, 2005). Their learning styles in the post-test were consistent with those in the pre-test.

Table 2. *The student teachers' learning styles in the pretest and posttest (N=37)*

Learning Styles	Pre-Test		Post-Test	
	f	%	f	%
Active/Reflective				
Fairly Well-Balanced (Active/Reflective)	25	67.6	28	75.7
Moderate Active	5	13.5	4	10.8
Strong Active	1	2.7		
Moderate Reflective	6	16.2	5	13.5
Strong Reflective				
Sensing/Intuitive				
Fairly Well-Balanced (Sensing/Intuitive)	15	40.5	14	37.8
Moderate Sensing	17	45.9	18	48.6
Strong Sensing	3	8.1	4	10.8
Moderate Intuitive	2	5.4	1	2.7
Strong Intuitive				
Visual/Verbal				
Fairly Well-Balanced (Visual/Verbal)	20	54.1	12	32.4
Moderate Visual	10	27.0	15	40.5
Strong Visual	3	8.1	8	21.6
Moderate Verbal	4	10.8	2	5.4
Strong Verbal				
Sequential/Global				
Fairly Well-Balanced (Sequential/Global)	25	67.6	23	62.2
Moderate Sequential	7	18.9	10	27
Strong Sequential	2	5.4	1	2.7
Moderate Global	2	5.4	3	8.1
Strong Global	1	2.7		

As observed in Table 2, majority of the student teachers' learning styles fell fairly into well-balanced active/reflective members. In terms of sensing/intuitive, more student teachers were categorized under moderately sensing (45.9%) while 40.5% of them were fairly classified under well-balanced sensing/intuitive. In terms of verbal/visual learning style, 54% of them were fairly labelled under well-balanced visual/verbal learners, whereas about 27% of them fell into moderate visual. This implies that physics teachers should provide for more visual and verbal ways to present concepts. Thereby, students may have an opportunity for learning process or presenting their ideas through visual and verbal outputs.

Sixty eight percent (68%) of them were fairly classified under well-balanced sequential/global, whilst about 19% of them fell into moderate sequential. Sequential learners generally understand through linear and logical steps. Global learners, on the other hand, learn with large jumps randomly absorbing facts and information until they get the whole idea. The Interactive Science Notebook under investigation was designed to serve the student teachers' different learning styles.

Table 3 shows their study habits (i.e., concentration, remembering, organizing time, studying a chapter, listening and taking notes, taking test and motivation) before and after the intervention. After their responses were scored accordingly, the researchers interpreted them using the following descriptions: *very good, good, fair and poor*. Table 3 indicates the results of the student teachers' study habits falling into the categories "*poor* and *good*." None of their study habits was categorized under either *very good* or *fair* category. The results showed that the percentages of the student teachers, who perceived themselves as good study habits at the "*concentration, remembering* and *motivation*" areas, slightly decreased from the pre-test to the post-test.

Table 3. *The student teachers' study habits in the pre-test and post-test*

Study Habit Areas	Pre-test		Post-test	
	Good (%)	Poor (%)	Good (%)	Poor (%)
Concentration	28(76)	9(24)	25(68)	12(32)
Remembering	31(84)	6(16)	29(78)	8(22)
Organizing Time	25(68)	12(32)	26(70)	11(30)
Studying a Chapter	30(81)	7(19)	31(84)	6(16)
Listening	33(89)	4(11)	33(89)	4(11)
Taking Notes	29(78)	8(22)	31(84)	6(16)
Taking Test	35(95)	2(5)	34(92)	3(8)
Motivation	34(92)	3(8)	34(92)	3(8)

As seen from Table 3, the percentages of the student teachers, who perceived themselves as good study habits at *organizing time, studying a chapter* and *taking test,* slightly increased from the pre-test to the post-test. However, the percentages of the student teachers, who perceived themselves as good study habits at the areas "listening and taking notes" and overall study habits, showed no change from the pre-test to the post-test.

Analysis of Variance (ANOVA) was performed to determine any significant difference between mean scores of the student teachers' study habits. As can be seen from Table 4, there was no significant difference between the student teachers' study habits in the different areas and overall score. This means that the use of ISN did not significantly improve their study habits.

Table 4. *The results of ANOVA on the student teachers' study habits*

Source	Degrees of Freedom	Sum of Squares	Mean Squares	F-Value	P-Value
Factor	20	226.47	11.323	1.76	0.149
Error	13	83.66	6.435		
Total	33	310.13			

The results of ANOVA revealed that a two-month intervention with the use of Interactive Science Notebook did not significantly change their study habits. However, they had good study habits as indicated by Table 4. Mega, Ronconi and De Beni, (2014) emphasized the importance of self-regulated learning in students' academic achievement levels. Self-regulated learning includes such strategies as examination, organization and metacognition that are important aspects of good study habits.

Table 5 displays their anxiety levels before and after the intervention. The results showed a decrease in the percentages of anxious student teachers from the pre-test to the post-test. Even though the treatment reduced some of the student teachers' test anxiety levels, this improvement from the pre-test to the post-test was not significant. This means that the ISN may have helped them not to feel anxious about physics despite the difficulty of the topics.

Table 5. *The student teachers' anxiety levels in the pre-test and post-test*

Description	Pretest		Post Test	
	F	**Percentage (%)**	**F**	**Percentage (%)**
Anxious	15	40.54	11	29.73
Not Anxious	22	59.46	26	70.27
Total	**37**	**100**	**37**	**100**

According to Mega *et al*., (2014), emotions, which affect students' performances in class, can be categorized in regard to their relations to activity, outcome and achievement. Emotions are manifested as enjoyment in the class activity, boredom from lectures, and anything resulting from success and failure in the classroom. Students with low mathematics achievement tend to have high mathematics anxiety (Zakaria, Zain, Ahmad, & Erlina, 2012). Since the use of ISN focused on conceptual aspect of physics instead of algorithm, majority of the student teachers was not anxious about physics.

Table 6 shows their attitudes in different constructs using the Students' Attitudes toward Physics questionnaire. Almost a majority or 76% of them had a good attitude towards physics as a subject in the posttest. The frequencies of the student teachers, who had a good attitude towards physics teaching, were the same at the pre-test and post-test. In fact, this was an expected result for the science student teachers.

The frequencies of the student teachers, who possessed a good attitude towards mathematics and physics, increased from the pre-test to the post-test while those of the student teachers, who had a fair attitude towards mathematics and physics, decreased from the pre-test to the post-test. This means that the student teachers, who were not proficient in mathematics, were not favorable towards the mathematics component of physics. Indeed, high-mathematics achievers tend to have positive attitudes towards mathematics (Mata, Monteiro, & Peixoto, 2012; Maloney, Schaeffer, & Beilock, 2013).

Table 6. *The student teachers' attitudes towards physics*

Attitude Constructs	Pre-test					Post-test				
	Very Good	**Good**	**Fair**	**Poor**	**Total**	**Very Good**	**Good**	**Fair**	**Poor**	**Total**
Attitude towards Physics Subjects	7	28	2	0	37	5	31	1	0	37
Attitude towards Physics Teaching	1	34	2	0	37	0	34	3	0	37
Attitude towards Mathematics and Physics subjects	0	5	31	1	37	0	13	24	o	37
Overall	0	35	2	0	37	0	35	2	0	37

To determine whether a significant difference exist between mean scores of their attitudes at the pre-test and post-test, a Wilcoxon signed-rank test was conducted. As seen from Table 7, 19 student teachers had higher negative ranks from the pre-test to the post-test, while 9 of them possessed higher positive ranks from the pre-test to the post-test. 9 student teachers did not change their attitudes from the pre-test to the post-test. For this reason, there was no significant difference between mean scores of their attitudes at the pre-test and post-test (z =-1.607, p =.108).

Table 7. *The results of Wilcoxon Signed-rank Test on the student teachers' attitudes at the pre-test and post-test*

Constructs	Negative ranks	Positive ranks	Ties	Z	p
Attitude towards physics subject	19	9	9	-1.607	.108
Attitude towards the teaching of physics	16	16	5	-1.045	.296
Attitude towards math and physics	5	20	4	-3.553	.000
Overall attitude	18	14	5	-1.675	.094

As seen from Table 7, there were equal numbers of the student teachers, who positively and negatively changed their attitudes towards the teaching of physics from the pre-test to the post-test while 5 of them remained unchanged towards the teaching of physics. However, this change was not significant (z=-1.045, p = .296). In terms of the student teachers' attitudes towards mathematics and physics, 5 of them had higher pre-test scores than the post-test ones. 20 of them, who possessed higher post-test scores than the pre-test ones, favorably changed their attitudes towards math and physics.
This attitudinal change may be attributed to their use of the interactive science notebooks. The use of varied methods to acquire information may have helped them easily and systematically learn the concepts. Thus, such a way may have significantly changed their attitudes towards Mathematics and Physics. Following the brain based strategy, the student teachers may have processed information and applied newly learned concepts to their daily lives. Such a strategy seemed to employ different meta-cognitive strategies to think, act and reflect their learning gains. That is, they actively participated in learning the concept(s) by means of drawing comic strips, asking questions, making concept maps, watching video lectures, and becoming a group member. Further, working on a task and connecting the acquired information to real-life situation may have created a good learning atmosphere for them. This is in contrast with the traditional teaching, where students passively sit and listen to their instructors until they are lulled to sleep.

The use of the interactive science notebook may have helped them realize "fun" and "active" ways of physics learning resulting into their perceptional changes towards Mathematics and Physics. Only 4 of them did not change their attitudes from the pre-test to the post-test. This attitude change was significantly different (z= -3.553, p= .000). For their overall attitudes towards physics, 18 of them had higher pre-test scores than post-test ones as negative ranks, 14 of them possessed had higher post-test scores than pre-test ones as positive ranks. 5 of them did not change their overall attitudes. However, this attitudinal change was not significant (z= -1.675, p =.094). Ercikan, McCreith and Lapointe (2005) found that attitude was the strongest predictor of student's participation in advanced mathematics courses. Students, who have confidence in doing math, will most likely join math classes with less anxiety. Similarly, Zakaria *et al.* (2012) claimed a negative correlation between anxiety and achievement. In addition, Dowker, Sarkar and Looi (2016) asserted that students with mathematics anxiety would avoid mathematics-related activities and situations. He added that the higher anxiety would reduce their performances. Dowker *et al.* (2016) emphasized that physics should have not focused on the mathematics but concentrated on the students' conceptual and functional understanding. Likewise, Perry, (2004) advocated the teaching of computational skills and the concepts at the same time. Leppävirta (2011) stressed that conceptual understanding was beneficial for low achievers and might lower their anxiety levels.

Table 8 shows the student teachers' achievement test scores from the pre-test to the post-test. Passing score (grade of 75%) in most test is 50% for a major subject. The results of the 30-item achievement test illuminated that 15 of them acted as passing scores. Physics is a major subject in the program *BSED Physical Sciences*.

Table 8. *The percentages and frequencies of the student teachers' pre-test and post-test scores in the physics achievement test*

	Pre-test		Post-test	
Scores	**f**	**Percentages (%)**	**f**	**Percentages (%)**
Above 15	5	14	11	30
Below 15	32	86	26	70
Total	37	100	37	100

The percentages of the student teachers, whose scores fell into below 50%, were 86% for the pre-test, and 70% for the post-test. This means an increase in the number of the student teachers, who were able to score 50% correctly in the physics achievement test. To determine any significant difference between pre- and post-test mean scores of their responses to the Physics Achievement Test, paired samples t-test was conducted.
Table 9 shows the results of their responses to the Physics achievement test after the use of the Interactive Science Notebook (ISN). The results of paired samples t-test (t (36) = - 6.127, $p < 0.05$) revealed a statistically significant difference from the pre-test to the post-test (the use of the interactive science notebook from 10.03 ±3.19 to 12.97 ± 2.84; $p<.05$; an improvement of 2.95 ± 2.92).

Table 9. *The results of ANOVA for multiple regression analysis*

	Sum of Squares	**Degrees of Freedom**	**Mean Square**	**F**	**Sig**
Regression	64.402	3	21.467	3.127	.039
Residual	226.571	33	6.866		
Total	290.973	36			
R^2 = .221					

A multiple regression analysis was also carried out to determine whether test anxiety level, attitude towards physics and study habits could predict their physics achievement levels. As seen from Table 9, the results indicated that overall regression model was a good fit for the data. Namely, the independent variables significantly predicted the dependent variable (F (3, 33) = 3.127, $p < .05$).

The general form of the equation to predict their physics achievement levels from study habits, test anxiety and attitude towards physics was:

Achievement in Physics = 4.62 + (.380 x study habits) + (.305 x test anxiety) + (5.89 x attitude)

The results revealed that their attitudes towards physics made more significantly contribution than did the study habits and test anxiety. These findings are supported by Boado (2013) addressing that students will perform better in physics when they possess good mathematics skills, positive attitude and good study habits. The finding of this study is similar to that of

Derossis et al. (2004) claiming that study habits account for a measurable small contribution to student performance.

The Student Teachers' Responses to the Interview Questions

When students were asked about their best topics in the Interactive Science Module, the percentages of the student teachers, who chose electrical nature of matter, electric potential, electric field and Coulomb's Law, were 53%, 14%, 19%, and 8% respectively. Two of them (6%) did not identify their best topics in the module. They disclosed that they chose the topic based on their performances and the associated activities. Their positive attitudes towards these topics seemed to have encouraged their success and enjoyment levels in performing different activities. That is, this issue may have helped them understand the relevant concepts.

Majority of them claimed that they had learned new concepts from the Interactive Science Module. However, when the students were asked to list down five concepts they had learned, only 19 out of 36 student teachers were able to correctly name the concepts. The rest of them listed such learning strategies as concept mapping, comic strip, POE instead of physics concepts. The students were also asked how the Interactive Science Notebook (ISN) and Interactive Science Module (ISM) had enabled them to learn the concepts. The students referred the following issues:

1. Reading and writing varied activities in the ISN helped to process information in a creative and informative way.
2. The ISN helped them organize the notes into best information.
3. The ISN provided good review materials facilitating to recall and understand.
4. The ISN afforded them to understand their lessons.

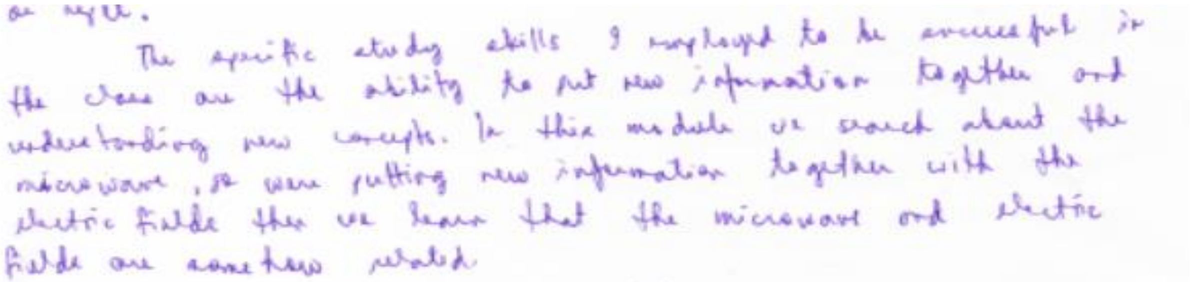
or style.
The specific study skills I employed to be successful in the class are the ability to put new information together and understanding new concepts. In this module we search about the microwave, we were putting new information together with the electric fields then we learn that the microwave and electric fields are somehow related

Figure 2. The student teacher C's response on the help of the ISN for learning

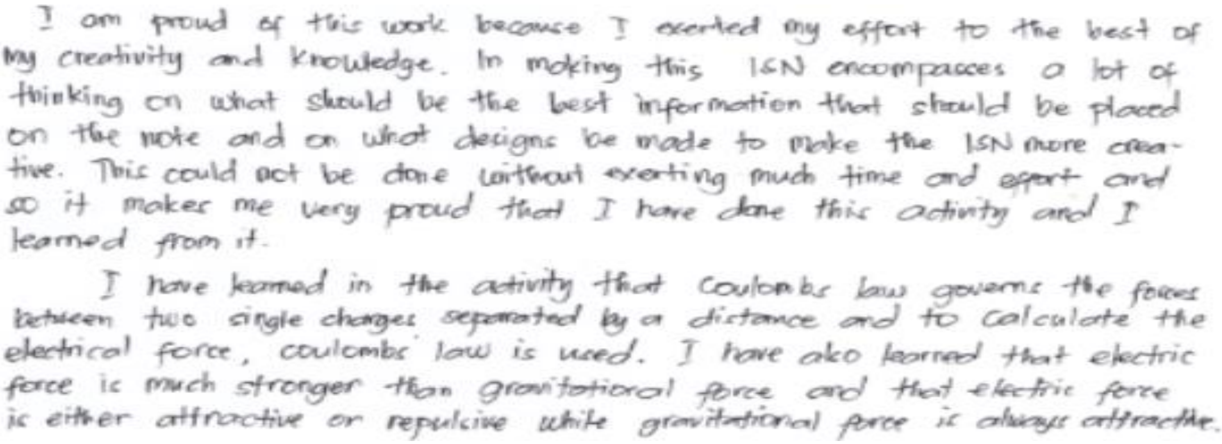
I am proud of this work because I exerted my effort to the best of my creativity and knowledge. In making this ISN encompasses a lot of thinking on what should be the best information that should be placed on the note and on what designs be made to make the ISN more creative. This could not be done without exerting much time and effort and so it makes me very proud that I have done this activity and I learned from it.
I have learned in the activity that Coulombs law governs the forces between two single charges separated by a distance and to calculate the electrical force, coulombs law is used. I have also learned that electric force is much stronger than gravitational force and that electric force is either attractive or repulsive while gravitational force is always attractive.

Figure 3. The student teacher a's response on his experience with the ISN and appreciation of the learning activities

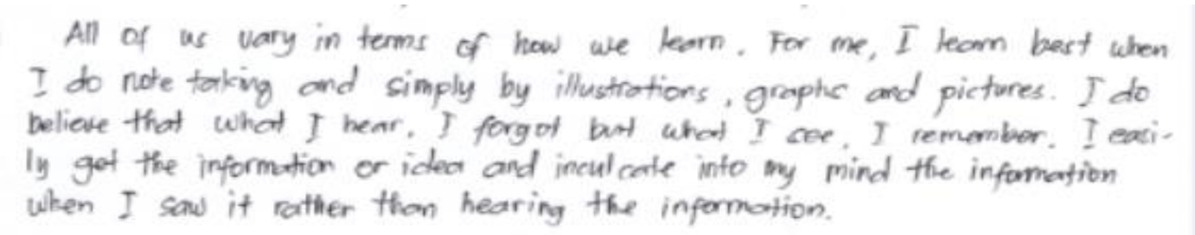
All of us vary in terms of how we learn. For me, I learn best when I do note taking and simply by illustrations, graphic and pictures. I do believe that what I hear, I forgot but what I see, I remember. I easily get the information or idea and inculcate into my mind the information when I saw it rather than hearing the information.

Figure 4. The student teacher B's response on the benefits of the ISN

CONCLUSION and RECOMMENDATIONS

Majority of the student teachers were female, half of whom was almost older than their classmates. Dominant learning styles were active, sensing, visual and sequential. There was an observed increase in the number of the student teachers, who fairly fell into well balanced in terms of active /reflective, moderate sensing and moderate visual. This may result from reflective and sensing activities in the interactive science notebooks.

Majority of them perceived themselves as good study habits. The number of the student teachers, who perceived themselves as good study habits at the "organizing time, studying a chapter and taking test" areas, slightly increased from the pre-test to the post-test. However, the number of the student teachers, who perceived themselves as good study habits at the "listening and taking notes" and overall study habits, revealed no change from the pre-test to the post-test.

There was no significant difference between their study habits of different areas and overall study habits at the pre-test and post-test. The two-month treatment with the use of the Interactive Science Notebook did not significantly change their study habits. Overall, the student teachers had good study habits as indicated by the results.

The use of the ISN helped them reduce their test anxiety levels, but this change was not really significant. The use of the ISN seemed to have maintained their overall attitudes towards physics despite an increase in the difficulty or complexity of the topic. Moreover, using the ISN significantly improved their attitudes towards the mathematical component of physics.

The use of the ISN significantly evolved their achievement test scores from the pre-test to the post-test. Test anxiety, study habits and attitude towards physics were effective at predicting their physics achievement levels. A positive attitude towards physics seemed to have helped them perform well in physics.

The Interactive Science Notebook in teaching physics may be used as an alternative method for educating science student teachers since their performances positively observed and improved. Strengthening mathematics skills at basic education level may be given a priority to help more students succeed in their bachelor programs. Further studies should be undertaken for other bachelor programs, which necessitate to enroll into physics.

Future studies should concentrate on curriculum materials and appropriate teaching approaches that will enhance students' physics achievement levels. Because different student groups may differently respond to the treatment or intervention (i.e., the use of the ISN), the findings of this study may only be true to the sample of the current study.

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