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LEARNING STYLES, STUDY HABITS AND ACADEMIC PERFORMANCE OF FILIPINO UNIVERSITY STUDENTS IN APPLIED SCIENCE COURSES: IMPLICATIONS FOR INSTRUCTION

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Abstract

In order to better prepare university students as proficient, versatile and productive information and industrial technologists in the 21st century, the need to implement instructional strategies and activities naturally align with their predispositions will make them better learners. This study examined the learning style preferences, study habits and level of academic achievement of students enrolled in applied science courses of one campus of a public higher education institution in the Philippines. The study employed descriptive correlational research design to a total of seventy-five respondents who were purposively sampled. Two sets of standardized instruments were utilized by the researcher. Results of the study revealed that the students of applied sciences courses preferred visual, group and kinesthetic as major learning styles while they manifest a moderate level of study habits. They also have a good level of academic achievement. Test of difference revealed that academic performance, father's occupation and type of high school graduated from spelled significant differences in their perceptual learning styles. They also spelled differences in their study habits when grouped according to academic standing in high school, writing skills, mothers' education, and test anxiety. Finally, there were significant relationships between learning styles, study habits and academic performance of students in applied science courses. The implications of the study can guide instructors to plan and deliver suitable instructional interventions.

Keywords – Applied science courses, Curriculum development, Instruction, Learning styles**,** Study habits**,** Technology education, University.

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1. Introduction

The development of a country is dependent on the capability of its human resources. The knowledge and technological advancement of society depend on the quality and preparation of manpower who have sound technical understanding, personal and interpersonal skills as scientists and technologist. As such, it is of utmost importance that the highest standards are set in defining the objectives, components, and

processes for Information technology and industrial technology programs of higher education institutions.

Knowledge and education are common goods. The acquisition and application of knowledge is a part of collective societal endeavor (UNESCO, 2015). The need to produce competent graduates in their specific discipline who possessed the skills and attributes to deal with the ever-changing work environment in the 21st century is a herculean task assigned to HEIs in the Philippines (Magulod, 2017a, 2017b). One of the important steps to undertake to ensure quality and optimal learning experience among university students is to consider their different learning styles and preferences. Learning style refers to how students learn and process information in their own ways.

A number of previous studies have investigated the relationship between college students' learning styles and academic performance, In fact, Moeinikia and Zahed-Babelan (2010) and Williams, Brown and Etherington (2013) confirm that there is a positive link between learning styles and academic performance in the university settings. Learning style is defined as the characteristics, strengths, and preferences in the way how people receive and process information (Hsieh, Jang, Hwang & Chen, 2011). It also refers to the fact that every person has his or her own method or set of strategies when learning (Gokalp, 2013). Likewise, James and Gardner (1995) as cited by Dung and Florea (2012) defined learning styles as a complex process for individual learner to effectively acquire information. Consequently, Reid (1987) as cited by Ghaedi and Jam (2014) defines learning styles as the changes among learners in using one or more senses to understand, organize, and, retain experiences.

As the premise of the present study, Threeton and Walter (2009) affirm that there is a dearth of learning style studies of students within the trade, technology and industry sector of career and technical education. Kolb and Kolb (2009) confirm that learning styles differ significantly to different professional and technical fields of specialization. An individual tends to choose degree courses where the learning environment nurtures their learning styles. This present study focused on the assessment of the learning style preferences of students enrolled in applied science courses with the end goal of contributing to the existing body of knowledge about the distinct learning styles of students in these disciplines.

Awareness of the different learning style preferences of students enrolled in applied sciences courses will eventually lead to more effective learning experiences. In fact, Alavi and Toozandehjani (2017) concluded that having a background of the learning styles of students can enhance their learning and at the same time help students strengthen self-actualization. Teevan, Michael and Schlesselman (2011) also emphasize that knowledge of the learning styles can help facilitate teachers to employ suitable teaching strategies and methods to nurture students' academic performance. This will also provide both teachers and students positive feedback on their strengths and weaknesses in the teaching and learning scenario. Likewise, knowledge of the learning styles can provide implications to curriculum design allowing teachers to implement a learner-centered curriculum model in the classroom. Dalmolin, Mackeivicz, Pochapski, Pilatti and Santos (2018) suggest that determining the learning styles of students will ultimately improve their educational experience. Previous exiting literature confirms that learning styles predict students' academic performance. Jiraporncharoen, Angkurawaranon, Chockjamsai, Deesomchok and Euathrongchit (2015) studied learning styles and academic achievement of undergraduate students in Thailand found out a positive association between the two. Barman, Aziz and Yusoff (2014) also studied the learning style awareness and academic performance of students concluded that students 'awareness of their strengths such as learning style and how to utilize their strengths may improve their academic performance.

Another variable being investigated is the study habits and skills of students enrolled in applied science courses. The literature further suggests that study habits are a predictive factor of academic performance. Ebele and Olofu (2017) found out that there is a significant relationship between study habits and students' academic performance. Looyeh, Fazelpour, Masoule, Chehrzad and Leili (2017) investigated the relationship between the Study habits and the Academic performance of Medical Sciences Students found out the significant relationship between the study habits of students and their academic performance. Similarly, Siahi and Maiyo (2015) studied study habits and academic achievement of students also found

out that a positive relationship of 0.66 between study habits and academic achievement. The results implied that the study habits need a significant attention if we are to improve performance. Furthermore, Chilca (2017) studied on the study habits and academic performance among university students in Peru concluded that study habits do influence academic performance.

Hence, in every school setting particularly in higher education institutions, the academic performance of students is an indicator of a quality learning experience. Academic achievement is measured in the form of students' remarkable scores across their subject courses and the display of learning outcomes which can be assessed through performance, classroom tests, assignments, outputs, and major examinations. Previous studies present that there are intellective and non-intellective factors affecting the academic achievement of students across levels.

Students' learning style preference and study habits should be understood. The interplay of learning style preferences, study habits and academic achievement of students enrolled in applied science courses at Cagayan State University prompted the researcher to investigate the relationship existing among these variables. Likewise, identifying the significant differences of these variables when grouped according to their socio-economic profile will provide a better picture of as to what specific personal learning interventions may be implemented. Moreover, to face the challenges of advancement, the development of proficient IT Professionals and highly skilled industrial technologists will eventually spur the advancement of the Philippine society. Hence, recognizing their innate learning dispositions and their attitude towards their studies will be a basis for the university to design and implement educational interventions with the goal of enhancing their academic performance and the quality of their learning experiences.

This study was carried out among the students of Cagayan State University at Lasam, the Philippines enrolled in the applied science courses namely Bachelor in Information Technology and Bachelor in Industrial Technology programs. These applied science courses are academic fields highly regarded as applying scientific knowledge to develop applications like technology and inventions for solving practical challenges. Hence, their conceptual skills, critical thinking, and creative abilities are required to be developed by the students as their graduate attributes. The development of their good study habits will make them better learners in their own ways by way of providing effective instructional strategies and provision of other instructional interventions to improve their academic performance is necessary. Hence, this study correlated the learning styles preferences, study habits and academic performance of students enrolled in applied science courses.

The study generally endeavored to assess the perceptual learning styles of undergraduate students enrolled in technology-related courses of Cagayan State University at Lasam. Therefore, the study sought to address the following research objectives: Firstly, identify the learning style preferences of students; secondly, assess the study habits of the respondents; thirdly, describe the level of academic performance of respondents; fourthly, test the significant differences on the perceptual learning styles, study habits and academic performance when grouped according to their profile variables, and lastly, determine the relationship among the learning styles, study habits and academic performance of the respondents.

Further, this study tested the research hypotheses in null form at 0.05 alpha level: 1) if there are no significant differences in the perceptual learning styles, study habits, and academic performance when grouped according to their profile variables, (2) there is no significant relationship between learning styles, study habits and academic performance of the respondents

2. Methodology

The study employed a descriptive correlational design. Descriptive component of the study also revolved on the personal profile of the respondents, their learning style preferences, study habits, and academic achievement. Subsequently, the correlational component was centered on the relationship between learning style preferences and study habits to the academic achievement of students enrolled in applied science courses.

The research participants were the seventy-five (75) third year Bachelor of Science in Electronics (BS Ind. Tech) and Bachelor in Information Technology (BSIT) of Cagayan State University at Lasam, Philippines. The respondents were taken in complete enumeration since the number of population is only a few. The researcher was permitted by concerned authorities to conduct the study through a letter of request. Personal administration of research instrument was conducted by the researcher. The participants were oriented about the purpose of the study and consent waivers were distributed to them to become the participants of the study. They were informed to honestly answer the questionnaire distributed to them to come up with the valid findings of this study.

This study utilized adopted two sets of standardized research instruments. To assess the learning style preference of students, Reid's Perceptual Learning Style Preference Questionnaire was used. It consisted of thirty statements with five questions equally distributed to six learning style preferences namely visual, tactile, auditory, group, kinesthetic and individual. Consequently, study habits inventory adapted from Gilbert Wrenn of Stanford University Press was utilized to assess the study habits of the respondents. Personal characteristics of the respondents were also considered.

After gathering the needed data, appropriate statistical tools were used to interpret the findings of the study. Descriptive statistics such as mean, frequency, rank and percentage were used. Inferential statistics such as independent sample t-test and one-way ANOVA were used to test the hypotheses of the study. Post-Hoc Tukey HSD test was also utilized to identify the significant differences among the categorical variables. Pearson r was used to test the significant relationship between the variables.

The assessment of the respondents on their learning style preferences and study habits used the common following scale: 4.20-5.00 (Very High/ Strongly Agree); 3.40-4.19 (High/ Agree); 2.60-3.39 (Moderate/ Neutral); 1.80-2.59 (Low/ Disagree); and 1.00-1.79 (Very Low/ Strongly Disagree). In like manner, to interpret the major and minor learning style preferences of the respondents, the following score ranges were adopted: 40-50- Major Learning Style Preference; 25-39- Minor Learning Style Preference; 0-24- Negligible Learning Style Preference.

3. Results and Discussion

3.1. Learning Styles of Applied Science Technology Students

Table 1 presents the assessment of the learning style preferences of students enrolled in the applied science courses of Cagayan State University at Lasam, Philippines. Generally, visual learning style, group learning style, and kinesthetic learning style were assessed by the respondents as their major learning style preferences while they put minor learning preference to tactical learning style, auditory learning style, and individual learning style. This indicates that most of the students of applied science courses particularly BS Information Technology and BS Industrial Technology students learn best through visual, collaborative and experiential learning.

	Learning Styles	Total Mean Score (n=75)	STD σ	Score Description
1	Visual Learning Style	40	3.84	Major Learning style Preference
2	Tactile Learning Style	36	4.77	Minor Learning style Preference
3	Auditory Learning Style	38	4.59	Minor Learning style Preference
4	Group Learning Style	41	4.31	Major Learning style Preference
5	Kinesthetic Learning Style	40	3.87	Major Learning style Preference
6	Individual Learning Style	39	4.40	Minor Learning style Preference

Legend: 40-50- Major Learning Style Preference; 25-39- Minor Learning Style Preference; 0-24- Negligible Learning Style Preference

Table 1. Learning Style Preference Scores of the Respondents

A closer look at the table, it reveals that visual learning obtained the total mean score of 40 (σ = 3.84), described as a major learning style preference of the respondents. The finding indicates that most of the students remember and understanding concepts and information better when they read. Most of them have the inclination of learning well from seeing words from sources, on the board, and in workbooks or textbooks. They manifest a better understanding of their lessons by presenting information with the aid of lecture notes, slides and handouts which can be provided by their instructors. This finding is supported by the study conducted by Veena and Shastri (2013) that applied science course students have a visual learning style preference. Khalid, Mokhtar, Omar-Fauzee, Kasim and Don (2013) noted that students of pure and applied science courses such as engineering and technology students were more active and more visual towards teaching and learning activities.

In like manner, group learning style emerged as a major learning style preference of the respondents as evidenced by that total mean score of 41 (σ = 4.31). The finding is indicative that most of the respondents value group learning and collaboration. They tend to remember information and concepts taught to them when they work with others. Hence, group interaction through group activities during class work will provide them a better acquisition of learning. Acikgoz (2002) describes that allowing students to learn in small number to process information as a group is a using cooperative learning strategy. Altun (2015) found out that cooperative learning has a significant effect on the academic achievement of students in science and technology course. Likewise, Magulod (2017a, 2017c, 2017f) suggest the use of multi-sensory learning materials to cater to different learning styles of learners making them more successful in their academic endeavor.

Further, the kinesthetic learning style obtained the total mean score of 40 (σ=3.87) interpreted as a major learning style preference of the respondents. This means that the respondents function better when learning is experiential or with total physical involvement in the learning situations. They prefer to do activities in the classroom through hands-on application. They show inclination of enjoying learning activities in the classroom through experiments. Therefore, the use of role-playing, field trips, and active participation will make them better learners. Oxford (2001) affirmed that kinesthetic learners like movement and work.

The respondents also consider tactile, auditory and individual learning styles as minor learning preferences. This also shows that the respondents manifest minor learning styles on hands-on experiences with models and materials, oral explanations, and learning individually. Tactile learning style obtained the total mean of 36 (σ = 4.77). This shows that the respondents manifest minor learning preference on building models or doing laboratory experiments. More so, auditory learning style registered with the mean score of 38 (σ = 4.59) indicating that the respondents show a minor preference on learning through oral discourse, listening to lectures, and hearing audiotapes. Finally, individual learning style rated with the mean of 39 (σ = 4.40) considered by the respondents as a minor learning preference. This shows that working alone to study was found to have a minor impact on the learning experience of the students. They do not prefer to work with projects and outputs alone.

The above findings of the study showed that the applied science courses of Cagayan State University at Lasam manifest learning preferences with the appeal of graphical, contextualized, experiential and collaborative teaching strategies.

3.2. Study Habits of Applied Science Technology Students

The data in Table 2 depict the study habits of students enrolled in the applied science courses. Generally, the respondents have a moderate level of study habits as evidence of the computed grand mean of 3.14. This implies that the students have not yet developed high positive attitudes towards the set of skills which will prepare themselves better for their academics. Hence, the need to further improve the study habits of students will help them become better learners. Mark & Howard (2009) highlight that poor study habits are the most common challenge for students.

	Study Habits and Skills	Mean	S.D.	D.I.	Rank
1	Time Management	3.35	0.45	Moderate	1
2	Concentration	3.14	0.57	Moderate	5
3	Note Taking	2.87	0.59	Moderate	8
4	Reading Comprehension	3.05	0.52	Moderate	6
5	Test Preparation and Test Taking	2.92	0.66	Moderate	7
6	Reading Speed	3.34	0.56	Moderate	2
7	Writing Skill	3.15	0.60	Moderate	4
8	Managing Test Anxiety	3.28	0.67	Moderate	3
	Grand Mean	**3.14**	**Moderate**		

Legend: 4.20-5.00 - Always; 3.40-4.19 - Usually; 2.60-3.39 - Sometime; 1.80-2.59 - Low; 1.00-1.79 - Very Low

Table 2. Study habits and Habits of the Respondents

Meanwhile, time management obtained the highest mean of 3.35 (σ = 0.45) interpreted to have a moderate level among the respondents. It implies that the students have a fair level of management towards their time in studying. Meanwhile, reading speed obtained the second rank of mean with 3.34 (σ = 0.56) implying that the students perceived themselves to have a moderate level of speed reading.

In like manner, the third rank among the means was test anxiety management obtaining 3.28 (σ = 0.67) suggesting that the students manifest a moderate level of managing their test anxiety. The fourth rank was writing skills gained 3.15 (σ = 0.60) assessment. This denotes that most of the students assessed themselves to have a fair level of writing skills. Consequently, concentration obtained the mean of 3.14 (σ = 0.57) ranked fifth showing that the respondents have an adequate level of memory and concentration towards their studies. Subsequently, reading comprehension was ranked sixth registering 3.05 (σ = 0.52) indicates that the students perceived themselves to have an average level of reading skills in selecting ideas, and getting the main ideas.

Moreover, test preparation and test taking gained the mean of 2.92 (σ = 0.66) ranked seventh among the means. This denotes that the moderate habit of preparing themselves to take examinations. Likewise, the lowest among the means was note taking as evidenced by the mean of 2.87 (σ = 0.59). This also suggests that most of the students have a moderate attitude towards writing down notes as study habits and skills.

From the finding of this study, it suggests that most of the students have assessed themselves to have a moderate level of all the study habits and skills identified. The top four study habits and skills assessed were time management, reading speed, managing test anxiety, writing skill and concentration. Therefore, requires interventions to be further developed and enhanced. Adeninyi (2011) posits that having good study habits will develop students to have a higher level of aspiration to pursue a career. Fielden (2004) also confirms that good study habits facilitate students to have higher skill outcomes. In consonance, Jones and Harlan (2005) suggest that educators need to be informed on what level the students attain independent learning skills and habits.

3.3. Academic Performance of Students Enrolled in Applied Science Courses

Table 3 reveals that the respondents have a good level of academic achievement with the total mean grade of 85.55 (σ = 0.3.991). The table further reveals 19 (25 %) have good academic performance, 18 (24 %) have a very satisfactory performance level, 16 (21 %) have very good academic performance, 12 (16 %) were on the satisfactory level of performance. The least contributors were only 2 (3 %) students with fair academic performance, 3 (4 %) with very outstanding performance and 5 (7 %) have a very outstanding academic performance level. The table also presents that no students have an outstanding, passing and failing academic achievement in their major subjects.

Point Brackets	Description	f	%
97-100	Excellent	0	0
94-96	Very Outstanding	3	4
91-93	Outstanding	5	7
88-90	Very Good	16	21
85-87	Good	19	25
82-84	Very Satisfactory	18	24
79-81	Satisfactory	12	16
76-78	Fair	2	3
75	Passing	0	0
Below 75	Failing	0	0
Total Mean Grade = 85.55 (Good)		**Std. Dev.= 3.991**	

Table 3. Academic Performance of the Respondents

3.4. Tests of Difference on the Learning Styles when Grouped According to Profile Variables

Profile Variables	Visual Learning style p-value	Tactile Learning style p-value	Auditory Learning Style p-value	Group Learning Style p-value	Kinesthetic learning style p-value	Individual Learning Style p-value
Sex	0.70 ns	0.07 ns	0.89 ns	0.24 ns	0.92 ns	0.74 ns
Birth Order	0.794 ns	0.458 ns	0.469 ns	0.425 ns	0.999 ns	0.991 ns
Course	0.47 ns	0.26 ns	0.66 ns	0.50 ns	0.92 ns	0.61 ns
Type of HS Graduated	0.105 ns	0.850 ns	0.682 ns	0.572 ns	**0.041***	**0.022***
Scholastic Standing in High School	0.34 ns	0.39 ns	0.64 ns	0.37 ns	0.93 ns	0.17 ns
Father's Occupation	0.97 ns	0.06 ns	0.199 ns	0.037*	0.117 ns	0.245 ns
Mother's Occupation	0.750 ns	0.856 ns	0.282 ns	0.368 ns	0.735 ns	0.907 ns
Father's Education	0.672 ns	0.156 ns	0.245 ns	0.258 ns	0.547 ns	0.829 ns
Mother's Education	0.845 ns	0.125 ns	0.057 ns	0.256 ns	0.716 ns	0.470 ns
Family Income	0.986 ns	0.576 ns	0.408 ns	0.846 ns	0.832 ns	0.636 ns
Academic Performance in Major Subjects	0.826 ns	0.258 ns	**0.001****	0.835 ns	0.218 ns	0.322 ns

* = significant at 0.05 level; ** = significant at 0.01 level; ns = not significant at 0.05 level

Table 4. Test of Difference on the Learning Style Preference of the Respondents

Table 4 shows that there is a significant difference between the learning style preferences of the students in applied science courses when grouped according to their personal variables. The significant differences were shown along with auditory learning style, group learning style preference, kinesthetic learning style, and individual learning styles.

Auditory learning style as a minor learning preference of the students spelled differences when grouped according to academic performance in major subjects ($p = 0.001$) indicating that students with high academic performance assessed themselves to have high auditory learning style inclinations. This explains that students with higher GPA have greater ability to listen to information and concepts presented to them.

Consequently, group learning style preference of the respondents spelled difference when grouped along father's occupation ($p = 0.37$) also suggesting that respondents whose fathers are service and technical workers have assessed themselves to have high group learning style preference. Similarly, graduates of private sectarian and public high schools showed higher assessment compared to those who graduated

from public-nonsectarian along kinesthetic learning style (p value = 0.041). Additionally, public high school graduates have the highest assessment of individual learning style preference (p value = 0.022).

Test of difference generally shows that academic performance, father's occupation and type of high school graduated from spelled significant differences on the perceptual learning styles of students enrolled in applied science courses of Cagayan State University at Lasam. The finding may be attributed to the different exposures and personal background of the respondents which affect their learning style preferences.

Table 5 reveals that there is a significant difference between the academic performance of the respondents when grouped according to their profile variables. Significant differences were seen along course (p-value = 0.042) and academic standing in high school (p value = 0.030). The finding indicates that BS Industrial Technology students have higher academic performance compared to the BS Information Technology students. This can be explained that the two-degree programs have a different complexity of the learning outcomes being studied. In like manner, those students who graduated with honors in their secondary education have higher academic performance in their major subjects. This can be practically explained that scholastic standing in high school predicts performance in college. This has been confirmed by the previous study of Hiss and Franks (2014) stating that general weighted average (GWA) in high school is a predictor of college performance which is more accurate than the results of the paper and pencil testing. Further, in the latest study of Hodara and Cox (2016) affirmed that scholastic standing in high school predicts the performance of students in college.

Profile Variables	Academic Performance P values
Sex	0.274 ns
Birth Order	0.277 ns
Course	0.0426*
Type of HS Graduated	0.808 ns
Academic Standing in High School	0.030*
Father's Occupation	0.744 ns
Mother's Occupation	0.198 ns
Father's Education	0.256 ns
Mother's Education	0.341 ns
Family Income	0.154 ns
Age	0.970 ns

* = significant at 0.05 level; ns = not significant at 0.05 level

Table 5. Test of Difference on the Academic Performance of the Respondents When Group According to Profile Variables

3.5. Difference on the Study Habits of the Respondents

Table 6 shows that there is a significant difference in the study habits and skills of the respondents when grouped according to their profile variables. Differences showed along academic standing in high school (p value = 0.047), writing skills (p value = 0.038), mothers' education (p value = 0.019) and test anxiety (p value = 0.034).

The difference on the note taking skill when grouped according to mother's education revealed that those students whose mothers were college undergraduates and graduates assessed themselves to have high note taking habit and skill compared to those students whose mothers have a lower level of education. This finding can be basically explained by the previous study conducted by Ferreira, da Silva and Queiroga (2014) that maternal level of education is related to students writing performance.

Moreover, test preparation and test taking, and Test anxiety management were found to have spelled difference when grouped along the academic standing of the respondents. This finding shows that students who graduated with honors assessed themselves to have higher test preparation and test-taking habit and skill. Hence, students who have high academic performance employ longer test preparation and better test anxiety management. De Zoysa, Chandrakumara and Rudkin (2014) on the relationship between academic performance and study strategies found out that high performing students have more strategies employed for the test.

Similarly, birth order of the respondents spelled the significant difference in their writing skill. The result of Post Hoc Tukey HSD Test revealed that most of the first born-respondents assessed themselves to have higher writing skill performance compared to the latter born- respondents. Literature suggests that birth order has a significant impact on the personality and academic performance of students. Ha and Tam (2011) claimed that firstborns were born to a higher intellectual environment compared to the latter borns because older sibling serves as the intellectual resource to the younger siblings which stimulate the intellectual development of older siblings.

	Time Management	Concentration	Note Taking	Reading Comprehension	Test Preparation and test Taking	Reading Speed	Writing Skill	Test Anxiety Management
Sex	0.514 ns	0.626 ns	0.463 ns	0.776 ns	0.204 ns	0.855 ns	0.753 ns	0.621 ns
Birth Order	0.926 ns	0.107 ns	0.093 ns	0.332 ns	0.135 ns	0.562 ns	**0.038***	0.113 ns
Course	0.273 ns	0.057 ns	0.392 ns	0.934 ns	0.162 ns	0.969 ns	0.445 ns	0.369 ns
Type of HS Graduated	0.142 ns	0.062 ns	0.069 ns	0.283 ns	0.181 ns	0.697 ns	0.403 ns	0.213 ns
Academic Standing in High School	0.302 ns	0.083 ns	0.106 ns	0.210 ns	**0.047***	0.218 ns	0.365 ns	**0.034***
Father's Occupation	0.248 ns	0.051 ns	0.631 ns	0.903 ns	0.903 ns	0.462 ns	0.099 ns	0.348 ns
Mother's Occupation	0.704 ns	0.595 ns	0.400 ns	0.393 ns	0.744 ns	0.988 ns	0.337 ns	0.511 ns
Father's Education	0.582 ns	0.088 ns	0.232 ns	0.886 ns	0.206 ns	0.166 ns	0.102 ns	0.378 ns
Mother's Education	0.512 ns	0.263 ns	**0.019***	0.138 ns	0,156 ns	0.138 ns	0.105 ns	0.104 ns
Family Income	0.563 ns	0.263 ns	0.833 ns	0.782 ns	0.918 ns	0.783 ns	0.299 ns	0.651 ns

* = significant at 0.05 level; ns = not significant at 0.05 level

Table 6. Test of Difference on the Study Habits of the Respondents

3.6. Relationship between Academic Achievement and Learning Style Preference

Learning Style Preference	r	P value
Visual Learning Style	.2483	**0.032***
Tactile Learning Style	.2334	**0.044***
Auditory Learning Style	.0198	0.865ns
Group Learning Style	.2396	**0.038***
Kinesthetic Learning Style	.2733	**0.018***
Individual Learning Style	.0288	0.805ns

* = significant at 0.05 level; ns = not significant at 0.05 level

Table 7. Correlation between Academic Achievement and Learning Style Preference

Study Habits and Skills	r	P value
Time Management	.2969	**0.009***
Concentration	.1559	0.179 ns
Note Taking	–.0189	0.871 ns
Reading Comprehension	.0310	0.791 ns
Test Preparation and Test Taking	–.0555	0.634 ns
Reading Speed	.0809	0.487 ns
Writing Skill	.3077	**0.007***
Test Anxiety	.0408	0.726 ns

* = significant at 0.05 level; ns = not significant at 0.05 level

Table 8. Correlation between Academic Achievement and Study Habits and Skills

Table 7 presents that there is a significant relationship between learning styles and academic performance of the respondents. This finding of the study validates Vaishnav (2013) stating that there is a positive association between learning styles and academic performance. In like manner, Abidin, Rezae, Abdullah and Singh (2011) observed the significant relationship between overall academic achievement and learning styles.

Significant associations were found between visual learning style preference (p value = 0.032), tactile learning style (p value = 0.044), group learning style (p-value = 0.038), and kinesthetic learning style (p-value = 0.018). The positive relationship between kinesthetic, visual, tactile, and group learning styles and the academic achievement of the students enrolled in applied science courses implies that the higher exposure of the students with the appeal of visual learning activities, contextualized, experiential and collaborative teaching approaches the higher academic performance they manifest.

Further, the finding appears logically that most of the students within information and industrial technology courses were inclined in hands-on learning which requires Industrial technology electronics students to have strong skills to learn, operate, control properly and safely an extensive range of equipment, tools and systems used in the field and being able to understand application software used in creating models of designs and systems for the information technology students. Their strong group learning inclination will allow them to work effectively in multi-disciplinary and multi-cultural teams.

Table 8 also presents that there is a significant relationship between academic performance and study habits. Significant relationships were also found between time management (p value= 0.009) and writing skill (p value= 0.007). The result confirms the finding of Khurshid, Tanveer & Qasmi (2012) that there exists a positive correlation between study habits and academic achievement. In the earlier study of Kaur and Pathania (2015) they also found out significant relations between academic achievement and study habits. The positive relationship between time management and writing skill of the students enrolled in applied sciences courses suggests that a greater amount of time organization and writing opportunities given to them the higher academic achievement they will manifest. In like manner, the finding clearly implies that information and industrial technology courses are time-oriented and technical information writing-oriented programs. Magulod (2017a, 207d, 2017e) note that creativity styles of students in writing are dependent on their emotions and learning environment.

Time management skill which is associated with academic performance implies that when the students have good time management they manifest organize duties according to their academic priorities. Kelly (2004) noted that time management is essential to any university student which is a key to their academic achievements. Alsalem, Alamodi, Hazazi, Shibah, Jabri and Albosrour (2017) confirm that students practicing time management skill have a better academic achievement. In like manner, Nasrullah and Khan (2015) affirm the correlation between time management skill and academic achievement of students. Consequently, the positive association between writing skill and academic achievement of the respondents' shows that improve in writing attitude and skills of the respondents better academic performance is excepted. Having students write out explanation, ideas, and concepts, diagrams, and

figures it provides them better understanding and memory recall of information. This finding affirms Waring (2007) that writing is a tool that can improve students' academic performance.

4. Conclusions

This study examined the learning style preferences, study habits and level of academic achievement of students enrolled in applied science courses. Results of the study revealed that the students of applied sciences courses preferred visual, group and kinesthetic as major learning styles while they consider tactile, auditory and individual learning styles as minor learning preferences. It was also revealed that they manifested a moderate level of study habits and skills along with time management, concentration, note taking, reading comprehension, test preparation, and test taking, reading speed, writing skill, and managing test anxiety. Most of the students have a good level of academic achievement. Test of difference revealed that academic performance, father's occupation and type of high school graduated from spelled significant differences on their perceptual learning styles particularly along with auditory learning style, group learning style preference, kinesthetic learning style, and individual learning styles. In like manner, significant differences spelled on their study habits when grouped according to academic standing in high school, writing skills, mothers' education, and test anxiety. Finally, there were significant relationships between learning styles, study habits and academic performance of students in applied science courses. The implications of the study can guide instructors to plan and deliver suitable instructional interventions.

As to the limitations of the study and future research directions, this present study is subject to a number of limitations. First, the sampling of respondents was based on the two applied sciences courses in one campus of a public higher education institution and it should be generalized by having data from different campuses of the University. Likewise, further studies with larger samples and more variables to be included. Third, ethnicity of the respondents may be considered since cultural differences may affect the learning style. Further, future studies utilizing both quantitative and qualitative approaches to describe the learning style preferences and study habits of students may be conducted. Finally, another study should be conducted to analyze the learning styles and study habits of students in relation to the use of different teaching strategies and how the students' process cognitive knowledge.

5. Implications for Instructional Interventions

Learning styles and study habits play a significant role in the academic achievement of students enrolled in applied science courses. When students recognize their personal learning styles and attitude they can take part purposively in the learning process.

As implications of the result of the study, the following instructional interventions may be adopted by the university: (1) Implementing the use of teaching and learning activities through graphical, collaborative and experiential learning approaches will cater to the visual, group and kinesthetic learning styles of the respondents. These learning styles were found to have a significant relationship in the academic performance of the students. (2) provision of in-service training for faculty members teaching in the applied science courses focusing on the use of effective visual presentations, performance-based learning assessment, use of innovative teaching strategies through games, simulation and, cooperative learning strategies. (3) the moderate level of students study habits may be improved with a seminar-workshop to be carried out by the guidance and counseling office and an office of students' services and welfare focusing on time management, managing test anxiety, development of reading and writing interest and skills of the students. These may also integrate with the teacher in their lessons to develop applied science students' academic success since time management and writing skills were significantly related to the academic performance of the students. (4) Provision of a suitable learning environment and spaces for students to maximize their learning opportunities should be considered.

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References

Abidin, M.J., Rezaee, A.A., Abdullah, H.N., Singh, K.K.B., (2011). Learning Styles and Overall Academic Achievement in a Specific Educational System. *International Journal of Humanities and Social Science.*

Acikgoz, K.U. (2002). *Active Learning.*

Adeniyi, V. (2011). *Studying to Pass: Implication for Students.* Lagos: Macmillan

Alavi, S., & Toozandehjani, H. (2017). The Relationship between Learning Styles and Students' Identity Styles. *Open Journal of Psychiatry,* 7, 90-102. https://doi.org/10.4236/ojpsych.2017.72009

Alsalem, W., Alamodi, L., Hazazi, A., Shibah, A., Jabri, S., & Albosrour, Z. (2017). The Effect of Time Management on Academic Performance among Students of Jazan University. *The Egyptian Journal of Hospital Medicine,* 69(8), 3042-3049. https://doi.org/10.12816/0042853

Altun, S. (2015). The Effect of Cooperative Learning on Students' Achievement and Views on the Science and Technology Course. *International Journal of Elementary Education,* 2015, 7(3), 451-468.

Barman, A., Aziz, R., & Yusoff, Y. (2014). Learning style awareness and academic performance of students. *South East Asian Journal of Medical Education,* 8(1). Available at: http://seajme.md.chula.ac.th/articleVol8No1/8_OR3_ArunodayaBarman.pdf

Chilca, L. (2017). Self-Esteem, Study Habits and Academic Performance Among University Students. *Propósitos y Representaciones,* 5(1), 71-127. http://dx.doi.org/10.20511/pyr2017. v5n1.145

Dalmolin A., Mackeivicz, G., Pochapski, M., Pilatti, G., & Santos, F. (2018). Learning styles preferences and e-learning experience of undergraduate dental students. *Rev Odontol UNESP,* 47(3), 175-182. https://doi.org/10.1590/1807-2577.05118

De Zoysa, A., Chandrakumara, P. & Rudkin, K. (2014). Learning and study strategies affecting the performance of undergraduate management accounting students in an Australian university. *AFAANZ Conference* (1-9). Australia: AFAANZ.

Dung, P., & Florea, A. (2012). An approach for detecting learning styles in learning management systems based on learners' behaviors. *International Conference on Education and Management Innovation IPEDR* (30). IACSIT Press, Singapore.

Ebele, U., & Olofu, P. (2017). Study habit and its impact on secondary school students' academic performance in biology in the Federal Capital Territory, Abuja. *Educational Research and Reviews,* 12(10), 583-588. https://doi.org/10.5897/ERR2016.3117

Ferreira, A., & da Sila, A.F., Queiroga, B.A., (2014). *Written Learning and Maternal Education.*

Fielden, K. (2004). Evaluating Critical Reflection for Postgraduate Students in computing. *Informing Science and Information Technology Education Joint Conference*, 2005, Flagstaff, Arizona. www.informingscience.org/ proceedings/InSITE2005/I38f36Field.pdf

Ghaedi, Z., & Jam, B. (2014). The relationship between Learning Styles and Motivation for Higher Education in EFL Students. *Theory and Practice in Language Studies,* 4(6), 1232-1237. https://doi.org/10.4304/tpls.4.6.1232-1237

Gokalp, M. (2013). The Effect of Students' Learning Styles to Their Academic Success. *Creative Education,* 4(10), 627-632. Available at: http://www.scirp.org/journal/ce https://doi.org/10.4236/ce.2013.410090

Ha, T.S., & Tam, C.L. (2011). A Study of Birth Order, Academic Performance, and Personality. *International Conference on Social Science and Humanity. IPEDR* (5). IACSIT Press, Singapore.

Hiss, W.C., & Franks, V.W. (2014). *Defining Promise: Optional standardized testing policies in American college and university admissions.* Arlington, VA: National Association for College Admission Counseling. Available at: http://www.nacacnet.org/research/research-data/nacac-Research/ Documents/DefiningPromise.pdf (Accessed: December 2015).

Hodara, M., & Cox, M. (2016). *Developmental education and college readiness at the University of Alaska (REL 2016-123).* Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Northwest. Available at: http://eric.ed.gov/?id=ED565798

Hsieh, S.-W., Jang, Y.-R., Hwang, G.-J., & Chen, N.-S. (2011). Effects of teaching & learning styles on students' reflection levels for ubiquitous learning. *Computers & Education,* 57, 1194-1201. https://doi.org/10.1016/j.compedu.2011.01.004

James, W.B., & Gardner, D.L. (1995) Learning Styles: Implications for Distance Learning. *New Directions for Adult and Continuing Education,* 67, 19-32. https://doi.org/10.1002/ace.36719956705

Jiraporncharoen, W., Angkurawaranon, C., Chockjamsai, M., Deesomchok, A., & Euathrongchit, J. (2015). Learning styles and academic achievement among undergraduate medical students in Thailand. *J Educ Eval Health Prof,* 12, 38. https://doi.org/10.3352/jeehp.2015.12.38

Jones, C.H., & Harlan, E.J. (1995). Study habits of students at a post-secondary vocational-technical institute. *Journal of Industrial Teacher Education,* 35(2). Available at: http://scholar.lib.vt.edu/journals/JITE/v35n2/slate.html (Accessed: April 2005).

Kaur, A., & Pathania, R. (2015). Study Habits and Academic Performance among Late Adolescents. *Stud Home Com Sci,* 33-35. https://doi.org/10.1080/09737189.2015.11885430

Kelly, M. (2004). Get time on your side. *Career & Universities,* 24(4), 28.

Khalid, R., Mokhtar, A.A., Omar-Fauzee, M.S., Kasim, A.L., & Don, Y. (2013). The Learning Styles and Academic Achievements among Arts and Science Streams Student. *International Journal of Academic Research in Progressive Education and Development,* 2(2).

Khurshid, R., Tanveer, A., & Qasmi, F. (2012). A relationship between Study Habits and Academic Achievement among Hostel Living and Day Scholars' University Students. *British Journal of Humanities and Social Sciences,* 3(2).

Kolb, A.Y., & Kolb, D.A. (2009). Experiential Learning Theory: a dynamic, holistic approach to management learning, education and development. (Adobe Digital Editions version). Available at: http://learningfromexperience.com/media/2010/08/ELT-Hbk-MLED-LFE-website-2-10-08.pdf https://doi.org/10.4135/9780857021038.n3

Looyeh, H., Fazelpour, S., Masoule, S., Chehrzad, M., & Leili, E. (2017). The Relationship between the Study habits and the Academic performance of Medical Sciences Students. *Journal of Holistic Nursing and Midwifery,* 27(2), 65-73. https://doi.org/10.18869/acadpub.hnmj.27.2.65

Magulod, G.C. Jr. (2017a). Creativity Styles and Emotional Intelligence of Filipino Student Teachers: A Search for Congruity. *Asia Pacific Journal of Multidisciplinary Research,* 5(1), 175-184. Available at: http://www.apjmr.com/wp-content/uploads/2017/01/APJMR-2017.5.1.20.pdf

Magulod, G.C. Jr. (2017b). Educational Philosophies Adhered by Filipino Preservice Teachers: Basis for Proposing Initiatives for 21st Century Teacher Education Preparation Program. *Asia Pacific Journal of Multidisciplinary Research,* 5(1), 185-192. Available at: http://www.apjmr.com/wp-content/uploads/2017/01/APJMR-2017.5.1.21.pdf

Magulod, G.C. Jr. (2017c). Evaluation of Multisensory Instructional Material Package for Elementary Learners. *Asia Pacific Journal of Multidisciplinary Research,* 5(4), 83-93. Available at: http://www.apjmr.com/wp-content/uploads/2017/11/APJMR-2017.5.4.10.pdf

Magulod, G.C. Jr. (2017d). Extent of Attainment of the Intended Program Attributes, Retrospection and Satisfaction of BS Industrial Technology Graduating Students from One Campus of a State University in Region 2, Philippines. *Asia Pacific Journal of Multidisciplinary Research,* 5(4), 107-117. Available at: http://www.apjmr.com/wp-content/uploads/2017/12/APJMR-2017.5.4.2.14.pdf

Magulod, G.C. Jr. (2017e). Factors of School Effectiveness and Performance of Selected Public and Private Elementary Schools: Implications on Educational Planning in the Philippines. *Asia Pacific Journal of Multidisciplinary Research,* 5(1), 73-83. Available at: http://www.apjmr.com/wp-content/uploads/2017/02/APJMR-2017.5.1.2.09.pdf

Magulod, G.C. Jr. (2017f). Personal Epistemologies and Teaching Styles of Filipino Preservice Elementary Teachers: Implications to Teacher Education Preparation Program. *Asia Pacific Journal of Multidisciplinary Research,* 5(1), 31-40. Available at: http://www.apjmr.com/wp-content/uploads/2016/12/APJMR-2017.5.1.05.pdf

Mark, A., & Howard, C. (2009). How to Study. *Psychological Science,* 20(4), 516-522.

Moenikia, M., & Zahed-Babelan, A. (2010). The role of learning styles in second language learning among distance education students. *Procedia Social and Behavioral Sciences,* 2, 1169-1173. https://doi.org/10.1016/j.sbspro.2010.03.167

Nasrullah, S., & Khan, M. (2015). The Impact of Time Management on the Students' Academic Achievements. *Journal of Literature, Languages and Linguistics,* 11.

Oxford, R. (2001). *Language Learning Styles and strategies* (3 ed.). USA: Heinle & Heinle.

Reid, J.M. (1995). *Learning Styles in the ESL/EFL Classroom.* Boston: Heinle & Heinle Publishers. International Thomson Publishing Book Distribution Center, 7625 Empire Drive, Florence, KY 41042.

Siahi, E.A., & Maiyo, J.K. (2015). Study of the Relationship between Study Habits and Academic Achievement of Students: A Case of Spicer Higher Secondary School, India [Abstract]. *International Journal of Educational Administration and Policy Studies*, 7(7), 2015th ser., 134-141. Retrieved February 8, 2018, from: https://files.eric.ed.gov/fulltext/EJ1077791.pdf

Teevan, C.J., Michael, L.I., Schlesselman, L.S. (2011). Index of Learning styles in a U.S. school of pharmacy. *Pharmacy Pract,* 9(2), 82-87. http://dx.doi.org/10.4321/S1886-36552011000200004

Threeton, M.D. & Walter, R.A. (2009). Automotive Technology Student Learning Styles and Their Implications for Faculty. *Journal of Industrial Teacher Education,* 46(3).

UNESCO (2015). Rethinking Education Towards a Global Common Good? Available at: http://unesdoc.unesco.org/images/0023/002325/232555e.pdf

Vaishnav, R.S. (2013). Learning Style and Academic Achievement of Secondary School Students. *Voice of Research,* 1(4).

Veena, N., & Shastri, S. (2013). Learning Preferences among Students. *IOSR Journal of Humanities and Social Science,* 15(6), 26-32. https://doi.org/10.9790/0837-1562632

Waring, J.W. (2007). *The Impact of Writing on Student Achievement*. Published Master's Thesis. University of North Carolina Wilmington.

Williams, B., Brown, T., & Etherington, J. (2013). Learning style preferences of undergraduate pharmacy students. *Currents in Pharmacy Teaching and Learning,* 5, 110-119. https://doi.org/10.1016/j.cptl.2012.09.003

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