

THE EFFICACY OF INTRINSIC MOTIVATION ON CHEMISTRY STUDENTS' ACHIEVEMENT AND RETENTION IN OGIDI EDUCATION ZONE OF ANAMBRA STATE: A GENDER PERSPECTIVE

Abstract

This study examined the efficacy of intrinsic motivation on Chemistry students' achievement and retention in Ogidi education zone of Anambra state: a gender perspective. It was quasi-experimental, non-randomized control group design. The study was guided by four research questions and four null hypotheses. The population of the study consisted of 2,154 (1,141 females and 1,013 males) Senior Secondary (SS) 1 Chemistry students in 26 state owned co-educational secondary school in Ogidi Education Zone of Anambra State. Simple random sampling technique (balloting without replacement) was used to select two out of the three local government areas in Ogidi Education Zone. The sample of the study consists of one hundred and fifty eight (158) (76 males and 82 females) Chemistry students. A Simple random sampling technique (balloting without replacement) was used also to select 4 schools while a flip of a coin was used to assign two of the schools to intrinsic group and the other two to the extrinsic group. Chemistry Achievement Test (CAT) developed by the researcher was used as the instrument for data collection. The instrument was duly validated by three experts and the reliability index of .81 was obtained using Pearson Product-Moment Correlation Coefficient (PPMCC). Mean and Standard Deviation was used to answer the research questions while ANCOVA was used to test the null hypotheses at .05 level of significance. The findings of the study showed that the female students taught Chemistry applying intrinsic motivational strategy achieved significantly higher than male students. The result also showed that the female students taught Chemistry applying intrinsic motivational strategy had slightly better retention mean score than male students. There was no significant difference between the mean achievement scores of male and female students taught Chemistry applying intrinsic motivational strategy. There was no significant difference in the mean retention scores of male and female students taught Chemistry applying intrinsic motivational strategy. Based on the findings, conclusion and recommendations were made.

Keywords: Intrinsic Motivation, Achievement, Retention, Chemistry and Gender

INTRODUCTION

Chemistry is the study of substances and their reactions; their application in forming new substances; the structure and properties of substances. Chemistry tries to examine the

constitution of both animate and inanimate objects around us which may be natural or artificial. Chemistry is one of the science subjects upon which technological breakthrough is built and it is also the pivot on which the wheel of science rotates. Chemistry contributes to human health care system, improved agriculture, and helped in environmental pollution remediation and control. It is applied in manufacturing and process industries like textile and food industries (Nweze-Akpa, 2011). The word Chemistry came from the word alchemy an earlier set of practices that encompassed elements of Chemistry, Metallurgy, Philosophy, Astrology, Astronomy, Mysticism and Medicine. It is commonly thought as the quest to turn lead (another common starting material) into gold. Campbell (2018) stated that in 1998, a recent definition of Chemistry was broadened to mean the study of matter and changes it undergoes.

Chemistry is one of the core subjects of science. As a building block for a range of science disciplines, Chemistry has the potential to link other sciences together and to foster greater scientific literacy (Tera, 2018). Chemistry is the basic gateway and the key to modern technology, medicine, engineering and other sciences (Okeke &Nwandinigwe, 2015). The study of Chemistry is needed to develop the necessary skills, intellectual and mental training needed in the science process skills such as: to observe, measure and apply scientific attitude towards natural phenomena that include the eagerness to learn and the ability to think critically. In contemporary Nigeria, great emphasis is placed on science for technological development and Chemistry is an important raw material for science. Students are encouraged to take-up science-related subjects such as Chemistry.

Chemistry teaching and learning can only be result-oriented when students are willing and teachers are favourably disposed using the appropriate strategies. Some factors have been identified as the cause of students' under-achievement in the science subjects including Chemistry. These factors include poor teaching method and strategies, poor motivation of

students, poor teachers and students' attitude to science and students' lack of interest among others (Onunkwo, 2019 and Unegbu, 2016). Consequently, students coming into senior secondary school develop phobia for Chemistry. There is need to fight against this noted under-achievement of students in Chemistry for the growth of the country technologies. One of the means to reverse the phobia in Chemistry may be by teaching students in secondary schools with strategies that will ignite their motivational emotions which can provoke their interest and motivate them to learn Chemistry.

Motivation refers to degree of readiness of an organism to pursue some designated goal and implies the determination of the nature and locus of the forces. This includes the degree of readiness, the driving force that causes the flux from desire to will in life (Emeka & Okeke 2020). Motivation has been shown to have roots in physiological, behavioral, cognitive and social area. Motivation in the classroom can be a powerful tool when used correctly.

Dennis (2019) outlined the importance of motivation in the classroom as follows:

- To improve classroom behavior and increase learning and achievement within a student.
- It allows for the teacher to teach more which increases the level of achievement in the classroom especially when behavior is improved.
- Cause students to believe they are capable of learning where they may not have believed in the past.
- Make students aware of their strengths and use it to the fullest.
- Help students to become functional members of the society by applying what they have learned in the school setting to their future employment.
- A good way of bringing about a sense of decorum in the classroom.

There are three major views on motivation. According to Onwuchekwa, (2015) these views are the traditional, human relations and human resources. The traditional motivation view held that an important aspect of an administrator's job is to make sure that workers

performed their repetitive task in the most efficient way. Administrators determine how the job should be done and use a system of wage incentives to motivate the workers or students such that the more they achieved, the more they are motivated. This view assumed that students who are rewarded by physical gifts only had very little to contribute outside the classroom. Human relations viewed motivation as being important to social needs, such as belongingness and recognition. Onwuchekwa (2015) opined that social contacts among students in the classroom through informal relationships encouraged belongingness and self-esteem, reduced stress and boredom. Human relations view believed that educators could motivate students by acknowledging their social needs and making them feel useful and important. Human resource view on motivation believed that students could be motivated by many factors such as the need for achievement and performing meaningful task. Many learners according to this view are motivated to do good work or learning and they do not see any learning undesirable. This view suggests that learners are likely to derive satisfaction from a good performance rather than performing well because they are rewarded. Hence, this study tends to find out the effect of teaching with intrinsic motivational strategies on senior secondary school male and female students' academic achievement and retention in Chemistry. Teaching Chemistry with intrinsic motivational strategy in senior secondary schools create innovativeness in students thereby helping them to enjoy studying Chemistry.

There are two types of motivation which include intrinsic and extrinsic motivation, but the major concern here is intrinsic motivation.

The word "intrinsic" means that something is inherent by nature. It is sometimes referred to as "inner", which refers to something coming from within. Intrinsic motivation is the act of doing an activity purely for the joy of doing it, and it is frankly very rare in school and work contexts. Intrinsic motivation refers to behavior that is driven by internal rewards (Bailey, Almusharraf & Hatcher, 2021). Intrinsic motivation is an inner drive that propels a person to

pursue an activity, not for external rewards, but because the action itself is enjoyable. In other words, a person is motivated by the fun, challenge or satisfaction involved with an activity, not for an outside outcome, pressure or reward.

Intrinsic motivation is defined as the doing of an activity for its inherent satisfaction rather than for some separable consequence. When intrinsically motivated, a person is moved to act for the fun or challenge entailed rather than because of external products, pressures, or rewards (Sansone & Tang, 2021). In other words, the motivation to engage in a behavior arises from within the individual because it is naturally satisfying. Intrinsic motivation occurs when we act without any obvious external rewards. We simply enjoy an activity or see it as an opportunity to explore, learn, and actualize our potentials. Intrinsic motivation is an important topic in education. Teachers and instructional designers strive to develop learning environments that are intrinsically rewarding. Unfortunately, many traditional paradigms suggest that most students find learning boring so they must be extrinsically goaded into educational activities.

Activities are intrinsically motivating if "people engage in it for its own sake, rather than in order to receive some external reward or avoid some external punishment." The words fun, interesting, captivating, enjoyable, and intrinsically motivating are used interchangeably to describe such activities. The factors that increase intrinsic motivation according to Lin and Wang (2021) include:

- **Challenge:** Students are more motivated when they pursue goals with personal meaning and when attaining the goal is possible but not necessarily certain. These goals may also relate to their self-esteem when performance feedback is available.
- **Control:** Students want control over themselves and their environments and want to determine what they pursue.

- Cooperation and competition: Intrinsic motivation can be increased in situations where students gain satisfaction from helping others. It also applies to cases where they are able to compare their own performance favourably to that of others.
- Curiosity: Internal motivation is increased when something in the physical environment grabs the individual's attention (sensory curiosity). It also occurs when something about the activity stimulates the person to want to learn more (cognitive curiosity).
- Recognition: Students enjoy having their accomplishment recognized by others, which can increase internal motivation.

Experts have noted that offering unnecessary rewards can have unexpected costs. While we like to think that offering a reward will improve a person's motivation, achievement, and performance, this isn't always the case. It is important to note, however, that a number of factors can influence whether intrinsic motivation is increased or decreased by external rewards. Salience or the significance of the event itself often plays a critical role (Siddiqui, Thomas & Soomro, 2020). The way in which the individual views the importance of different characteristics of the event impacts whether the reward will affect a person's intrinsic motivation for participating in that activity. Researchers have arrived at three primary conclusions regarding extrinsic rewards and their influence on intrinsic motivation:

1. Intrinsic motivation will decrease when external rewards are given for completing a particular task or only doing minimal work. If parents heap lavish praise on their child every time they complete a simple task, the child will become less intrinsically motivated to perform that task in the future.
2. Praise can increase internal motivation. Researchers have found that offering positive praise and feedback when people do something better than others can improve intrinsic motivation.

3. Unexpected external rewards decreases intrinsic motivation. Rewarding in this situation needs to be done with caution because students will sometimes come to expect rewards.

Intrinsic motivation which can be affected by external rewards which influence the quality and extent of retention in spans of meaningfulness, specific and image evolving characteristics. Although retention is usually measured in collaboration with academic achievement, intrinsically motivating activities are pursued because they are fun or personally challenging. Researchers like Wang, Hwang, Yin and Ma (2020), opined that the strategy of the intrinsic motivation deployed by the teacher could aid the extent of academic achievement and knowledge retention. Ozden and Gultekin, (2018) asserted that when intrinsic motivation is employed, it help students to internalize what they have been taught in order to apply them. Though, there is a balance. Expected and tangible extrinsic rewards can undermine intrinsic motivation for retention even if they are implemented in good faith. Therefore, specific steps for Chemistry instructional delivery with intrinsic motivation in mind deserve further studies. Thus, this study tends to find out the effect of intrinsic motivational strategies on senior secondary school students' achievement and retention in Chemistry. Teaching Chemistry with intrinsic motivational strategies in senior secondary schools create innovativeness and also help students to develop spirit of reading in them thereby helping them to enjoy studying Chemistry on their own which then improve their achievement and retention.

Academic achievement is an important variable that expresses the success or failure of a teaching and learning process. Achievement is the attained ability or degree of competence in school tasks usually measured by standardized test and expressed in grades or units based on norms derived from a wide sampling of pupil's performance (Nwanna, 2012). It is usually determined by grading assigned by either with letters, range or percentage to determine the level of performances at a particular time. Academic achievement is described by Dike (2013)

as the scholastic standing of a student at a given moment, which states individual abilities. Students' academic achievement can be explained in the form of grades, obtained from tests or examinations on courses taken. Therefore, achievement can be the examination performance of what the students learnt or skills acquired over a period of time. It also indicates the final results of both male and female students in Chemistry. In the context of this study, achievement is the successful accomplishment of goals and how students are able to demonstrate their intellectual abilities in Chemistry concepts through testing over sometime. Poor achievement in Chemistry can be attributed to many factors among which is the poor motivational strategies. Omoniyi and Torru (2019) have shown that the fall in standard of achievement may be attributed to poor motivational strategies adopted by teachers in schools. The resultant effect is poor achievement and low retention level of students in examinations.

Retention is the continuous possession of something or existence of something. It is also the ability to possess, use or keep information and ability to reproduce past experience or previously familiar experience (Attah 2014). In education, retention is defined as the remaining impression of experience or experience of learning (Eze, 2012). Retention, therefore, involves the amount of learning experience that is correctly remembered at a later time. Retention according to Ibe (2021) is the process by which a child stores information in the memory for use at a later period. It represents the amount of learning experience that is correctly remembered at a later time. Retention occurs when facts or experiences are stored in the long-term memory. Students retaining what they learnt for a long time aids their overall achievement in a subject. High degree of attention to be attached to knowledge retention in Chemistry learning could be elucidated by taking into consideration the ease to forget what is learned. Dwelling on two different types of memory might help understand what is required for knowledge retention to take place. When a stimulus is perceived, it is first routed to primary memory with short-term storage. As long as adequate motivation for rehearsal takes

place, long-term storage can be ensured. Review of literature reveals that the necessity of motivation for the transfer of the newly acquired knowledge from short term memory to long term memory is highlighted particularly in information-processing approach to memory (Allison, 2014). Attention and motivation can play a crucial role to encode stimulus into long term memory and attention is put forth as a prerequisite for learning to occur. In addition, the study conducted by Korkmaz Toyucu and Tay (2016) reported that cooperative learning and systematic teaching and effective use of motivational strategies could enable knowledge retention. Given the findings of these studies, the way teaching is carried out in classes is a precursor of whether students can retain what is covered in lessons. Motivation enhances retention and the driving force through which knowledge is acquired helps in its retention.

Achievement and retention in Chemistry as a science subject have been the major objects of research over the years. According to Agommuoh (2016) on the reasons for poor achievement in Chemistry are teacher's strategy. According to Emeka and Okeke (2020), intrinsic motivation generally improve students' interest and retention. Thus, the researcher explored an effective and efficient strategy of instruction; Teaching with intrinsic motivation, its effect on students' achievement and retention in Chemistry in senior secondary school. Another variable that this study investigated on is gender.

Gender related issues in science education have continued to receive serious attention judging from the number of studies done to that effect. Gender refers to a psychological term, which describes behaviours and attributes expected of individual on the basis of being a male or a female (Peter, Gabrael& Johnson, 2020). Babajide (2010) opined that science subjects, which include Physics, Biology and Chemistry, are given masculine outlook by educational practitioners. In addition, studies by Ogunleye and Babajide (2011) lend credence to the significant of gender on science achievement. Agomuoh (2010) found that gender influences student's conceptual shift in favour of male students. The issue of gender and students'

achievement and retention especially in Chemistry has been inconclusive. In most societies, gender role has relegated females to the side-lines, preventing them from participating in and benefiting from educational and development efforts (Ogbuanya& Owodunni, 2015). In recent times, the gender factor has assumed prominence in science education discourse. It has been documented that disparity exists between male and female students' achievement. Therefore, one sees that the issue of gender has not yet been resolved particularly in relation to students' poor achievement and low retention in Chemistry and the extent intrinsic motivational approach can change the indecisiveness of the problem hence the need for the study. In this study, the researcher is interested in using intrinsic motivation in the learning of Chemistry to find out its effect on achievement and retention among male and female students.

Maslow's (1954) need-based theory of motivation describes a pyramid comprising a series of layers from the base with the most fundamental physiological needs such as food, water, shelter and sex, rising to the apex where self-actualization needs which includes morality and creativity. The physiological needs are food, shelter and clothing, good and comfortable work conditions etc. These are basic human needs necessary for existence and survival. The security needs are the need for safety, fair treatment, protection against threats, job security etc. Affiliation needs include the needs of being loved, accepted, part of a group while esteem needs include the need for recognition, respect, achievement, autonomy, independence. Finally, self-actualization needs, which are the highest in the level of Maslow's need theory, include realizing one's full potential or self-development. It is called the pinnacle of one's calling. According to Maslow, once a need is satisfied, it is no longer a need. It ceases to motivate one's behaviour, instead lead to motivation of the next level up in the hierarchy. All these needs gear towards human development and survival and have implication in the education of oneself.

The importance of Maslow's theory for education is the relationship between deficiency needs and growth needs. A hungry child is weak, irritable, restless, uninterested in what is going on around him. Inattentive students who are very hungry or in physical danger will not be interested in learning. If the basic needs of students are not met, learning will suffer. But when students are motivated well with food by the parent, their achievement and retention tends to improve well.

The learner also craves for social recognition, attention and high esteem from teachers, parents, peers and seniors. The learner wants some assurance that he will pass the examination and attain the deserved goals. Constant denigration and threats of failure from the teacher can devastate the learner and threaten their sense of security. Teachers need to give children a sense of hope rather than give them the impression that they will fail and drop out of school. Teachers should show students love and affection. Rejection puts students off and kills pride and a sense of self-worth. Love should be shown to all students and a teacher should not demonstrate clear love for some students while he shows definite hatred for others. When these needs are met, students will move to the need to know and understand, hence, their achievement and retention will be improved. In school, most of these needs are not met resulting to poor achievement and low retention among students. In view of the above, this study wish to determine how intrinsic motivation are able to improve secondary school students' achievement and retention in Chemistry.

Emeka and Okeke (2020) investigated the effect of motivation (intrinsic and extrinsic) on students' interest and retention in Chemistry in Anambra East L.G.A. of Otuocha Education Zone of Anambra State. The study was guided by four research question and two hypotheses. The study was a quasi-experimental study which consisted of 150 (78 males and 72 females) SS 1 Chemistry students drawn from four selected public secondary schools in Anambra East L.G.A. Six research questions and two hypotheses guided the study. Instrument

for data collection was Chemistry Interest Inventory (CII) and Chemistry Achievement Test (CAT) consisting of 25 items each. They were validated and their reliability was tested which gave a reliability index of 0.86 and 0.81 respectively using K-R formula 21. Mean, standard deviation and z-test were used for data analysis. The result showed that the mean retention scores of students taught with intrinsic motivation was higher than those in extrinsic motivation group. There were no significant difference between the mean interest of male and female students of both type of motivation. Thus, the study is related to the present study, but the area of the study and population size are different from the present study. This study has four research questions and two hypotheses while the present study has six research questions and six hypotheses. The more the research questions and hypotheses, the more concrete and reliable the information are. This study used z-test to analyse hypotheses while the present study used ANCOVA.

Statement of the Problem

Motivation is a force, drive or need that start and maintain an activity towards the achievement of personal goals. Intrinsic motivations are those rewards that are internal. The idea behind motivation is to identify a good deed and reward the action to promote repetition of good deed. An efficient and effective teacher can lift up the moral of the students using intrinsic motivational strategy in their process of teaching. Chemistry is verse and abstract in nature as well as activity oriented. It needs intrinsic motivational strategy that can create the desire to learn them and meet the needs of the students. Intrinsic motivation enhances the ability to retain learned ideas because it energizes students actively during the learning process.

The use of intrinsic motivation in the teaching process may bring solution to the gender persistent inconclusiveness in Chemistry. Teachers are encouraged to engage in intrinsic motivational strategy to avoid teaching Chemistry in boredom. Thus, the problem of

the study if put into question is: What is the efficacy of intrinsic motivation in enhancement of male and female students' achievement and retention in Chemistry?

Purpose of the Study

The purpose of the study is to ascertain the efficacy of intrinsic motivation on Chemistry students' achievement and retention in Ogidi education zone of Anambra state on gender perspective. Specifically, the study seeks to:

- i. Determine the mean achievement scores of male and female students taught Chemistry applying intrinsic motivational strategy.
- ii. Ascertain the mean retention scores of male and female students taught Chemistry applying intrinsic motivational strategy.

Research Questions

The following research questions guided the study:

1. What are the mean achievement scores of male and female students taught Chemistry applying intrinsic motivational strategy?
2. What are the mean retention scores of male and female students taught Chemistry applying intrinsic motivational strategy?

Hypotheses

The following hypotheses guided the study at .05 level of significance:

1. There is no significant difference between the mean achievement scores of male and female students taught Chemistry applying intrinsic motivational strategy.
2. There is no significant difference between the mean retention scores of male and female students taught Chemistry applying intrinsic motivational strategy.

METHOD

The study adopted quasi experimental research design. This is in support of Nworgu (2015) which stated that quasi-experimental design is where random assignment of subjects to

experimental or control groups is not possible rather intact classes are used. It is quasi-experimental because treatment groups was used. The population of the study comprised all the 2,154 (1,141 females and 1,013 males) SS 1 Chemistry students in public secondary schools in Ogidi Education Zone of Anambra State. A total of 158 (76 males and 82 females) SS1 Chemistry students were selected by simple random sampling technique. The instrument for data collection was Chemistry Achievement Test (CAT) which consisted of 25 multiple choice items. CAT was divided into two sections; Section A was designed to get bio data of the students and Section B contained the objective questions. CAT was used for achievement and retention tests. The instrument was validated by three experts drawn from department of Chemistry and Education Foundation of Nwafor Orizu College of Education, Nsugbe. Pearson Product Moment Correlation was used to establish the reliability of the instrument with an overall reliability coefficient of .81 which was considered adequate for the study. The experimental procedure was conducted in two phases. The first phase was training of the research assistants who were the regular Chemistry teachers of the sampled students. The second phase involved teaching of the students and administration of the instrument (CAT) by the class teachers. Research assistants were guided by the researcher who organised three days training for them on how to use the lesson plan prepared by the researcher. Research assistants gave both group of student the instrument to serve as their pre-test before teaching. Research assistants used the same lesson plan but different method, taught for 2 weeks after which the instrument was rearranged and served as post-test. After 2 weeks, it was rearranged again which was given to the same groups to serve as the retention test. Data collected were analyzed using mean, standard deviation and ANCOVA. Mean and standard deviation was used to answer research questions while ANCOVA was used to test the null hypothesis at .05 level of significance.

RESULT

Research Question 1

What are the mean achievement scores of male and female students taught Chemistry applying intrinsic motivational strategy?

Table 1: Pre-test and Post-test Mean and Standard Deviation Scores of the Achievement Scores of Male and Female Students Taught Chemistry Applying Intrinsic Motivational Strategy.

Motivational Strategies	Gender	Pre-test			Post-test		
		N	M	SD	M	SD	Adj. M
Intrinsic	Male	39	26.77	15.95	69.44	14.58	69.18
	Female	42	18.19	13.46	74.76	11.43	74.98
Total		81					

Table 1 shows pre-test and post-test mean and standard deviation of the achievement scores of male and female students taught Chemistry applying intrinsic motivational strategies. From the result, the mean achievement score and standard deviation of male students were 69.44 and 14.58 respectively. This gave a mean gain scores of 42.67. From the result also, the mean achievement score and standard deviation of female students taught Chemistry applying intrinsic motivational strategy were 74.76 and 11.43 respectively. This gave a mean gain scores of 56.57. Although there was more spread in the pre-test achievement scores for both male and female students, males had more spread for both pre-test and post-test. The adjusted mean scores for the male students was 69.18 and that of female was 74.98. This implies that female students taught Chemistry applying intrinsic motivational strategy, achieved significantly higher than male students.

Research Question 2

What are the mean retention scores of male and female students taught Chemistry applying intrinsic motivational strategy?

Table 2: Mean and Standard Deviation Scores of the Retention Score for Male and Female Students Taught Chemistry Applying Intrinsic Motivational Strategy.

Motivational Strategies	Gender	Retention			
		N	M	SD	Adj. M
Intrinsic	Male	39	62.67	8.91	62.80
	Female	42	63.71	9.65	63.60
Total		81			

Table 2 presents the mean and standard deviation scores of the retention scores of male and female students taught Chemistry applying intrinsic motivational strategies. The mean retention score of male students was 62.67 whereas of female students was 63.71. Their standard deviation scores of 8.91 and 9.65 respectively, show that male and female students had comparable variability in distribution of retention scores. However, the mean gain difference between male and female students was 1.04 in favour of female students. This implies that female students taught Chemistry applying intrinsic motivational strategy, had slightly better retention than male students as shown by their adjusted mean scores of 63.60 and 62.80 respectively.

Hypotheses Testing

Hypothesis 1

There is no significant difference in the mean achievement scores of male and female students taught Chemistry applying intrinsic motivational strategy.

Table 3: Analysis of Covariance for Students' Post-test Achievement Scores by Motivational Strategies and Gender.

Source	SS	df	MS	F	P	η^2
Corrected Model	2756.96 ^a	4	689.24	4.53	.00	.11
Intercept	201360.45	1	201360.45	1324.4	.00	.90
Pretest	90.40	1	90.40	.59	.44	.00
Motivational Strategies	784.95	1	784.95	5.16	.02	.03
Gender	39.96	1	39.96	.26	.61	.00
Motivational Strategies * Gender	1804.22	1	1804.22	11.87	.00	.07
Error	23260.99	153	152.03			
Total	797700.00	158				
Corrected Total	26017.95	157				

a. R Squared = .106 (Adjusted R Squared = .083)

The results displayed in Table 3 shows there was no significant main effect of gender on students' achievement in Chemistry, $F(1,153) = 0.26$, $p = 0.61$, partial eta square = 0.00. Since the obtained p-value was more than the stipulated .05 level of significance, the null hypothesis was not rejected. Therefore, there was no significant difference in the mean achievement scores of male and female students taught Chemistry applying intrinsic motivational strategy.

Hypothesis 2

There is no significant difference between the mean retention scores of male students taught Chemistry applying intrinsic motivational strategy.

Table 4: Analysis of Covariance for Students' Retention Scores by Motivational Strategies and Gender

Source	SS	df	MS	F	P	η^2
Corrected Model	1809.24 ^a	4	452.31	5.70	.00	.13

Intercept	157256.06	1	157256.06	1981.7	.00	.93
				1		
Pretest	24.93	1	24.93	.31	.58	.00
Motivational Strategies	1628.66	1	1628.66	20.52	.00	.12
Gender	124.38	1	124.38	1.57	.21	.01
Motivational Strategies * Gender	39.38	1	39.38	.50	.48	.00
Error	12141.14	153	79.35			
Total	584672.00	158				
Corrected Total	13950.38	157				

a. R Squared = .130 (Adjusted R Squared = .107)

The results displayed in Table 4 indicates there was no significant main effect of gender on students' retention in Chemistry, $F(1,153) = 1.57$, $p = 0.21$, partial eta square = 0.01. Since the obtained p-value was more than the stipulated .05 level of significance, the null hypothesis was not rejected. Therefore, there was no significant difference in the mean retention scores of male and female students taught Chemistry applying intrinsic motivational strategy.

Discussion of Findings

The discussion of findings was organized under the following:

1. Female students taught Chemistry applying intrinsic motivational strategy achieved significantly higher than male students. There was no significant difference in the mean achievement scores of male and female students taught Chemistry applying intrinsic motivational strategy.
2. Female students taught Chemistry applying intrinsic motivational strategy had more retention mean score than male students. There was no significant difference in the mean retention scores of male and female students taught Chemistry applying intrinsic motivational strategy.

Female students taught Chemistry applying intrinsic motivational strategy achieved significantly higher than male students. There was no significant difference in the mean

achievement scores of male and female students taught Chemistry applying intrinsic motivational strategy.

The finding was in conformity with the finding of Buchi (2019), who reported that female students enjoy learning Chemistry more than male students. The finding was also in conformity with the finding of Onasanya& Ahmed (2011) who observed significance difference existing between the cognitive achievement of male and female students in Biology. Ugbe and Dike (2012) in their studies, showed that female academic achievements in science and Chemistry were statistically equal to those of male. In another development, Okeke (2007) and Nzewi (2010) are of the view that female students achieved as high as their male counterparts when given equal opportunities.

However, the finding was in contrary to that of Owojaiye and Zuya (2016)who reported that male students show much more positive attitudes than their female counter parts towards Chemistry. It is also in contrary to that of Nwanna (2012) and Mbajiorgu (2013) who are of the opinion that science and technology is a male dominated subject and females tend to shy away from scientific and technological fields. The finding was also in contrary to that of Oladejo, (2011) and Dantum (2014), who reported that there were no significant effect on students' achievement in Physics.

Female students taught Chemistry applying intrinsic motivational strategy had more retention mean score than male students. There was no significant difference in the mean retention scores of male and female students taught Chemistry applying intrinsic motivational strategy.

The result further showed that female students manifested higher retention than male students. The result showed no statistical significance difference in Chemistry between male students and female students. This result indicated that the use of intrinsic motivational strategies enable both male and female students to gain, retain and motivate them highly and offer them the opportunity to develop their creative ability by participating fully in the classroom irrespective of gender and thus were able to recall what they learnt.

The finding was in conformity to that of Omwirhiren (2015) who reported that there was significant effect in the retention of male and female students taught Chemistry with motivation and lecture instructional strategy in favour of female students. The findings was also in line with Trumper (2016) who reported that gender difference in senior secondary school students' retention of Chemistry concepts is inevitable.

The findings of the study however contradicted that of Owojaiye&Zuya (2016), Nwanna (2012) and Mbajiorgu (2013)who reported that male students show much more positive attitudes than their female counter parts towards Chemistry.The findings of the study also contradicted that of Marumo, Joseph &Anikelechi (2019) who in their studies revealed that male school going adolescents are more academically motivated and also had better retention than female school going adolescents.

Conclusion

Motivation in the classroom can be a powerful tool when used correctly. Motivation is an important concept in psychology whose relevance to teaching and learning is underscored every day in every classroom. Its knowledge is worthwhile for a professional teacher. Based on the findings of this study, the following conclusions were drawn:Applying intrinsic motivational strategywhile teaching Chemistry is effective for meaningful learning to occur. The female Chemistry students taught applying intrinsic motivational strategy achieved significantlyhigher than male Chemistry students.

Again, the application ofintrinsic motivation enhances both male and female students' retention of Chemistry concepts. Thus, based on this study, the application ofintrinsic motivation is very effective in learning. It helps to improve students' achievement and retention of Chemistry by both male and female students.

Recommendations

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

1. Teachers should use variety of teaching strategies such as intrinsic motivation to provide students with successful learning environment.
2. Teachers should use motivation to increase positive behavior from students, which results in a conducive learning environment to retain.
3. It is important to sensitize teachers that adequate use of intrinsic motivation could serve as a basis for improving students' achievement and retention.
4. Ministry of education (federal and state) should organize seminars and workshops to keep teachers abreast of the applications of intrinsic motivational strategies for instruction delivery.

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