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EFFECT OF JIGSAW INSTRUCTIONAL STRATEGY ON STUDENTS' INTEREST IN BASIC SCIENCE IN TARABA STATE, NIGERIA

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ABSTRACT

The study explored the effect of jigsaw instructional strategy on students' interest in basic science in Taraba State, Nigeria. Three research questions and null hypotheses guided the study. A quasi-experimental research design was adopted. The population comprised all the 6288 students in upper basic II in Jalingo Education Zone in 2024/2025 session. The sample size was 209 students from two sampled intact classes. Purposive and simple random samplings were used as sampling techniques. 91 students were in the experimental group and taught with jigsaw instructional strategy while 118 students were in the control group and learned through conventional instructional strategy. Basic Science Interest Scale (BSIS) was used for data collection. BSIS was validated by three experts: two from science education and one from measurement and evaluation unit all from Taraba State University, Jalingo. Reliability index of BSIS was found to be 0.79 using Cronbach alpha formula. Mean and standard deviation were used to answer all the research questions while Analysis of Covariance (ANCOVA) was used to test all the null hypotheses at 0.05 level of significance. The findings revealed that students taught using jigsaw instructional strategy showed significantly higher interest than their counterparts in the conventional instructional strategy ($p<0.05$). There was no significant effect of gender on interest ($p>0.05$). Similarly, there was no significant interaction effect of strategies and gender on interest ($p>0.05$). It was concluded that when learning through jigsaw instructional strategy enhances interest. It was recommended teachers of basic science should utilise this strategy as it improves students' interest in basic science.

Key Words: Jigsaw, Interest, Gender and Basic Science

INTRODUCTION

The developmental strides of nations around the world have been attributed to science and technology. Apparently, nations with better scientific and technological practices are considered more developed than nations with low scientific and technological practices. Education has risen to this regards to bridge the gap; nations have adopted and invested in science education in order to proliferate scientific literacy. In Nigeria, science is taught across all the three levels of education: primary, secondary and tertiary. In formal education setting, science is first introduced to the Nigerian learner through basic science; basic science is a unit of a subject called basic science and technology (BST). Basic Science is designed to provide students with rudimental knowledge and skills in various scientific and technological disciplines. In the Nigerian educational system, the subject of Basic Science which is taught at the primary level plays a pivotal role in laying this crucial foundation. This interdisciplinary subject aims to equip students with a broad understanding of scientific concepts and their practical applications in areas such as physics, chemistry, biology, and technology. The foundational nature of basic science, especially at the primary level requires careful selection and utilisation of instructional strategy which could improve learning outcomes. In this study, jigsaw instructional strategy was considered.

Jigsaw instructional strategy is a cooperative instructional strategy which ensures that no student is isolated during the teaching and learning process. Rahman and Lewis (2019) saw jigsaw as a general term for students working together on a task. Nnorom (2015) defined jigsaw strategy as an instructional strategy in which small groups with students of diverse abilities use a variety of learning activities to improve the learning experiences. Teachers are often puzzled with meeting the learning needs of learners with diverse learning abilities; jigsaw could be pivotal in that regards. With involvement of students who must belong to a group, learning becomes active and students

contribute towards learning a whole new concept. Daiko et al. (2023) explained that in Jigsaw instructional strategy, the class is broken into groups of 4-6 members and assigned tasks which are only parts of the lesson to be taught for the groups ('home groups') to work on. Thereafter, each student from every home group is assigned a portion of the material; then the home groups members will disengage from the group and join other teams and form expert groups. Whereas in the expert groups, the students study intensively their particular material to ensure that they understand it well and prepare it for peer tutoring. Mikano and Simon (2025) alluded that after this, each student returns to his or her respective home group he or she teaches his assigned material to the rest of his or her group and learns the other sub-topics from his/her peers in the group. Apparently, jigsaw instructional strategy is activity-based. If implemented well under the guidance of a teacher, the exchange of ideas and seemingly peer-based learning between students could enhances the affective domain components of learning such as the learner's interest toward school subjects.

Interest is an important variable in learning because it determines how deeply involved learners will be in an activity. Ezike and Obodo (2019) defined interest as the feeling of intent, concern, or curiosity about something. Obodo and Robert (2018) described interest as the attraction that forces or compels a child to respond to a particular stimulus. This pointed out that a child develops interest if a particular stimulus is attractive, arousing, or stimulating. Interest in a subject breeds curiosity about the subject. Interest in basic science, from the ongoing, refers to individual reactions, feelings, and impressions about science at its elementary level. Interest is a very strong factor in the teaching and learning of science. Yaapera (2024) revealed that the current status of students' interest in basic science is at its low level. This is attributable to persistent use of conventional teaching strategies where students are only passively involved in the learning process. Jigsaw instructional strategy, being an innovative strategy could enhance students' interest in basic science in the Taraba State context. Studies outside this context have produced positive results regarding its effectiveness on students' interest. Nduji et al. (2020) found that jigsaw instructional strategy significantly improves students' interest better than lecture method. Michael et al. (2022) found that when students are taught with jigsaw instructional strategy, their interest is significantly improved more than students who learned in the conventional teaching strategy. In the same vein, Areelu and Ladle (2018) observed that students' interest is significantly enhanced with jigsaw strategy especially in comparison with conventional approach. These studies showed that jigsaw instructional strategy could enhance students' interest towards varying school subject but establishing its empirical evidence in the Taraba State context formed that backbone of this study. Students' interest could be influenced by gender.

Okorie and Ezeh (2016) defined gender as a psychological term and a cultural construct developed to differentiate between the roles and behavioural attributes of males and females. Gender roles and expectations within the community could influence students' interest, performance and retention in basic science. Societal biases may impact the encouragement or discouragement of male and female students from pursuing and developing interest in some school subjects. Teacher's choice of instructional strategy is also a crucial factor as some strategies could have inherent bias towards a certain gender. To this regards, the difference in students' interest upon exposure to a strategy has been factored into various research studies as well as the present study. Gender related findings have produced varying results. Baba et al. (2022) found that there is no significant gender difference in students' interest in basic science. Azeet et al. (2022) who observed that jigsaw instructional strategy improves students' interest irrrespective of their gender. Nevertheless, a contrasting finding was shown as Godpower-Echie and Ihenko (2017) found that gender significantly influences students' interest in integrated science which is now basic science.

In gender-strategy interaction where the effectiveness of strategies on students' interest are investigated to be dependent on gender or not, Azeet et al. (2020) found no significant interaction effect of strategies and gender on students' interest. Similarly, Areelu and Ladle (2018) who found that there is no significant interaction effect of strategies and gender on students' interest. However,

Umezulike and Umezulike (2023) showed that there is a significant interaction effect of strategies and gender on students' interest. Addressing gender-related factors is essential for promoting equal opportunities and enhancing overall learning outcomes of students; especially interest. In this light, the study investigated the effect of jigsaw instructional strategy on students' interest in basic science in Taraba State.

Purpose of the Study

The overall purpose of the study was to investigate the Effect of Jigsaw Instructional Strategy on Students' Interest in Basic Science in Taraba State, Nigeria. Specifically, the study sought to:

1. Find out the interest ratings of students taught basic science concepts using jigsaw instructional strategy and conventional instructional strategy
2. Determine the interest ratings of male and female students taught basic science concepts using jigsaw instructional strategy.
3. Ascertain the interaction effect of gender and teaching strategies on students' interest in basic science.

Research Questions

The following research questions guided the study

1. What is the mean interest rating of students taught basic science concepts using jigsaw instructional strategy and conventional instructional strategy?
2. What is the mean interest rating of male and female students taught basic science concepts using jigsaw instructional strategy?
3. What is the interaction effect of gender and teaching strategies on students' interest in basic science?

Hypothesis

The following null hypotheses guided the study:

H_{o1}: There is no significant difference in the mean interest rating of students taught basic science concepts using jigsaw instructional strategy and conventional instructional strategy.

H_{o2}: There is no significant difference in the mean interest rating of male and female students taught basic science concepts using jigsaw instructional strategy.

H_{o3}: There is no significant interaction effect of gender and strategies on students' interest in basic science.

METHODOLOGY

The study adopted a quasi-experimental research design of pre-test, post-test, post post-test non-equivalent group. The quasi-experimental design is the requisite design for studies seeking to establish the cause-and-effect relationships of variables based on non-random factor. The study sought to establish the cause-and-effect relationship of Jigsaw Instructional Strategy on Students' Interest in intact classes hence the choice of the design. The population of the study consisted of all the students in upper basic two in the 43 public co-educational primary schools in Jalingo Education Zone of Taraba State, Nigeria. The sample size of the study was 209 students. 91 students were in the experimental group while 118 students were in the control group. From the 91 students in the experimental group, 30 were male students while 60 were female students. The sample was drawn from two intact classes of two co-educational primary schools in Jalingo Education Zone through multistage sampling. The instrument used for data collection was a 30-item Basic Science Interest Scale (BSIS). It comprises two sections, A and B. section A accounts for the socio-demographic information of the respondents while section B consists of 30 items, positively and negatively worded, seeking to measure the students' interest towards basic science. The 30 items on BSIS are on a 4-point rating scale of strongly agree (SA), Agree (A), Disagree (D), and Strongly

Disagree (SD) which translates into 4, 3, 2, and 1 for positive items and 1, 2, 3 and 4 for negative items respectively. The reliability index of 0.79 was obtained for the instrument (BSIS).

Data was collected using the BSIS. The data was collected in two phases. Pre-test data was collected on students' Interest the second week of the exercise. This is because the first week was for introduction and training of the research assistants. The research assistants who were the basic science teachers of the sampled schools in turn helped in the administration of the instruments. The data collected at this stage accounted for the initial between and within groups' differences. Thereafter, treatment began and lasted for four (4) weeks. After treatment, the second phase of the data collection began when BSIS was re-administered to the students with the help of the research assistants. The data obtained at this stage is the post-test and accounted for the students' interest in basic science.

RESULTS

Research Question 1: What is the mean interest rating of students taught basic science concepts using jigsaw instructional strategy and conventional instructional strategy?

Table 1: Mean and standard deviation of interest rating of students taught basic science concepts using jigsaw and conventional instructional strategies

Strategy		PreBSIS	PostBSIS	Mean gain
	Mean	3.12	3.54	0.42
JIS	N	91	91	
	Std. Deviation	0.43	0.20	
	Mean	3.24	3.33	0.09
CIS	N	118	118	
	Std. Deviation	0.43	0.43	
Mean difference		0.12	0.21	0.33

Table 1 above indicates that before treatment, students in the jigsaw instructional strategy group, being the experimental group, had mean interest rating of 3.12 with standard deviation of 0.43 while students in the control group exposed to conventional instructional strategy had a mean of 3.24 with standard deviation of 0.43. This means that initially, students in the conventional instructional strategy had slightly better interest rating than students in the jigsaw instructional strategy with mean difference of 0.12. The standard deviation values at this stage depict that the scores of students in the jigsaw instructional strategy and conventional instructional strategy were evenly dispersed (0.43 apiece). After treatment exercise, students in the jigsaw instructional strategy group had a mean interest rating of 3.52 with standard deviation of 0.20 while students in the conventional instructional strategy had mean interest rating of 3.33 with standard deviation of 0.43. The standard deviation values at this stage depict that the scores of students in the conventional instructional strategy group were more dispersed compared to students in the jigsaw instructional strategy group since it had a higher standard deviation (0.43 to 0.20). Apparently, students in the jigsaw instructional strategy acquired more interest in basic science than their counterparts in conventional instructional strategy as they gained 0.42 to 0.09 obtained by students in the conventional instructional strategy. The difference in mean gain is 0.33 in favour of jigsaw instructional strategy.

Research Question 2: What is the mean interest rating of male and female students taught basic science concepts using jigsaw instructional strategy?

Table 2: Mean and standard deviation of interest rating of male and female students exposed to jigsaw instructional strategy

Gender JIS		preBSIS	postBSIS	mean gain
	Mean	3.14	3.51	0.37
Male	N	31	31	
	Std. Deviation	0.33	0.16	
	Mean	3.11	3.56	0.45
Female	N	60	60	
	Std. Deviation	0.47	0.22	
Mean difference		0.03	0.05	0.08

Table 2 above indicates that at pre-test, male students in the jigsaw instructional strategy had mean interest rating of 3.14 with standard deviation of 0.33 while their female counterparts had a mean of 3.11 with standard deviation of 0.47 This means that initially, the male students had slightly better interest rating than female students in the jigsaw instructional strategy with mean difference of 0.03. The standard deviation values at this stage depict that the ratings of female students were more dispersed compared to the male students' ratings since it had a higher standard deviation. After the exercise, male students in the jigsaw instructional strategy had a mean interest rating of 3.51 with standard deviation of 0.16 while female students in the same group had mean achievement score of 3.56 with standard deviation of 0.22. The standard deviation values at this stage depict that the scores of female students in this group were only slightly more dispersed compared to male students in the jigsaw instructional strategy since it had a higher standard deviation. Apparently, female students appeared to benefit slightly more in terms of achievement than their male counterparts as they gained 0.45 to 0.37 obtained by male students. The difference in mean gain is 0.08 in favour of the female students in the jigsaw instructional strategy.

Research Question 3: What is the interaction effect of gender and teaching strategies on students' interest in basic science?

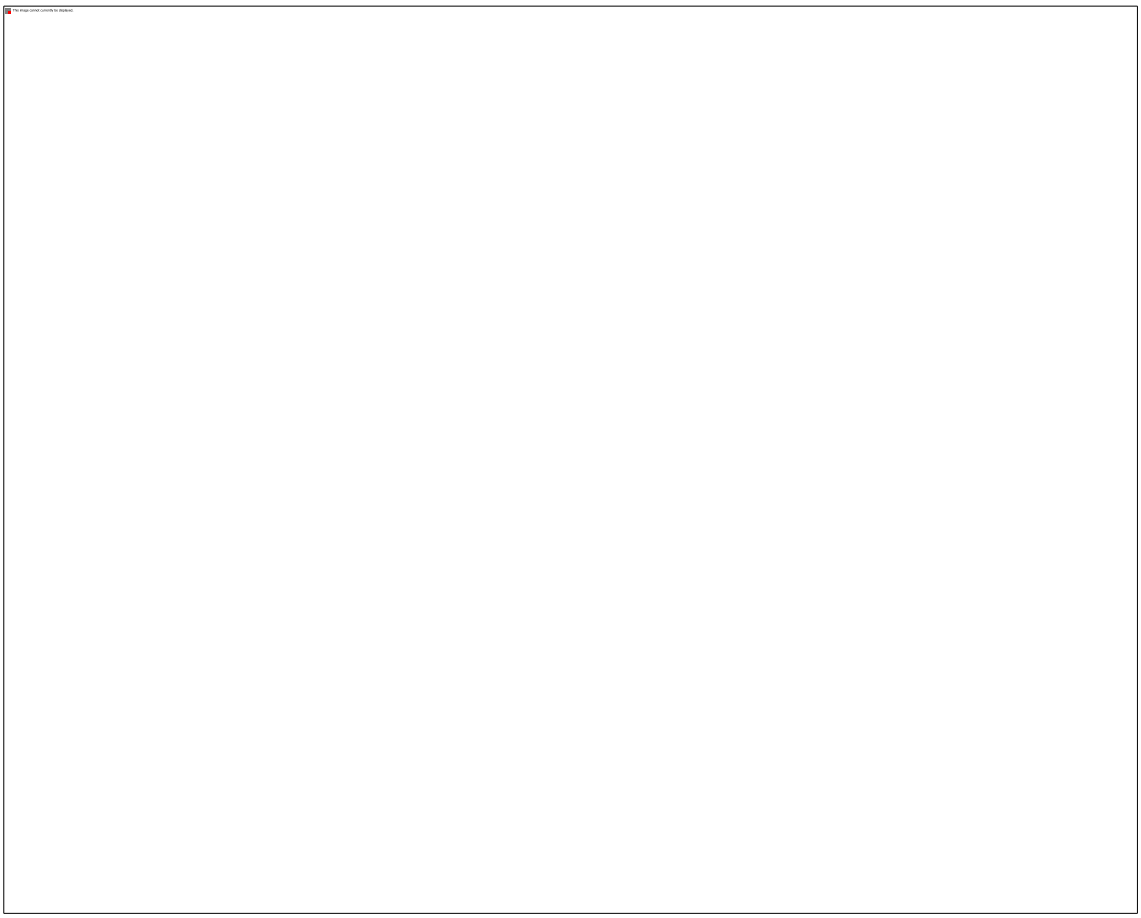

Figure 1: Graph of interaction effect of strategies and gender on students' interest in basic science

The figure 3 above shows the interaction effect of the two strategies and gender on students' interest in basic science. From the graph, it could be deduced that the male and female lines are not parallel and could intersect at the jigsaw instructional strategy part of the plots of the two strategies. Since the two lines are not parallel and may intersect with each other, it means there is an interaction effect of strategies and gender on students' interest. This means that there is slight possibility of male students being favoured more in the jigsaw instructional strategy than their counterparts in the conventional instructional strategy group while the female students in the conventional instructional strategy group could be more favoured than female students in the jigsaw instructional strategy.

Null Hypothesis 1

H_{o1}: There is no significant difference in the mean interest rating of students taught basic science concepts using jigsaw instructional strategy and conventional instructional strategy.

Table 3: One-way ANCOVA analysis of the interest rating of students taught basic science concepts using jigsaw and conventional instructional strategies.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2.411a	2	1.205	9.747	.000	.086
Intercept	40.488	1	40.488	327.356	.000	.614
preBSIS	.091	1	.091	.736	.392	.004
strategies	**2.404**	**1**	**2.404**	**19.439**	**.000**	**.086**
Error	25.479	206	.124			

Total	2473.942	209
Corrected Total	27.890	208

Table 3 above shows that F (1,206) = 19.439 and p = 0.000 which is less than the benchmark 0.05. This means that there is a significant difference in the mean interest rating of students exposed to jigsaw instructional strategy and conventional instructional strategy. Consequently, null hypothesis 1 is rejected. Research question 1 from table 1 indicated that students in the jigsaw instructional strategy gained more in interest. Subsequently, this test of hypothesis proves that the difference is statistically significant in favour of jigsaw instructional strategy. Meaning that jigsaw instructional strategy improved students' interest in chemistry significantly more than conventional instructional strategy. In addition, the partial eta squared value of 0.086 shows that about 9% of the variation of the students' interest in basic science is accounted for by the effect of the treatment exercise.

Null Hypothesis 2

H_{O2}: There is no significant difference in the mean interest rating of male and female students taught basic science concepts using jigsaw instructional strategy.

Table 4: One way ANCOVA result of interest rating of male and female students taught basic science concepts using jigsaw instructional strategy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.076a	2	.038	.908	.407	.020
Intercept	22.255	1	22.255	534.737	.000	.859
JpreBSIS	.019	1	.019	.466	.497	.005
Jgender	**.054**	**1**	**.054**	**1.294**	**.258**	**.014**
Error	3.662	88	.042			
Total	1144.774	91				
Corrected Total	3.738	90				

The table 4 above shows that F (1,88) = 1.294 and p = 0.258 > 0.05. This means that the significance level is higher than the benchmark of 0.05. Consequently, the null hypothesis is accepted as this signifies that there is no significant difference in the mean interest rating of male and female students exposed to jigsaw instructional strategy. Table 2 showed the mean difference in interest of male and female students in the jigsaw instructional strategy where female students gained more in interest than their male counterparts. However, the result of the test of hypothesis presented in table 8 above shows that the difference is not significant. This means that male and female students taught basic science through jigsaw instructional strategy will gain equally in terms of interest. The partial eta squared value to this regards is 0.014 meaning only about 1.4% of the variation of students' interest in jigsaw instructional strategy group was due to gender differences.

Null Hypothesis 3

H_{O3}: There is no significant interaction effect of gender and strategies on students' interest in basic science.

Table 5: Two-way ANCOVA result of interaction effect of gender and strategies on students' interest in basic science

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2.685a	4	.671	5.432	.000	.096
Intercept	40.325	1	40.325	326.378	.000	.615
preBSIS	.075	1	.075	.606	.437	.003
strategies	2.303	1	2.303	18.643	.000	.084
Gender	.242	1	.242	1.960	.163	.010
Strategies * gender	**.018**	**1**	**.018**	**.142**	**.707**	**.001**
Error	25.205	204	.124			
Total	2473.942	209				
Corrected Total	27.890	208				

Table 5 above shows that interaction effect of strategies and gender, F (1,204) = 0.142; p = 0.707 > 0.05. This means the result of test of significance is higher than the benchmark 0.05; consequently, the null hypothesis is accepted. This implies that there is no significant interaction effect of strategies (jigsaw instructional strategy and conventional instructional strategy) and gender on students' interest in chemistry. Figure 5 showed that there is a possibility of intersection of the plots of gender and strategies. However, this test of hypothesis confirms that the intersection, otherwise called interaction is not significant. Essentially, this infers that the interest gain accompanying the use of either jigsaw instructional strategy or conventional instructional strategy does not depend on whether the students involved is a male or female. In other words, both male and female students benefit equally with regards to gain in interest when jigsaw instructional strategy and conventional instructional strategy are involved. The partial eta squared value of 0.001 means that only 0.1% of the students' interest gains in both groups was as a result of the interaction of the strategies and gender of students.

DISCUSSION OF FINDINGS

The findings revealed that students taught using jigsaw instructional strategy had higher mean interest than their counterparts taught through conventional strategy with the difference in interest being statistically significant. The jigsaw instructional strategy likely improved students' interest in basic science more because it promotes active participation, collaboration, and a sense of responsibility for learning. By working in groups and teaching peers, students become more engaged and motivated. The learners at this stage have diverse learning styles which the jigsaw instructional strategy caters and also encourages deeper understanding through peer explanation. In contrast, the conventional strategy is often teacher-centred and less interactive, which can reduce student enthusiasm and consequently students' interest of learning basic science. Also, relative to the learners and the learning environment, the jigsaw is a relatively novel approach for the students who have long been used to the teacher-centred methods of instruction. The introduction of a different strategy makes them keen on learning more and developing interest in basic science since they now are engaged actively in the learning process. This is consistent with the finding of Nduji et al. (2020) who found that jigsaw instructional strategy significantly improves students' interest better than lecture method. It also agrees with Michael et al. (2022) who found that when students are taught with jigsaw instructional strategy, their interest is significantly improved more than students who learned in the conventional teaching strategy. In the same vein, Areelu and Ladle

(2018) found that students' interest is significantly enhanced with jigsaw strategy especially in comparison with conventional approach.

The study revealed that there is no significant difference in the interest rating of male and female students taught using jigsaw instructional strategy. The finding could be attributed to the fact that jigsaw instructional strategy promotes equal participation and values every student's contribution. The collaborative nature of the method reduces gender-based competition and emphasizes teamwork. It also provides a supportive environment where both genders feel equally empowered to engage as they learn. The findings showed that male and female students in the study area could learn together in groups without the grouping interfering with their learning outcomes. The finding agrees with Baba et al. (2022) who found that there is no significant gender difference in students' interest in basic science. It also agrees with Azeet et al. (2022) who observed that jigsaw instructional strategy improves students' interest irrespective of their gender. Nevertheless, the finding disagrees with Godpower-Echie and Ihenko (2017) who found that gender significantly influences students' interest in integrated science which is now basic science.

The study revealed that there is no significant interaction effect of strategies and gender on students' interest. This is consistent with Azeet et al. (2020) who found no significant interaction effect of strategies and gender on students' interest. It also agrees with Areelu and Ladle (2018) who found that there is no significant interaction effect of strategies and gender on students' interest. However, it contradicts the finding of Umezulike and Umezulike (2023) who found that there is a significant interaction effect of strategies and gender on students' interest.

CONCLUSION

Informed by the findings, the study concluded that jigsaw instructional strategy enhances students' interest in basic science significantly better than conventional strategy. Utilisation of the strategy infers that students will show improved interest in basic science. The study also concluded that gender does not significantly influence students' interest when taught with jigsaw instructional strategy neither does it have a significant interaction effect with gender. The ultimate goal of improving students' learning outcomes irrespective of gender could be attained in basic science in Taraba State with the utilisation of jigsaw instructional strategy.

RECOMMENDATIONS

The study's funding engendered the following recommendations:

1. Teachers of basic science in Taraba State should utilise jigsaw instructional strategy for classroom instructions.
2. Jigsaw instructional strategy should be used by teachers to eliminate gender disparity especially when there is evidence of gender differences in students' interest, performance and retention.
3. Awareness should be created by the State's ministry of education on effectiveness of jigsaw and they need for its utilisation.

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