

Effect of Social Media Integrated Learning and Group Study on the Achievement of Pre-Service Chemistry Teachers in Colleges of Education in Delta State

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Abstract: The study examined the effect of social media integrated learning and group study on the achievement of pre-service chemistry teachers in colleges of education in Delta state. Two research questions and three hypotheses guided the study. The quasi-experimental design was used, specifically the pretest posttest nonrandomized control group design. A sample of 71 second year pre-service Chemistry teachers from Federal College of Education, Asaba and College of Education, Agbor were involved in the study. The instrument for data collection was Chemistry Achievement Test (CAT) validated by lecturers in science education, and education foundation and one experienced chemistry teacher. The reliability of the instrument was established using Kuder-Richardson formula 20 which yielded coefficient of internal consistency of 0.93. The data obtained were analyzed using mean, standard deviation, and Analysis of Covariance (ANCOVA). The results showed that there was a significant difference between the mean achievement scores of students taught using social media integrated learning and group study and those taught using the conventional method in favour of the former. There was no significant interaction effect of gender and teaching methods on students' achievement in chemistry. The study recommended that chemistry teachers should adopt the use of social media integrated learning as a medium to facilitate interaction, cooperation and group study among pre-service teachers.

Keywords: social-media, pre-service, teachers, group study, chemistry

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I. Introduction

The social constructivists' approach to learning emphasizes that learning is a social activity. This is because knowledge is a human product and is socially and culturally constructed. Thus, for efficient learning to take place, individuals are engaged in activities so that they can create meaning and have in-depth understanding of the concept taught through their interaction with each other and their immediate environment. This approach to learning is especially suited for pre-service chemistry students. Chemistry according to Ojokuku (2010) is the branch of science that studies matter, its structure, composition, properties and the changes it undergoes. The study of chemistry Udosen (2015) noted helps us to acquire knowledge about matter; learn to observe; record and make intelligent inferences. The study of chemistry is related to other fields and forms part of the foundational knowledge required for studying other science disciplines.

Chemistry teachers seem to be faced with so many challenges in chemistry teaching and learning process. This is highly reflected in the poor achievement in chemistry by students at all levels of education (Kaya & Cetin, 2012). Such poor achievement is a function of poor chemistry teachers who also underwent poor formation as pre-service teachers (Ayla, Oktay, & Ayse, 2010). The poor formation of the pre-service teachers is also clearly expressed in their performances during the pre-service teacher training in colleges of education. This has been the concern of many researchers, educational administrators and other educational stakeholders in recent times. A possible solution seems to lie in developing an instructional and learning strategies that could make for greater interactivity between teachers and pre-service teachers as well as among pre-service teachers themselves in a group study. One way to achieve this is to employ as an aid to instruction and learning, the use of social technologies adaptable to different learning contexts and which find common usage among pre-service teachers. Social media which is becoming an integral part of our lives come to mind at this point.

According to Heyam (2014), social media is a strong electronic network tool for social interaction and connection, improving fairly ties and friends in a rich social context. Heyam added that students, including pre-service teachers, are spending much time on social media and are considered the largest category that uses such application. The popularity of social media, such as Facebook, whatsapp, 2go, LinkedIn, Twitter, and Xing, continue to grow, providing people with amazing opportunities to interact through social networks (Hinze, Bernd, Christian & Jan, 2011; Junco, 2013; Nadkarni & Stefan, 2012). Many pre-service teachers happily make use of

these opportunities by spending significant time on social media (Schulze, Scholer&Skiera, 2014). Through the social connections that they typically maintain on these platforms, individuals can gain access to resources that may be the key to their academic success including information. They may also be linked to other important and functional communication networks that lead to effective learning. Yet with limited time available, too much time spent socializing has been shown to have negative effects on academic success (Junco, 2012a). For example, for students, who are perhaps the most intensive users of social media, interacting on the platform, playing video games and using other electronic media (Jacobsen &Forste, 2011), expressing themselves, and maintaining friendships, are time-intensive acts that might limit the time available for studying, thus possibly harming their academic performance (Mihaly, 2009).

Results more so indicated a higher performance in a social-media experiment where learning contents were discussed in groups and compared to the other two groups without such interaction. Many studies also focused on using social media applications, where they categorized them as productivity tools. Alonso, Guzman, and Mescua (2013) listed many in their literature, where they focused on mobile applications and how they can accommodate the functionalities of learning management systems. Facebook and whatsapp resulted to a significant improvement in students' achievement in universities. A study in a Vietnamese university concluded that students using Facebook as a social media learning platform improved substantially with respect to their achievement (Tuan &Tu, 2013). The same study also concluded that the improvements and value of social network sites were not only related to the academic performance but also the adaptation to the social environment of school resulting in group studies.

Group study is a kind of cooperative or collaborative learning approach that involves getting students of mixed ability together to help each other achieve academic goals. Here, the students help each other accomplish their educational task. This has been a very difficult task to organize for many teachers especially because of the time. Social media however, provides the avenue to accomplish this. The joint effect of the social media and group study well planned and executed holds many academic benefits especially for chemistry pre-service teachers. The benefit of this approach is predicated on the fact that pre-service teachers not only improve on their performance but also learn through such method of instruction how to handle their own students when they become teachers eventually.

Since chemistry pre-service teachers are the teachers who will implement chemistry curriculum in the future, how they see themselves in their future classrooms has a great significance and value. Pre-service chemistry teachers begin the teacher education programs with a set of values and beliefs about the nature of knowledge, how students learn, and what strategies may best be applied in classroom environment. These pre-service chemistry teachers have many years of experience of textbook-driven and teacher-centered education. This instructional style affects pre-service teachers' achievement and beliefs about teaching and learning.

Researchers have found that pre-service teachers' beliefs about teaching and learning had a significant role in internalizing the information given in both subject-matter and pedagogy courses (Ridvan, Betül&Ömer, 2011). This belief is also gender-related given the common idea that the teaching job is often seen by many as rather feminine. The use of social media integrated learning and group study could help change this misconception as pre-service teachers and their teachers interact often.

PURPOSE OF STUDY

The study focused on effect of social media integrated learning and group study on the achievement of pre-service chemistry teachers. The study specifically sought to determine:

1. Effect of social media integrated learning and group study on pre-service chemistry teachers' achievement.
2. Influence of gender on the achievement pre-service chemistry teachers.
3. Interaction effect of gender and teaching method on the Chemistry Achievement.

RESEARCH QUESTIONS

The following research questions guided the study.

1. What are the mean achievement scores and standard deviation of pre-service chemistry teachers exposed to social media integrated learning and group study and those who were not exposed to the treatment?
2. What are the mean achievement scores and standard deviation of male and female pre-service chemistry teachers?

Hypotheses

The following null hypotheses formulated to guide the study were tested at 0.05 level of significance.

1. There is no significant difference between mean achievement scores of pre-service chemistry teachers exposed to social media integrated learning and group study and those who were not exposed to the treatment.

2. There is no significant difference between the mean achievement scores of male and female pre-service chemistry teachers.
3. There is no significant interaction effect of gender and teaching methods on pre-service teachers' achievement in chemistry.

II. Method

Research Design

The design adopted for the study was quasi-experimental design. Specifically, the pretest-posttest non-equivalent control group design was used. In this design intact classes are used since there is no random assignment of the research subject into control and experimental groups (Nworgu, 2015).

Area of the Study

The area of the study was Delta North senatorial district of Delta State. Agbor in Ika South Local Government and Asaba in Oshimilli South Local Government Areas were used for the study. Agbor town is an Igbo-speaking group of Ika descent with some Bini influence. The people traditionally rely on farming and fishing for their food and commerce. Asaba is made of the Igbo speaking Umuezei, Ugbomanta, Umaji, Umuagu and Umuonaje communities. It is a commercial city and the capital of Delta State.

Population of the Study

The population of the study was made up of 480 (245 males and 235 females) pre-service chemistry teachers in College of Education Technical, Asaba and College of Education Agbor (Source: Ministry of Higher Education, Asaba). Specifically, the study involved 200 level pre-service chemistry teachers.

Sample and Sampling Technique

The sample size for the study was made up of 71 (38 females and 33 males) second year (200L) pre-service chemistry teachers. Using purposive sampling technique, the 200L pre-service chemistry teachers in Federal College of Education Technical, Asaba and College of Education, Agbor in their intact classes were chosen for the study. The reason for selecting them was because they are also not going for their teaching practice experience which could have disrupted the research exercise. With a flip of coin, one of the two colleges was assigned to experimental group and the other as the control group.

Instrument for Data Collection

The instrument for the collection of data was a Chemistry Achievement Test (CAT). In the study, social media group pages were also created by the researcher as well as plans of interactive activities to be done in the social media pages.

Chemistry Achievement Test (CAT): The Chemistry Achievement Test was constructed by the researcher in line with the contents and objectives of the first three topics in the course outline for "ICH 222-Organic Chemistry" as contained in the curriculum handbook for colleges of education. The CAT consisted of two sections namely; section A and section B. Section A was designed to generate information on the gender of the respondents. Section B was made up of 40 multiple-choice objective test items constructed to measure the pre-service chemistry teachers' achievement in chemistry. It is made up of four options A-D. The test exercise lasted for 90 minutes..

Social Media Group Pages and Activities: The chemistry lecturer's notebook of the pre-service chemistry teachers were obtained from the lecturers in the two schools and used by the researcher to develop plans of interactive activities on the selected topics for the social media group pages created. The topics were: Chemistry and molecular geometry of Alkanes, Electrophilic and Nucleophilic reactions, Oxidative cleavage and its application in structural determination e.gOzonolysis, Relative stability of Carbonium ions; the Markownikoff's rule; radical reaction, and reduction and addition polymerization of polymers from alkenes and vinyl compounds and natural rubber. The topics were chosen because they are the topic contained in the scheme of work of Colleges of Education at the time of the research. To ensure uniformity of subject matter contents area for the achievement test, only the topics contained in both outlines and the lecturers' notebooks obtained were used in preparing the test items. The social media group page was a web page created by the researcher with a "Whatsapp" social media account for the experimental group only.

The page served as a host or a forum for interaction among all the members of the experimental group and also for the individual study groups that were created for the study during the treatment process of the experimental group. The whatsapp account had limited accessibility and only members of the experimental group were admitted into the social media web page. The social media group page for the entire experimental

group bore the name "PSERVICE TEACHERS SET" with a display picture (DP) of the institutions logo. The individual group pages bore the names: "Pservice teachers set 1", "Pservice teachers set 2", "Pservice teachers set 3", "Pservice teachers set 4", "Pservice teachers set 5" for individual groups 1,2,3,4 and 5.

Validation of the Instrument

The researcher sent copies of the initial draft of the CAT and the lesson plans to three lecturers in the Departments of Science Education (Chemistry) and Educational Foundations (Measurement and Evaluation) in NnamdiAzikiwe University, Awka. The CAT was sent along with the purpose of the study, research questions and hypotheses to the validators. The researcher requested the validators to vet the items for clarity of expression, plausibility of the distractors and appropriateness to the level of the students as well as the suitability of the lesson plan for the purpose of the study. The suggestions of the validators and their corrections were effected in the instruments.

Reliability of the Instrument

The reliability of CAT was determined using Kuder-Richardson Formula 20. This was done by administering the CAT instrument once to 40 pre-service chemistry teachers in Federal College of Education, Sagbama and the generated score was used to compute the reliability. The reliability index of the instrument obtained was 0.93.

Experimental Procedure

The Organic chemistry lecturers in both Colleges were used as research assistants in the study. The lecturers were briefed on the purpose of the study and the parts they needed to play in the study. Both lecturers were requested to ensure that they covered the three (3) selected topics within the stipulated time to ensure uniformity of subject matter taught before administration of the posttest. The lecturer for the experimental group was requested to make all the necessary and subsequent announcements on the experimentation, collect all the necessary information from the students and ensure maximum group participation. He was given the attendance for participation in the social media pages taken by the researcher for both the individual and general group. This was done in one week.

The experimentation involved: first asking students who did not have whatsapp accounts to create same. This information was passed on by the course lecturer. The phone numbers used for the creation of the individual pre-service chemistry teachers' whatsapp accounts were gathered and submitted by the class captain to the researcher through the lecturer. The researcher used these numbers to group the pre-service chemistry teachers into five study groups. Thereafter, each number was added to one of the various study group whatsapp accounts with group page names: "Pservice teachers set 1", "Pservice teachers set 2", "Pservice teachers set 3", "Pservice teachers set 4", "Pservice teachers set 5". The pre-service chemistry teachers in the entire E-group were added to the general group page "PSERVICE TEACHERS SET". This was done in the first week and in the same week, the CAT pre-test was also administered without a feedback.

The second to the eight week involved the normal lectures of the experimental and control groups on the selected topics with the conventional methods of the lecture of both groups. After the lesson for each week, the pre-service chemistry teachers in the experimental group were exposed to more information on the topic on the general page, with all efforts to make the lesson clearer. This involves posting contents of the material discussion plan instrument, tutorial clips on the lesson contents on the general group page, with related questions that could incite the group members to ask questions. Specific group questions and assignments were pasted on the individual group pages with a request by the lecturer to paste the answers to their individual group questions on the general page. This was done by the page coordinator (a participant) who was assigned by the researcher through the course lecturer. Other group members did same, with each group asking questions about what they did not understand by posting their questions on the general group page. This exercise was facilitated by the researcher who was made known to the students by the lecturer as the social media assistant. The whole exercise lasted for eight (8) weeks.

The control group was exposed to the same lesson content without any involvement with social media using the convectional teaching method. Their usual chemistry lecturers taught the students in this group. In the eighth (8th) week, the CAT was administered as a post-test with the CAT items and answer options reshuffled. Each correctly answered question earned the individual two and half (2.5) marks.

Control of Extraneous Variables

1. Experimenter bias: To control for experimental bias, the chemistry regular lecturers of both Colleges taught the pre-service chemistry teachers. The researcher only supervised the activities in each group.
2. Class interaction: Class interaction occurs where the experimental and control group participants exchange or share information and materials peculiar to their groups. The colleges for the exercises were located in different local governments within the Delta North senatorial district. This controlled for class interaction.

3. Teacher variable: The researcher stated clear objectives drawn from the achievement test, and as contained in the outline for both lecturers to strive and achieve.
4. Initial group difference: Since there was no randomization in the assignment of subjects to the experimental and control groups, ANCOVA statistical technique was used to control any initial group differences among the subjects.
5. Hawthorne Effect: Hawthorne effect is said to occur when the subjects become aware that they are being observed or used in a study and that could affect the outcome of the study. Hawthorne effect was controlled in this study by using the regular lecturers known to the students.
6. Effect of Pre-test on Post-test: The exercise lasted for seven weeks thereby allowing for enough space between the two tests administrations. To reduce this further, the post-test items were reshuffled.

Method of Data Analysis

The research questions were answered using mean and standard deviation while the hypotheses were tested with Analysis of Covariance (ANCOVA) at 0.05 level of significance. The decision rule was that whenever P-value was less than 0.05, the null hypotheses was rejected, otherwise the null hypotheses was not rejected.

III. Results

Research Question 1: What are the mean and standard deviation of achievement scores of pre-service chemistry teachers exposed to social media integrated learning and group study and those who were not exposed to the treatment?

Table 1: Mean and Standard Deviation Scores in Pretest and Posttest of Experimental and Control Group

Groups	N	Pre-test Mean	Post-test Mean	Gain in mean score	Pre-test SD	Post-test SD
Experimental	30	36.42	49.45	13.03	6.91	10.55
Control	41	24.45	37.39	12.94	9.02	10.76

Table 1 shows that the treatment group taught using social media integrated learning and group study had a gain in mean score of 13.03. The control group had a gain in mean score of 12.94. The treatment group had a standard deviation of 6.91 in the pretest and 10.55 in the posttest. The control group had a standard deviation of 9.02 in the pretest and 10.76 in the posttest. From Table 1, it can be seen that both the treatment and control groups had higher score variation after the treatment. The variation of scores was however, higher in the experimental group than in the control group.

Research Question 2: What are the mean and standard deviation of achievement scores of male and female pre-service chemistry teachers?

Table 2: Mean and Standard Deviation Scores in Pretest and Posttest of Male and Female Pre-service Chemistry Teachers

Method	Gender	N	Mean pre-test	Mean post-test	Gain in mean score	SD pre-test	SD post-test
Experimental	Male	10	33.50	55.25	21.75	7.19	9.89
	Female	20	37.86	46.55	8.69	6.45	9.84
Control	Male	10	21.00	37.50	16.50	6.79	13.02
	Female	31	25.57	37.36	11.79	9.46	10.18

Table 2 shows that the males had a gain in mean score of 21.75. The female students have a gain in mean score of 8.69. The males had a standard deviation of 7.19 in the pretest and 9.89 in the posttest. The standard deviation in the pretest score of the females is 6.45 and 9.84 in the posttest. The use of social media integrated learning and group study increased the score variation for both the males and females in the posttest.

Hypothesis 1: There is no significant difference between the mean achievement scores of pre-service chemistry teachers exposed to social media integrated learning and group study and those who were not exposed to the treatment.

Table 3: Summary of Analysis of Covariance (ANCOVA) for Test of Significance of Effect of Social Media Integrated Learning and Group Study and Influence of Gender on Achievement of Pre-service Chemistry Teachers

Source	SS	Df	Mean Square	F	Sig.
Corrected Model	3237.747 ^a	4	809.437	7.480	.000
Intercept	9178.459	1	9178.459	84.816	.000
Pretest	213.433	1	213.433	1.972	.165
Method	922.105	1	922.105	8.521	.005
Gender	156.826	1	156.826	1.449	.233
Gender*method	261.827	1	261.827	2.419	.125
Error	7142.239	66	108.216		
Total	138538.750	71			
Corrected Total	10379.986	70			

Table 3 shows that there was a significant main effect of the treatment on the achievement scores of the students, $F(1, 70) = 8.521, P(0.005) < 0.05$. Thus, the null hypothesis was rejected. Therefore, there is a significant difference between the mean achievement scores of pre-service chemistry teachers exposed to social media integrated learning and group study and those who were not exposed to the treatment in favour of the experimental group.

Hypothesis 2: There is no significant difference between the mean achievement scores of male and female pre-service chemistry teachers

From table 3, there was no significant difference between the mean achievement of the male and female students exposed to social media integrated learning and group study, $F(1, 70) = 1.449, P > 0.05$. Thus the null hypothesis was not rejected. Therefore, there is no significant difference between the achievement of male and female pre-service chemistry teachers.

Hypothesis 3: There is no significant interaction effect of gender and teaching methodson the achievement of pre-service chemistry teachers.

Table 3 also shows that there was no significant interaction of gender and teaching methods as measured by the Chemistry Achievement Test, $F(1, 70) = 2.419, P > 0.05$. Therefore, the null hypothesis was not rejected. Thus, there is no significant interaction effect of gender and teaching method as measured from the Chemistry Achievement Test (CAT).

IV. Discussion

The findings of the study revealed a significant effect of social media integrated learning and group study on pre-service chemistry teachers' achievement. There was a significant difference in the mean achievement scores of the pre-service teachers in the social media integrated learning group and the conventional method in favour of the social media group. The use of social media gave pre-service teachers the opportunity to interact more among themselves over the chemistry concepts being learnt. It also allowed the teachers to get immediate feedback on their learning by assessing the quality of responses given to questions that were asked in the group pages. Misconceptions were also easily and immediately corrected. This probably enhanced the pre-service chemistry teachers' learning and aroused their motivation and interest over what was taught. This is supported by Heyam (2014) who noted that one of the positive influences of social media is that it improves motivation to learn.

The finding of this study is supported by Karpinski (2009) who reported that social media is advantageous to both students and teachers if used as a tool of knowledge creation and dissemination. The findings of the study also lend credence to the findings of Lam (2012) and Tuan and Tu (2013), who reported a positive association between internet and social media and academic achievement. Also, the findings of this study support that of Zahid et al. (2013) who found that there is a significant effect of social media and students' achievement.

The results of the analysis revealed that there was no significant difference in the mean achievement scores of male and female students taught using social media integrated learning and group study. The use of social media integrated learning group study favoured both the male pre-service teacher and the females. In the group interactions, it was observed that both males and females posted information and responded quite often to questions. The use of social media afforded the students the opportunity to learn chemistry concept in a way different from the classroom. This was easy for both the males and females to adapt. Students were commenting and learning from their individual location point and were not influenced by sex of discussant in the group pages. The males often commented on the pages with the females often asking questions without further attempt to answer questions posed in the pages. This made the males and females to achieve more through the social media which gave all the students equal opportunity to learn.

The finding of this study is contradicts the findings of Onasanya et al. (2013) who reported that there was no significant relationship between social media and students achievement based on gender.

However, the finding of the study is in line with the findings of Catherine (2009) who reported differences in the achievements of males and females in sciences. Catherine's report on gender differences in science achievement was measured by the number of degrees obtained by females and males in science discipline. The males tend to achieve more.

The findings of this study revealed that there was no significant interaction effect of gender and teaching methods as measured by the pre-service teachers' mean scores in the Chemistry Achievement Test (CAT). Although, there was a significant difference in the achievement of male and female students in the experimental group, the mean achievements of all the pre-service teachers in both experimental and control groups relative to the teaching methods, was not affected by gender. The explanation here is that, social media integrated learning solely accounted for the variance in the pre-service teachers' mean scores and was not gender biased.

Social media and group study as was used in the study serve as a forum for all the students to learn. They were all given opportunity to post meaningful information in the group pages. They were also allowed to ask questions and be taught without any form of gender bias. This uniform attention to all the students affected their achievement without much influence for gender. Thus, gender and teaching method did not significantly interact over their achievement.

V. Conclusion

The findings of this study revealed a significant positive effect of social media integrated learning and group study on the Pre-service teachers' achievement in chemistry. The conclusion is that social media integrated learning and group study significantly and positively enhanced the pre-service teachers' achievement in chemistry.

VI. Recommendations

The following recommendations were made in the light of the findings of this study:

1. The government, through the ministry of education, should make provision for free wireless internet services so as to provide pre-service teachers with data bundles to explore the benefits of social media integrated learning in the course of their study.
2. Chemistry teachers should adopt the use of social media integrated learning as a medium to facilitate interaction, cooperative and group study among pre-service teachers so that they can help each other learn and share knowledge about chemistry concepts.
3. School administrators and the government should also provide free internet services dispersed through routers so as to enable students use such Wifi internet connections in social media integrated learning and group study.

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