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Academic Performance in Introductory College Chemistry among Freshmen in Selected Higher Education Institutions in Caraga Region, Philippines

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Abstract:- This study focused on the academic performance of freshmen in Introductory College Chemistry (ICC) in two prestigious universities in Caraga Region namely; Father Saturnino Urios University (FSUU) a private sectarian school and Caraga State University (CSU) a state university.

Distinctly, it sought to respond the problem on the high school pedagogical experience in Introductory College Chemistry freshmen students in two HEI's in terms of, chemistry activities, organization and structure of chemistry course, laboratory experience and characteristics of the high school chemistry teacher. It also investigated the academic performance of the respondents in ICC and to find out if there is a significant association between the student's high school pedagogical experiences in chemistry and their performance in ICC.

In association between the students pedagogical experiences in high school chemistry and the used of technology, results showed that there was no significant association with the performance in relation to selected chemistry task such as the number of days spent in class, experiences in chemistry laboratory activities, preparation of laboratory prior to actual activity and the amount of discussion during the laboratory activity. Among the variables, only the positive characteristics of high school teachers showed statistically significant association with the academic performance of the respondents. Wherein teachers with high mean responses have a high incidence of positive characteristics. FSUU respondents who belong to numerically low-grade bracket tend to be affected with high school chemistry teachers with negative or no good positive characteristics of high school chemistry teachers.The time spent by high school teachers in selected chemistry topics has a significant association with the academic performance of the respondents coming from both schools, FSUU and CSU. And laboratory grades and the time spent in the following topics; Atoms and Periodic Table, Chemical Reactions and Equations, Solutions, Stoichiometry, and the history of people of chemistry has a significant relationship to the grade in a laboratory.

Keywords:- *Academic performance in ICC, high school pedagogical experiences, characteristics of high school teachers and chemistry topics.*

I. INTRODUCTION

Chemistry was commonly viewed as the "central science" since the mastery of its concepts, particularly regarding the structure of matter, is essential to further coursework in all sciences. Since chemistry course was in many cases that first science is taken by the students at the college level, they certainly determined to succeed higher science course works. As a consequence, prospective sciences major were deterred from taking professional courses because of their unsuccessful experiences in Introductory College Chemistry (ICC). In essence, chemistry performs the function of gatekeeper for future study in many sciences. Hence, preparation for chemistry at the college level would be an impact consideration and in most courses, this research study focuses on student's preparation and performance in the area of chemistry. Further, this study described directly the connection between teaching practices in high school chemistry courses and the real world measure of student's performance in the ICC coursework. The identification of factors that related to the success or failure of the students in ICC may provide useful insights for promoting sciences learning achievement. In particular, this research claimed that influential factor falls into one category which was the previous science learning experiences. Identification of pedagogical practices in the science learning and the determination of influential links between science teaching in the high school and sciences in college may be beneficial in the effort to improved science achievement wherein CMO 30, series of 2004provides the addition of ICC General Education courses in any degree course.

High school teachers make much of preparing their students for success in college courses. Students who planned to pursue college science should be encouraged to prepare with high school courses in biology chemistry and physics. Yet, college chemistry professors were less sanguine about the preparation that high school chemistry provided. Many were dismayed by the difficulty that students have in their introductory course in spite of their preparation in high school. Dropouts and failure rate were high in these "gate-keeping courses"[2]. While success in introductory college chemistry opens the door for students to opportunities in engineering, medicines and scientific research, failure in the course classes these career options and presses students toward non-sciences fields, negating years of preparation an inspiration. The

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purpose of this research study was to examine the link between high school chemistry pedagogical experiences and performance in introductory college chemistry.

II. OBJECTIVE OF THE STUDY

This study was anchored on the theory that implementing in taking Introductory College Chemistry course can affect the performance level student' with regards to higher chemistry courses. Mullis, et al.,[3]stated that the identification of factors that relate to science success or failure of the students may provide useful clues for providing science learning and achievement. In addition to that, preparation for chemistry performs that function as the gatekeeper for future study in many sciences, and this preparation also will be an important consideration in most cases. In taking up ICC in the first year was the earliest possible completion of chemistry courses sequences that were prerequisite to the higher Chemistry and some upper biology courses[4]. Introductory College Chemistry acts as the bridge that transports the students into higher Chemistry and other science subjects and served as a better foundation for the rest of higher science courses.

Laboratory gives the students an opportunity to go beyond the lectures and words in the textbook and experiences the scientific process from which conclusions and theories concerning chemical behavior were drawn. Laboratory was also a valuable tool for learning experiences and an integral part of chemistry class [5]. Figuerra and Samonte[6] state that by using different materials. And also, through laboratory students can easily digest seminal knowledge in chemistry essential to the understanding of most complex cognate disciplines.

High school chemistry pedagogical experiences do appear to play significant roles in the future success of students in ICC courses[7]. The role of the teachers was to encourage and facilitates students learning. Content and mode of learning, however, were student's decisions. Creativity in teaching is important; it is the process of becoming sensitive to problems, deficiencies, and gaps in knowledge, missing elements, and disharmonies. Identify the difficulty, searching for solutions, making guesses or formulating hypothesis was most helpful in science teaching. All these were blended in the laboratory method of teaching science as cited by Hidalgo [8].

This study seeks to determine the relationship between the high school experiences in Chemistry and the student's performance in Introductory Chemistry.Specifically, the study seeks answers 1)What is the high school pedagogical experience of Introductory College Chemistry freshmen students in two prestigious universities in Caraga in terms of: chemistry activities; organization and structures of chemistry course,laboratory experience, and characteristics of the high school teacher? 2)What is the academic performance of the respondents in Introductory College Chemistry? and 3)Is there a significant association between the students' high school pedagogical experiences in chemistry and their performance in Introductory College Chemistry?

III. METHODOLOGY

A. Research Design

The study used the descriptive method. It investigated the high school pedagogical experiences of the students its relationship in their academic performance in Introductory College Chemistry and determined if there exists a significant relationship between these variables. Thiswas conducted in the two highly respected higher institutes in Caraga namely; Father Saturnino Urios University (FSUU) and Caraga State University (CSU) main campus. Father Saturnino Urios University is located at the heart of Butuan City. CSU is the only state university in the region. The population of the study involves all freshmen who have enrolled the Introductory College Chemistry in two HEI in Caraga Region namely: FSUU & CSU main campus from each of this population the researchers have taken 100students from each of the schools in the research setting. A total of 200 students were the respondents of the study.

B. Research Instrument

The survey instrument was patterned from the study made by Sadler and Thai, [7] entitled "Factors Influencing Success in Introductory College Chemistry" from Harvard University Research Institutes which was sent by the author himself to the researcher with minor revisions to fit in with a setting in our locality. The revised survey questionnaire was subjected to further validation was found to have a reliability index of 0.8335.The instruments were subjected to usual validation procedures before it was floated. A reliability index of 0.10 or better sought in order to declare the instrument valid and reliable for use in the study.

C. Procedure

Permissions from the President of different schools like FSUU & CSU main campus were requested for gathering the data needed. Questionnaires were distributed with the help of the freshmen students' advisers in different institutes and asking for their full cooperation by answering the questionnaire to best of their knowledge through the appropriate answer. And the grades for the respective respondents were taken from the registrar's office of the two schools. The design of this study revised on the retrospection from the participants regarding their high school experiences. The data were collected through questionnaires and randomly distributed through selected sections of FSUU freshmen and CSU main campus, enrolled last first semester school year 2016 in Introductory College Chemistry courses for science education, agriculture, and engineering, nursing and commerce completed during the class sessions. The responses to the survey consisted of students self-report of their demographic and educational background and high school pedagogical experiences. For scoring and quantification

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Descriptive statistics were used to determine the high school pedagogical experiences of freshmen students of introductory college Chemistry. If the scale of the responses for a particular indicator does not allow for the computation of the mean, the mode (the response with the highest frequency) was taken as representative of a particular indicator. In such case, the frequency and the percentage of the modal responses were calculated. For particular indicators whose means may be computed, the following interpretations were used:

Table 1. A requirement for Learning the Material

Mean Response	Interpretation
1.00 – 1.80	Entirely memorization with little or no understanding
1.80 – 2.60	Mostly memorization, some understanding
2.60 – 3.40	The equal amount of memorization and understanding
3.40 – 4.20	Mostly with understanding, some memorization
4.20 – 5.00	Full understanding with little or no memorization

Table 2. Characteristics of Laboratory Activity and Characteristics of High School Chemistry Teacher

Mean Response	Interpretation
1.00 – 1.80	Not evident / Negligibly Evident
1.80 – 2.60	Weakly Evident
2.60 – 3.40	Moderately Evident
3.40 – 4.20	Evident
4.20 – 5.00	Very Evident

Thus, allows for the computation of the mean, a corresponding interpretation was utilized to determine the overall response. Otherwise, the mode (the response with the highest frequency) was taken as representative of a particular indicator. In the latter case, the frequency and the percentage of the modal response were also calculated. Since the dependent variable, the respondent's performance in Introductory College Chemistry, was categorical (specifically, ordinal) and analysis revealed that the number of categories would have to be reduced further instead using all possible grades, a significant relationship by means of a correlation analysis was not likely to yield accurate and statistically significant results. Instead, two statistical methods that both employ Chi-square test to determine statistically significant were used to determine the *association* between the independent and dependent variables. When the independent variable was also categorical, contingency analysis was used and the result was illustrated using a mosaic plot. When the independent variable was a mean of a group of responses, logistic regression was used and the result was illustrated using a logistic regression plot.

In all of the analysis that will follow, analysis for the responses from the two HEIs, CSU, and FSUU, will be presented separately. No attempt shall be made in the interpretation to compare the results from the two schools, if ever; a significant relationship seems to exist since the two schools were not included in the variables of interest in this study. In addition, the grading systems and standards differ.

IV. RESULTS AND DISCUSSION

For the High School Pedagogical Experiences of Freshmen Students of Introductory College Chemistry

Table 3. Regularity of the Use of Different Types of Technology

CSU	Modal Response	Frequency	Percentage
Calculator-based laboratory	2 or 3 Times a Month	16	53.33%
Microlabs	2 or 3 Times a Week	15	50.00%
Computers	Once a Month	13	43.33%
Computer/Probes	2 or 3 Times a Week	13	43.33%
Computer Simulations	2 or 3 Times a Week	16	53.33%
Internet	2 or 3 Times a Week	14	46.67%
Videos/DVD	Never	23	76.67%
FSUU	**Modal Response**	**Frequency**	**Percentage**
Calculator-based laboratory	Never	9	30.00%
Microlabs	Never	19	63.33%
Computers	Never	23	76.67%
Computer/Probes	Never	24	80.00%
Computer Simulations	Never	19	63.33%
Internet	Never	18	60.00%
Videos/DVD	Once a Semester	16	53.33%

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The above shows that the most evident incidence of the users of different types of technology in the high school Chemistry class is 2 or 3 times a week, except for computers which were used mostly once a month, and videos/DVD which were never used by most of the respondents. FSUU students, on the other hand, responded quite differently, with a majority of the students responding that different types of technology were never used in their class, except for videos/DVD where the modal response was once a semester.

Table 4. Regularity of Chemistry-Related Tasks

CSU	Modal Response	Frequency	Percentage
Analyze pictures and illustrations	Rarely	23	76.67%
Communicate concepts using pictures and illustrations	Rarely	23	76.67%
Draw or interpret graphs by hand	Weekly	16	53.33%
Generate graphs or analyze data using computer software	Rarely	19	63.33%
Build or manipulate physical models	Never	18	60.00%
FSUU	Modal Response	Frequency	Percentage
Analyze pictures and illustrations	Rarely	22	73.33%
Communicate concepts using pictures and illustrations	Rarely	12	40.00%
Draw or interpret graphs by hand	Never	16	53.33%
Generate graphs or analyze data using computer software	Never	18	60.00%
Build or manipulate physical models	Never	15	50.00%

The modal responses for performing Chemistry-related tasks correspond to low regularity or occurrence. For instance, a majority of CSU student responded that the analysis of pictures was rarely done in this high school chemistry classes, as well as communicating concepts using illustrations and using computer software to generate graphs and analyze data. Building or manipulating physical models were mostly never used, while drawings and interpreting graphs by hand were done on a weekly basis by most of the respondents. The modal responses for performing chemistry-related task correspond to low regularity. For instance, a majority of FSUU students responded that the analysis of pictures was rarely done in their high school chemistry classes.

Table 5. Organization and Structure of High School Chemistry Course

Number of days the class meets in a week

	Modal Response	Frequency	Percentage
CSU	5 days	22	73.33%
FSUU	5 days	21	70.00%
. Length of Chemistry Course			
	Modal Response	Frequency	Percentage
CSU	Full year	100	100.00%
FSUU	Full year	100	100.00%
A requirement for Passing the Material			
	Mean Response	Standard Deviation	Interpretation
CSU	4.1	1.24	Mostly with understanding, some memorization
FSUU	3.13	1.36	The equal amount of memorization and understanding

Majority of CSU respondents said that their high school Chemistry class meets five days a week, as well as FSUU. On the other hand, the length of their high school Chemistry Course was one whole year for all of the respondents.

The third indicator showed the requirement for passing the material, in terms of the comparative incidence of memorization and understanding. Results showed that the high school Chemistry class of CSU consisted mostly of understanding and some

memorization, while for FSUU respondents, memorization and understanding were equally evident. This result was taken to be an indication of a positive pedagogical practice as opposed to mere memorization with little or no understanding.

Table 6. Time Spent on Selected Chemistry Topics

CSU	Modal Response	Frequency	Percentage
Atoms and the Periodic Table	A few weeks	43	43%
Chemical Reactions and Equations	A few weeks	53	53%
Solutions	A few weeks	53	53%
Gases and Gas Laws	A few weeks	43	43%
Stoichiometry	A few weeks	33	33%
Nuclear Reactions	A few weeks	66	66%
Biochemistry	A few weeks	33	33%
History and People of Chemistry	A few weeks	36	36%

FSUU	Modal Response	Frequency	Percentage
Atoms and the Periodic Table	A few weeks	63	63%
Chemical Reactions and Equations	A few weeks	66	66%
Solutions	A few weeks	70	70%
Gases and Gas Laws	A few weeks	53	53%
Stoichiometry	A few weeks	60	60%
Nuclear Reactions	A few weeks	60	60%
Biochemistry	A few weeks	60	60%
History and People of Chemistry	A few weeks	50	50%

Results indicated that the modal response for all of the selected Chemistry topics by respondents from CSU and FSUU was “a few weeks”. This means that for most of the respondents, no single topic in Chemistry seemed to dominate the year-long duration of the course, but rather, their high school teachers have exerted efforts to devote an equal amount of time for different topics.

Table 7. Experiences in Chemistry Laboratory Activities

Number of Laboratory Activities Each Month

		None	1	2	3	4	5	More than 5
CSU	F	0	10	13	30	20	4	23
	%	0%	10%	13%	30%	20%	4%	23%
FSUU	F	23	20	13	4	23	0	17
	%	23%	20%	13%	4%	23%	0%	17%

Preparation Prior to Laboratory Activity

	Modal Response	Frequency	Percentage
CSU	Read directions while doing the lab	50	50%
FSUU	Discussed the lab in detail during class before doing the lab	43	43%

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Table 8. Characteristics of Laboratory Activity

CSU	Mean Res	Std. Dev.	Interpretation
The lab builds upon previous lab activity	2.43	1.25	Weakly Evident
The lab addresses belief about the world	2.10	0.92	Weakly Evident
The class repeats the same lab activity to enhance understanding	2.27	1.23	Weakly Evident
The class uses the same equipment's for different experiments	2.97	1.40	Moderately Evident
FSUU	**Mean Res**	**Std.Dev.**	**Interpretation**
The lab builds upon previous lab activity	2.90	1.29	Moderately Evident
The lab addresses belief about the world	2.23	1.45	Weakly Evident
The class repeats the same lab activity to enhance understanding	3.23	1.59	Moderately Evident
The class uses the same equipment's for different experiments	3.23	1.36	Moderately Evident

Amount of Discussion after Laboratory Activity

	None at all	5 min	10 min	Half of the class	Whole Class or More
CSU	7	13	13	50	17
	7%	13%	13%	50%	17%
FSUU	7	13	23	27	30
	7%	13%	23%	27%	30%

For the number of laboratory activities each month, the modal response for CSU respondents was 3 times a week, for FSUU respondents, an equal number indicated either no laboratory activities or 4 times a week. The frequencies for the rest of the responses were presented in Table 5 since the modal response does not significantly outweigh the other responses. In general, the number of laboratory activities for all the respondents vary with no single response being evident.

In addition, half of the CSU respondents indicated that they read directions while doing their high school chemistry lab activities, the other half consisted of roughly equal responses for reading the direction for the lab immediately before starting, discuss the lab in detail during class before doing the lab, read the direction the night before and read and discuss the directions in class a day before doing the lab. For FSUU respondents, the most evident preparation prior to a lab activity was a discussion of the details in class prior to the conduct of the activity.

The characteristics of laboratory activity most of the CSU students responded that the lab builds previous lab activity was weakly evident, as well as the lab addresses belief about the world and the class, repeats the same lab activity to enhance understanding. Most of the CSU students responded that class uses the same equipment for different experiments was moderately evident. For the FSUU students responded that the lab builds upon previous lab activity was moderately evident as well as the class repeats the same lab activity to enhance understanding and the class uses the same equipment's. The lab addresses belief about the world was weakly evident.

The amount of discussion after a laboratory activity varies for FSUU respondents, with most of the respondents saying that a whole class or more was devoted to the discussion. However, this constitutes only 30% of the respondents and does not significantly outweigh that of the other responses. For CSU respondents, a majority said that only half of the class was spent for the discussion.

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Table 9. Characteristics of High School Chemistry Teacher

CSU	Mean Response	Standard Deviation	Interpretation
Knowledge of Chemistry	3.77	1.01	Evident
Enthusiasm for Chemistry	3.47	1.07	Evident
Fairness	3.13	1.01	Moderately Evident
Pleasantness	3.63	1.03	Evident
Ability to organize lessons and class activities	3.93	1.01	Evident
Ability to explain problems in several different ways	3.73	0.98	Evident
Ability to handle discipline and manage classroom	3.77	1.14	Evident
Ability to keep students on task during a lesson	3.63	1.07	Evident
Ability to maintain student's interest during lesson	3.23	1.22	Moderately Evident
FSUU	**Mean Response**	**Standard Deviation**	**Interpretation**
Knowledge of Chemistry	4.07	1.08	Evident
Enthusiasm for Chemistry	3.45	1.43	Evident
Fairness	3.90	1.09	Evident
Pleasantness	4.10	0.84	Evident
Ability to organize lessons and class activities	3.90	0.99	Evident
Ability to explain problems in several different ways	3.83	1.15	Evident
Ability to handle discipline and manage classroom	3.80	1.13	Evident
Ability to keep students on task during a lesson	3.77	1.14	Evident
Ability to maintain student's interest during lesson	2.80	1.27	Moderately Evident

The levels of manifestation of different positive traits of a high school Chemistry teacher were given in Table 10. The responses for both CSU and FSUU respondents were roughly consistent in the sense that all characteristics were found to be either evidence of moderately evident.

Table 10. Demographic Profile of High School Chemistry Teacher

		Male	Female
CSU	F	17	83
	%	17%	83%
FSUU	F	24	76
	%	24%	76%

Age of High School Chemistry Teacher

		20-30 yrs. old	30-50 yrs. old	over 50 yrs. old
CSU	F	37	56	7
	%	37%	56%	7%
FSUU	F	17	77	6
	%	17%	77%	6%

The Academic Performance of the Respondents in Introductory College Chemistry

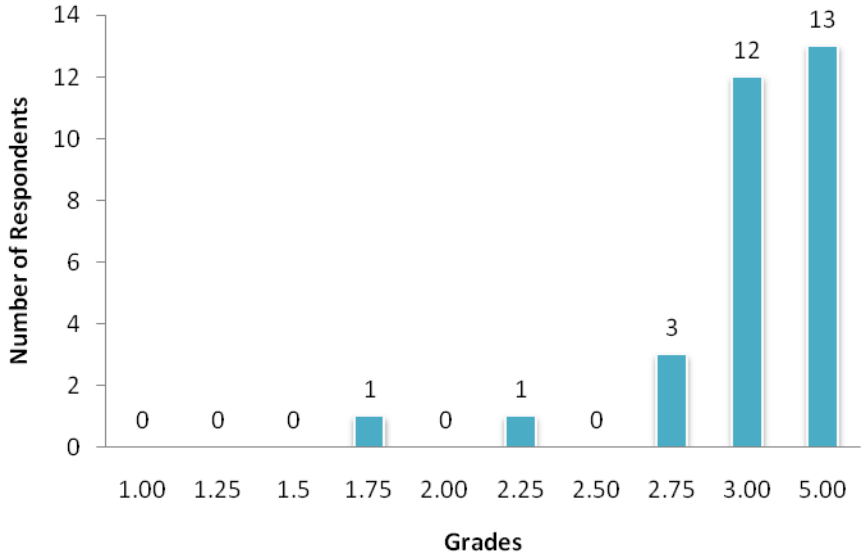

Fig 1:- Academic Performance in Introductory College Chemistry of Respondents From CSU (Distribution By Grade)

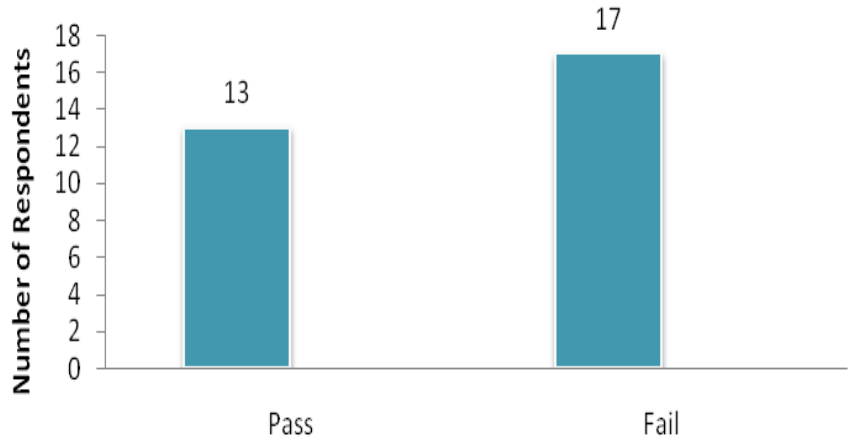

Fig 2:- Academic Performance in Introductory College Chemistry of Respondents From CSU (Distribution By Pass or Fail Status)

Thirteen or 43.33% of CSU respondents failed in their Introductory College Chemistry Course. Among the 17 or 56.67% who passed, a great majority obtained the minimum passing grade of 3.00 with 12 respondents, followed by 2.75 with three respondents. The grades of 2.25 and 1.75 each obtained a single respondent, leaving the other grades unrepresented. This particular distribution of grades implies that a regrouping of the categories was necessary in order to facilitate the interpretation of the tests for the significant association that will follow. In particular, chi-square was likely to return unreliable results when at least of the categories has very few observations. Table 10 shows regrouping of the categories into either pass or fail.

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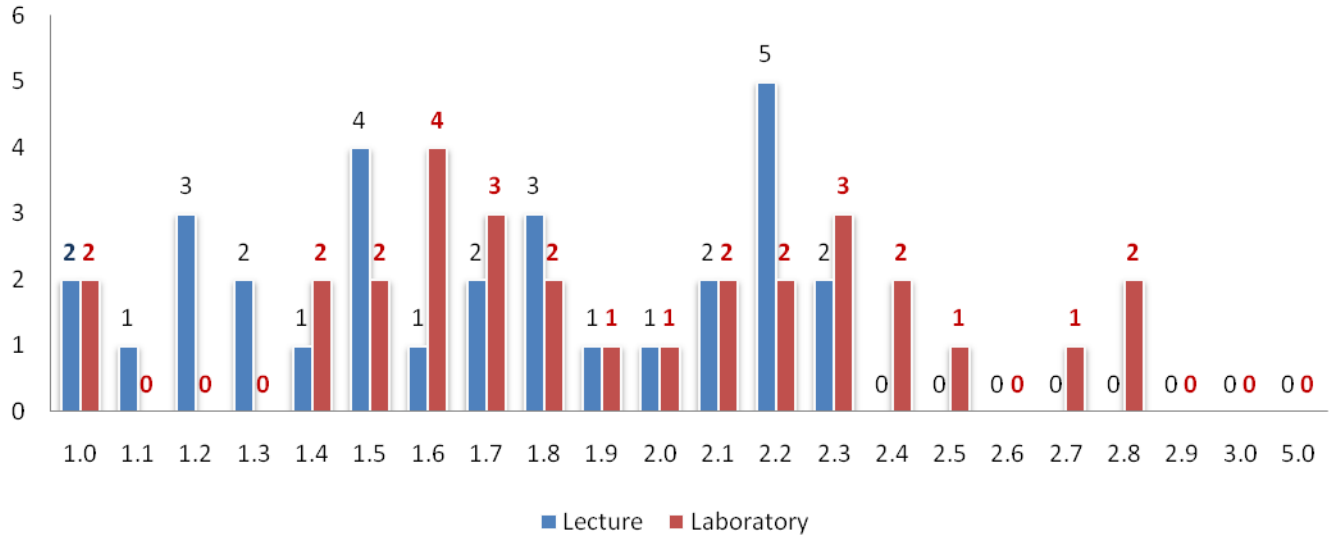


Fig 3:- Academic Performances in Introductory College Chemistry of Respondents from FSUU (Distribution By Pass or Fail Status)

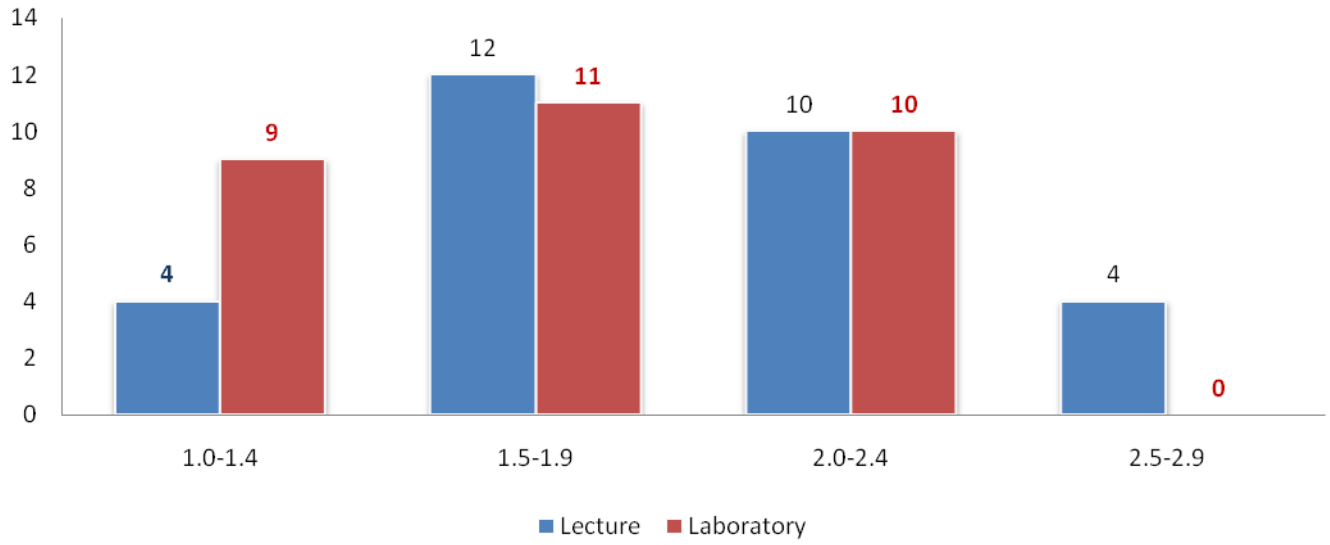


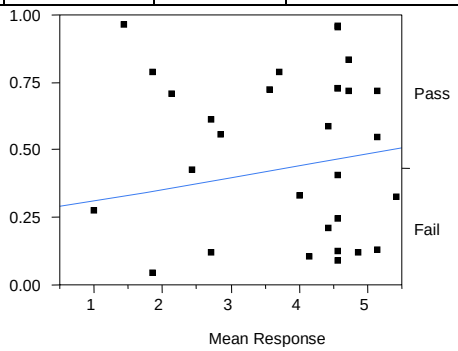
Fig 4:- Academic Performances in Introductory College Chemistry of Respondents from FSUU (Distribution by Grade Intervals)

In FSUU, the grades in Introductory College Chemistry were given into two separate components, namely Lecture and Laboratory. As such, these two components will be considered separately during analysis. None of the respondents from FSUU failed the subject in either component, and the grades in laboratory tend to be higher than those in lecture. (This neither implies, however, that FSUU respondents performed better than CSU respondents, nor that FSUU respondents are more adept in laboratory work than in lecture.) Note also that in the FSUU grading system, more grades were possible since the increment was done by 0.10, as opposed to 0.25 which was used in CSU. Because of this, some grades were either underrepresented or do not have any respondents at all. This calls, as with the case of CSU, for a regrouping of the categories, as shown in Table 10.

A Relationship between the Students' Pedagogical Experiences in High School Chemistry and Performance in Introductory College Chemistry

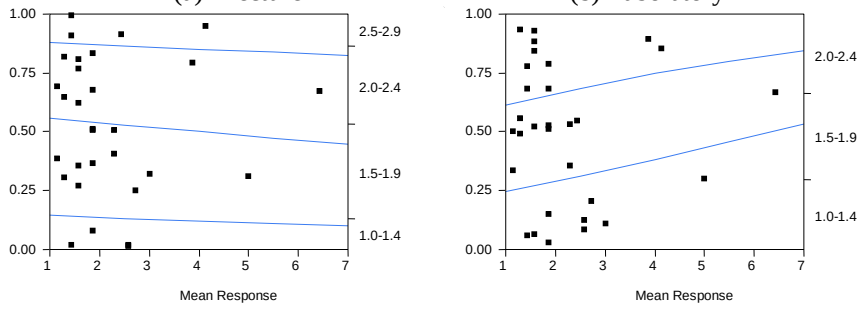
Table 11. Logistic Fit of Performance in Chemistry By Frequency of Use of Different Types of Technology

CSU	Chi-square	P-value	Interpretation
Mean Response	0.37	0.54	Not Significant



FSUU	Chi-square	P-value	Interpretation
Mean Response	Lec 0.07 Lab 0.59	0.78 0.44	Not Significant Not Significant

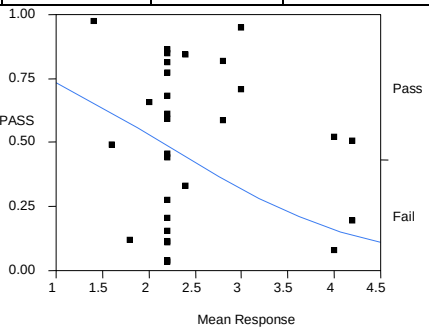
(a) Lecture (b) Laboratory



The Chi-square values for both logistic fits were found to be not significant. For the case of CSU, the vertical curves that separate the mean responses for the categories show that among those who passed or failed the subject, the proportion that has high and low mean responses for the use of technology was not significantly different. The same observation was also evident among FSUU respondents. This means that no sufficient evidence was found from the data to show any significant association between the use of technology and performance in Introductory College Chemistry.

Table 12. LogisticFit of Performance in ChemistryBy Frequency of Chemistry-Related Tasks

CSU	Chi-Square	P-value	Interpretation
Mean Response	0.33	0.57	Not Significant



FSUU	Chi-Square	P-value	Interpretation
Mean Response	Lec 0.23 Lab 1.85	0.63 0.17	Not Significant Not Significant

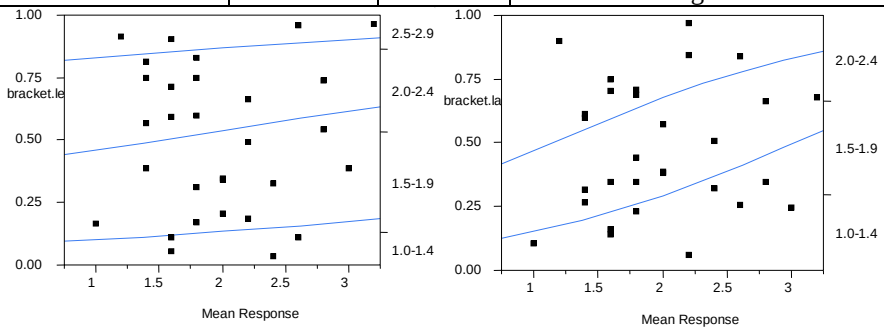


Table 8. Above showed the logistic fit of performance in Chemistry by a frequency of selected Chemistry-related tasks. The p-values larger than 0.05 implied that no sufficient evidence was found to determine any significant association between these two variables.

Table 12. Contingency Analysis of Performance in Chemistry by Organization and Structure of High School Chemistry Course

Number of days the class meets in a week			
	Chi-square	P-value	Interpretation
CSU	1.37	0.71	Not Significant
FSUU	Lec 2.33	0.51	Not Significant
	Lab 1.30	0.52	Not Significant
Length of Chemistry Course			
	Chi-square	P-value	Interpretation
CSU	0	NA	NA
FSUU	0	NA	NA
A requirement for Learning the Material			
	Chi-square	P-value	Interpretation
CSU	2.98	0.56	Not Significant
FSUU	Lec 16.54	0.17	Not Significant
	Lab 12.65	0.12	Not Significant

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As shown by the large p-values, there was no significant association between performance in Introductory College Chemistry and number of days the class meets in a week and the requirement for learning the material. No test of significance as the association for the length of chemistry course can be made since only single response (one year) had been observed by all respondents.

Table 13. Contingency Analysis of Performance in Chemistry By Time Spent on Selected Chemistry Topics

CSU	Chi-square	P-value	Interpretation
Atoms and the Periodic Table	7.10	0.07	Not Significant
Chemical Reactions and Equations	4.72	0.19	Not Significant
Solutions	4.18	0.38	Not Significant
Gases and Gas Laws	1.69	0.64	Not Significant
Stoichiometry	1.73	0.78	Not Significant
Nuclear Reactions	0.27	0.97	Not Significant
Biochemistry	5.98	0.31	Not Significant
History and People of Chemistry	3.04	0.55	Not Significant
FSUU	Chi-square	P-value	Interpretation
Atoms and the Periodic Table	Lec 14.08	0.22	Not Significant
	Lab 17.96	0.00	Significant
Chemical Reactions and Equations	Lec 10.16	0.34	Not Significant
	Lab 13.53	0.04	Significant
Solutions	Lec 0.85	0.45	Not Significant
	Lab 15.36	0.02	Significant
Gases and Gas Laws	Lec 11.41	0.49	Not Significant
	Lab 6.78	0.56	Not Significant
Stoichiometry	Lec 12.01	0.21	Not Significant
	Lab 13.61	0.03	Significant
Nuclear Reactions	Lec 10.96	0.28	Not Significant
	Lab 9.33	0.16	Not Significant
Biochemistry	Lec 12.52	0.41	Not Significant
	Lab 9.87	0.27	Not Significant
History and People of Chemistry	Lec 22.37	0.22	Not Significant
	Lab 21.25	0.05	Significant

On the previews results on time spent on selected chemistry topics, it was found that CSU respondents responded that they meet five times a weeks and it shows that there's no significant association between performance in ICC and the time spent on the selected topics. For FSUU respondents responded that only the laboratory has a significant association between time spent and performance in ICC, opposed to the lecture which shows no significant association.

Table 14. Contingency Analysis of Performance in Chemistry By Experiences in Chemistry Laboratory Activities

Number of Labs Each Month

	Chi-Square	P-value	Interpretation
CSU	16.37	0.68	Not Significant
FSUU	Lec 18.94	0.12	Not Significant
	Lab 16.64	0.08	Not Significant
Preparation Prior to Laboratory Activity			
		Chi-Square	P-value	Interpretation
CSU	Read directions while doing the lab	4.03	0.10	Not Significant
FSUU	Discussed the lab in detail	Lec 19.73	0.07	Not Significant
	during class before doing the lab	Lab 12.57	0.13	Not Significant

Characteristics of Laboratory Activity

CSU	Chi-Square	P-value	Interpretation
The lab builds upon previous lab activity	7.96	0.09	Not Significant
The lab addresses belief about the world	3.85	0.28	Not Significant
The class repeats the same lab activity to enhance understanding	0.82	0.94	Not Significant
The class uses the same equipment's for different experiments	4.02	0.40	Not Significant
FSUU	Chi-Square	P-value	Interpretation
The lab builds upon previous lab activity	Lec 19.69 Lab 14.07	0.07 0.08	Not Significant Not Significant
The lab addresses belief about the world	Lec 23.00 Lab 8.69	0.03 0.37	Significant Not Significant
The class repeats the same lab activity to enhance understanding	Lec 19.61 Lab 4.67	0.07 0.79	Not Significant Not Significant
The class uses the same equipment's for different experiments	Lec 18.81 Lab 12.64	0.09 0.12	Not Significant Not Significant

13.4 Amount of Discussion After Laboratory Activity

	Chi-Square	P-value	Interpretation
CSU	4.23	0.38	Not Significant
FSUU	Lec 15.49 Lab 8.29	0.21 0.41	Not Significant Not Significant

As with most previous results no sufficient evidence was found to establish a significant association between performance in ICC and the following indicators of experiences in high school chemistry laboratory activities: number of labs each month, preparation prior to laboratory activity, characteristics of laboratory activity and amount of discussion after laboratory activity.

Table 15. Contingency Analysis of Performance in Chemistry By Characteristics of HS Chemistry Teacher

CSU	Chi-Square	P-value	Interpretation
Knowledge of Chemistry	5.81	0.12	Not Significant
Enthusiasm for Chemistry	5.64	0.23	Not Significant
Fairness	5.69	0.22	Not Significant
Pleasantness	3.72	0.29	Not Significant
Ability to organizes lessons and class activities	4.12	0.39	Not Significant
Ability to explain problems in several different ways	4.08	0.25	Not Significant
Ability to handle discipline and manage classroom	2.84	0.59	Not Significant
Ability to keep students on task during a lesson	2.07	0.56	Not Significant
Ability to maintain student's interest during lesson	1.36	0.85	Not Significant
Mean Response*	3.76	0.05	Significant
FSUU	Chi-Square	P-value	Interpretation
Knowledge of Chemistry	Lec 9.27 Lab 3.92	0.41 0.69	Not Significant Not Significant
Enthusiasm for Chemistry	Lec 16.32 Lab 8.06	0.18 0.43	Not Significant Not Significant
Fairness	Lec 10.76 Lab 5.15	0.29 0.53	Not Significant Not Significant

Pleasantness	Lec 12.55 Lab 5.33	0.18 0.50	Not Significant Not Significant
Ability to organizes lessons and class activities	Lec 10.04 Lab 1.14	0.35 0.98	Not Significant Not Significant
Ability to explain problems in several different ways	Lec 17.22 Lab 8.87	0.14 0.35	Not Significant Not Significant
Ability to handle discipline and manage classroom	Lec 16.33 Lab 8.48	0.18 0.39	Not Significant Not Significant
Ability to keep students on task during a lesson	Lec 9.02 Lab 8.40	0.70 0.40	Not Significant Not Significant
Ability to maintain student's interest during lesson	Lec 12.88 Lab 6.90	0.38 0.55	Not Significant Not Significant
Mean Response*	Lec 3.19 Lab 0.32	0.05 0.57	Significant Not Significant
Note: * - Logistic Regression usedinstead of Contingency Analysis			

Mean Response*	3.76	0.05	Significant
FSUU	Chi-Square	P-value	Interpretation
Knowledge of Chemistry	Lec 9.27 Lab 3.92	0.41 0.69	Not Significant Not Significant
Enthusiasm for Chemistry	Lec 16.32 Lab 8.06	0.18 0.43	Not Significant Not Significant
Fairness	Lec 10.76 Lab 5.15	0.29 0.53	Not Significant Not Significant
Pleasantness	Lec 12.55 Lab 5.33	0.18 0.50	Not Significant Not Significant
Ability to organizes lessons and class activities	Lec 10.04 Lab 1.14	0.35 0.98	Not Significant Not Significant
Ability to explain problems in several different ways	Lec 17.22 Lab 8.87	0.14 0.35	Not Significant Not Significant
Ability to handle discipline and manage classroom	Lec 16.33 Lab 8.48	0.18 0.39	Not Significant Not Significant
Ability to keep students on task during a lesson	Lec 9.02 Lab 8.40	0.70 0.40	Not Significant Not Significant
Ability to maintain student's interest during lesson	Lec 12.88 Lab 6.90	0.38 0.55	Not Significant Not Significant
Mean Response*	Lec 3.19 Lab 0.32	0.05 0.57	Significant Not Significant
Note: * - Logistic Regression usedinstead of Contingency Analysis			

On the previous results in the characteristics of the HS chemistry teacher, the respondents of both schools responded that those positive traits were being observed. The CSU result showed that the characteristics of the HS teacher have the significant association with the academic performance in ICC. For the FSUU shows that the characteristics of the HS chemistry teacher have a significant association with the academic performance with the in ICC in terms of lecture, in contrast with the laboratory which showed no significant association.

Among all the variables identified the logistics fit of characteristics of high school chemistry teacher showed statistically significant association with academic performance in ICC. For instance, a P-value of 0.05 for CSU respondents shown that it was unlikely for the observed association to have occurred by chance. The logistic fit plot shows that the greater proportion of those who passed the subject had HS chem. Teachers with high mean responses, i.e., high incidence of positive characteristics. The same observation was true for grades in the lecture of FSUU students. Students, who belong to a numerically low-grade bracket, tend to have high school chem. teachers with high or evident mean responses. On the other hand, no significant association was found for the grade in a laboratory of FSUU respondents as shown by nearly vertical logistics curves.

Table 16. Contingency Analysis of Performance in Chemistry by Gender of HS Chemistry Teacher

	Chi-Square	P-value	Interpretation
CSU	0.03	0.87	Not Significant
FSUU	Lec 4.19 Lab 0.70	0.24 0.70	Not Significant Not Significant

Table 16. Showed that there was no significant association between the genders of the HS chemistry teacher to the performance of ICC

Table 17. Contingency Analysis of Performance in Chemistry by Age of HS Chemistry Teacher

	Chi-Square	P-value	Interpretation
CSU	0.15	0.65	Not Significant
FSUU	Lec 2.16 Lab 3.02	0.13 0.22	Not Significant Not Significant

Table 17. Showed that there was no significant association between the ages of the HS chemistry teacher to the performance of ICC.

V. CONCLUSION

The following were the findings of the study on the high school pedagogical experience of ICC in freshmen students. In terms of chemistry activities, first was the use of the different types of technology. The response of the CSU students responded that they were using technology frequently and the FSUU students' responded that they rarely used technology with their high school class. The second activity was the chemistry related tasks, CSU students, as well as the FSUU students, responded that they rarely used chemistry related task during their high school chemistry. Third was the organization and structure of high chemistry course, the CSU, and FSUU freshmen students responded that they meet in their respected class five days a week but, the CSU students consisted mostly of understanding and some memorization while the FSUU students responded that equal amount of memorization and understanding, thus this was a positive indication of a positive pedagogical practice as opposed to mere memorization with little or no understanding. And another indicator for the time spent on selected chemistry topics, CSU and FSUU students responded that this topic was being discussed a few weeks that means high school teachers have exerted efforts to devote the equal amount of time in discussing topics in chemistry.

Pertaining to laboratory activities, CSU students responded that they used to have their laboratory activities three or four times each month but, with the FSUU students responded they rarely do their share of laboratory activities each month. Another laboratory activity was about preparation prior to laboratory activity, according to CSU students only half of them had already read the directions of the laboratory activity before actually doing it but for the FSUU respondents responded that laboratory activity was being discussed prior to actual experiments. The last indicator about laboratory activity was about the relevance of the laboratory activity in terms of belief about the world. The response of both schools was the laboratory activity weakly relates the understanding of chemistry about the environment and beliefs about the world. Thus, the amount of discussion after the actual laboratory performance signifies according to CSU students said that only half of the class was spent for the discussion while the FSUU students said that most of the time of the class was spent in discussion.

The last indicator for the chemistry activities was the level of manifestation of the different positive traits of the high school chemistry teachers said that all of these characteristics were either evident or moderately evident manifested in their chemistry teacher. On the academic performance of the respondents in ICC, thirteen or 43.33% of CSU respondents failed in their ICC. Among the seventeen or 56.67% who passed, a great majority obtained the minimum passing grade of 3.00 with 12 respondents, followed by 2.75 with three respondents. They grade of 2.25 and 1.75 each obtained a single respondent, leaving the other grades unrepresented. While in FSUU, the grades in ICC were given in two separated components, namely lecture and laboratory and none of the FSUU respondents failed the subject in either component, and the grades in laboratory tend to be higher than those in lecture.

In association between the student's pedagogical experiences in high school chemistry and the users of technology, results showed that there was no significant association same with the performance in relation to selected chemistry related task, the number of days spent in class, experiences in chemistry laboratory activities, preparation of laboratory prior to actual activity and the amount of discussion

during the laboratory activity. Among the variables, only the positive characteristics of high school teacher show statistically significant association with the academic performance of the respondents. Wherein teachers with high mean responses' has a high incidence of positive characteristics. FSUU respondents who belong to numerically low-grade bracket tend to be affected with high school chemistry teachers with negative or no good positive characteristics of high school chemistry teachers. The time spent by high school teachers in selected chemistry topics has a significant association with the academic performance of the respondents coming from both schools. And grades in a laboratory and the time spent in the following topics; Atoms and Periodic Table, Chemical Reactions and Equations, Solutions, Stoichiometry, and history of people of chemistry as a significant relationship to the grade in a laboratory.

VI. RECOMMENDATIONS

Based on the findings and outcome of this study, the following recommendations were formulated:

1. The High School Teachers should be aware that positive characteristics or traits is one of the determining factors for the students to be interested in chemistry and they should uplift and boost the interest of the students by giving encouragement and making the chemistry class more interesting in a way to enhance the learning capabilities of the students to love chemistry and other science subjects.

2. The Administrators especially the hiring personnel's should be strict in accepting new applicant especially those science teachers who are really major of the said specialization hence this will be one of the determining factors in the learning achievement in chemistry and another science subject.

3. High School Teachers in chemistry should give more emphasis on basic topics on chemistry and give more ample time in the discussion in order that the students will have a good foundation once they reach the difficult topics.

4. High School Teachers in chemistry should make the laboratory activity more often especially on topics relating to climatic change and environmental effect so that the students will be environmentally aware and be an agent of change in the future.

5. Students should not be negative in dealing with chemistry subject and they should be aware that chemistry is a central science and an interesting subject. They should take time in loving it.

REFERENCES

[1]. CMO No. 30, Series of 2004-Revised Policies and Standards for Undergraduate Teacher Education Curriculum.

[2]. Facione, P. A., Sanchez, C. A., Facione, N. C., &Gainen, J. (1995). The disposition toward critical thinking. The Journal of General Education, 1-25.

[3]. Mullis, I. V., Martin, M. O., Beaton, A. E., Gonzalez, E. J., Kelly, D. L., & Smith, T. A. (1998). Mathematics and Science Achievement in the Final Year of Secondary School: IEA's Third International Mathematics and Science Study (TIMSS). TIMSS International Study Center, Boston College, School of Education, Campion Hall, Chestnut Hill, MA 02167; World Wide Web: http//wwwcsteep. bc. edu/timss.

[4]. Tai, R. H., Sadler, P. M., & Loehr, J. F. (2005). Factors influencing success in introductory college chemistry. Journal of Research in Science Teaching, 42(9), 987-1012.

[5]. Paulson, D. R. (1999). Active learning and cooperative learning in the organic chemistry lecture class. Journal of Chemical Education, 76(8), 1136.

[6]. Vanlehn, K., Burleson, W., Echeagary, H. C., Christopherson, R., Sanchez, J. G., & HIDALGO, Y. (2011). The level up procedure: How to measure learning gains without pre-and post-testing. In Proceedings of the 19th International Conference on Computers in Education. Chiang Mai, Thailand: Asia-Pacific Society for Computers in Education.

[7]. Faikhamta, C., Coll, R. K., &Roadrangka, V. (2009). The development of Thai pre-service chemistry teachers' pedagogical content knowledge: From a methods course to field experience. Journal of Science and Mathematics Education in Southeast Asia, 32(1), 18-35.

[8]. Pitpiorntapin, S., &Topcu, M. S. (2016). Teaching based on socioscientific issues in science classrooms: A review study. KKU International Journal of Humanities and Social Sciences, 6(1), 119-136.

[9]. Hazari, Z., Tai, R. H., & Sadler, P. M. (2007). Gender differences in introductory university physics performance: The influence of high school physics preparation and affective factors. Science Education, 91(6), 847-876.

[10]. Tai, R. H., Sadler, P. M., &Mintzes, J. J. (2006). Factors influencing college science success. Journal of College Science Teaching, 36(1), 52.

[11]. Belt, S. T., Leisvik, M. J., Hyde, A. J., & Overton, T. L. (2005). Using a context-based approach to undergraduate chemistry teaching–a case study for introductory physical chemistry. Chemistry Education Research and Practice, 6(3), 166-179.

[12]. Tai, R. H., Ward, R. B., & Sadler, P. M. (2006). High school chemistry content background of introductory college chemistry students and its association with college chemistry grades. Journal of Chemical Education, 83(11), 1703.