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EXPLORING THE IMPACT OF HOMOGENEOUS AND HETEROGENEOUS ABILITY GROUPING ON UNDERGRADUATES ACADEMIC PERFORMANCE

Dr. Tunji Henry Ogunyebi

Department of Science Education,
Bamidele Olumilua University of Education,
Science and Technology, Ikere Ekiti, Nigeria.
E-mail-ogunyebi.tunji@bouesti.edu.ng
https://orcid.org/0000-0002-7378-6679

Abstract

This paper examined the relative impact of heterogeneous and homogeneous ability grouping on undergraduates in Ekiti, Nigeria. The study adopted a pre-test, post-test, control group quasi-experimental design. Three null hypotheses were generated and tested at 0.05 level of significance. The sample consisted of 120 Science Education students selected from 200 Level (2023/24 session) through purposive sampling technique. The instrument that was used for the study was Science Education Achievement Test (SEAT). Expert judgments were used to ensure face and content validity. Test-retest method was used to determine the reliability and reliability Coefficient of 0.82 was obtained. The data were analyzed using inferential statistics of t-test. The study found out that there was no significant difference between the posttest means scores of students in the two homogeneous and heterogenous ability groups respectively after exposure to treatment. It was also revealed that there was a significant difference between the posttest means scores of students in the homogenous and heterogeneous ability group after exposure to treatment. Based on this finding, it was recommended among other things that the University management should organize seminar among lecturers of the institution on effective use of group interaction strategies in their various departments among others.

Keywords- Ability Grouping; Achievement; Heterogeneous; Homogeneous; Undergraduates

Introduction

The importance of science and technology to national development in the life of any country cannot be overemphasized. This is because knowledge and skills in science and technology are very vital in the development of any society. The future of our society will be determined by citizens who are able to understand and help in reshaping the complex influences of Science and technology in our world. Technological change does not happen in a vacuum; decisions about which technologies to develop and use engage ideas about values. In order to influence the development of technology for the better, we must first understand how technology and

society are inextricably bound together.(Johnson, & Wetmore, 2021).Similarly, Bibri (2022) asserted that science and technology push the boundaries of knowledge and have profound and significant effects on society, showing how social reality changes with every global period. The connections between scientific knowledge, technical systems, and values and ethics from a variety of viewpoints are at the heart of the methodical investigation of science and technology. With the ever-changing world of technology, classrooms are gaining more technology and having to incorporate it into student learning. Although technology can benefit student learning, it can also be detrimental to the educational process.

Technology enhances many learning opportunities and allows for student comfort but can also be a tool that is too heavily relied on and can potentially effect student fine motor development and problem-solving skills (Carstens, Mallon, Bataineh, & Al-Bataineh, 2021). As a result, the sciences are the focus of Nigeria's educational policies and initiatives. Understanding the topics and methods that science studies is essential to comprehending many of the problems facing contemporary society, including new technology and sustainable development. Higher education institutions' involvement in an endeavor to adopt a more appropriate role as conductors of sustainable development is becoming increasingly critical (Neves, Soveral, Pereira Morais, & Lima, 2024).

As observed by the researcher, a survey of the undergraduate results in Science Education in some universities in Ekiti State for two sessions (2022-2023) revealed that students' performance had been on the decline. This could be a reflection of the fact that the students have not demonstrated the necessary cognitive reasoning skills needed for good performance or science classrooms are becoming more diverse with differences in terms of learning environment, students' background, students' interest and abilities. Most studies have laid much emphasis on other teachers and students factors, not considering students' ability and characteristics.

Ability grouping, simply put, is the practice of dividing students for instruction on the basis of their perceived capacities for learning. It is the practice of placing students of similar academic level within the same group for instruction. Researchers have struggled for years to find answers to the questions about ability grouping. Does anyone benefit from it? Is anyone harmed by it? Who benefits or is harmed the most? The answer is always clear-cut and often depends on whom you ask and what learning outcomes are deemed important. Kulik and Kulik's meta-analysis in Allan,(1991) address a number of important issues about ability grouping for academic instruction. Important topics include how adults view grouping, how gifted children serve as role models for other students, and how grouping affects teacher expectations and student behaviour. Others believe that the practice should be abandoned since it has negative effects. For many years, the topic of heterogeneous/homogeneous grouping has been a significant concern. First of all, the selection of pupils based on success, ability, or other characteristics has been referred to by a variety of names. Basically, 'streaming', 'tracking' and 'setting' have been used to express selection of students on the basis of achievement and frequently 'ability grouping' has come to be used more than 'homogenous grouping'

Homogeneous grouping is the distribution of students, who function at similar academic, social, and emotional levels, being placed in the same cooperative learning

group together. For example, children who are deemed at-risk or with special needs are placed in one group, while the gifted and talented students are placed in another while heterogeneous grouping is when a diverse group of students is put in the same cooperative learning group. Students of different ages, educational backgrounds, interests, special needs, etc., may make up this mixed group. Although they are roughly the same age, the academic, social, and emotional functioning of the students varies. In addition to sharing their distinct skills and interests, this approach to heterogeneous grouping enables students to actively engage with other people and learn from one another's diversity.The argument between homogeneous and heterogeneous classroom grouping, as presented by Beronilla & Natividа (2025), has long been a major topic of discussion in the field of education. According to their research, the foundation of inclusion which has many advantages in terms of equality, social interaction, and diverse learning environmentsis heterogeneous grouping.

Classes that are heterogeneous that is, where students have different skills, backgrounds, and learning styles really mirror the actual world and should help students get ready for teamwork and society. Conversely, homogenous grouping, in which pupils are grouped based on perceived aptitude or success levels, restricts peer learning possibilities, maintains academic and social stratification, and perpetuates inequality. According to Ma, Li, Tang, Zhang, Liu, and Jiao's (2022) thesis, learning from peers with varying skill levels improves cognitive growth and peer-assisted learning for both advanced and extra assistance learners. Additionally, inclusive heterogeneous classrooms foster empathy, social cohesiveness, and respect for one another all of which align with the broader educational objectives of inclusive education and holistic development.

Grounded in Vygotsky's Zone of Proximal Development, Mixed-ability classroom and Ability-based sectioning Approach, Five Pillars of Cooperative Learning by Johnson, Johnson & Smith, Collaboration and Peer Learning, and Social and Emotional Development, the argument points out that learning from peers of different abilities has the effect of enhancing cognitive development and peer-assisted learning for both advanced and additional support learners.

According to McGillicuddy and Devine (2020). It is impossible to overstate the influence of how educators "do" teaching and how students "do" learning. Global and local policy imperatives continue to support ability grouping as a "effective" pedagogical tool for meeting the diverse needs of children, particularly in the areas of literacy and numeracy, despite research showing that it negatively affects children's academic and social learning experiences in the classroom. They argued that this is a symbolically violent process that negatively impacts the psychosocial positioning of children as they negotiate their identities within the figured world of the primary school classroom. This in turn influences their learner identities, as well as their perceptions of their ability to learn.

Ability grouping's detractors claim that it is only another kind of racial segregation because it divides kids based on both race and socioeconomic status. However, proponents of ability grouping claim that by enabling teachers to more effectively adapt the pace and content of instruction to students' requirements, the technique raises student accomplishment. According to Brandt, Lechner, Tetzner, and Rammstedt (2020), cognitive capacity and personality qualities are known indicators of academic success. However, how reliable and broadly applicable are the correlations between

performance, cognitive capacity, and personality? expanding on theoretical claims that the demands and opportunities for trait expression in the learning environment should influence the relationship between traits and performance. The high-ability students maintain interest and incentive in homogeneous group but they languished when grouped with the slow- learners while opponent of ability grouping contend that ability grouping not only fails to benefit any student as it also channels poor and minority students to low tracks where they receive a lower quality of instruction than their groups and contributes to a widening of the achievement gap.

It also showed that there is a concern that low-ability children will be denied learning chances and demotivated to learn due to peer, personal, and teacher expectations of subpar performance if they are placed in homogeneous groups. In their study paper, Yu, Kreijkes, and Salmela-Aro (2022) investigate the pervasive practice of ability grouping in educational institutions across many nations, examining its effects on academic achievement and implications for equity among math students. However, other academics believed that it was unethical to slow down the progress of high-ability kids by placing them in diverse group classrooms where they might be more interested in teaching other students than in learning new material. For instance, Alam and Mohanty (2023) look into the widespread practice of ability grouping in educational institutions across various countries, analyzing its implications for equity among math students as well as its consequences on academic achievement. The findings demonstrate how urgently educational systems must give up ability grouping and switch to other pedagogical approaches that support growth mindsets, equitable chances, and inclusive education for all kids. This article's ramifications go beyond the immediate issues facing educational institutions, school associations, and proponents of mathematical education. In particular, the knowledge gained from this study has important implications for the broader development of teenagers and young people.

The research on ability grouping, particularly its effects on performance is quite extensive. Several meta-analyses and research syntheses have been conducted and a number of literature reviews have been published. Research reports suggest the effect of ability grouping on student performance depend on the type of grouping arrangement. It was generally revealed that the homogeneous ability groups achieve more than the heterogeneous group in studies that directly compare the two. In their article, Wing, Lam, and Chung (2008) showed that, contrary to what most ability grouping research has demonstrated, better achievement can be achieved through collaborative work among peers of the same level of competence rather than solely through the unidirectional assistance of a more capable peer or expert. According to Vygotsky's (1978) theory of thought and language, the meanings of words are created through the historical development of interpersonal relationships as well as via interactions with the outside world and society at large. This suggests that a child must engage in what has been called meaningful interaction—interacting with a more capable member of society to get assistance—from the very beginning of life in order for growth to take place. The important point about this is that it does not only help the weaker accomplish the task at hand, but also enables the child to perform the task independently. Therefore, in order to benefit from interactions and exchanges, the low ability learners need to communicate with someone who has sufficient proficiency in the subject to ensure that the input is not just at the learner’s level, but at times, slightly beyond it.

Although Vygotsky's research concentrated on children's cognitive development, Van Lier (2014) contends that the theory applies to all learning and to both symmetrical (i.e., equal-ability) and asymmetrical (i.e., expert-novice) groupings. The AAA principle highlights the significance of Awareness, Autonomy, and Authenticity in language learning and instruction. It suggests that these three components are essential for successful language learning, going beyond conventional methods to emphasize a more comprehensive and learner-centred experience. Students can gain knowledge from instructing others in this way. The act of teaching or explaining to others may help low ability learners develop their knowledge and internalize what they learnt before. There is controversy over the issue as grouping may be based on imperfectly measured ability, informal grouping, vague interpretation of terms, survey instruments that fail to discriminate ability and tracking, allocated resources, extent of grouping and the curriculum. Responding to growing concern over ability grouping, schools have introduced some alternative methods of delivering instruction, such as cooperative learning (which presumes heterogeneous learning groups).

Considering Suryawan, Payadnya, and Jayantika (2025). Research on heterogeneous group design in mathematics education and empirical data comparing the effects of homogeneous and heterogeneous groups on students' problem-solving skills (PSA) are currently lacking. Although PSA is an essential mathematics talent, it is nevertheless challenging to achieve it through effective group design. This study closes this information gap by investigating how homogeneous group designs affect PSA among Denpasar high school students. 120 students were randomly assigned to six distinct teaching sessions in a quasi-experimental one-group pretest-posttest approach. Data from the pretest and posttest were analyzed using paired sample t-tests to assess changes in PSA.

The analysis focused on problem understanding, planning, implementation, and reflection. The findings revealed a significant improvement in PSA scores with homogeneous groups, suggesting that grouping students by similar ability levels enhances peer interactions and instructional support more effectively than heterogeneous group designs. Teacher and student interviews corroborated these results, highlighting more equitable participation and tailored learning experiences in homogenous settings. While this study underscores the benefits of homogeneous grouping in improving problem-solving abilities (PSA), it also identifies the need for integrating diverse instructional media. Future research should examine the impact of various educational technologies.

According to studies by Mesghina, Hong, and Durrell (2024), cooperative learning is beneficial for structuring instruction to increase student involvement and achievement. It's still unclear, though, if students benefit more from classmates with comparable or higher levels of prior knowledge. In a similar vein, it's critical to differentiate between individual learning and group performance. Finally, the significance of group composition may be clarified by students' perceptions of the value of cooperative learning, group dynamics, and self-concept. 139 university students with relatively little (LPK) or high (HPK) prior statistics knowledge participated in a mixed-methods experiment in five introductory statistics sessions. Throughout the term, students completed activities in homogeneous (all LPKs) or heterogeneous (at least one HPK) groups that were randomly assigned within the class. Few academic interventions

for gifted students have produced more empirical support than acceleration and ability grouping, according to Missett, Brunner, Callahan, Moon, and Price Azano (2014). Formative assessment is promoted as a tool that teachers can use to properly incorporate accelerative practices and ability grouping into the classroom. However, formative assessment, ability categorization, and accelerative methods are not often put into practice despite their scientific backing. This qualitative study aimed to investigate how teachers' use of formative assessment, ability grouping, and accelerative activities was impacted by their expectations about students' abilities. The results show that teachers' adoption of best practices in pacing and grouping tactics is supported by the availability and implementation of formative evaluations as well as high teacher expectations about student abilities.

In a study published in 2015, Adesoji, Omilani, and Nyinebi examined the impact of both homogeneous and heterogeneous gender pairing cooperative learning methodologies on secondary school students' chemistry achievement. Three hypotheses were examined at the 0.05 level of significance, with mental capacity serving as the moderating variable. The study used a quasi-experimental, pretest-posttest, control group methodology. From six schools—two mixed schools, two boys' only schools, and two girls' only schools—a total of 300 children were chosen at random. Students' Chemistry Achievement Test (SCAT), Students' Mental Ability Test (SMAT), and periodic table lecture notes were the tools utilized in the study. According to Aluvalu, Kulkarni, and Asif's (2017) research, students in classrooms at educational institutions have a range of learning capacities. In such classes, instructors who deliver lectures in a uniform pitch will not be able to instruct and meet the learning levels of diverse student groups. Based on assessments, teachers intentionally work with low, middle, and high learners/readers in each classroom. In actuality, it is the largest obstacle faculty members must overcome. Faculty following traditional teaching techniques fails to achieve optimized classroom audibility levels and optimize the students learning in the classroom. With faculty's uniform approach to teaching, the learning needs of individual students may not be fully met in heterogeneous classroom environments. The teaching strategies followed to optimize the learning of heterogeneous students with experimental results and handling such classrooms are discussed in this paper. This study will help faculties wishing to improve the quality and effectiveness of teaching and learning in heterogeneous classrooms.

Cotě, Doz, Zuljan, Türakelj, & Felda (2023) evaluated the effectiveness of classifying students into homogeneous or heterogeneous groups based on their experience with an individual kind of differentiation. Thus, seven factors were taken into account in the study: (1) learners' motivation and learning performance; (2) learners' activity; (3) didactic methods of adapting instruction to diverse learners; (4) the impact on learners' personality formation; (5) cooperation among learners; (6) opportunities for professional development; and (7) cooperation with parents. The research has shown that there is a statistically significant difference between the teachers who teach in homogeneous groups and the teachers who teach in heterogeneous groups in all the seven aspects of the appraisal of the efficiency of grouping learners into homogenous or heterogeneous groups. Regarding most of the assertions, teachers belonging to both groups perceive the way of teaching they perform as having the most advantages.

Wang (2013) claims that both homogeneous and heterogeneous grouping strategies have an impact on college-level students' learning in cooperative learning environments. The following are the main conclusions: (1) Heterogeneous grouping based on ability has a greater positive impact on student achievement and satisfaction; (2) studies based on race and culture cannot consistently draw conclusions about the effects of grouping; (3) learning styles are more positively impacted by heterogeneous grouping based on learning styles than student achievement; and (4) studies based on personal characteristics support heterogeneous grouping, although experiment results varied.

Overall, heterogeneous grouping is more beneficial for student achievement as well as student satisfaction than homogeneous grouping. It is in lieu of these, that the researcher considered the relative effects of heterogeneous and homogenous ability grouping on the academic performance of undergraduates studying Science Education in Ekiti State, Nigeria.

Statement of the Problem

Some Nigerian undergraduates have been reported to perform below expectation on multiple occasions. Another reason why many students' performance in higher education is viewed as poor is because of ineffective teaching strategies that discourage students from actively participating in lectures. Pupils may do poorly and assimilate less if they merely listen to lectures without paying attention or are distracted. Additionally, the researcher noticed that certain pupils differed in their cognitive capacities, learning preferences, and patterns of interaction. These circumstances appear to have a variety of consequences on how well science is taught and learned.
It is against these mentioned observations that this research was carried out to investigate the relative effects of heterogeneous and homogeneous ability grouping on the academic performance of undergraduates studying Science Education in Ekiti State, Nigeria.

Research Objectives

The purpose of this study was to examine the relative effects of heterogeneous and homogeneous ability grouping on undergraduate academic performance and to determine which of the grouping methods would produce higher effect on students' performance scores in Science Education.

Hypotheses

To achieve the objectives of the study, the following hypotheses were formulated:
Ho_1 There is no significant difference between posttest means scores of students in the homogeneous and homogeneous ability groups after being exposed to treatment.
Ho_2 There is no significant difference between posttest means scores of students in the heterogeneous and heterogeneous ability groups after being exposed to treatment.
Ho_3 There is no significant difference between posttest means scores of students in the homogeneous and heterogeneous ability groups after being exposed to treatment.

Methodology

The study is a pretest-posttest and control quasi-experimental design. The two groups control for the other. The population of the study consisted of all the Science Education Students in the universities in Ekiti, Nigeria, who are in the second years of study (200Level) for 2022/2023 academic session. They are made up of boys and girls from the department. The total number of 200Level for the session is 346 students. The samples were 120 students selected through multistage sampling procedures. The first stage involved using purposive sampling technique to select 200Level students, because 300&400Level were on Teaching Practice at the time of research. The second stage involved the use of proportional sampling to select based on the population of each school, while gender is taken into consideration. The researcher assigned students to two ability levels. In order to study the effects of ability grouping, students were selected through purposive sampling technique of 60 students per ability level. Their second semester 200Level results (CGPA) was the criteria for purposive sampling. The students were placed in three groups. The first group consisted of students in homogenous class ability level group while the second group consisted of the students in a heterogeneous ability level and the third group consisted of the students in a homogeneous and heterogeneous ability level. One instrument named Achievement Test in Science Education(ATSE) that cover all the content of the chosen topics used as achievement test was used for the study. To ensure the face and construct validity of the instrument, the instrument was subjected to screening by experts in test and measurement; the final drafts were based on their comments and suggestions. The reliability of the instruments was established through test- retest method. The instrument was administered twice in an interval of two weeks on 25 students that were not part of the study. The scores correlated yielded the reliability co-efficient of 0.82, which was considered appropriate.

Results

Ho_1: There is no significant difference between posttest mean scores of students in the homogeneous and homogenous ability groups after being exposed to treatment.

Table 1: Independent t-test Posttest Mean Scores of students in the homogeneous and homogenous ability groups after being exposed to treatment

Homogeneous Group	N	Mean $\bar{x}$	Std. Dev.	df	t	p-value	Remarks
1st Group	30	48.61	6.266	9	3.444	0.069	Not Significant
2nd Group	30	50.27	8.145				

Table 1 shows that there is no significant difference between posttest mean scores of students in the homogeneous and homogenous ability groups after being exposed to treatment. ($t = 3.444$, $p > 0.05$). This means that the t-value is not significant at $p > 0.05$. The result ascertains the equivalent ability of the students in the two groups after the treatment.

Ho_2: There is no significant difference between posttest mean scores of students in the heterogeneous and heterogenous ability groups after being exposed to treatment.

Table 2: Independent t-test Posttest Mean Scores of students in the heterogeneous and heterogenous ability groups after being exposed to treatment

Heterogeneous Group	N	Mean $\bar{x}$	Std. Dev.	df	t	p-value	Remarks
1st Group	30	35.57	8.042	9	2.332	0.062	Not Significant
2nd Group	30	37.12	8.221				

Table 2 shows that there is no significant difference between posttest mean scores of students in the heterogeneous and heterogenous ability groups after being exposed to treatment. ($t = 2.332$, $p > 0.05$). This means that the t-value is significant at $p = 0.05$. The result ascertains the difference in the ability of the students in the two groups after the treatment.

Ho_3: There is no significant difference between posttest mean scores of students in the homogeneous and heterogenous ability groups after being exposed to treatment.

Table 3: Independent t-test Posttest Mean Scores of students in the homogeneous and heterogenous ability groups after being exposed to treatment

Group	N	Mean $\bar{x}$	Std. Dev.	df	t	p-value	Remarks
Homogenous	60	36.80	8.041	9	0.242	0.015	Significant
Heterogenous	60	54.71	11.173				

Table 3 shows that there is significant difference between posttest mean scores of students in the homogenous and heterogeneous ability groups after being exposed to treatment. ($t = 0.242$, $p < 0.05$). This means that the t-value is significant at $p = 0.05$. The result ascertains the equivalent ability of the students in the two groups after the treatment.

Discussion

The research on ability grouping, particularly its effects on performance is quite extensive and improves performance. This was corroborated by Wing, Lam, & Chung (2008) who demonstrated in their article that better achievement can be obtained through collaborative work among peers of the same level of competence and not only through the unidirectional help of a more capable peer or expert, as the majority of

research on ability grouping have shown. However, it was proven that classroom learning was more successful for proficient students in the homogenous and heterogeneous group. This was supported by Cotě, Doz, Zuljan, Türakelj, & Felda (2023) who evaluated the effectiveness of classifying students into homogeneous or heterogeneous groups based on their experience with an individual kind of differentiation. This can be explained from a socio-cultural perspective too. Vygotsky (1978) in his theory of learning argued that, from the very beginning of life, for development to occur, a child needs to interact with a more able member of society to receive assistance, which has been referred to as meaningful interaction. The important point about this is that it does not only help the weaker accomplish the task at hand, but also enables the child to perform the task independently (Greenfield, 2002). Consequently, it can be that low ability students have improved more through interaction with their more capable peers. Jayantika, Payadnya, & Suryawan,. (2025) also reiterated that to benefit from interactions and exchanges, the Low ability learners need to communicate with someone who has sufficient proficiency in the subject to ensure that the input is not just at the learner's level, but at times, slightly beyond it. Therefore, the researcher came into this perception that the students with a lower ability needs to get more help and feedback from their partners.

This finding can be explained from a socio-cultural perspective as well. Van Lier (2014On the other hand, the proficient students in the heterogeneous group achieved as much as proficient students in the homogeneous group despite the fact that they spent considerable time working with weaker students) believes that although Vygotsky's work focused on the cognitive development of children, the theory is applicable to all learning and to both asymmetrical (i.e. expert-novice) and symmetrical (i.e. equal-ability) groupings. This way, students can learn from the act of teaching others. The act of teaching or explaining to others may help low ability learners develop their knowledge and internalize what they learnt before.

Conclusion

The findings suggest that learners boosted their performance through cooperation with either low or high proficient learners in both homogeneous and heterogeneous groups. Low ability students have improved more through interaction with their more capable peers. On the other hand, the high proficient students in the heterogeneous group achieved as much as high proficient students in the homogeneous group despite the fact that they spent considerable time working with weaker students.

Recommendations

The following recommendations were proffered;

1. Lecturers are recommended to make the students cooperate with their course mates and put emphasis on the importance of their participation in the classroom work, and let them get habituated to it through practice.
2. Lecturers are also required to monitor students' interaction because through this, students' ability is observed and appropriate measures are taken.
3. Lecturers should not be left alone in this process, support from peers, students, from policy-makers, from training courses as well as findings from empirical

research on the use of cooperative learning and group composition are deemed important in this process.

4. University management should organize a seminar/workshop among the lecturers of the institution on the effective use of group/peer interaction strategies in their various classes and appropriate consideration of various students' abilities to enhance performance.

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