
ENHANCING THE CREATIVITY SKILLS OF CHEMISTRY STUDENTS THROUGH INNOVATIVE INSTRUCTIONAL TECHNIQUES

By

DR. EVELYN OBIANUJU EGOLUM

*Department of Chemistry,
Nwafor Orizu College of Education,
Nsugbe*

DR. EKENE NNONYEM IGBOEGWU

*Department of Chemistry,
Nwafor Orizu College of Education,
Nsugbe*

AND

DR. CORDELIA O. OKONKWO

*Ogbaru High School,
Ogbakuba*

Abstract

This study investigated Chemistry teachers awareness and utilization of the innovative instructional techniques in teaching and learning as well as the strategies that can enhance the use of the innovative techniques to enhance the creativity skills of chemistry students. The design for the study was a descriptive survey. Purposive sampling technique was used to sample thirty-three (33) chemistry teachers from government owned secondary schools in Onitsha Education Zone of Anambra State. The validated questionnaire used to collect data had a reliability coefficient of 0.87 using Cronbach Alpha technique. Analysis of data was done using mean score. The findings of the study revealed that most chemistry teachers are not aware of the innovative instructional techniques that can be used to teach chemistry and so they do not use them in their teaching. The results of the study also showed that adequate provision of facilities for hands-on-activities, giving group work to ensure cooperation of students in learning, use of exploration to explain chemistry principles, use of E-learning, E-assessment and computer assisted instruction

Dr. Evelyn Obianuju Egolun; Dr. Ekene Nnonyem Igboegwu and Dr. Cordelia O. Okonkwo

among others were the strategies that can enhance the use of innovative techniques in teaching. It was recommended among others that chemistry teachers should undertake training to learn innovative techniques of teaching chemistry and they should employ team-teaching approach to the teaching of topics that involves creativity skills. All these will help to develop creativity skills in chemistry students and enhance their learning. Conclusions and recommendations were also made.

The greatest worry of any nation like Nigeria is how to fully utilize science education to develop peoples ability to manage and induce change and thereby improve the standard of living of their citizenry (Ezekannagha and Mokebe, 2009). It has been noted that the difference between the developed and developing countries is based on the quality and quantity of science and technology they possess (Ochu, 2007). If Nigeria must survive as a nation, it needs science and technology used and managed by Nigerians.

Nigerian education system should be able to produce candidates who will be able to apply their acquired knowledge to real life situations, people who will use their acquired knowledge to harness the national resources for the betterment of the nation instead of depending on the exportation of crude oil (Mallo and Kakmena, 2010). The teaching of science subjects generally and Chemistry in particular should be such that will allow students to undertake their students industrial work experience scheme (SIWES) in different industries to put their acquired knowledge to real life situations. In this way, Chemistry teaching would enable young people to have access to new knowledge, to expect change. For this change to be meaningful and scientifically reasonable, the Chemistry teachers must be innovative so as to impart creativity skills in their students. When one is creative, it means the person have productive learning and can find new solutions to problems.

Creativity is a mental activity performed where there is no prior correct solution or answer. Creativity is defined as the tendency to generate or recognize ideas, alternatives or possibilities that may be useful in solving problems, communicating with others and entertaining ourselves and others. (Franken, 2010). According to Naiman (2010), creativity is the act of turning new and imaginative ideas into reality. Creativity involves two processes: thinking and then producing.

It is an experience of thinking characterized by a high degree of innovation and originality, divergent thinking and risk taking. It is the ability to transcend traditional ideas, rules, patterns, relationships or the like and to create meaningful new ideas, forms, methods, interpretations and so on. Creativity requires passion and commitment. Creativity in learning is often highlighted as a skill essential for in the 21st century. A skill is said to be acquired or developed if it can be demonstrated correctly

Enhancing The Creativity Skills Of Chemistry Students Through Innovative Instructional Techniques

at least, in every two out of three occasions that demands it. Skills are expertness, practical ability, dexterity and facility for doing something e.g. observing, classifying assembling, cutting, screwing, manipulating handling drawing, repairing predicting generalization, etc.

For Chemistry education to be able to help students develop creativity skills, traditional methods of teaching that is used in most of schools should be de-emphasized. This traditional method has increasingly proved inadequate to meet the needs of students and the society. It has also failed to satisfy technologically – aware groups of students, to fulfill the demand from employers for graduates with transferable skills and to accommodate the pedagogical swift in emphasis from teaching to learning. (Gagan, 2010). To promote more effective students' learning in schools, innovative instructional techniques have been emphasized.

Innovation according to Naiman (2010), is the production or implementation of an idea. It can be perceived as the transformation of creative ideas into useful application by combining resources in new or useful ways to produce valuable things or improve technological services. Innovative instructional technique offer opportunities for enhancing the students learning experiences in Chemistry education (Eliks and Byers, 2010). Most of these innovative techniques are student-centred, open-ended and draw attention to the regular gain in terms of student's motivation and increased skills acquired. Innovative instructional techniques include;

- Problems solving based approach
- Laboratory technique
- Collaborative learning
- E-learning
- Computer assisted teaching and learning
- Computer supported collaborative learning
- Problem and context based approach
- Co-operative learning/peer tutoring
- E-assessment
- Inquiring/discovery approaches.

These innovative instructional techniques are activity-based and they develop in students critical thinking skills, creativity, open-mindedness, intellectual honesty etc., and they have been found to yield better quality and creative learning (Asiriwa, 2009). This study therefore sought to find out if Chemistry teachers use these innovative techniques in Chemistry teaching and learning since it helps teachers teach effectively and promote students' learning. This is because studies such as that of Asiyai (2005), Offiah and Egolum (2007) have indicated that ineffective teaching strategies, lack of relevant mathematical concepts, poor attitude of teachers to work and

Dr. Evelyn Obianuju Egolum; Dr. Ekene Nnonyem Igboegwu and Dr. Cordelia O. Okonkwo

so on were among the factors that militate against effective implementation of chemistry curriculum in secondary schools.

Research Questions

The following research questions guided this study;

1. To what extent are Chemistry teachers aware of the innovative instructional techniques that can be used to teach chemistry?
2. To what extent do Chemistry teachers use innovative instructional techniques in teaching?
3. What are the strategies for enhancing the use of innovative instructional techniques in teaching chemistry?

Method

The design for the study was a descriptive survey. The population comprised of all the chemistry teachers in Onitsha Education Zone of Anambra State numbering fifty-one (51). The researchers by purposive sampling technique selected twenty (20) chemistry teachers from Government owned secondary schools in Onitsha North Local Government Area which has the highest number of schools in the zone, six (6) teachers from secondary schools in Onitsha South Local Government Area and eight (8) teachers from government owned secondary schools in Ogbaru Local Government Area making a sample size of thirty-three (33) teachers. The instrument used for data collection was a validated questionnaire which had a reliability coefficient of 0.87 using Cronbach Alpha technique. The questionnaire was divided into two parts. Part A sought information on the personal data of teachers such as name of schools etc. Part B had three sections. Sections A, B and C. Sections A and B had ten items on the teacher's extent of awareness and utilization of innovative instructional techniques in teaching Chemistry. The teachers were expected to rate the items using four point Likert modified rating scale of High Extent (HE) = 4 points, Moderate Extent (ME) = 3 points, Low Extent (LE) = 2 points and Very Low Extent (VLE) = 1 point. Section C consisted of thirteen items on the strategies for enhancing the use of innovative instructional techniques in teaching chemistry. The respondents were expected to indicate their agreement or disagreement on the strategies using four points Likert modified rating scale of Strongly Agree (SA) = 4 points, Agree (A) = 3 points, Disagree (D) = 2 points and Strongly Disagree (SD) = 1 point. The data collected were analyzed using mean score. A mean of 2.50 and above, indicated agreement to the item while a mean less than 2.50 indicated disagreement to the item.

Results

The results were presented in tables according to the research questions.

Table 1: Mean Ratings of Chemistry Teachers Level of Awareness of the Innovative Instructional Techniques.

S/N	Innovative Instructional Technique	Mean	Remark
1	Problem solving based approach	1.97	Disagreed
2	Laboratory Technique	2.68	Agreed
3	Collaborative Learning	1.15	Disagreed
4	E-Learning	0.85	Disagreed
5	Computer Assisted Teaching and Learning	2.00	Disagreed
6	Computer Supported Collaborative Learning	0.81	Disagreed
7	Problem and Context Based Approach	1.24	Disagreed
8	Cooperative Learning/Peer Tutoring	1.78	Disagreed
9	E-Assessment	0.52	Disagreed
10	Inquiry/discovery Approach	2.40	Disagreed

Results in table 1 revealed that all the items on the table have mean score below 2.50 except item No. 2. This showed that most of the respondents were not aware of the mentioned innovative techniques.

Table 2: Mean Ratings of Chemistry Teachers Extent of Utilization of Innovative Instructional Techniques in Teaching.

S/N	Innovative Instructional Technique	Mean	Remark
1	Problem solving based approach	1.85	Disagreed
2	Laboratory Technique	2.57	Agreed
3	Collaborative Learning	1.28	Disagreed
4	E-Learning	0.45	Disagreed
5	Computer Assisted Teaching and Learning	0.75	Disagreed
6	Computer Supported Collaborative Learning	0.82	Disagreed
7	Problem and Context Based Approach	0.74	Disagreed
8	Cooperative Learning/Peer Tutoring	1.86	Disagreed
9	E-Assessment	0.13	Disagreed
10	Inquiry/discovery Approach	1.99	Disagreed

Result in table 2 revealed that only item 2 technique is utilized by the chemistry teachers in teaching while all the other items were rarely used, hence their mean value of less than 2.50.

Table 3: Mean Ratings on the Strategies for Enhancing the Use of Innovative Techniques.

S/N	Items	Mean	Remark
1	There should be adequate provision of facilities for hands-on-activities during chemistry instruction.	3.40	Agreed
2	Chemistry teachers should be sponsored for seminars and workshops to learn the use of innovative techniques in teaching.	3.72	Agreed
3	They should be empowered to take their students to scientific and industrial places.	3.04	Agreed
4	Teachers should always give group work to students and ensure their maximum cooperation.	2.68	Agreed
5	Government should develop teachers technical skills and build their confidence in the system to ensure effective transfer of creative skills to their students.	3.53	Agreed
6	There should be use of problem-solving activities that require more than routine chemistry calculations.	2.81	Agreed
7	Collaborative chemistry group activities to help students communicate with others in a variety of ways should be encouraged.	2.54	Agreed
8	Teachers should nurture exploration of principles of chemistry.	2.51	Agreed
9	Classroom environment should reflect active interactions among students.	2.75	Agreed
10	Team teaching approach should be used to	3.65	Agreed

Enhancing The Creativity Skills Of Chemistry Students Through Innovative Instructional Techniques

teach topics that involves creativity.

11	Provision of E-assessment methods and training of teachers on its use.	3.00	Agreed
12	Teachers should be adequately trained in the use of computer in teaching chemistry.	3.42	Agreed
13	There should be provision of E-library and internet services in secondary schools to boast computer age.	3.81	Agreed

Results in table 3 revealed that most of the chemistry teachers agreed that all the strategies are relevant for enhancing the use of innovative instructional techniques in teaching chemistry, hence the mean ratings of above 2.50.

Discussion of Findings

The findings of this study revealed that most chemistry teachers are not aware of the innovative techniques that can be used in teaching Chemistry and so they do not use them except laboratory technique which they claim they use for practical work. This is in agreement with the findings of Gagan, (2010), who found out in his study that innovative methods are not used in the teaching and learning of Chemistry and recommend that they should be used. Also Egolum and Igboegwu (2013) in their study opined that teachers should use varying innovative activity-oriented methods to teach Chemistry to enhance attainment of MDGs.

The result of this study in table 3 showed that Chemistry teachers believed that adequate provision of facilities for hands-on-activities in the class, giving group work to ensure cooperation of students in learning, using of ICT, use of exploration to explain Chemistry principles, use of E-library in learning among others were the strategies that can help to enhance the use of innovative techniques in chemistry delivery. Ogbuefi (2006) indicated that group work that does not include cooperative learning does not have significant positive effects on achievement. Also Adigun and Zosu (2012) in their study noted that ICT are offering new alternatives to the traditional classroom. Innovative techniques when used in teaching allow the delivery of education delivery to adapt to individual needs as opposed to having the individual adapt to how education is delivered.

Conclusion

Chemistry is perceived as a grueling subject to learn so any encouragement towards improving learning, maintaining interest and overcoming students' dissatisfaction should be welcomed. Therefore, the teaching of Chemistry should emphasize connection between what happens in the classroom and the wider society. This means the teaching and learning approach should be practically-oriented and experimentally driven so that the students will acquire creativity skills and thus, be able to find new solution to problems.

Recommendations

In line with the findings of this study, the researchers made the following recommendations:

1. Chemistry teachers should be innovative in their teaching by varying their teaching strategies to make learners actively involved. Every lesson should be an opportunity for exploration free flow ideas, for examining alternatives and for drawing out the best from every learner.
2. Teaching and learning should be student-centered and In other words, Chemistry teachers should undertake training on the use of innovative techniques to teach effectively.
3. There should be collaborative Chemistry group activities in which students can communicate with others in a variety of ways.
4. Teachers should employ a team-teaching approach to the teaching of topics involving creativity skills.

References

- Adigun, A.O. & Zosu, S.J. (2012). Computer-Aided Instruction and Academic Performance in Basic Technology. *Annual Proceedings of the Science Teachers Association of Nigeria. (STAN)* 232-238.
- Asiriwa, O.D. (2009). Developing Entrepreneurial Skill through Chemistry Education. *Annual Proceedings of STAN.* 191-194.
- Asiyai, R.I. (2005). *Enhancing Chemistry in Secondary Schools Through Concept Mapping Instructional Strategy.* 46th Annual Conference Proceedings of Science Teachers Association of Nigeria (STAN), 205-209.
- Egolum, E.O. & Igboegwu, E.N. (2013). Meeting the Challenges of MDGS through Chemistry Curriculum Reforms and Implementation in Secondary Schools. *Annual Proceedings of STAN.* 10-15.

Enhancing The Creativity Skills Of Chemistry Students Through Innovative Instructional Techniques

Eliks, I. & Byers, B. (2010). Innovative Methods of Teaching and Learning Chemistry in Higher Education. *Journal of chemistry Education Research and Practices*. 7 (4). 233-240.

Ezekannagha, C.N. & Mokebe, H.I. (2009). Incorporating Entrepreneurial Skills into Science Laboratory Technique (SLT) Curricula for Nigeria Polytechnics: A Cash Study of Chemistry Option. *Annual Proceedings of STAN*. 164-168.

Franken, R.E. (2010). Human Motivation. <http://bit.ly/93/BEU>.

Gagan, M. (2010). Book Review. *ECTN Association Newsletter*.

Mallo, Y.I. & Kakmena, G.A. (2010). Global Economic/Financial Crisis: A Challenge to the Teaching of Physics for Self Reliance. *Annual Proceedings of STAN*. 383-387.

Naiman, L. (2010). Creativity at Work <http://bit.ly/93/BEU>

Ochu, A.N.O. (2007). Evaluation of Undergraduate Chemistry Education Programme in the Universities in North Central Education Zone in Nigeria. *An Unpublished Ph.D Thesis of the University of Nigeria, Nsukka*.

Offiah, F.C, & Egolum, E.O. (2007). Effects of Prior Knowledge of Some Relevant Mathematical Concepts on Students Achievement in Stoichiometry in Chemistry. *Journal of Science, Engineering and Technology*, (149) 7676-7685.

Ogbuefi, R.E. (2006). The Effect of Cooperative Learning and Direct Instruction in Reading Comprehension Strategies of Main Idea Identification. *Journal of Education Psychology*. 183(1) 8-16.