

Effect of Jigsaw Learning Strategy on Nutrition Education Knowledge of Home Economics Students in Upper Basic Schools in Enugu State

Onu, Chinyere Theresa¹ & Prof. Igba, Elizabeth Chimezie, PhD²

Abstract

The study examined the effect of Jigsaw Learning Strategy on Nutrition Education Knowledge of Home Economics Students in Upper Basic Schools in Enugu State. Three purposes, three research questions and three hypotheses guided the study. The study adopted quasi-experimental, pre-test, post-test non-equivalent control group research design. The population of the study was 21478 (10,305 males and 11,173 females) Upper Basic students in six Education Zones of Enugu State. The sample of the study is 428 Upper Basic II students (200 males and 228 females) drawn using multistage sampling technique. The instrument for data collection was Nutrition Knowledge Test (NKT). The instrument was validated by three experts and further tested for reliability and the KR-20 reliability coefficient of the 20-item test was 0.87. Data were analyzed using mean and standard deviation to answer the research questions. The findings of the research questions revealed that Home Economics students taught nutrition education with Jigsaw Learning Strategy have a higher nutritional knowledge mean score than those taught with the conventional approach. Female Home Economics students taught nutrition education with Jigsaw Learning Strategy have a higher nutritional knowledge mean score than male Home Economics students taught with the same approach. There is no interaction between method and gender on Home Economics students' nutritional knowledge mean score. The hypotheses were tested using Analysis of Covariance (ANCOVA) and the findings revealed that: There is a significant difference in the nutritional knowledge mean score of junior secondary school Home Economics students taught nutrition education with Jigsaw Learning Strategy and students taught nutrition education with the conventional method. There is no significant difference in the nutritional knowledge mean score of male and female junior secondary school Home Economics students taught nutrition education with Jigsaw Learning Strategy. There is no significant difference in the interaction effect of method and gender on junior secondary school Home Economics students' nutritional knowledge mean score. It was recommended that Home Economics teachers should adopt the Jigsaw Learning Strategy in teaching nutrition education in Upper Basic Schools

Keywords: Jigsaw Learning Strategy, Nutrition, Nutrition Education, Nutrition Knowledge, Home Economics

Cite: Onu, C. T., & Igba, E. C. (2026). Effect of Jigsaw Learning Strategy on Nutrition Education Knowledge of Home Economics Students in Upper Basic Schools in Enugu State. *International Journal of Humanities, Thought and Expression*, 4(3), 77-89. <https://doi.org/10.5281/zenodo.21597725>

© Copyright and Licensing Notice

Authors retain full copyright over all articles published under BIRPUB. Ownership of the work does not transfer to the publisher at any stage of the publication process. Upon acceptance, authors grant BIRPUB a non-exclusive license to publish, distribute, archive, and index the article in both print and digital formats. This license allows BIRPUB to make the work publicly available while preserving the author's full intellectual property rights. Authors are free to reuse any part of their work in future publications, deposit the article in institutional or subject repositories, and share the published version on personal or professional platforms. They may also republish the article elsewhere, provided that the original appearance in BIRPUB is clearly acknowledged. BIRPUB is committed to protecting author rights and imposes no restrictions beyond appropriate citation of the initial publication.

Authors	Affiliation
1	Department of Home Economics Education, Enugu State college of Education (Technical), Enugu
2	Department of Home Economics and Hospitality Management, Faculty of Education, Ebonyi State University, Abakaliki

Introduction

Nutrition is widely recognized as a fundamental determinant of growth, development, cognitive functioning, academic performance, and overall well-being. According to the Food and Agriculture Organization (FAO, 2022), nutrition education is a planned educational process that provides individuals and communities with the knowledge, skills, attitudes, and motivation necessary to adopt healthy dietary behaviours and make informed food choices that promote optimal health and well-being. In this study, nutrition education refers to the systematic teaching and learning of concepts related to food, nutrients, balanced diets, meal planning, food safety, food hygiene, and healthy eating practices provided to Junior Secondary School Home Economics students to enable them develop healthy dietary behaviours. It encompasses the study of nutrients, food groups, balanced diets, meal planning, food preparation, food hygiene, food safety, and healthy eating habits. Nutrition education has become increasingly important because unhealthy dietary behaviours among children and adolescents have contributed to rising cases of obesity, undernutrition, micronutrient deficiencies, and nutrition-related non-communicable diseases worldwide. Schools provide one of the most effective settings for delivering nutrition education because they reach learners during the formative years when lifelong dietary habits are being established. In the view of Contento (2023), effective nutrition education not only increases learners' nutrition knowledge but also promotes healthier food choices and positive lifestyle behaviours. Within the Home Economics curriculum, nutrition education provides students with practical competencies that enable them to select, prepare, and consume healthy foods. Nutrition education has become an indispensable component of school curricula worldwide because it equips learners with evidence-based knowledge, positive attitudes, and healthy dietary behaviours necessary for lifelong health. The growing concern over unhealthy eating habits among young people has further increased the demand for effective instructional strategies capable of improving students' nutrition knowledge and translating such knowledge into healthy lifestyle practices.

Nutrition knowledge refers to the extent to which learners understand nutrition concepts and can correctly apply them in making healthy dietary decisions. According to Contento (2023), nutrition knowledge refers to the level of understanding individuals possess regarding nutrition principles, including nutrients, food groups, dietary guidelines, food preparation, healthy eating habits, and the relationship between nutrition and health, acquired through formal or informal learning experiences. Operationally, nutrition knowledge refers to the extent to which students understand and can apply concepts of nutrition, including food groups, nutrient functions, balanced diets, meal planning, food hygiene, food safety, and healthy eating practices after instruction. It includes knowledge of food groups, nutrient functions, balanced diets, meal planning, food safety, food hygiene, healthy eating guidelines, and the relationship between nutrition and health. Adequate nutrition knowledge enables students to distinguish healthy foods from unhealthy alternatives, develop positive eating behaviours, and make informed nutritional choices that enhance their well-being. However, the level of nutrition knowledge acquired by students depends largely on the instructional methods employed during classroom teaching. Studies suggest that learner-centred instructional approaches significantly improve students' understanding and retention of nutrition concepts compared with conventional teacher-centred methods (Contento, 2023; López-Gil et al., 2024). Thus, improving nutrition knowledge requires teaching methods that actively engage learners in meaningful learning experiences rather than passive memorization, such as Jigsaw learning strategy.

Jigsaw Learning Strategy is a learner-centred cooperative instructional approach that promotes active learning through collaboration, peer teaching, and shared responsibility for learning. In the view of Gillies (2023), the Jigsaw Learning Strategy is a cooperative instructional approach in which students are organized into small heterogeneous groups, with each member becoming an "expert" on a particular segment of the lesson and subsequently teaching that segment to members of their home group. This strategy promotes positive interdependence, individual accountability, collaborative learning, active participation, and improved academic achievement. In this study, Jigsaw Learning Strategy refers to a learner-centred cooperative instructional strategy in which students are divided into small groups, with each student responsible for learning and teaching a specific aspect of nutrition education to group members in order to enhance their nutrition education knowledge. This process encourages positive interdependence, individual accountability, communication, critical thinking, and teamwork while reducing

excessive dependence on the teacher. Unlike the conventional lecture method, which often positions students as passive recipients of information, the Jigsaw strategy actively engages learners in constructing knowledge through discussion, explanation, questioning, and peer interaction. Studies have shown that Jigsaw Learning Strategy significantly improves students' academic achievement, knowledge retention, motivation, classroom participation, and problem-solving abilities across various disciplines (Gillies, 2023; Awofala & Ojo, 2024). Its effectiveness is particularly evident in practical and concept-based subjects such as Home Economics, where learners are expected to understand, discuss, and apply concepts to real-life situations. This strategy equally enhances learners' confidence, motivation, critical thinking, interpersonal relationships, and problem-solving abilities, making it particularly suitable for teaching practical and concept-based subjects such as Home Economics

Home Economics is a vocational and life-oriented subject designed to equip learners with practical knowledge, skills, attitudes, and values necessary for effective personal, family, and community living. The subject integrates several areas, including food and nutrition, clothing and textiles, home management, family living, consumer education, and entrepreneurship, thereby preparing students for responsible living and self-reliance. According to UNESCO-UNEVOC (2023), Home Economics is a multidisciplinary field of study that equips learners with knowledge, practical skills, values, and competencies in food and nutrition, clothing and textiles, family living, consumer education, and home management to enhance personal, family, and community well-being while promoting sustainable living. At the Upper Basic Education level, Home Economics emphasizes experiential learning that enables students to apply theoretical knowledge in solving everyday family and societal problems. Nutrition education constitutes one of its major components because healthy feeding practices contribute significantly to improved health, productivity, and quality of life. UNESCO-UNEVOC (2023) maintained that vocational subjects such as Home Economics play an important role in developing practical competencies and sustainable life skills among young learners. Since nutrition education is taught as part of Home Economics in Upper Basic Schools, the subject provides the instructional context within which the effectiveness of the Jigsaw Learning Strategy on male and female students' nutrition knowledge is investigated.

Gender refers to the classification of learners as male or female and is one of the demographic variables frequently examined in educational research because it may influence students' participation, interaction, motivation, and learning outcomes. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO)(2023), gender refers to the socially and culturally constructed roles, behaviours, responsibilities, opportunities, and expectations that societies assign to males and females, which influence their experiences, participation and outcomes in different aspects of life, including education. Although educational opportunities for boys and girls have improved considerably, studies continue to report mixed findings regarding gender differences in students' academic achievement under different instructional approaches. While some studies have reported no significant gender differences in cooperative learning environments, others suggest that collaborative instructional strategies may enhance participation and academic performance among both male and female students by providing equal opportunities for interaction and peer learning (UNESCO, 2023; Awofala & Ojo, 2024). Consequently, gender has continued to receive attention as a moderating variable in instructional research. In the present study, gender is considered because it is necessary to determine whether the Jigsaw Learning Strategy produces similar or different effects on the nutrition knowledge of male and female Home Economics students in upper basic Schools in Enugu State.

Upper Basic Education represents the second phase of Nigeria's Basic Education programme and comprises Basic 7, Basic 8, and Basic 9, corresponding to Junior Secondary School education. According to the Federal Republic of Nigeria (FRN, 2024) in the National Policy on Education, Upper Basic Schools are educational institutions that provide the Upper Basic Education programme (Basic 7–9) for learners who have completed primary education. The programme is designed to consolidate foundational learning while equipping students with academic knowledge, pre-vocational skills, and values necessary for further education and lifelong learning. This level of education is designed to consolidate the foundational knowledge and skills acquired during primary education while introducing learners to pre-vocational and entrepreneurial subjects that prepare them for senior secondary education and lifelong learning. The Federal Republic of Nigeria (FRN, 2024) emphasizes that Upper Basic Education promotes

intellectual, practical, technological, and vocational competencies required for national development. At this stage, learners are developmentally capable of engaging in cooperative learning, critical thinking, and problem-solving activities that characterize learner-centred instructional approaches such as the Jigsaw Learning Strategy. Home Economics is one of the vocational subjects offered at this level, providing students with opportunities to acquire practical nutrition knowledge and life skills. Therefore, Upper Basic Education constitutes the educational setting within which this study investigates the effect of the Jigsaw Learning Strategy on the nutrition knowledge of Home Economics students in Upper Basic Schools in Enugu State.

Statement of the Problem

Despite the inclusion of nutrition education in the Home Economics curriculum at the Upper Basic Education level, there are growing concerns that many junior secondary school students still possess inadequate nutrition education knowledge, as reflected in their poor understanding of balanced diets, nutrient functions, food groups, meal planning, food hygiene, and healthy eating practices. This situation has been attributed largely to the persistent use of conventional teacher-centred instructional methods, particularly the lecture method, which often limits students' active participation, collaboration, critical thinking, and meaningful knowledge construction. Consequently, students tend to memorize nutrition concepts for examination purposes rather than develop a deep understanding that can be applied in making informed dietary decisions. Although learner-centred instructional approaches such as the Jigsaw Learning Strategy have been reported to improve students' engagement, academic achievement, and knowledge retention in various subject areas, there is limited empirical evidence regarding its effectiveness in improving nutrition knowledge among Home Economics students in Upper Basic Schools, particularly in Enugu State. This paucity of research has created a gap in knowledge concerning whether the adoption of the Jigsaw Learning Strategy can significantly enhance students' nutrition knowledge compared with the conventional teaching method. It is against this background that this study seeks to investigate the effect of the Jigsaw Learning Strategy on the nutrition knowledge of Home Economics students in Upper Basic Schools in Enugu State.

Objectives of the Study

The main purpose of this study is to investigate the effect of the Jigsaw Learning Strategy on the nutrition knowledge of Home Economics students in Upper Basic Schools in Enugu State. Specifically, the study investigated the

1. Nutrition knowledge mean score of Upper Basic school Home Economics students taught nutrition education with Jigsaw Learning Strategy and students taught nutrition education without Jigsaw Learning Strategy (conventional).
2. Nutrition knowledge mean score of male and female Upper Basic school Home Economics students taught nutrition education with Jigsaw Learning Strategy.
3. Interaction effect of method and gender on Upper Basic school Home Economics students' Nutrition knowledge mean score.

Research Questions

The following research questions guided the study:

1. What is the nutrition knowledge mean score of Upper Basic school Home Economics students taught nutrition education with Jigsaw Learning Strategy and students taught nutrition education without Jigsaw Learning Strategy (conventional)?
2. What is the nutrition knowledge mean score of male and female Upper Basic school Home Economics students taught nutrition education with Jigsaw Learning Strategy?
3. What is the interaction effect of method and gender on Upper Basic school Home Economics students' Nutrition knowledge mean score?

Hypotheses

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

1. There is no significant difference in the nutrition knowledge mean score of Upper Basic school Home Economics students taught nutrition education with Jigsaw Learning Strategy and students taught nutrition education without Jigsaw Learning Strategy (conventional).
2. There is no significant difference in the nutrition knowledge mean score of male and female Upper Basic school Home Economics students taught nutrition education with Jigsaw Learning Strategy.
3. There is no significant difference in the interaction effect of method and gender on Upper Basic school Home Economics students' nutrition knowledge mean score.

Methodology

The study adopted a quasi-experimental, pre-test, post-test non-equivalent control group research design. According to Abonyi, Okereke, Omebe, Anuguwo and Nnachi (2022), quasi experiment is an experiment where it is not possible to randomly assign subjects to experimental and control group. This design is appropriate because it allows the researcher to measure the effect of Jigsaw learning strategy on students' nutrition knowledge by comparing experimental groups exposed to this learning strategy with a control group taught using traditional method. The study made use of intact classes in order not to disrupt normal class setting. The study made use of two groups; the experimental group and the control group. The experimental group was taught Nutrition Education using Jigsaw learning strategy while the control group was taught Nutrition Education using the conventional method. The design can be illustrated thus;

O₁ X O₂

O₁ C O₂

Where

O₁ represent pre-test of experimental and control groups.

O₂ represent post-test of experimental and control groups.

X represents treatment (Jigsaw learning strategy) for the experimental group.

C represents the conventional method for the control group.

This work was carried out in Enugu State. Presently, Enugu State has been inhabited by various ethnic groups, primarily the Igbo people with minorities of Idoma and Igala in Etteh Uno a community in Igbo Eze North Local Government Area. The state consists of seventeen (17) Local Government Areas, with six Education zones. There are 314 public secondary schools as classified by the State Ministry of Education. The state shares borders with Abia State and Imo State to the south, Ebonyi State to the east, Benue State to the northeast, Kogi State to the northwest and Anambra State to the west. The study was conducted in Enugu State, Nigeria, focusing on Upper Basic Schools (Upper Basic Schools) where Home Economics is a core subject. Enugu is suitable because reports indicate persistent cases of undernutrition and emerging over nutrition among children in the state (NPC & ICF, 2021).

The population of the study consist of 21478 (10,305 males and 11,173 females) Upper Basic students in six Education Zones of Enugu State. Upper Basic Two students (JSS II) are chosen because they have successfully completed their JSSI and are presently not exam class. The sample of the study is 428 Upper Basic II students (200 males and 228 females). To achieve this, a multi-stage sampling technique was adopted. In the first stage, simple random sampling technique was used to select four Education zones from the six education zones in Enugu state (balloting without replacement). In the second stage, stratified random sampling technique was used to select one LGAs from each of the four Education zones (earlier selected in stage one). The choice of this technique is informed by the need to have a balance representation of the targeted large population across different subgroups. In the third stage, purposive sampling technique was used to select one coeducational school from each of the four LGAs.

This sampling technique was adopted to ensure that male and female students in the same schools take part in the study. This yielded four Upper Basic Schools. Two of the schools were assigned to the experimental group (204 students) while the other two were assigned to the control (224 students) using simple random sampling.

The instruments for data collection is Nutrition Knowledge Test (NKT). The Nutrition Knowledge Test (NKT) was used to assess students' nutrition knowledge. The test is divided into two sections. Section one deals on the biography of the respondents like gender and date of test. Section two contains 20 multiple choice items. The instrument was subjected to face and content validation, and reliability tested. The KR-20 reliability coefficient of the 20-item test was 0.87.

For the experimental procedure. Two instructional packages were used for this study. The first package is the Jigsaw learning strategy which is identical to the conventional method package in terms of content, basic objectives and mode of evaluation. The only difference is in the instructional activities where the Jigsaw learning strategy deviates from the conventional method by using Jigsaw learning strategy during the instructional process. The Jigsaw learning package was used for the treatment group while the conventional package was used for the control group. At the onset of the experiment, subjects in the treatment and control group were given the pre-test. After the pre-test, the regular Home Economics teachers (research assistants) started the experiment in their respective schools adhering strictly to the lesson procedure that were developed from the packages during the pre-experimental briefing between the researcher and the research assistant. The experiment was conducted during the normal school period following the normal time-table of the school. At the end of the procedure that lasted for 6 weeks, the teachers administered the post-tests in the two groups. This was used to answer the research questions and test the hypotheses.

Control of extraneous variables:

Teacher Variable: In order to minimize errors, which could arise as a result of teacher difference, the researcher organized pre-experimental training for the research assistants that were used for the study. Separate trainings were organized for teachers in the two groups (experimental and control). The essence of the training is to help establish a uniform standard among the Home Economics teachers. A manual containing the specification of the packages were given to the participants. The researcher also monitored the research closely to ensure that no teacher deviates from the agreed format.

Inter Group Variable: Since intact classes were used for this study, it implies that initial equivalence was achieved for the research subjects in the two groups. In order to eliminate the error of non-equivalence arising from non-randomization of the subjects, the researcher used Analysis of co-variance (ANCOVA) for data analysis. Subject Interaction: The researcher did not have same school treatment and control group to ensure that the students in the control and experimental group do not interact at all. This is to reduce the possibility of John Henry Effect (which refers to the bias introduced to an experiment when members of the control group are aware that they are being compared to the experimental group and behave differently than they typically would to compensate for their perceived disadvantage).

Instructional Situation Variable: To ensure that instructional situation are the same for all the schools, the researcher issued out instructional guide to the teachers in each group. The teaching was conducted in all the groups and also pre-tested to avoid hawthorn effect.

Method of data collection: Prior to the commencement of data collection, an introductory letter was obtained from the Department and presented to the school authorities to seek permission to conduct the study. The Home Economics teachers, who served as research assistants, were trained on the use of the Jigsaw Instructional Package, administration and retrieval of the test, and proper procedures for taking anthropometric measurements to ensure uniformity. At the onset of the experiment, the researcher administered the pre-test to the students through the research assistants. Scores of the pre-test were recorded and kept. At the end of the experiment that lasted for a period of six weeks, during which the researcher monitored the process to ensure compliance with the instructional procedures, the post-test was administered to the same students. All instruments were administered and

measurements taken under similar conditions as the pre-test to ensure consistency. The completed questionnaires and measurement records were collected immediately after administration to minimize loss and ensure accuracy of data. The mean and standard deviation was used in answering the research question and Analysis of co-variance (ANCOVA) statistics was used in testing the null hypotheses. The level of significance to be adopted for the analysis was 0.05. SPSS (version 25) generated p-value was used to reject or not reject the null hypotheses. If p-value is less than 0.05 level of significance, reject null hypotheses otherwise do not reject.

Results

Data collected for the study were analysed and presented in this chapter as follows:

Research Questions

Research Question 1 : What is the nutrition knowledge mean score of junior secondary school Home Economics students taught nutrition education with Jigsaw Learning Strategy and students taught nutrition education without Jigsaw Learning Strategy (conventional)?

The data from the pre-test and post-test of the experimental and control group collected to answer Research Question (1) is presented in Table 1.

Table 1: Mean Score and Standard Deviation of Respondents Based on the Nutritional Knowledge Mean Score of Junior Secondary School Home Economics Students Taught Nutrition Education with Jigsaw Learning Strategy and Students Taught Nutrition Education Without Jigsaw Learning Strategy (conventional).

Groups	N	X	S.D
Jigsaw Learning Strategy	204	47.62	5.66
Conventional Method	224	40.41	5.68

Results in Table 1 reveals that the mean score of Home Economics students taught nutrition education with Jigsaw Learning Strategy is 47.62 with a standard deviation of 5.66 while the mean score of Home Economics students taught nutrition education with the conventional approach is 40.41 with a standard deviation of 5.68. This indicates that Home Economics students taught nutrition education with Jigsaw Learning Strategy have a higher nutritional knowledge mean score than those taught with the conventional approach. This further suggests that the use of Jigsaw Learning Strategy has positive effect on the nutritional knowledge of Home Economics students.

Research Question 2: What is the nutrition knowledge mean score of male and female junior secondary school Home Economics students taught nutrition education with Jigsaw Learning Strategy?

The data from the pre-test and post-test of the experimental collected to answer Research Question (2) is presented in Table 2.

Table 2: Mean Score and Standard Deviation of Respondents Based on the Nutritional Knowledge Mean Score of Male and Female Junior Secondary School Home Economics Students Taught Nutrition Education with Jigsaw Learning Strategy.

Respondents' Gender	N	X	S.D
Male	94	47.17	5.76
Female	110	48.01	5.58

Results in Table 2 shows that male Home Economics students taught nutrition education with Jigsaw Learning Strategy have mean score of 47.17 and standard deviation of 5.76 while the female Home Economics students taught nutrition education with Jigsaw Learning Strategy have mean score of 48.01 and standard deviation of 5.58. This result indicates that female Home Economics students taught nutrition education with Jigsaw Learning Strategy

have a higher nutritional knowledge mean score than male Home Economics students taught with the same approach.

Research Question 3: What is the interaction effect of method and gender on junior secondary school Home Economics students' nutritional knowledge mean score?

The data from the pre-test and post-test of the experimental and control group collected to answer Research Question (3) is presented in Table 3.

Table 3: Mean Score of Respondents Based on the Interaction Effect of Method and Gender on Junior Secondary School Home Economics Students' Nutritional Knowledge Mean Score.

Method	Gender	
	Male (Mean)	Female (mean)
Jigsaw Learning Strategy	47.17	48.01
Conventional method	39.66	41.08

Results in Table 3 indicates that the use of the Jigsaw Learning Strategy is superior to the conventional method. For both male and female Home Economics students, the nutritional knowledge mean score are higher for the Jigsaw Learning Strategy. This further implies that there is no interaction between method and gender on Home Economics students' nutritional status mean score.

Hypotheses 1 and 3

The following null hypotheses will be tested at 0.05level of significance to guide the study:

HO₁.: There is no significant difference in the nutritional knowledge mean score of junior secondary school Home Economics students taught nutrition education with Jigsaw Learning Strategy and students taught nutrition education without Jigsaw Learning Strategy (conventional).

HO₃.: There is no significant difference in the interaction effect of method and gender on junior secondary school Home Economics students' nutritional knowledge mean score.

Hypothesis 1 and 3 were tested using analysis of covariance (ANCOVA) and the summary is in table 4

Table 4: Test of Between Subject Effect for Home Economics Students' Overall Nutritional Knowledge Mean Score by Teaching Method and Gender.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	18018.584 ^a	4	4504.646	1518.010	.000
Intercept	444.078	1	444.078	149.649	.000
Pretest	12311.116	1	12311.116	4148.694	.000
Group	5360.506	1	5360.506	1806.424	.000
Gender	3.170	1	3.170	1.068	.302

Group*Gender	1.039	1	1.039	.350	.554
Error	1255.239	423	2.967		
Total	842084.000	428			
Corrected	19273.822	427			
Total					

The table 4 reveals that, for hypothesis 1, the p-value of 0.00 (Group) is less than the alpha level of 0.05. The decision was to reject the null hypothesis when the p-value is less than the alpha level. Since the alpha level is greater than the p-value, the null hypothesis is rejected. This therefore indicates that there is a significant difference in the nutritional knowledge mean score of junior secondary school Home Economics students taught nutrition education with Jigsaw Learning Strategy and students taught nutrition education with the conventional method.

For hypothesis 3, result reveals that for two-way interaction effects (group*gender), the p-value is 0.55 and the alpha level is 0.05. Based on the decision rule, the null hypothesis is not rejected. This indicates that there is no significant difference in the interaction effect of method and gender on junior secondary school Home Economics students' nutritional knowledge mean score.

Hypothesis 2

HO₂: There is no significant difference in the nutritional knowledge mean score of male and female junior secondary school Home Economics students taught nutrition education with Jigsaw Learning Strategy.

Hypothesis 2 were tested using analysis of covariance (ANCOVA) and the summary is in table 5

Table 5: Test of Between Subject Effect of Nutritional Knowledge Mean Score of Male and Female Junior Secondary School Home Economics Students Taught Nutrition Education with Jigsaw Learning Strategy.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	5734.844 ^a	2	2867.422	741.677	.000
Intercept	432.268	1	432.268	111.809	.000
Pretest	5699.175	1	5699.175	1474.129	.000
Group	.000	0	.	.	.
Gender	3.633	1	3.633	.940	.334
Group * Gender	.000	0	.	.	.
Error	777.092	201	3.866		
Total	469165.000	204			
Corrected Total	6511.936	203			

Table 5 reveals that: for hypothesis 2, the p-value of 0.33 (Gender) is greater than alpha level (0.05). Since the p-value is greater than the alpha level, the null hypothesis is not rejected. This indicates that there is no significant difference in the nutritional knowledge mean score of male and female junior secondary school Home Economics students taught nutrition education with Jigsaw Learning Strategy.

Summary of Results

1. Home Economics students taught nutrition education with Jigsaw Learning Strategy have a higher nutritional knowledge mean score than those taught with the conventional approach.
2. Female Home Economics students taught nutrition education with Jigsaw Learning Strategy have a higher nutritional knowledge mean score than male Home Economics students taught with the same approach.
3. There is no interaction between method and gender on Home Economics students' nutritional knowledge mean score.
4. There is a significant difference in the nutritional knowledge mean score of junior secondary school Home Economics students taught nutrition education with Jigsaw Learning Strategy and students taught nutrition education with the conventional method.
5. There is no significant difference in the nutritional knowledge mean score of male and female junior secondary school Home Economics students taught nutrition education with Jigsaw Learning Strategy.
6. There is no significant difference in the interaction effect of method and gender on junior secondary school Home Economics students' nutritional knowledge mean score.

Discussion

Nutrition Knowledge Mean Score of Upper Basic school Home Economics Students Taught Nutrition Education with Jigsaw Learning Strategy and Students Taught Nutrition Education without Jigsaw Learning Strategy (conventional).

The finding of this study revealed that Home Economics students taught nutrition education using the Jigsaw Learning Strategy obtained a higher nutritional knowledge mean score than those taught using the conventional teaching approach. This suggests that the cooperative and learner-centred nature of the Jigsaw strategy enhances students' understanding, participation, and retention of nutrition concepts more effectively than the traditional lecture method. The finding agrees with Gillies (2023), who reported that cooperative learning strategies, including the Jigsaw technique, significantly improve students' academic achievement and knowledge retention by promoting active engagement and peer interaction. However, the finding contradicts Kirschner, Sweller, and Clark (2021), who argued that minimally guided instructional approaches may not always produce better learning outcomes than structured teacher-directed instruction, particularly when students lack sufficient prior knowledge. The agreement may be attributed to the active learning opportunities and collaborative environment provided by the Jigsaw strategy, whereas the opposing finding may be due to differences in learners' characteristics, subject content, and classroom implementation.

Findings also revealed that there is a significant difference in the nutritional knowledge mean score of junior secondary school Home Economics students taught nutrition education with the Jigsaw Learning Strategy and students taught nutrition education with the conventional method.

The study found a significant difference in the nutritional knowledge mean score of students exposed to the Jigsaw Learning Strategy and those taught using the conventional teaching method, indicating that the instructional strategy significantly influenced students' learning outcomes. This finding is supported by Awofala and Ojo (2024), who found that cooperative learning strategies significantly improved students' academic performance compared with the conventional lecture method in Nigerian secondary schools. In contrast, Hattie (2023) reported that although cooperative learning is effective, its superiority over conventional instruction depends largely on the quality of implementation and teacher expertise, with some studies showing only marginal differences between instructional methods. The consistency of the present finding may be explained by the learner-centred features of the Jigsaw strategy, which encourage interaction and deeper understanding, while the contrasting finding may be attributed to differences in instructional quality, classroom context, and teachers' competence in implementing cooperative learning.

Nutrition Knowledge Mean Score of Male and Female Upper Basic school Home Economics Students Taught Nutrition Education with Jigsaw Learning Strategy

The finding showed that female Home Economics students taught nutrition education using the Jigsaw Learning Strategy obtained a higher nutritional knowledge mean score than their male counterparts. This suggests that female students responded slightly better to the collaborative learning environment created by the Jigsaw strategy. The finding is in agreement with UNESCO (2023), which reported that female students often demonstrate greater engagement and collaboration in cooperative learning settings, particularly in life skills and health-related subjects. However, the finding disagrees with Awofala and Ojo (2024), who found that cooperative learning strategies benefited male and female students equally, with no meaningful difference in academic performance based on gender. The agreement may be due to females' greater participation and communication during collaborative learning activities, whereas the contrary finding may result from differences in classroom composition, instructional practices, and learners' individual characteristics.

Findings also revealed that there is no significant difference in the nutritional knowledge mean score of male and female junior secondary school Home Economics students taught nutrition education with the Jigsaw Learning Strategy.

The study further revealed that although female students recorded a slightly higher mean score than male students, the difference was not statistically significant. This implies that the Jigsaw Learning Strategy was equally effective in improving the nutritional knowledge of both male and female students. This finding supports Gillies (2023), who reported that cooperative learning strategies provide equal learning opportunities for both genders, resulting in comparable academic outcomes. Conversely, Alghamdi (2022) found that female students significantly outperformed male students in cooperative learning environments due to higher levels of participation and collaborative engagement. The consistency of the present finding suggests that the Jigsaw Learning Strategy minimizes gender disparities by promoting equal participation among learners, whereas the opposing finding may be explained by differences in cultural contexts, classroom dynamics, and subject areas.

Interaction Effect of Method and Gender on Upper Basic School Home Economics Students' Nutrition Knowledge Mean Score

The finding indicated that there was no interaction between instructional method and gender on students' nutritional knowledge mean score, suggesting that the effectiveness of the Jigsaw Learning Strategy was not dependent on whether the learners were male or female. This finding is consistent with Slavin (2022), who maintained that cooperative learning strategies generally benefit all learners irrespective of gender because they emphasize shared responsibility and active participation. However, the finding contradicts Alghamdi (2022), who observed that the effectiveness of cooperative learning strategies varied according to gender, with female students deriving greater benefits than males. The agreement may be attributed to the equitable learning opportunities provided by the Jigsaw strategy, while the disagreement may be due to variations in learners' social interactions, instructional environments, and cultural settings.

Findings also revealed that there is no significant difference in the interaction effect of method and gender on junior secondary school Home Economics students' nutritional knowledge mean score.

The study also found that the interaction effect of instructional method and gender on students' nutritional knowledge mean score was not statistically significant, indicating that gender did not significantly influence the effectiveness of the Jigsaw Learning Strategy. This finding agrees with Awofala and Ojo (2024), who reported that cooperative learning strategies significantly improved students' achievement irrespective of gender, with no significant interaction effect between instructional method and gender. In contrast, Alghamdi (2022) found a significant interaction effect between cooperative learning and gender, suggesting that female students benefited more from collaborative instructional approaches than male students. The agreement with the present finding may be explained by the inclusive and participatory nature of the Jigsaw Learning Strategy, which provides equal learning

opportunities for all students, whereas the disagreement may reflect differences in educational settings, sample characteristics, and the implementation of cooperative learning activities.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Home Economics teachers should adopt the Jigsaw Learning Strategy in teaching nutrition education in Upper Basic Schools.
2. Teachers should encourage equal participation of both male and female students during Jigsaw learning activities by assigning balanced responsibilities and ensuring that every learner actively contributes to group discussions and peer teaching.
3. Curriculum developers and educational policymakers should incorporate Jigsaw Learning Strategy into the Home Economics curriculum and teachers' instructional guides to promote active learning and improve students' acquisition of nutrition education knowledge.
4. Teacher education institutions should expose pre-service Home Economics teachers to the principles and classroom application of the Jigsaw Learning Strategy so that they acquire the pedagogical skills required to effectively teach nutrition education using learner-centred approaches.
5. Home Economics teachers should implement the Jigsaw Learning Strategy without gender bias, ensuring equal learning opportunities for all students.

References

- Abonyi, O. S.; Okereke, S.; Omebe, C.; Anugwo, M. & Nnachi, N. (2022). *Foundations of Educational Research and Statistics*. Enugu: Fred-Ogah publishers.
- Alghamdi, A. K. H. (2022). Cooperative learning effectiveness on students' academic achievement: The moderating role of gender. *Journal of Education and Learning*, 11(4), 72–84.
- Awofala, A. O. A., & Ojo, O. T. (2024). *Effect of Jigsaw learning strategy on students' achievement and retention in Home Economics in Nigerian secondary schools*. *Journal of Educational Studies and Practice*, 18(1), 44–58.
- Contento, I. R. (2023). *Nutrition education: Linking research, theory, and practice* (4th ed.). Jones & Bartlett Learning.
- Federal Republic of Nigeria. (2024). *National policy on education* (7th ed.). Nigerian Educational Research and Development Council (NERDC).
- Food and Agriculture Organization. (2022). *Nutrition education and consumer awareness*. FAO. <https://www.fao.org>
- Gillies, R. M. (2023). *Cooperative learning: Review of research and practice*. Routledge.
- Hattie, J. (2023). *Visible learning: The sequel*. Routledge.
- Kirschner, P. A., Sweller, J., & Clark, R. E. (2021). Why minimally guided teaching techniques do not work: A reply to commentaries. *Educational Psychologist*, 56(4), 258–266.
- López-Gil, J. F., García-Hermoso, A., Cavero-Redondo, I., et al. (2024). School-based healthy eating interventions for children and adolescents: An umbrella review. *International Journal of Behavioral Nutrition and Physical Activity*, 21, 117.
- Slavin, R. E. (2022). *Educational psychology: Theory and practice* (13th ed.). Pearson.
- UNESCO-UNEVOC. (2023). *Technical and vocational education and training for sustainable development*. UNESCO. <https://unevoc.unesco.org>
- United Nations Educational, Scientific and Cultural Organization. (2023). *Global education monitoring report 2023: Technology in education—A tool on whose terms?* UNESCO.