MPRI-JAEE | INTERNATIONAL JOURNAL OF ASSESSMENT & EVALUATION IN EDU.
VOL. 05 NO. 8 – JULY, 2024

EFFECTS OF GAGNE'S TASK-ANALYSIS ON INTEREST AND PERFORMANACE IN ALGEBRA AMONG SENIOR SECONDARY SCHOOL STUDENTS, KATSINA STATE, NIGERIA

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Keywords: Gagne's Task-Analysis, Academic Performance, Students' Interest, Conventional Method and Gender.

Abstract

This study investigates the effects of Gagne's task – analysis (GTA) on interest and performance in Algebra. It adopts a quasi-experimental design using pretest, posttest and control groups. The population of the study consists of all SS 2 students in the twelve education zones in Katsina State. Four education zones were purposively sampled from twelve education zones in the state. Multi –stage sampling techniques was employed and four senior secondary schools were randomly selected from each of the four zones. Two instruments were used to collect data for the study. They were Algebraic Interest Scale (AIS) and Algebraic Performances Test (APT). The AIS and APT were validated by experts in Psychology/Counseling and Mathematics Education Departments of Federal College of Education, Katsina. A school outside the sampled schools was used for pilot study to test the reliability of the APT and AIS. The reliability of the APT and AIS was obtained as 0.69 and 0.78 using Pearson Product Moment Correlation Coefficient (PPMCC) and Cronbach Alpha Coefficient respectively. Four research objectives, questions and Null hypotheses were stated to guide the study. The research questions were analyzed using Mean, Mean-rank, Sum of mean rank, and standard deviation while Mann-whitney U-test and Independent t-test were used to test the significance of the hypotheses at 0.05 significance level. The results indicated that: there was a significant difference between the mean academic performance scores of students taught using Gagne's task analysis (M=34.07; S.D.= 8.79) and those taught using Conventional method (M=30.42; S.D.=11.47), t (382)=3.46, p =.00 ≤ .05;

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there was a significant difference in the interest mean level of SS11 students taught Algebraic concepts using GTA (M_r=226.28) and those taught using conventional method (M_r=160.50), V=1919.0, Z=5.84, P=.00 < .05; there was a significant difference between performance mean score of male (M=36.12, S.D.=7.52) and female students (M=28.17, S.D.(10.99)), t(178); p=.00<.05; taught Algebraic concepts using GTA; there was no significant difference between the interest mean level of male(M_R=98.47) and female students (M_R=83.37); V=3360; Z=1.59; P=.051>.05 taught using GTA. The study concludes among others that Gagnes' task-analysis improves senior secondary schools students' academic performance and boasted the interest of the students towards the study of Algebraic concepts in Mathematics. Based on the findings, the researchers recommended among others the use of GTA in the teaching of Algebraic concepts and other concepts in Mathematics, Science and so on.

Introduction

Science Education has been and will continue to be of tremendous importance to humanity for its ability to explain natural phenomena as well as playing a very significant role in the technological development of both developing and developed nations. Accordingly, Bitnus(2012) opined that Science Education consist of an embodiment of subjects which include physics, chemistry, biology, and mathematics at senior secondary school level for the involvement of students to learn through the use of a good method. Mathematics being the backbone of all scientific technology and all activities of human development is vital in this era of technological advancement. The present senior secondary school mathematics is hinged on the conception of science which requires rational thinking and decision making.

The learning of mathematics is inherently complicated, as described by Effiom (2015). This complexity arises from the unique nature of the contexts in which learners acquire knowledge, skills, and attitudes. Each learning environment, along with the individual experiences and backgrounds of the students, contributes to the distinctive challenges faced in mathematics education. Mathematics learning requires active and insightful engagement from students to ensure better knowledge retention and an increased interest in the subject (Ahmed and Abimbola, 2011). When a student develops a positive interest in mathematics, it can significantly enhance their performance. Interest has been defined in various ways by different authors. Obodo (2012) describes interest as the attraction that compels a child to respond to a particular stimulus. This definition emphasizes the inherent motivation that drives students towards engaging with mathematics. Taylor (2019) argues on this by suggesting that interest leads individuals to make various choices regarding the activities in which they engage, showing a preference for some and aversion to others. This implies that a student's interest in mathematics is reflected in their reactions, impressions, and feelings towards mathematics-related tasks.

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Michelson (2013) views interest as a crucial motivational factor in the learning development process. He argues that a student understands, experience, skills, and enjoyment of science and mathematics increase significantly as a result of practical, hands-on work. Practical work not only enhances learning but also sustains student interest, making the learning experience more enjoyable and effective. Lack of interest, on the other hand, is identified as one of the primary causes of students' low academic performance in mathematics (Okoro, 2011). It is possible that students with a positive interest in mathematics are more likely to retain concepts such as algebra longer than those without such interest. This retention is crucial for building a strong foundation in mathematics, which is necessary for success in more advanced topics.

Recent research on students' interest in science and mathematics education has shown that interest levels are generally quite poor (Odunisi, 2014). Nna (2012) points out that this lack of interest has led to dwindling enrollments in mathematics departments and poor performance among students at the secondary school level. This trend of concern to mathematics educators because it indicates a broader issue within the education system that needs to be addressed to ensure student's are adequately prepared for future academic and professional endeavors. Ajai (2013) confirmed that Gagne's task- analysis can significantly improve students' interest as well as their academic performance. This instructional strategy focuses on structured, systematic learning processes that engage students actively and make learning more accessible and enjoyable. By breaking down complex mathematical concepts into manageable steps, Gagne's strategy helps students build confidence and develop a deeper interest in the subject.

To further understand the role of interest in mathematics education, it is essential to explore the factors that contribute to students' engagement and motivation. For instance, teachers' attitudes and teaching methods play a significant role in shaping students' perceptions of mathematics. Educators who use innovative, student-centered approaches can create a more dynamic and stimulating learning environment that fosters interest and curiosity. Moreover, the use of technology and interactive tools can enhance students' learning experiences and make mathematics more engaging. Digital platforms and educational software that offer interactive simulations, games, and real-world problem-solving activities can capture students' interest and make abstract mathematical concepts more tangible and relatable. Another important aspect is the role of parental and peer support. Encouragement and positive reinforcement from parents and peers can boost students' confidence and interest in mathematics. Creating a supportive learning community where students feel valued and motivated can lead to sustained interest and improved academic performance.

Algebra is a branch of mathematics that uses alphabetic symbols to represent numbers and quantities in formulas and equations. Although algebra is considered one of the most important aspects of school mathematics, it does not only play a significant role in the broader field of mathematics but also functions as a gatekeeper to future educational and

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employment opportunities (Silver, 2017). This is because proficiency in algebra is often a prerequisite for advanced studies in science, technology, engineering, and mathematics (STEM) fields. Mastery of algebraic concepts is crucial for students who wish to pursue careers in these areas, as it underpins much of the higher-level mathematical thinking required..Effiom (2010) noted that algebra is a very technical and abstract aspect of mathematics, which is often difficult for students to understand. This difficulty can lead to a reliance on memorization rather than true comprehension, hindering the learning process. For many students, the abstract nature of algebraic symbols and operations can be intimidating and challenging to grasp. As a result, achieving a better understanding of algebraic concepts requires a careful and thoughtful selection of appropriate teaching methods and strategies. These methods must be designed to help students understand the underlying principles of algebra rather than just memorize procedures.

To effectively teach algebra, educators must employ strategies that foster deep understanding and engagement. For students to develop the mathematical skills necessary for problem-solving, communication, reasoning, and making connections, which are essential in everyday life, they need a solid foundation in algebra (Iji, Abakpa & Takor, 2015). This involves using instructional techniques that encourage active learning and critical thinking. By engaging students in activities that require them to apply algebraic concepts to real-world problems, teachers can help them see the relevance of algebra and build their confidence in using it. Studies have shown that students' achievement in mathematics, particularly in algebra, which constitutes a significant portion of national examinations such as the West Africa Examination Council (WAEC) and the National Examination Council (NECO), has been consistently low over the years (Azuka, 2013). This persistent underperformance underscores the need for innovative teaching approaches that can make algebra more accessible and engaging for students. Traditional methods that emphasize rote learning and repetitive practice are often insufficient for fostering a deep understanding of algebraic concepts.

Therefore, a problem-solving approach to teaching algebra becomes essential. Such an approach emphasizes the importance of understanding problems, exploring multiple solutions, and developing strategies for tackling complex questions. It encourages students to think critically and creatively, rather than simply following set procedures. This aligns with the views of Bitrus (2012), who revealed that a problem-solving approach to teaching most concepts in mathematics, especially algebra, redefines the role of the teacher as a facilitator of learning rather than a transmitter of knowledge. In this model, the learner becomes a manager and director of their own learning, actively engaging with the material and taking responsibility for their educational journey. The work of this study will dwell on Gagne's Task Analysis, a model developed by the cognitive and behavioral psychologist Robert Gagne. This model is particularly suitable for planning the teaching

process in computer and internet-based programs. It is a technology-intensive process that synthesizes behavioral and cognitive psychology. Gagne's Task Analysis involves breaking down complex tasks into smaller, more manageable components, making it easier for students to understand and master each step before moving on to the next. This structured approach helps to build a strong foundation in algebra by ensuring that students have a clear understanding of each concept before they progress.

Gagne's model also emphasizes the importance of providing appropriate feedback and reinforcement to support learning. By using a systematic approach to instruction, educators can ensure that students receive the guidance and support they need to succeed in algebra. This can include using digital tools and resources to create interactive and engaging learning experiences that cater to the diverse needs of students..Gagne's Task Analysis offers a structured and technology-enhanced approach to teaching algebra, helping students to build confidence and competence in this critical subject. By focusing on problem-solving and active learning, teachers can empower students to take control of their education and develop the skills they need to thrive in a rapidly changing world.

Gagne, Briggs, and Wager (1992) identified nine critical steps in their instructional model which include: (1) gaining attention, (2) informing learners of objectives, (3) stimulating recall of prior learning, (4) presenting the content, (5) providing learning guidance, (6) eliciting performance (practice), (7) providing feedback, (8) assessing performance, and (9) enhancing retention and transfer. These steps are designed to ensure a comprehensive and effective learning process. The model posits that learning is both a product and a process, meaning that the end result of learning is shaped by the methods and steps used to achieve it. For students to fully benefit from this model, their interest in the subject matter is crucial. Interest plays a significant role in academic performance, influencing the effectiveness of teaching methods and strategies. Students who are engaged and interested are more likely to perform well academically, as they are motivated to learn and retain information. The Gagne model's structured approach can help foster this interest by providing clear objectives, engaging content, and continuous feedback, all of which contribute to a more interactive and rewarding learning experience.

Academic performance is an essential factor that influences the choice of teaching methods and strategies. Teachers must consider various indices and variables, such as students' prior knowledge, learning preferences, and the complexity of the subject matter, to select the most appropriate instructional approach. Given these considerations, the researcher deemed it necessary to ascertain the extent to which Gagne's Task Analysis problem-solving strategy affects the interest and performance of senior secondary school students in algebra. This study aims to determine whether this instructional model can enhance students' understanding and engagement with algebraic

concepts, leading to improved academic outcomes. .Nwaobi (2017) reported that Gagne's hierarchical learning strategy had significant effects on students' performances in mathematics. This strategy, which emphasizes a step-by-step approach to learning, was found to favor students' mathematics performance and interest. By breaking down complex problems into manageable tasks, the strategy helps students build a solid foundation of knowledge and skills. This incremental approach not only boosts students' confidence but also enhances their ability to tackle more challenging problems over time. Adeyemi (2018) confirmed a non-significant difference between male and female students exposed to the two teaching methods (Gagne's Task Analysis and expository instructional methods). This finding suggests that Gagne's model is effective for all students, regardless of gender, and can be used to promote equity in education. The model's emphasis on clear objectives, practice, and feedback helps ensure that all students have the opportunity to succeed, regardless of their starting point. To further elaborate, gaining attention, the first step in Gagne's model, is critical for engaging students at the beginning of a lesson. This can be achieved through various means, such as presenting an interesting problem, showing a video, or posing a thought-provoking question. By capturing students' interest early on, teachers can set the stage for effective learning.

Informing learners of objectives provides students with a clear understanding of what they are expected to learn and achieve. This helps them to focus their efforts and understand the relevance of the lesson. Clear objectives also serve as a benchmark against which students can measure their progress. Stimulating recall of prior learning connects new information to what students already know. This step helps to reinforce previous knowledge and provides a context for new concepts, making it easier for students to integrate and retain new information. Presenting the content involves delivering the lesson material in a structured and engaging manner. This can include a combination of lectures, demonstrations, and multimedia resources. Providing learning guidance involves offering support and resources that help students understand and apply the content. This can include scaffolding, examples, and step-by-step instructions. Eliciting performance (practice) gives students the opportunity to apply what they have learned. Practice is essential for reinforcing new knowledge and skills. Providing feedback helps students understand what they are doing well and where they need to improve. This step is crucial for learning, as it helps to correct mistakes and reinforce correct responses.

Assessing performance involves evaluating students' understanding and mastery of the content. This can include formal assessments, such as tests and quizzes, as well as informal assessments, such as observations and discussions. Enhancing retention and transfer ensures that students can apply what they have learned in new and different

contexts. This can involve reviewing and summarizing key points, as well as providing opportunities for students to apply their knowledge in real-world situations. Gagne's Task Analysis problem-solving strategy provides a comprehensive framework for effective teaching and learning. By following the nine steps outlined in the model, teachers can enhance students' understanding, engagement, and performance in algebra. This instructional approach is particularly beneficial for teaching complex and abstract concepts, such as those found in algebra, and can be used to promote equity and improve academic outcomes for all students. The research supports the effectiveness of this model, highlighting its potential to significantly impact students' interest and performance in mathematics.

Problem Statement

Over the years, students' poor performance in mathematics has been an issue of great concern to mathematics educators, particularly in the area of algebra. This poor performance has continued year after year, especially at the senior secondary school level, as remarked by the WAEC Chief Examiners' report (2013). The desire to understand the root cause of this poor performance in mathematics has been the focus of researchers for some time now. Various studies and observations have pointed to several contributing factors..One significant factor is the teaching methods employed by educators. It has been observed that many teachers do not utilize appropriate teaching methods or strategies for teaching mathematics, especially the concept of algebra. The poor performance is often attributed to the continued use of conventional chalk-and-talk methods or rote memorization techniques, which fail to engage students or help them develop a deep understanding of mathematical concepts (Dahiru, 2013). These traditional methods do not cater to the diverse learning needs of students and often lead to disinterest and poor retention of mathematical concepts.

The lack of innovative and effective teaching strategies has been highlighted by researchers as a critical issue. Many educators lack the knowledge or resources to implement more engaging and effective teaching methods. This situation is exacerbated by the fact that mathematics is often perceived as a difficult and abstract subject, which further discourages students. The conventional methods do not address these perceptions or make the subject more accessible and interesting to students. Additionally, the curriculum and assessment methods contribute to the problem. The emphasis on rote learning and memorization for examinations does not encourage critical thinking or problem-solving skills, which are essential for understanding algebraic concepts. Students are often trained to pass exams rather than to understand and apply mathematical principles. This focus on exam-oriented learning leads to a superficial

understanding of algebra, where students may perform well on tests but struggle with applying the concepts in real-life situations or advanced studies.

Another contributing factor is the lack of professional development and support for teachers. Teachers need ongoing training and resources to implement new teaching strategies effectively. Professional development programs can provide teachers with the skills and knowledge to use innovative methods such as Gagne's Task Analysis steps. These programs can also create a community of practice where teachers share experiences and strategies, further enhancing their teaching methods. The classroom environment also play a crucial role in students' learning experiences. An engaging and supportive classroom environment can significantly impact students' interest and performance in mathematics. When students feel supported and are provided with opportunities to explore and understand mathematical concepts through practical work and interactive activities, their interest and performance improves.

In light of these challenges, the researcher intends to use Gagne's Task Analysis steps to teach algebraic concepts. This method involves breaking down the learning process into manageable steps, making it easier for students to grasp complex concepts. Gagne's model steps emphasizes gaining attention, informing learners of objectives, stimulating recall of prior learning, presenting content, providing learning guidance, eliciting performance, providing feedback, assessing performance, and enhancing retention and transfer. By using this structured approach, the researcher aims to create a more engaging and effective learning experience for students. The goal is to see whether this method can improve students' performance and boost their interest in the subject. Gagne's Task Analysis steps provide a systematic way of teaching that can address the shortcomings of traditional methods. By focusing on active learning, providing continuous feedback, and ensuring that students understand each step before moving on to the next, this method can help students develop a deeper understanding of algebraic concepts.

Furthermore, the researcher hopes that by using this method, students will be more motivated to learn and develop a positive attitude towards mathematics. When students are actively engaged in the learning process and can see the relevance and application of what they are learning, their interest and enjoyment of the subject increase. This, in turn, can lead to better performance and a greater likelihood of pursuing further studies and careers in mathematics-related fields.

In summary, the persistent poor performance of students in mathematics, particularly in algebra, is a multifaceted problem that requires a comprehensive approach to address. By using Gagne's Task Analysis steps, the researcher aims to provide a more effective teaching strategy that can improve students' understanding and interest in algebra. This study has the potential to contribute significantly to the field of mathematics education

by providing evidence-based strategies that can be adopted by educators to enhance teaching and learning outcomes in mathematics.

Objectives of the Study

The objectives of this study were to:

1. ascertain the effect of Gagne's task –analysis on interest among senior secondary students in Algebra.
2. find out the effect of Gagne's task –analysis on the performance of senior secondary school students in Algebra.
3. Determine if there is gender differences between the performance of male and female senior secondary school students when Algebra using Gagne's task-analysis.
4. Determine if there is gender differences between the interest of male and female senior secondary school students when Algebra using Gagne's task-analysis.

Research Questions

In view of the nature of this research topic, the following research questions were raised to guide the study. They were to:

1. What is the effect of Gagne's task –analysis on interest among senior secondary students in Algebra?
2. What is the effect of Gagne's task –analysis on the performance of senior secondary school students in Algebra?
3. Is there any effect of Gagne's task-analysis on male and female students' performance of senior secondary school in Algebra?
4. Are there any effects on the interest of senior secondary school students when taught Algebra using Gagne's task –analysis?

Research Hypotheses

The following Null hypotheses were formulated and tested at .05 level of significance.

- H_{o1} There is no significant effect of Gagne's task –analysis on interest among senior secondary students in Algebra.
- H_{o2} There is no significant effect of Gagne's task –analysis on the performance of senior secondary school students in Algebra.
- H_{o3} There is no significant difference between students the performance of male and female students when taught Algebra using Gagne's task-analysis.
- H_{o4} There is no significant differences between interest of male and female senior secondary school students when taught Algebra using Gagne's task –analysis.

Methodology

The study adopted a quasi-experimental control group design employing pre-test and

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post–test. It was used due to the fact that the researcher has no control over the sample size. A sample 382 (SS11) students were drawn purposively from a population of 69,932 within four (4) Education zones in Katsina state. The sample consists of 190 males and 192 females. Two instruments were developed: (1) Algebraic Interest Scale (AIS) and Algebraic Performance test (APT) and both instruments were validated by experts. The reliability confidents of .87 and .69 were obtained for AIS and APT using Cronbach Alpha and Pearson Product Moment correlation coefficient (PPMCC) respectively. The students in both the Control and the Experimental groups were taught for 4 weeks using prepared plans for conventional and nine steps of GTA. At the end of 4 weeks, the post-test was given to the two groups to determine the effectiveness of the teaching strategies. The research design is illustrated in Fig. 1 below.

Group 1: EG…… 0_1…… X_1…… 02

Group 1: CG…… 0_1…… X_0…… 0_2

KEY

EG⇒ Experimental group

CG ⇒ Control group

0_1⇒ Pretest

X_1⇒ Treatment

X_0⇒ No treatment

0_2⇒ Post-test

The population of the study consists of all the public senior secondary school year two students in Katsina. The data collected were analyzed using SPSS version 23 and the hypotheses were tested using Mann-whitney U- test and Independent t- test at P ≤ 0.05 level of significance.

Results and Discussion

H_{01}: There is no significant effect of Gagne's task –analysis on interest among senior secondary students in Algebra.

To test the null hypothesis one, the data generated via Algebraic Interest Scale (AIS) were subjected to Mann-Whitney U-test statistic and the summary of the result is presented in Table 1.

Table 1: Summary of Mann-Whitney U-test on the difference between the Interest of Students in Experimental and Control Groups.

Variables	Groups	N	Rank	Ranks	MR.D	Df	U	Z	P
Interest	Experimental	180	226.28	40731.0	65.78	384	11919.0	5.839	0.00
	Control	202	160.50	32422.0					

Significant at P ≤ 0.05 level of significance.

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The results presented in Table 1 indicate a significant difference in the mean interest levels of students between the experimental and control groups, favoring the experimental group. This distinction is supported by a calculated p-value of 0.00, which is lower than the predetermined alpha level of significance of 0.05. This statistical outcome implies a meaningful disparity between the experimental and control groups regarding student interest levels. Consequently, the null hypothesis, which posited no significant difference in interest levels between students taught algebraic concepts using Gagne's Task Analysis and those taught using the lecture method, is decisively rejected.

The rejection of the null hypothesis signifies a substantial difference in the mean academic performance scores of students in mathematics when exposed to Gagne's Instructional Strategy for algebraic concepts compared to those not exposed. This divergence can be attributed to the effectiveness of Gagne's Strategy in fostering student comprehension, contrasting with the traditional lecture method, which tends to be teacher-centered.

These findings align with previous research by Agboghoroma, Job, and Akpakiniovo (2022), who similarly found that Gagne's learning hierarchy enhances achievement, retention, and attitudes among secondary school students in physics. They also corroborate the conclusions of Nwaobi (2017), who observed that Gagne's hierarchical learning strategy improves academic performance in Mathematics, particularly favoring males over females. However, they contrast with the findings of Dahiru (2013), who reported that the use of Gagne's Instructional strategy alone does not significantly improve students' interest levels

H_{02}: There is no significant effect of Gagne's task –analysis on the performance of senior secondary school students in Algebra.

In order to test the null hypothesis two, the data generated via Algebraic Performance Test (APT) were subjected to independent sample t-test statistic. The results obtained were computed and used in Table 2.

Table 2: Summary of t-test Statistics on the significant difference between the Mean Performance Scores for Experimental and Control Groups.

Variable	Groups	N	Mean	Std. D	M.df	D.f	T	P
Performance	Experimental	180	34.07	8.787	3.65	384	3.456	0.00
	Control	202	30.42	11.47				

Significant at P ≤ 0.05 level of significance.

The results presented in Table 2 indicate a significant difference in the mean academic performance scores between the experimental and control groups, favoring the experimental group. This distinction is underscored by a calculated p-value of 0.00, which

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is below the predetermined alpha level of significance of 0.05 (p value 0.00 < 0.05). This statistical finding implies a substantial disparity in academic performance between the experimental group, where algebraic concepts were taught using Gagne's Task Analysis, and the control group, which utilized the lecture method. Consequently, the null hypothesis, which hypothesized no significant difference in mean performance scores between the two instructional methods, is rejected.

This outcome is consistent with the research of Tang, Tsai, and Huang (2020), who found that Gagne's learning hierarchy and inherited coding approach effectively built mathematical skills, diagnosed learning issues, and enhanced academic performance. Similarly, Kasinath and Flosy (2022) concluded that instructional strategies based on Gagne's instructional design positively impacted the development of thinking skills and academic performance among secondary school mathematics students.

However, the results of this study differ from those of Maede (2023), who reported that students taught using Gagne's learning hierarchy achieved lower academic outcomes compared to those instructed with the Bybee Instructional model. This discrepancy may stem from differences in the student cohort's level and the specific subject area studied, highlighting the nuanced effects of instructional strategies in varying educational contexts.

H_{03}: There is no significant difference between performance mean scores of male and female students taught algebraic concepts using Gagne's Task Analysis.

In order to test the null hypothesis two, the data generated via Algebraic Performance Test (APT) were subjected to independent sample t-test statistics. The results obtained were computed and used in Table 3.

Table 3: Summary of independent t-test Statistics on the significant differences between the Mean Performance Scores of Male and Female Students in the Experimental Group.

Variable	Gender	N	Mean	Std. D	df	D.f	T	P
Performance	Male	85	36.12	7.521	7.95	178	5.647	0.00
	Female	95	28.17	10.99				

Significant at P ≤ 0.05 level of significance

The results presented in Table 3 reveal a significant difference in the mean academic performance scores between male and female students within the experimental group, favoring male students. This conclusion is supported by a calculated p-value of 0.00, which falls below the predetermined alpha level of significance of 0.05 (p value 0.00 < 0.05). Therefore, the null hypothesis, which posited no significant difference in performance mean scores between male and female students taught algebraic concepts using Gagne's Task Analysis, is decisively rejected.

This outcome contrasts with the findings of Hausmann, Chi, & Roy (2014), who asserted that Gagne's Task Model, being activity-oriented, led to better performance among male students compared to female students. Additionally, it diverges from the findings of Salmon (2005), who reported that female students outperformed male students in problem-solving tasks. The discrepancy observed in this study may be attributed to the possibility that male students exhibited a greater inclination towards and proficiency in collaborative activities, which are integral to Gagne's Task Analysis approach.

Furthermore, these findings differ from those of Worokwu (2022), who found no significant effect of Gagne's Learning Hierarchy on the achievement of Chemistry students. This disparity in results may be influenced by variations in instructional settings or contexts where the studies were conducted.

H_{04}: There is no significant difference between interest of male and female students when taught Algebra using Gagne's task –analysis.

To test the null hypothesis four, the data generated via Algebraic interest scale (AIS) were subjected to Mann whitney u-test and the summary of the result is presented in Table 4 thus:

Table 4: Summary of Mann whitney u-test on difference between the Interest level of Male and Female Students in the Experimental Group.

Variable	Gender	N	Mean. Rank	Sum of Ranks	MR.D	Df	U	Z	P
Interest	Male	85	98.47	8370.0					
	Female	95	83.37	7920.0	15.10	178	3360.0	1.594	0.051

The results presented in Table 4 indicate notable differences in mean rank scores between male and female students within the Experimental group. Specifically, male students achieved a mean rank score of 98.47, totaling 8370.0 (adjusted to 837.00 for clarity), while female students in the same group attained a mean rank score of 83.37, totaling 7920.0 (adjusted to 792.00), resulting in a mean rank difference of 15.1 between genders. The p-value .051 was obtained which is greater than .05 the significance level. Therefore, the null hypothesis is retained. These findings contradict with those of Yeh et al. (2019), who reported that a lower application of Gagne's learning strategy correlated with decreased interest in learning mathematics among both male and female students, leading to reduced academic performance. The disparity observed in this study may potentially be attributed to variations in how teachers implemented the instructional strategy.

In essence, the study's findings highlight significant gender-based differences in rank scores within the Experimental group, underscoring the importance of instructional consistency and effectiveness in achieving desired educational outcomes.

Conclusion and Recommendations

In the study, the researcher conducted a thorough investigation into the Effect of Gagne's

Task Analysis (GTA) on the interest and academic performance of senior secondary school students in algebra. The findings unequivocally demonstrated that GTA not only improved but significantly enhanced both student interest and academic performance compared to traditional instructional methods. Students exposed to GTA exhibited heightened engagement and a deeper understanding of algebraic concepts, highlighting the efficacy of Gagne's approach in facilitating comprehensive learning outcomes.

Furthermore, the study revealed a noteworthy aspect of GTA: its gender insensitivity. This pivotal discovery underscores the method's universal applicability, making it equally beneficial for both male and female students. By fostering an environment where instructional strategies do not favor one gender over another, GTA promotes inclusivity in education, thereby supporting equitable learning opportunities for all students. In light of these compelling findings, the following comprehensive recommendations are proposed to optimize the integration and implementation of Gagne's Task Analysis in educational settings.

1. Incorporate into Curriculum: Educational institutions should integrate Gagne's Task Analysis into their algebra curriculum and explore its applicability in other subjects. This integration should be supported by comprehensive teacher training.
2. Continuous Professional Development: Provide ongoing training for educators to enhance their pedagogical skills, including specialized instruction in Gagne's Task Analysis. This training ensures teachers can effectively implement GTA to meet diverse student needs.
3. Monitor and Evaluate: Establish regular assessment mechanisms to monitor the effectiveness of Gagne's Task Analysis in boosting student interest and academic performance. Feedback from students and teachers will help refine teaching practices.
4. Expand Research Efforts: Encourage further research to broaden the scope of Gagne's Task Analysis across different educational contexts and subject areas. Explore its impact on various student demographics and settings.
5. Support Policy Initiatives: Educational policymakers should prioritize evidence-based teaching strategies like Gagne's Task Analysis. Develop policies that promote effective instructional methods to enhance student engagement and achievement.
6. Engage the Community: Collaborate with parents, guardians, and community members to build understanding and support for Gagne's Task Analysis. Foster a supportive educational environment that encourages student learning and development.

Acknowledgement

The researchers of this work are hereby acknowledging Tertiary Education Trust Fund (TETFUND) for sponsoring this research under the Institution Based Research (IBR), equally Federal College of Education, Katsina as well as the reviewers and publishers of this work are acknowledged by the researchers.

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