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STUDENTS' PERCEPTIONS OF COLLABORATIVE LEARNING APPROACH AND THE INTERPLAY OF SOME DEMOGRAPHIC VARIABLES IN LEARNING BASIC SCIENCE

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Abstract: *In recent pedagogical innovations aimed at enhancing students' understanding of basic scientific knowledge, the collaborative learning approach (CLA) has emerged as an enterprising pedagogical approach. However, there has been limited research attention on students' perceptions of the use of CLA amidst its obvious benefits. For this purpose, students' perception, toward the use of CLA in Basic Science was evaluated. Using cross-sectional survey design and Social cognitive theory (SCT), students learning behaviour and perception were explained. Data have been collected through questionnaires from basic education students. Descriptive statistics were utilized to answer the research questions, while hypothesis testing was conducted using independent sample t-tests and ANOVA at a 0.05 alpha level. The findings provided evidence that students' perception is generally positive towards the use of CLA, & no significant difference in the perception of male & female students was observed. The findings also provided evidence that there is no significant difference between students' birth order and their perceptions of CLA in the classroom. Amongst all, the classroom setting & teacher relationship with the students should be revisited to enhance equal participation of males & females.*

Key words: *collaborative learning approach; basic science; demographic variables students' perception.*

Introduction

The recent evolution of innovative instructional strategies focusses on enhancing classroom delivery of scientific knowledge, leading to a shift from conventional methods such as the lecture method to student-centred approach. This shift correlates with 21st-century demand for skills such as problem-solving and critical thinking which innovative teaching approaches provide. Despite this focus, poor research attention focusing on students' perceptions of innovative teaching especially collaborative learning (CLA), and particularly among basic education students in Nigeria persisted. Furthermore, there is insufficient research on how demographic factors such as birth order and gender, affect students' perceptions and reactions to this instructional technique.

Collaborative Learning Approaches (CLA) is an approach that emphasizes shared responsibility and social interaction among students to achieve collective learning goals. Based on this student-centred framework, learners engage in small groups to tackle tasks, exchange ideas, and enhance their understanding through task collaboration (Laal, 2016; Nur & Butarbutar, 2022; Paul & Kundu, 2021). CLA promotes higher learning engagement, critical thinking, and community building (Ramzan et al., 2023). The approach effectively motivates students, thus, encouraging a positive outlook on collaborative methods in educational settings (Nwafor et al., 2023). Additionally, student perceptions, which may differ based on gender, can influence learning engagement and academic outcomes, highlighting the diverse nature of learners in a given learning environment.

Existing literatures have contrasted between individualized instruction and collaborative learning (CLA), revealing that while self-motivated students tend to embrace independent learning, CLA yields higher achievement levels among students (Salma, 2020). Individualistic learners, on the other hand, focus on personalized goals and self-directed exercises, which can limit social interaction and feedback inherent in CLA settings (Sartain, 2018). Nevertheless, studies by Kubat (2015) and Tong (2022) suggest that students who prefer working independently demonstrate improved knowledge and performance. To this end, the effectiveness of pedagogical approaches can vary amongst students. Based on these contrasting reports, the current study explored students' perceptions of CLA and how demographic factors influence these perceptions in basic education contexts.

Literature Review

Theoretical background

Social cognitive theory of learning (Bandura, 1977)

Perception constitutes a multifaceted cognitive phenomenon that generates a distinctive representation of the world, which may differ

from objective reality. Social Cognitive Theory (SCT) explains the interrelationship among leaner behaviour, the environment, and learner characteristics in a triadic framework. This theoretical construct discusses individuals' responses as a function of these interrelated elements. In educational research, SCT offers a conceptual foundation for defining the mechanisms by which students acquire knowledge in the classroom. This theory posits that individual experiences, the conduct of others, and environmental variables significantly influence personal learning behaviors. Based on this theory, students' learning behaviours and their perceptions can be modulated through social interactions with peers within a collaborative learning context.

Social interaction can influence students' engagement in the classroom. The active participation of students in CLA is regarded as a critical indicator of their cognitive engagement (Fan & Dai, 2021), and underscores the necessity of social interaction and communicative exchanges in facilitating successful collaborative learning outcomes. Students' environment in the context of this study, encompasses their educational settings, family dynamics, and interactions with their peers. Consequently, the principles of SCT serve as a foundational framework that underpinned the present study.

Students' perception of innovative methods of teaching

Variations in perceptions on the use of CLA could differ amongst students in the same learning environment. Razman, Javaid, and Ali (2023); and Crisiantita and Mandasari (2022) concurred that students possess predominantly positive and favorable perceptions concerning the use of CLA. They linked their assertions to various factors such as learning opportunities, constructive feedback, and students' awareness of other advantages associated with collective learning experiences. Conversely, students who maintain individualistic and autonomous learning preferences tend to favour independent project execution (Kubat, 2015; Kilarkaje et al., 2019). Kubat and Kilarkaje maintained that how an individual engages with learning constitutes the optimal approach for that learner. This implies that learning style should not be perceived as a deficit but rather as an enhancement to pedagogical strategies. The present study therefore, focused on explaining students' perceptions regarding the utilization of CLA in the classroom.

Demographic variables and students' perception

Research indicates that students' perceptions of CLA differ by demographics, as highlighted by studies from Zhou et al., (2019) and Al-Quasham et al., (2022), who maintained that Male students tend to view CLA more positively than female students, showing their preference for dynamic and heterogeneous groups. However, female students prioritize

the quality of learning in a collaborative setting, while male students focused more on opportunities for improvement (Ahmadi et al., 2021). Similarly, female students exhibited stronger engagement in collaborative tasks, while male students were more engaged in less collaborative behaviours (Feng et al., 2023). Studies by Wokocha & Allen, (2021); Nwafor et al., (2023) Suaco et al., (2023) observed no significant gender differences in perceptions of CLA, indicating that the relationship between gender, birth order, and students' perceptions of CLA remains complex and context-dependent.

According to Menchak et al., (2022), the sequence of birth exerts an influence on the perceived academic performance among students, with firstborns, middle-borns, and last-borns demonstrating distinct academic outcomes. Nevertheless, within the African-American demographic, female firstborns articulated elevated perceptions of educational opportunities in comparison to their male counterparts. In a similar vein, middle-borns expressed more pronounced sentiments regarding sibling cohesion when contrasted with their youngest siblings, thereby revealing a sophisticated comprehension of family dynamics (Michele et al., 2016). While birth order may affect individual perceptions and experiences, its overarching influence appears to be constrained when juxtaposed with other variables such as gender.

In conclusion, existing literatures revealed a divergence in the perceptions of the CLA between male and female students, notwithstanding its evident advantages. More so, studies (Kunwar, 2020; and Robinson & Lee, 2023), have revealed the potential influence of demographic variables on students' perceptions and preferences regarding pedagogical approaches. Nevertheless, there is a lack of consensus on this specific issue. The majority of the existing studies predominantly utilized qualitative research design in their approaches, especially among students in higher education, leaving a paucity of studies addressing the same issues among students in basic education in Nigeria. Moreover, there has been no investigation dedicated to explaining how demographic variables such as gender, birth order, and family size, affect students' perceptions of the CLA. To address these identified gaps, the current study aimed to ascertain;

1. Students' perception about the use of CLA in learning Basic Science
2. Male and female students' perception about the use of CLA in learning Basic Science
3. Frequency and percentage of students' perception of CLA based on their family birth order
4. Level of significance of male and female students' perception about the use of CLA in learning Basic Science

5. Level of significance of students' perception of CLA based on their family birth order in learning Basic Science

Methods

Study design

To explore students' perceptions regarding the utilization of CLA and the influence of some demographic variables, the present study employed a cross-sectional descriptive survey design. The survey research design explains one or more attributes of a particular demographic group (Pandey, 2024). This design explains critical insights into a collective's attitudes, behaviours, beliefs, and demographic characteristics. Following this design, questionnaires serve as effective instruments for data collection due to their reliability, validity, and generalizability (Fraenkel, et al., 2012).

Population and sampling

The sample size of the study was made up of 200 (male = 108 {54%}; female = 92 {46%}) basic education students in public secondary schools in Awka Metropolis. They were obtained from three intact classes in three different local governments in the study area using the Taro Yemane formula.

Instrumentation and Collection of Data

The instrument for data collection was a structured questionnaire. It was assembled by the researchers after a thorough review of the literature. The instrument was made up of 9 item statements rated on a 4-point Likert scale with 4 numerical values: 4 (strongly agree); 3 (agree), 2 (disagree), and 1 (Strongly disagree). The questionnaire was structured to reflect students' perceptions of the use of CLA in the classroom. The instrument was subjected to validation by three experts. The recommendations of the experts were incorporated leading to the final copy of the questionnaire. The instrument using the Cronbach Alpha reliability formula; yielded a coefficient value of .746, which accounts for the reliability of the agency. This data was collected at the end of the 3rd term of the 2023/2024 academic session.

Statistical technique

To obtain the participants' demographics, a Statistical Package for Social Science (IBM SPSS v27) was used by applying descriptive statistics methods i.e. mean, standard deviation, frequency and percentage to answer the research questions. Meanwhile, the hypotheses were tested using an independent sample t-test and analysis of variance (ANOVA).

Demographic information

Variables	Subgroup	Freq.	%
Gender	Male	108	54%

	Female	92	46%
Students' birth order in the family	1st Born	64	32%
	2nd Born	54	27%
	3rd Born	41	20.5%
	4th Born	17	8.5%
	5th Born	9	4.5%
	6th Born	8	4%
	7th Born	4	2%
	8th Born	3	1.5%
Number of household members	1-2 persons	7	3.5%
	3-4 persons	51	25.5%
	5-6 persons	82	41%
	7 or more persons	60	30%
		200	**100%**

Table 1: distribution of the study subjects according to individual characteristics

The study found that most students in Awka Education Zone had a positive perception of the use of CLA, citing its ability to help students express their ideas, understand Basic Science concepts, develop problem-solving skills, improve teamwork, and express ideas comfortably. However, some students had a negative perception.

		Male			**Female**		
s/n	**Statement**	$\overline{X}$	**SD**	**Remark**	$\overline{X}$	**SD**	**Remark**
1	My teacher encourages me to participate in group work in the class.	3.00	1.10	Negative	3.01	.97	Negative
2	My teacher provides opportunities for us to share our ideas and thoughts during lessons.	3.31	0.90	Positive	3.04	1.09	Negative
3	Collaborative learning activities in the classroom help me understand Basic Science concepts well.	3.32	0.73	Positive	3.38	.70	Positive
4	I learn more from my peers through collaborative learning activities	3.14	0.93	Negative	2.99	.92	Negative

	during Basic Science classes.						
5	Collaborative learning activities in Basic Science classes help me develop problem-solving skills.	3.26	0.64	Positive	3.15	.78	Positive
6	I think collaborative learning is an effective way to learn Basic science.	3.33	0.65	Positive	3.24	.94	Positive
7	Collaborative learning activities in Basic Science helped me develop teamwork and communication skills.	3.42	0.77	Positive	3.36	.92	Positive
8	I feel comfortable expressing my ideas during group activities.	3.21	0.82	Positive	3.07	.92	Negative
9	I prefer studying Basic Science alone rather than in a group.	2.70	1.17	Negative	2.66	1.18	Negative
	Weighted Mean	**3.18**	**0.85**	**Positive**	**3.10**	**0.93**	**Negative**

Table 3: Male and female students' perception of CLA in the classroom

		Male			**Female**		
s/n	**Statement**	$\overline{X}$	**SD**	**Remark**	$\overline{X}$	**SD**	**Remark**
1	My teacher encourages me to participate in group work in the class.	3.00	1.10	Negative	3.01	.97	Negative
2	My teacher provides opportunities for us to share our ideas and thoughts during lessons.	3.31	0.90	Positive	3.04	1.09	Negative
3	Collaborative learning activities in the classroom help me understand	3.32	0.73	Positive	3.38	.70	Positive

	Basic Science concepts well.						
4	I learn more from my peers through collaborative learning activities during Basic Science classes.	3.14	0.93	Negative	2.99	.92	Negative
5	Collaborative learning activities in Basic Science classes help me develop problem-solving skills.	3.26	0.64	Positive	3.15	.78	Positive
6	I think collaborative learning is an effective way to learn Basic science.	3.33	0.65	Positive	3.24	.94	Positive
7	Collaborative learning activities in Basic Science helped me develop teamwork and communication skills.	3.42	0.77	Positive	3.36	.92	Positive
8	I feel comfortable expressing my ideas during group activities.	3.21	0.82	Positive	3.07	.92	Negative
9	I prefer studying Basic Science alone rather than in a group.	2.70	1.17	Negative	2.66	1.18	Negative
	Weighted Mean	**3.18**	**0.85**	**Positive**	**3.10**	**0.93**	**Negative**

Table 3: Male and female students' perception of CLA in the classroom

Table 3 shows contrasting views on the use of CLA among male and female students. Female students have a generally negative perception, while male students have a positive perception. This implies that CLA appeals more to male students in Basic Science, while female students do not find it conducive or comfortable.

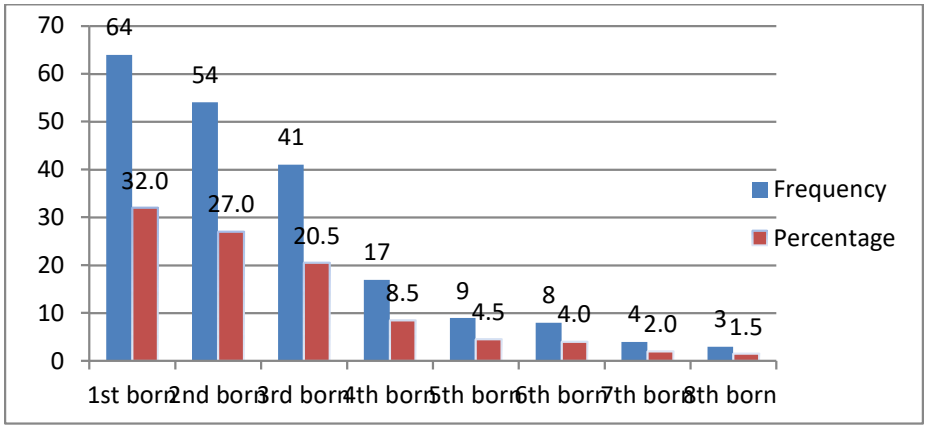

Figure 1 Frequency and Percentage distribution of students' Perceptions based on their Birth Order in the family

Based on the student's birth order, Figure 1 shows the frequency and percentages of how they perceived CLA in the classroom. According to the table, students who are first-born, accounting for 32.0% (64), of the study sample, had the highest perceptions of CLA in the classroom. Those who were second-born (27.0%), third-born (20.5%), fourth-born (8.50%), fifth-born (4.50%), and so forth followed accordingly. This revealed a descending order among students in their perception of CLA, which suggests that the frequency and percentage of student's perception of the use of CLA in the classroom decreases with an increase in their birth order.

Hypothesis 1: There is no significant difference in the perception of male and female students toward the use of CLA in the classroom

Independent Samples Test

		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**$\overline{X}$ Diff.**	**Std. Error Diff.**	**95% Confidence Interval Diff.**	
									Lower	**Upper**
Perception x Gender	Equal var. assumed	3.585	.060	1.29	198	.183	.79	.61372	-.51233	1.837
	Equal var. Not assumed			1.26	170.1	.181	.79	.62613	-.51233	1.837

Table 4: independent t-test of difference in perception about collaborative learning approach based on gender

Table 4 shows that an independent sample t-test was conducted to compare male and female students' perceptions regarding the use of CLA in Basic Science classrooms in Awka Metropolis. The table shows that there is no significant difference (t(198) = 1.29, P = .060) in the scores of males (M = 27.90, SD = 4.88), and females (M = 28.69, SD = 3.78), although the female show more mean perception than the male. The magnitude of the difference in means (mean difference = .79, 95% CI -.51233 to 1.83793) was not significant. Thus, H1 was not rejected, meaning that there is no significant difference in the male and female students' perception of the use of the collaborative learning approach in the classroom.

Hypothesis 2: there is no significant difference in the perception of students toward the use of CLA in the class and the number of family members in their homes.

	Sum of Squares	**Df.**	**Mean Square**	**F**	**Sig.**	**Decision**
Between Groups	9.341	3	3.114	.164	.921	*Not Significant*
Within Groups	3726.879	196	19.015			
Total	**3736.220**	**199**				

Table 5: ANOVA test of significance between students' perception of CLA and the number of members in their family

Participants were divided into four groups (group 1: 1-2 members; group 2: 3-4memebr; group 3: 5-6 members; group 4: 7 and above). The ANOVA result suggests that there is no evidence that students' birth order in the family influences their perception of CLA in the classroom *(F = .164; p = >0.05)*. This implies that irrespective of a student's birth order in the family, their perception of CLA remains the same. Therefore, there is no evidence that birth order influences how students perceive the use of CLA in the classroom.

Discussion

The study investigated students' perception towards the use of the collaborative learning approach (CLA), and the interplay of some demographic variables. Research questions and hypotheses that guided the study were answered and tested respectively.

The first question in table 2 addressed students' perceptions on the use of CLA in the classroom. The finding revealed that about 85% of the students in the study area had a positive perception toward the use of CLA. This outcome explains their awareness of the approach and the prospect the learning method holds in enhancing peer interaction and the formation of community in the classroom. The outcome also explains a strong sense of togetherness in completing assignments and interactive learning among students (Laal, 2015). The finding is in agreement with

Razman, Javaid and Ali, 2023; Crisianita and Mandasari (2022) that students exhibit positive and favourable views of CLA. However, the finding is in disagreement with (Kubat, 2015; and Kilarkaje, *et al., 2019*) on independent and individualistic learning.

Table 3 sampled the perception of male and female students toward the use of CLA in learning basic science. The findings showed that male students perceive the use of CLA positively unlike their female counterparts with a general negative perception. This could mean that learning activities and opportunities provided in CLA favoured males more than females. This could also mean that male students were more comfortable sharing ideas than the female in the classroom. This finding is in line with Zhou *et al.,* (2019; & Alqasham, *et al.,* 2022), who observed that male students significantly have more general positive perception of CLA compared to female students. However, the negative perception of female students could be attributed to some factors such as possible evidence of unequal distribution of collaborative learning workload and possible stereotype threat in the classroom. Moreover, female students may have preferred independent learning, experienced higher levels of academic stress or had difficulty with ambiguous or open-ended tasks.

More so, the observed contrasting perceptions toward the use of CLA among male and female students were subjected to hypothetical testing. The result of the independent sample t-test in table 4, revealed that male and female students' perceptions toward the use of CLA are not significant. This implies that there is no evidence that gender influences the perception of students toward the use of CLA in the classroom. Despite the observed variations in their mean scores, the difference between male and fenale students was not significant. This outcome agrees with Wokocha & Allen (2021); Nwafor, *et al.,* (2023); & Suaco, *et al.,* (2023) that no significant difference exists between males and females in their perception of CLA.

Table 5 showed student's birth order in the family and their perception of CLA in the classroom. The finding revealed an interesting trend that the frequency and percentage of students' perception towards the use of CLA in the classroom decreases with an increase in their birth order. Students who identified as 1st born, 2nd born and 3rd born perceived the use of CLA in the classroom more, compared to those with later birth order in the family. This could mean that students who are 1st born experience more attachment to activities with collaborative tendencies. Also, compromised teacher guidance and family orientation and dynamics could have necessitated this observation in the study area. Students who are older in birth order may have more responsibility leading to less collaboration, unlike those of the firstborn who enjoy increased parental attention leading to collaboration. However, the

ANOVA test of significance in table 5 revealed that this observation was not significant. Therefore, there is no evidence that students' birth order in the family influences their perception of CLA in learning basic science. The finding disagrees with Menchak *et al.,* (2022).

Conclusion

Based on the findings of the study, we can conclude that positive perception of the use of CLA exist among students, with male students expressing more positive views compared to females. Despite the differences, it was found statistically insignificant. Additionally, as students' birth order increases, their perception of CLA declines, yet no significant correlation was found between students' perception and their birth order.

Limitation and Future Direction

As with all studies, the present study is not without pitfalls and shortcomings. The study acknowledges its limitations, particularly the small sample size, which restricts the generalizability of its findings. The participants were primarily second-year basic education students, suggesting a need for future research to include larger sample size, involving diverse populations, such as high school or college students. Additionally, subsequent studies should explore the impact of other demographic variables such as socioeconomic status, and family structure, on students' perceptions of CLA. Longitudinal studies are also needed to assess the effects of birth order and other demographic factors on collaborative learning.

Ethics statement

Participants gave their consent for participation in the study.

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Conflict of Interest

The authors declare no conflicting or competing interests.

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