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Comparative Study on Think-Pair Share and Jigsaw Methods of Teaching Chemistry among S.H.S Students in Ghana.

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Abstract: This study compared the effect of think-pair-share and jigsaw methods of Teaching chemistry in the Ghanaian's senior high schools. The quasi-experimental design was adopted for the study. The population of the study was 100 S. H. S chemistry students in our lady of Lourdes Girls' Senior High school out of which a sample of 61 students on the same year group was selected using purposive and random sampling techniques. The instruments for data collection was chemistry test and it was validated by the lecturer. Data were collected by administering the instruments as pretest and posttest before and after treatment respectively. The data obtained were analyzed using mean, standard deviation and the t-test. The findings of the study showed a significant difference in the mean scores of the students taught using think-pair-share and those taught using jigsaw method in favour of think-pair share method. This was further certified by the value from the t-test which indicates a significant difference between the the two methods. From this study, it is therefore recommended that chemistry educators/ teachers be encouraged to integrate the think-pair-share method to facilitate more profound learning experiences and that workshops and seminars be organized for chemistry instructors to adequatly and accurately incorporate the think-pair-share method into their teaching methodologies.

Keywords: Think-Pair-Share, Jigsaw, Method, Chemistry, Chemical Bonding, technology.

I. Introduction

The world is rapidly progressing in technology, and a nation's advancement relies heavily on its scientific foundation (Akpan, 2010). Chemistry, a crucial subject in Ghanaian senior high schools, poses challenges for students in understanding and applying concepts without practical work (Kassim, 2014). Teaching chemistry faces obstacles, including inadequate infrastructure and technical personnel, hindering effective sessions (Arokoyu & Ugonwa, 2012). Common conventional methods used in teaching includes: field or lab work, problem-solving activities, case study, lecture method e.t.c. The above teaching methods has impact on not only practical sessions but also overall chemistry education in Ghanaian high schools. Researchers, educators, and teachers acknowledge chemistry's difficulty due to abstract concepts and challenging language, leading to alternative conceptions among students (Cardellini, 2012). This paper seeks to compare the effectiveness of think-pair share and jigsaw methods of teaching chemistry among senior high school students in Ghana. Effective teaching methods are crucial to replacing students' prior conceptions with accepted scientific views in chemistry education. Inorder to encouraged active class participation, the method used in the teaching is very important, think pair share and jigsaw are two different teaching methods but to be able to come out with the approprate method you need to compare the difference in the mean achievement scores of students taught chemistry with think-pair-share strategy(TPS) and those taught with jigsaw method (JSM)

II. Literature Review

Contemporary behavioral and educational experts concur that learning follows structured ways with distinct stages and application within each stage. Adam (2002) simplifies this process, identifying three stages in understanding the occurance, these are: the building stage, development stage, and practice stage. The learning stages, as per modern educational theory, aligns with Bidstall's explanation that theoretical teaching primarily occurs in the building stage, which has the least time investment. Understanding of the phenomenon is developed in the development stage, and learning is perfected in the practice stage (Bidstall, 2005). Broadhead (2010) underscores the gradual reduction of the teacher's involvement from the building to the practice stage. Cortes (2000) asserts the paramount importance of the practice stage in culminating the learning process, receiving extensive attention from educators worldwide. Fabian (2009) advocates for students' initiative and judgment during the practice stage, contrasting with traditional teaching methods prevalent in underdeveloped and developing countries. In these nations, the instructor remains an active participant in the learning process, even during the practice stage, contrary to modern teaching approaches. Ives (2001) explains that in contemporary teaching methods, learning occurs through active student participation, with the teacher serving as a mentor or guide. The practice stage of learning employed three extensive methods which include the behavior-controlled practice method, mutual practice method, and team practice method.

Think - paire share method of teaching

The think-pair-share method, employed by educators to facilitate classroom interactions, promotes higher-level thinking among

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students. This cooperative instructional strategy involves a three-stage discussion cycle: first, students individually contemplate a question, then they engage in paired discussions to refine their ideas and arrive at a final answer, and ultimately, each pair shares their enhanced response with the entire class (Hmelo-Silver, 2013).

Jigsaw method of teaching

The Jigsaw instructional strategy, as outlined by Mari & Gumel (2015) and developed by Elliot, operates on the principle that collaboration enhances individual development, and achieving goals depends on the success of each group member. In this cooperative teaching approach, class members are divided into groups of 4-6 individuals, referred to as "home groups," each assigned specific tasks related to different parts of the lesson. Subsequently, students temporarily join "expert groups" to thoroughly study their assigned material, preparing for peer tutoring. Upon returning to their home groups, each student teaches their assigned material and learns about other sub-topics from peers. For instance, the topic of chemical bonding may be subdivided into sections like definition, interatomic and intermolecular, with each team member responsible for one section. This method encourages mutual support and interest among students, fostering a collaborative learning environment that unites children of diverse backgrounds and abilities (Lestik&Plous, 2012).

Teacher Characteristics and Performance in Chemistry

Teachers wield significant influence on students' knowledge acquisition in science, particularly in chemistry. The impact of teachers and their instructional methods on gender differences in chemistry achievement must be acknowledged. Well-informed teachers are less likely to convey misconceptions, exude confidence in information delivery, require less preparation time, and can present a broader array of examples and analogies, facilitating easier understanding for students. While teaching experience occasionally correlates with enhanced science achievements, distinctions emerge between male and female teachers in terms of classroom behavior and student.

Effective Teaching Approaches in Chemistry

Educational authorities often attribute students' poor chemistry performance at the secondary level to inadequate teaching methods. Implementing effective teaching methods can stimulate active learning and bolster students' confidence. The lecture method of teaching often results in limited dialogue. Recognizing the significance of learner motivation, educators can foster self-motivated independent learners by providing meaningful tasks of moderate difficulty, creating a positive atmosphere, and encouraging participation. An enthusiastic educator with a genuine interest in students and their learning enhances overall performance, aligning with the belief that expectations influence outcomes.

A dynamic approach to teaching chemistry involves incorporating diverse activities like role-playing, discussions, and demonstrations to engage learners, deviating from the monotonous lecture-style. Consistency with scientific inquiry principles, starting with intriguing questions and phenomena, is crucial for effective teaching. Encouraging group work mirrors real-world scientific collaboration, promoting common understanding, responsibility, feedback, and communication. Effective chemistry education should embody scientific values, fostering curiosity, creativity, healthy questioning, and discouraging dogmatism among learners (Agbemabiese, 2007).

Students' Interest in Science (Chemistry) Education

Interest, defined as a likelihood to invest energy in specific stimuli, plays a pivotal role in students' academic engagement. Van Den Branden (2015) emphasized the positive correlation between student interest and learning. Despite this, global studies have shown that, the interest of the students in senior high schools in Ghana depreciated drastically in learning the sciences, particularly physics and chemistry, with factors contributing to this decline still unclear (Hasni & Potvin, 2015). Research indicates a significant decrease in interest as students progress through secondary school, especially notable for girls (Grabau, 2017). Additionally, the perception of science subjects as difficult has risen, accompanied by a persistent decline in post-compulsory high school science enrollment worldwide (Hasni & Potvin, 2015).

III. Methodology

Research Design

This research work made used of the quasiexperimental design, which utilized pretest and Posttest to show the relationship between the effect of the various treatments. This particular design method is considered by the researcher because it is one of the good designs that can be used to accurately identify the effect of treatments given to different groups(Emaikwu, 2015). Again, it gives room for comparison of the pretest achievement among different groups for the establishment of internal validity of the participating groups. It also gives room for the researcher to the treatment effect using the Posttest achievement.

Target Population:

Population has been defined to represent a whole from which a sample can be obtained by a researcher(Taherdoost, 2016). Similarly, according to Rubin & Babbie, (2009) they said that a population represent a large group of peoples or individuals that have common characteristics and from which a researcher can draw a sample for study purpose. According to Rosemane & DeBoer, (2010), research population comparises individuals, objects or even events that among which each group have similar

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characteristics of are of interest to the researcher. It is also regarded as the larger group from which representative sample is obtained.

The target population for this study was all S.H.S elective chemistry students in Ghana. However, the accessible population comprised S.H.S 2 chemistry students from Our Lady of Lourdes Girls' Senior High School (O.L.L.Girls) in the Upper East Region of Ghana.

Research Approach

The research approach used was test, a descriptive method to analyze the data. The study used quantitative data. The application of quantitative techniques helps in the in-depth understanding of the topic, chemical bonding. Objective testing made up of twenty question were set from the topic and used. Equivalent question were equally set from the same topic and used after the interventions.

Sampling Procedure

The students were randomly divided into two groups or classes using the lottery numbers system method. The think pair share method was used in one class of thirty students and the jigsaw method was also used in the other class of thirtyone students.

IV. Results

Table 1: Extracted information from the students scores from the think pair share (TPS) and the jigsaw method (JSM).

Group	N	Pretest Mean	Posttest Mean	Gained Mean	Pretest SD	Posttest SD	Sig. V
TPS	31	30	10.63	18.87	8.24	3.43	4.03
TPS	10	55	10.55	16.55	6.00	3.76	3.88
Sig. V	-	0.911	0.0496	-	-	-	-

The Table 1 information was extracted from the test scores of the students and from the results, students instructed in chemistry via the think pair share (TPS) learning approach had a pretest mean scores of 10.63 and a posttest mean scores of 18.87, resulting in a meanscores gain of 8.24. Conversely, students taught with the jigsaw method(JSM) had a pretest mean scores of 10.55 and a posttest mean scores of 16.55, yielding a mean gain of 6.00. The difference in variation scores between the posttest and pretest for TPS (4.48) and the jigsaw method (0.92) indicates a higher variability with the think pair share method compared to the jigsaw method. A confidence level of 0.05 was used as a base to affirmed the degree of confidence with regard to the mean scores.

Discussion of Result

From the results of both teaching methods, there excit a significant difference of 0.0495 between the students means scores of the Posttest of the two teaching methods. The confidence level was taken at p - value of 0.05. The 2.3×10^{-8} and 8.8×10^{-8} indicates that there is a significant increased between the pretests and the respective Posttests.The study found a significant difference of 0.0496 in students' achievement when comparing those taught using the think-pair-share method versus the jigsaw method, with the former showing better results. This is attributed to the interactive nature of the think-pair-share approach, which allows students to discuss and clarify concepts with peers, leading to a deeper understanding. Through this process, students not only solidify their learning but also develop scientific thinking skills and improve their scientific literacy. Additionally, the collaborative learning experience encourages students to independently seek further understanding, both individually and with their peers, leading to increased motivation and enhanced academic achievement through deeper learning.

V. Conclusion

From the t-test results for the Posttest for the think pair share method and that of the Posttest for the jigsaw method, which is 0.0496 which is significant at p- value of 0.05 confidence level, it suggest that the method which yielded the greater average mean scores from the Posttest is preferred to the one with the least average mean score.This therefore suggest that employing the think-pair-share approach enhances the teaching and comprehension of chemistry concepts, fostering greater student engagement. Moreover, its implementation encourages peer interaction, promoting student accountability for learning.

VI. Recommendations

To emphasize the importance of student interest in academic engagement and address the decline in interest and performance in science, especially chemistry, during secondary school, the chemistry tutors or teachers needs to be encouraged to integrate the think-pair-share method of teaching in their teaching inorder to facilitate more profound learning experiences and also workshops and seminars should be organized for chemistry instructors to adeptly incorporate the think-pair-share strategy into their teaching methodologies.

References

1. Agbemabiese, P. G. E. (2007). Emerging themes in educational reforms in Ghana as seen through education reforms in the United States. ProQuest Dissertations and Theses,250.http://ezproxy.nottingham.ac.uk/login?url=http://search.proquest.com/

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docview/304818055?accountid=8018%5Cnhttp://sfx.nottingham.ac.uk/sfx_local/?url_ver=Z39.882004&rft_val_fmt=info:ofi/fmt:kev:mtx:dissertation&genre=dissertations+&+theses&sid=ProQ:ProQues

2. Akpan, B. B. (2010). Innovations in Science and Technology Education through Science Teacher Associations. Science Education International, 21(2), 67–79.
3. Arokoyu, A. ., & Ugonwa, R. . (2012). Assessment of Resource Availability for Chemistry Instruction in the Secondary Schools in Rivers State. Journal of Emerging Trends in Educational Research and Policy Studies, 3(3), 346–351.
4. Adams, S. (2002).Study of pedagogical effectiveness in learning, Research Report 365, DfES, London, 23-66.
5. Birdsall, N. (2005). Towards universal primary education: Investments, incentives, and institutions. European Journal of Education, 40, 337-349.
6. Broadhead, P. (2010). Play and learning in early childhood settings: Theory and practice, Sage, London, 203-209.
7. Corts, D. P. (2000). Assessing undergraduate satisfaction with an academic department. College Student Journal, 34(3), 399-408.
8. Fabian, H. (2009). Development and learning for young children, Sage, London, 133-169.
9. Grabau, L. J. (2017). Aspects of science engagement, student background, and school characteristics: Impacts on science achievement of U.S. students.1-A(E), No Pagination Specified-No Pagination Specified.
10. Hasni, A., & Potvin, P. (2015). Student's interest in science and technology and its relationships with teaching methods, family context and self-efficacy. International Journal of Environmental and Science Education, 10(3), 337–366. https://doi.org/10.12973/ijese.2015.249
11. Hmelo-Silver, C. (2013). Creating a learning space in problem-based learning. Interdisciplinary Journal of Problem-Based Learning, https ://doi.org/10.7771/1541-5015.1334
12. Ives, B. (2001).A preliminary assessment of effectiveness in basic skills it training. MIS Quarterly, 25(4), 401-426.
13. Kassim, A. G. (2014). How to use the laboratory and conduct practical for skills acquisition for secondary school students. (August), 160–164. https://doi.org/10.14662/IJARER2014.036
14. Lestik, M. & Plous, S. (2022). Jigsaw classroom, Retrieved 7th March, 2022, from jigsaw.org, 2012.
15. Mari, J. S., & Gumel, S. A. (2015). Effects of jigsaw model of cooperative learning on self efficacy and achievement in chemistry among concrete and formal reasoners in colleges of education in Nigeria. International Journal of Information and Education Technology, 5(3), 196-199. https://doi.org/10.7763/IJIET.2015.V5.501
16. Rosemane, J. E., & DeBoer, G. (2010). Exploring the Nature of Science: Using the Atlas of Science Literacy and Other Education Resources from AAAS Project 2061. Science.
17. Rubin, A., & Babbie, E. R. (2009). Research Methods for Social Work Licensed to : iChapters User (Issue August).
18. Taherdoost, H. (2016). Sampling Methods in Research Methodology ; How to Choose a Sampling Technique for Research Hamed Taherdoost To cite this version : HAL Id : hal-02546796 Sampling Methods in Research Methodology ; How to Choose a Sampling Technique for. International Journal of Academic Research in Management (IJARM), 5(2), 18–27.
19. Van Den Branden, K. (2015). Sustainable education: Exploiting students' energy for learning as a renewable resource. Sustainability (Switzerland), 7(5), 5471–5487. https://doi.org/10.3390/su7055471