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RESEARCH ARTICLE

Enhancing Classroom Learning Outcomes: The Power of Immediate Feedback Strategy

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Abstract
The study investigates the effects of using immediate feedback as a teaching strategy. Additionally, the impacts of immediate feedback and gender on students' classroom learning outcomes were examined. The study was designed as a quasi-experimental, pretest-posttest, experimental, and control group. The sample consisted of 225 junior secondary school level 2 (JSS 2) students. Students were chosen from two intact coeducational classes and split into experimental and control groups. All relevant data was collected using a study tool called the Science, Technology, English Language & Mathematics Achievement Test-Questionnaire (STEMAT-Q), which was developed, validated, and used. Data collected were analysed using the mean, standard deviation, Student's t-test, and analysis of covariance (ANCOVA). The study's findings demonstrate that an immediate feedback technique significantly affects the learning outcomes of students. However, for treated male and female students, the interaction effects of the immediate feedback technique and gender on classroom learning outcomes were not significant. Immediate feedback is particularly successful at addressing student confusion, correcting errors, identifying learning gaps, bridging gender differences in student learning outcomes, and inspiring students to learn well. Based on the above findings, the researcher recommends the provision of immediate feedback for students during the learning process or class discussion or activities to enhance their learning skills and help them retain key concepts, ideas, and principles.

Keywords
Immediate Feedback, Treatment, Gender, Interaction Effects, Achievement Test, Learning Outcome

INTRODUCTION

We define feedback as comments and suggestions given to students during class or after they have finished a task or project. Students discover their opinions or beliefs about the situation through this feedback. After the assignment is finished, this kind of feedback must be provided. Assessing students learning ability is a way of measuring student achievement and a means of improving teaching and learning processes. Thus, the regular assessment carried out by teachers in the classroom is designed to eliminate the detrimental and discouraging effects of an examination given at the end of teaching and learning processes. According to several researchers, mastery learning involves using strategies including feedback and remedial instruction (Afemikhe, 1985; Ughamadu, 1990; Odulaja, 1993; Ajogbeje, 2012; Ndukwu & Ndukwu, 2017). Godson and Okey (1978) reported that the use of modified formative tests in the assessment of learning difficulties or disabilities improve students' skills and learning retention. Tests are designed to diagnose a student's strengths and disabilities, improve learning and teaching,

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mathematical and other academic skills. The theoretical framework of this study focuses on the immediate feedback model developed by the researcher. The model is used to examine the effects of instruction with immediate feedback on student learning. Carroll (1963) proposed a concept of individualized mastery strategy in which students are usually divided into subjects according to their intelligence and aptitudes. And it was determined that the majority of such learning will lead to the student mastering the subject if it satisfies their particular demands in terms of the sort of education provided and the time allotted. This model focuses on meeting students' learning needs rather than timing and assessment. Bloom (1968) proposed a modification of this strategy, proposing a group-based diagnostic formative assessment strategy that included feedback and treatment. In other words, at the conclusion of each lesson, pupils are evaluated using ungraded diagnostic or formative tests. The strategy focuses on the continuous monitoring and evaluation of students' learning needs during and after school. Again, time constraints are one of the biggest barriers to adopting this model. Based on these problems, Ajogbeje (2023) proposed an immediate feedback model that includes immediate feedback and appropriate correction or revision of the learning process, without establishing proficiency or competence. This model is shown in Figure I below.

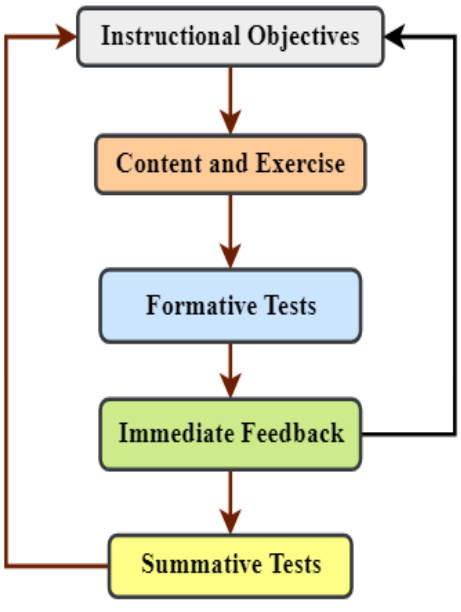

Figure 1. Ajogbeje (2023) Immediate Feedback Model

Immediate feedback and corrective instructions are used to identify group dynamics that are strong and weak and to diagnose individual learning difficulties in an effort to enhance teaching and learning. The aim is to consider immediate feedback as a variable in instructional design related to cognitive performance and several emotional traits. The researcher believes that students' poor performance in science, basic technology and mathematical subjects may result in teachers piling up problems over time and ultimately cause their students to lose all knowledge of science, basic technology and mathematical subjects. When student learning is regularly assessed and immediate feedback is given throughout the teaching and learning process, students are more likely to recognize learning gaps.

Literature Review

A literature review that included reviews of related studies showed that many researchers are trying to find different ways and solutions to students' poor performance in science, basic technology and mathematical subjects. Onuigbo & Eze (2010) highlighted the use of e-learning, problem-solving learning techniques, project methods, role-playing, games, information and communication technologies, and the presentation of facts and narratives. Ajogbeje (2012), Akkuzu (2014), and Ndukwu & Ndukwu (2017) argue that feedback is an information learners receive after completing tasks that demonstrate the validity and effectiveness of learning strategies. Many instructors or classroom teachers only provide students with feedback at the completion of the term. Positive feedback-based teaching strategies can enhance learning results (Hattie, 2009). At all educational levels, feedback is a crucial tool for fostering learning and performance (Hattie, 2013). Feedback is helpful for language, math, science, and basic technology subjects, according to evidence from prior studies (Higgins & Nicholl, 2003), and it is a crucial component of a successful education (Onuigbo & Eze, 2010).

According to this study, feedback is a procedure where teachers allow students know about their skills and assess their performance in order to advance them. Information provided by classroom teachers, classmates, book read, parents and guardians, previous experiences, and others can be referred to as feedback. It helps both teachers and students to reassess previously

learned topics. Feedback can be categorized by form (delayed or immediate), modality (written or verbal), and information provided (positive or negative) (Duane, 2005). Numerous studies on the following forms of feedback have been done, according to studies by Onuigbo and Eze (2010), Ajogbeje and Alonge (2012), Hattie (2013), Akkuzu (2014), and Ndukwu and Ndukwu (2017). These studies include modifications, progress, formats, and modalities of feedback. Although studies have shown that feedback can actually help improve some aspects of human behavior, the researchers in the aforementioned research studies took the time to carefully consider the advantages and disadvantages of various feedback strategies. As a result, the researcher discovered that there are very few studies that look at the use of immediate feedback strategies.

Feedback and Classroom Learning Outcome

Assessment involves using a variety of assessment methods to guide and improve student learning and achievement. Most students take formative and diagnostic tests at various stages of their learning, and decisions and guidance on how to continue their education are based on the results of these tests (Ajogbeje, 2012 and Klopter, 1971). Feedback is "information provided by an agent about an aspect of performance or understanding". It is a response to student action to engage, inform, and extend knowledge by bridging "the gap between current understanding, performance, and purpose." It is associated with knowledge and information about learning outcomes (Ajogbeje, 2012) and motivating learners (Bridgeman, 1974). Providing feedback to learners has both a (1) motivational effect (Gronlund & Linn, 1990; Ajogbeje, 2012) and a (2) knowledge correction effect, according to earlier and more contemporary studies (Bardwell, 1981; Erinosho, 1988; Gronlund & Linn, 1990; Ajogbeje, 2012). Granlund and Linn (1990) suggested that assessment of student motivation can be helpful in providing information about student progress. Bardwell (1981) also stated that feedback is the information that classroom teachers give to students about their performance in an assignment or examination, and when this information is given, students begin to understand their own abilities. Erinosho (1988) stated that after students succeeded in an examination or a task, they liked the subject or the task and found ways to be successful in the examination. In other words, these students rated themselves as motivated and competent in upcoming assignments and exams. However, Erinosho (1988) also reported that negative feedback on task or test performance can lead to one or two effects. First, students sit down and use feedback to check their accuracy and performance on assignments and upcoming exams. Second, failure on subsequent assignments and tests can be negatively impacted by dissatisfaction, feelings of inadequacy, loss of interest, and poor performance.

In this regard, Kulharvy (1977) suggested that feedback fails to perform its facilitative role under two conditions: first, the initial student response if the feedback is helpful; and second, if the subject being studied is too challenging or difficult for the student. In the absence of these conditions, he continued, the research can draw the conclusion that providing feedback on students' performance based on the aforementioned two assumptions helps identifying and correcting errors as well as making clear the right responses. Scannel and Tracy (1975) argued that incomplete or inadequate knowledge of performance on the task prior to a test or task can lead to lower learning or failure and poor content retention. Erinosho (1988) also claimed that students who do not have information about their performance on tests or assignments will create stress in students because they cannot evaluate their performance and competence on the given task or examination.

Kirkland (1971) believes that how students perceive the test affects test-taking behavior. He added that when students accept their assigned test scores as representative of their performance, they will be more willing to accept their test scores and respond appropriately. Therefore, the researcher believes that test scores that do not match or reflect students' thoughts or expectations about themselves may negatively affect classroom learning. In other words, the most important aspect of feedback is its corrective function, and this strategy will be more appropriate and effective if students receive immediate feedback after an incorrect answer. Therefore, the researcher hope to use the feedback as a corrective influence on students and improve their learning. We have seen that feedback increases student confidence, motivation to learn, and ultimately student achievement. And there are different forms of feedback and it can be provided on an ad hoc, irregular or continuous basis. Feedback can also be added to the end of a learning module, listed in a

question, or once a year in a performance appraisal form. But what is the best way for students to get feedback?

Immediate Feedback and Classroom Learning Outcome

The practice of explaining to pupils why they failed, where they failed, and what they did incorrectly while they continue to study is a form of immediate feedback. A lot of work has been done in classrooms to provide immediate feedback and learning outcomes in the classroom (Epstein et al., 2002; Metcalfe, Kornell, and Finn, 2009). Kerr, Kelly, and Heffernan (2013) reported that giving feedback immediately after completing a task results in better learning outcomes than giving the same feedback the next day. According to Kulik & Kulik (1988), immediate feedback is more useful than delayed or traditional feedback. They also reported that immediate feedback from students during learning activities results in better learning outcomes. Additionally, they claimed that receiving immediate feedback from students during learning activities improves learning outcomes than expecting the same feedback the next day (Keher, Kim, & Heffernan, 2013). Unfortunately, many Nigerian teachers do not use or do not know how to use immediate feedback in the classroom. Such teachers usually do not give immediate feedback to their students. Sadly, a lot of Nigerian educators either do not use or are unable to use immediate feedback in the classroom. These instructors typically do not provide their students with immediate feedback. Woolfolk (2010) found that feedback is effective when given while the classroom lesson activities is in progress.

Immediate feedback is a strategy used to make teaching and learning more effective by encouraging students to work hard and succeed in school. According to Rozek (2014), immediate feedback can aid learning. Regardless of gender, the researcher is interested in discovering whether immediate feedback can enhance learning outcomes. Ajogbeje (2012) and Denzin (2008) considered gender as one of the factors affecting student performance. Onuigbo and Eze (2010) report that the results of their research study show gender imbalance and mathematics bias in Nigeria. Boys have been shown to outperform girls in mathematics. Conversely, a study by Jeff (2015) found that females outperformed males in mathematics. The discussion about gender findings led the researcher to investigate what happens when immediate feedback strategies are used in classroom teaching and learning. What all these reported results mean is that feedback is effective to the extent that students perceive the results as representing their goals. Feedback from tests contribute to learning when students try to do well, and these students tend to take responsibility for their own success or failure rather than blaming environmental factors. If you don't have a goal in mind, information about scores alone will not be effective in improving performance. Most of the studies reviewed showed that the type of feedback students receive about their performance in these studies is targeted.

Effective Feedback and Classroom Learning Outcome

Feedback is an information provided by classroom teachers or instructors about their students' performance or technical knowledge. It is a response to the students' action or response aiming to inform, communicate and grow by reducing the doubts between present understanding and intentions. Immediate feedback helps increase students' knowledge by correcting errors, maintaining competence, and dispelling misconceptions about the subject. The more and more classroom teachers provide feedback to students, the better their results. Additionally, when teachers or instructors give immediate feedback during a lesson or as a follow-up, students are more likely to pause, interact and engage in conversation, and alter their behavior. Thus, by providing immediate feedback before regular feedback, students learn more about how to do better through practice.

The form of feedback might be verbal, written, or pointed out. Feedback from assessments and instruction is meant to boost rather than lower student performance. Negative criticism or feedback can undermine students' efforts and performance. Teachers have a specific obligation to encourage student learning and offer feedback in order to prevent pupils from feeling overwhelmed after class. However, other studies have disputed similar findings (Breitwieser et al., 2022; Engelmann et al., 2021). After three weeks of study, some research suggests that using prompts can increase learning performance on themes from the domain of educational psychology (Christoph and Maria 2019). In a second session three weeks later, Engelmann et al.

(2021) found no evidence of a lasting benefit from meta-cognitive cues. The positive effects of prompts on learning achievement are highly variable and may improve with repetition, as reported by Breitwieser et al. (2022). Our classes are diverse and some learners want to know where they stand in their studies, some want to advance to the next level, while others need to be careful not to interrupt learning and make it worse (Dinham, 2002, 2007a; 2007b).

Effective feedback encourages learners to evaluate their own learning and learning practices so they can improve their learning outcomes. Additionally, it updates students on their progress toward achieving the success criteria. Feedback is a two-way process that fosters learning progress for the learners and helps the teacher identify where the learners are on the learning continuum when a classroom instructor has strong professional connections with learners based on mutual respect. According to Hattie, (1999; 2023), Dinham (2002, 2007a; 2007b) and Wiggins (2012) an effective feedback expected to be provided by classroom teachers or instructors should include the following:

- Does not give praise, reward, or punishment but schedules regular time to discuss feedback with students on an individual or small group basis.
- Concentrates on the quality of the learner's work product and/or processes and tries to give feedback as close to the learning and assessment task as possible.
- Motivates and challenges the learner to further develop their knowledge and skills, and equally encourages them to ask questions about their feedback.
- It focuses on the caliber of the work and is detailed in identifying what the student has done well and what has been misunderstood or not understood.
- It is closely related to the success criteria and learning intentions and might be spoken, a gesture or written.
- Let the students know that your main goal is to make sure they comprehend how their learning is being assessed.
- Confirm that the student comprehends the material being covered;
- Inquire of the student what they believe they need to improve on;
- Be clear and detailed in your criticism, including examples whenever available.
- Share your thoughts on potential future steps for development.
- Encourage dialogue by inviting students to discuss their work with you or their peers.
- Be trustworthy, sincere, and truthful. Every time a student completes an assignment, repeat.

From the studies reviewed, one can see that the motivation for assessment and feedback during practice is to improve student outcomes, not to limit current outcomes. Unfortunately, students may not always have appropriate internal feedback and may instead produce maladaptive internal feedback in multi-session learning, which consists of at least two similar learning sessions with a time lag in which the learning environment is the same but the learning materials are different. For instance, students may overestimate their learning outcomes due to faulty self-evaluation (Chou and Zou 2020) and hence stop studying before they have actually mastered the material.

A good feedback system is very important for students. Bad comments can limit a student's effort and success. Teachers have a special responsibility to support students' skills and provide commentary so that students are not burdened outside the classroom. İn the previous studies, children in the samples were divided into treatment groups using criteria like ability, pretest scores, and prior grades, in most of the studies. Thereafter, students are given a task to perform, and rather than receiving a true grade for it, their performance is randomly evaluated. Some gave students random scores according to treatment group (Bridgeman, 1974). Others use words like "excellent", “good", and "tried" (Means and Means, 1971; Bridgman, 1974). The performance of the experimental groups is then compared to that of the control groups using posttest results. Some students receive grades that they feel do not reflect their abilities. This can reduce confidence in subsequent tests, which can affect motivation and, consequently, performance.

Finally, the implications for the effects of feedback on post-task performance are inconclusive. It may be necessary to broaden the perspective of the investigation being conducted. Other aspects of the learning environment can affect the effectiveness of feedback. The question

therefore arises of how these effects affect learning outcomes and how they can be combined with other social and psychological factors to improve students' skills. It's a matter of how you decide to use it. As a result, the researcher examines solutions for immediate feedback in this work. In order to inform what and how to do during teaching and learning, students use this procedure to point out errors and make prompt assessment changes. As a result, the purpose of this study is to investigate how immediate feedback affects students' learning outcomes. The study specifically aimed to ascertain: 1. The impact of immediate feedback on students' learning outcomes. 2. The impact of gender on students' academic performance 3. The impact of gender and immediate feedback strategies on students' learning outcomes. The study sought to answer the following questions and test the following hypotheses.

Research Questions

The following research questions were raised to guide the investigation:

1. How do students exposed to immediate feedback and those subjected to conventional feedback differ in terms of their mean learning outcome scores?
2. How do student gender differences in mean learning outcome scores compare?
3. How do gender and immediate feedback strategies interact to affect students' mean learning outcomes?

Research Hypotheses

The study was designed to test the validity or otherwise of the following hypothesesat 0.05 level of significance:

1) Treatment has no significant impact on pupils' learning outcomes.
2) The gender of students has no significant impact on their learning achievements.
3) Treatment and gender had no significant interaction effects on students' learning outcomes.

MATERIALS AND METHODS

All secondary schools in Ondo State made up the study's sample population. With experimental and control groups, a quasi-experimental, non-equivalent pretest-posttest control group design was adopted. The 225 students who made up the sample for this study came from two co-educational secondary schools in Akure South Local Government Area, Ondo State, and were chosen using the purposive sampling technique. The two chosen schools were split into an experimental group (the group that received immediate feedback) and a control group. The following are the treatment packages provided for the experimental and control groups:

Instructional Strategies I

Inresponse to class-related questions or assessments, instructional strategy 1 instructs students on each topic. While instruction is still going on and before moving on to the next topic or unit, immediate feedback is given. Students are given the opportunity to talk about their performance and offer potential course corrections.

Instructional Strategies II

Each lesson concludes with an in-class test. Before the start of the next lesson, students receive feedback on their test results. During the teaching and learning process, there was no feedback, no corrections, and no discussion of the outcomes.

Experimental Procedures

Before starting the study, the researcher went to the principals of the schools that were chosen and requested their cooperation and permission to use the classroom teachers. The goals, interests, and intentions of the researcher were also reviewed, as was how to collaborate with school administration to seamlessly incorporate the research activities into the academic program. The basic science, basic technology, English language, and math instructors, who later worked as the researcher's research assistants, were introduced to the researcher by the principals in their spare time. The Hawthorne effect, in which participants react to the knowledge that they were a part of the experiment, is eliminated when research assistants are chosen as the treatment group rather than the control group. Selected research assistants were informed about the objectives of the research study by the researcher, cooperation was sought, and the starting time was decided. The research assistants were personally trained on what to do and how to do it before the research work started. The experiment lasted for 6 weeks, of which 1 week was used for the pretest and research assistant training, 4 weeks for treatment, and the last week for the posttest.

Since the experiment is being conducted at the beginning of a new academic session, the students' prior understanding of the subject matter is minimal at best. Because there are no set

guidelines for the amount of time allotted to teaching each topic in the group, ability disparities within the group are also taken into consideration. The researcher works with research assistants to develop efficient teaching strategies, test questions, and evaluation techniques rather than participating directly in the data collection process. Pretests, treatment sessions, and posttests take place during regular class times. The experimental group's lesson plan was used by the treatment group to teach English language and math five times per week, as well as basic science and basic technology three times per week for four weeks. The control group's lesson plan was also used by the control group to teach English language and math five times per week, as well as basic science and basic technology three times per week for four weeks. Under the researcher's direction, research assistants performed the evaluation.

Each group takes a 40-minute class every day and five times a week English language and mathematics and three times a week for basic science and technology, depending on the school schedule. The researcher kept an eye on how research assistants used lesson plans and the reduction of cheating by students during exams. The control group's instruction contained the feedback delivered at the conclusion of the topic, but the experimental plan included immediate feedback.

The students were given the Science, Technology, English and Maths Achievement. Test (STEMAT-Q) developed by the researcher as a pretest, or before beginning treatment. Following the pretest, the researcher reshuffled the STEMAT-Q items that would be used in the posttest. STEMAT-Q was utilized by the researcher to gather all the necessary information for the study. It is made up of 40 objective questionsthat were designed by the researcher with assistance from four JSS II teachers using material from the students' textbookson basic science, basic technology, English language, and mathematics. The STEMAT-Q is made up of two parts. Part B contains 40 achievement test items on topics from basic science = 10 items, basic Technology = 10 items, English language=10 items, and mathematics = 10 items. Part A refers to the respondent's biodata. With the assistance of four STEM teachers, experts in STEM education, and a test and measurement expert for face validity, the STEMAT-Q instrument was validated. The content coverage, appropriateness, and instructional technique of the instrument were to be corrected and validated by the experts in accordance with the topic, purpose, research question, and hypotheses. The instrument for this study was modified in response to their recommendations. A pilot test was carried out at two public secondary schools in the Akure North Local Government Area of Ondo State to assess the reliability of the research instrument. In two schools, fifty (50) JSS II STEM students each received a copy of the STEMAT-Q, and the data collected was used to calculate the instrument's reliability coefficient of 0.79 using Kuder-Richardson (KR20).

To assess the appropriateness and non-discrimination of the STEMAT-Q items, a difficulty index analysis was also computed. After confirming face validity, the training program's usability was evaluated. The lesson plans developed by the researcher were used by the four JSS II STEM teachers who were chosen for the pilot test to instruct and assess JSS II pupils. To assess the reliability, applicability, and suitability of the training plan, field training was carried out. Lesson plans frequently feature helpful advice from teachers. The lesson plan's alignment with the research's goals was further ensured via field testing. The study focuses on the effects of using immediate feedback as a teaching strategy and does not include any direct intervention, manipulation, or collection of personal data from human subjects participants. the research instrument was reviewed and approved by the Centre for Research and Development (CERAD) Ethics Assessment Committee of Bamidele Olumilua University of Education, Science, and Technology.

Statistical Analysis

To evaluate the null hypotheses generated at the 0.05 significance level, the Student's t-test and analysis of covariance (ANCOVA) were utilized. The mean and standard deviation were used to answer the study questions.

RESULTS

Part 1: Impact of Immediate Feedback on Pupils' Learning Outcomes.

The participants' pre-treatment (pretest) and post-treatment (posttest) mean scores and standard deviations are displayed in Table 1.

Table 1. The mean and standard deviation of the treatment groups' posttest results

Variable		Pretest		Posttest	
Feedback Treatment	N	Mean	SD	Mean	SD
Experimental Group	144	20.68	13.07	42.78	20.22
Control Group	81	20.52	10.19	37.32	11.68

The results in Table 1 show that both groups achieved higher posttest scores. With a mean score of 42.78 compared to 37.32, the immediate feedback group outperformed the control group. A t-test statistic was computed as stated in Table 2 to assess whether there was a significant difference in scores between treatment groups.

Table 2. The mean posttest scores for the experimental and control groups

Group	N	Mean (μ)	SD (σ)	df	t_{cal}	t_{tab}
Experimental Group	144	42.78	20.22	224	10.23	1.96
Control Group	81	37.32	11.68			

*P < 0.05

Part II:Impact of Gender Differenceson Pupils' Learning Outcomes.

Students' pre-treatment (pretest) and post-treatment (posttest) mean scores and standard deviations were calculated for male and female in the treatment group, as shown in Table 3.

Table 3. The mean and standard deviation of posttest results for both male and female students

Variable		Pretest		Posttest	
Gender	N	Mean	SD	Mean	SD
Male	63	32.57	11.05	44.15	18.27
Female	81	31.15	10.69	43.23	17.86

The findings in Table 3 show how male and female students perform academically differently. Male students' pretest mean score was 32.57, with a standard deviation of 11.05; their posttest mean score was 44.15, with a standard deviation of 18.27. The pretest mean score for female students was 31.15, with a standard deviation of 10.69, and the posttest mean score was 43.23, with a standard deviation of 17.86. Students' posttest mean scores were higher than their pretest mean scores for both genders, with male students having slightly higher mean improvements than female students. The t-test was computed as stated in Table 4 to assess whether there is a significant difference between the mean scores of male and female students.

Table 4. Mean posttest results for male and female students

Group	N	Mean (μ)	SD (σ)	df	t_{cal}	t_{tab}
Immediate Feedback Group	63	44.15	18.27	143	1.702	1.96
Control Group	81	43.23	17.86			

*P < 0.05

Table 4 reveals that the difference in student performance is not statistically significant. Table 4 also shows that the treatment was particularly successful for male students, who performed better academically in the experimental group.

Part III: Treatment and Gender Interaction Effects on Students' Learning Outcomes.

As shown in Table 5, mean scores and standard deviations for the interaction between gender and immediate feedback strategies on students' learning outcomes were computed.

Table 5. Gender and immediate feedback interactioneffect on students learning outcomes

Variable			Pretest		Posttest	
Feedback Treatment	**Gender**	**N**	Mean	SD	Mean	SD
Experimental Group	Male	63	21.09	9.44	48.64	19.04
	Female	81	21.02	10.04	45.24	20.09
Control Group	Male	36	20.03	11.07	31.12	11.15
	Female	45	15.72	8.98	30.62	13.88

The findings in Table 6 reveal the interaction effect of gender and immediate feedback strategies on students' academic achievement. The interaction effect for treatment-gender F (1, 221) = 0.672, P < 0.05 was not statistically significant.

Given that the association value (0.438) used as a decision criterion is greater than 0.05, the null hypothesis is not rejected, and it is therefore concluded that there is no interaction between gender and immediate feedback on student learning outcomes.

Table 6. Posttest scores' analysis of covariance (ANCOVA) by gender and treatment

Source	Sum of Squares	df	Mean Square	F-cal.	Sig.
Corrected Model	1192,578	4	298.145	4.454*	.002
Intercepts	904.450	1	904.450	13.511*	.000
Pretest	1095.825	1	1095.825	16.340*	.000
Treatment	58. 001	1	58. 001	0.866	.420
Gender	41.008	1	41.008	0.613	.538
Treatment x Gender	45.406	1	45.406	0.672	.438
Error	14794.331	221	66.943		
Corrected Total	12235.795	225			

DISCUSSION

As can be seen from Table 2, the calculated t-test is greater than the t-test obtained from the table (i.e., $t_{cal} > t_{tab}$), which shows that the difference in students' performances is good for the experimental group. In other words, the result shows that the treatment had a positive effect on the academic outcomes of the experimental group. It can be concluded that giving immediate feedback to students in the teaching and learning processes improves learning outcomes. According to the study's findings, using immediate feedback techniques can significantly affect students' academic performance. In comparison to the control group, which received instruction in basic science, basic technology, English language, and math using the traditional feedback technique, the experimental group greatly outperformed it. This result is in line with the findings of Onuigbo & Eze (2010), Ajogbeje & Alonge (2012), Metcalfe, Kornell, & Finn (2009), Ndukwu & Ndukwu (2017) and Hathila, Baria, Damor, & Mahajan (2023). Onuigbo and Eze (2010) reported that the use of feedback when teaching students with maths difficulties improves their maths performance. Ajogbeje and Alonge (2012) also reported that feedback with remediation has an impact on students' achievement. While Metcalfe, Kornell, and Finn (2009) argue that immediate feedback leads to better performance than delayed feedback. According to Ndukwu & Ndukwu (2017), teaching low achievers using an immediate feedback technique has a considerable impact on their proficiency in mathematics. Hathila, Baria, Damor & Mahajan (2023) also reported an improvement in students' knowledge, understanding, and confidence as it helps in identifying gaps and loopholes in learning processes. According to the study's findings, students might improve their academic performance, increase their motivation, self-control, and self-efficacy, and close the gap between their present performance and their intended performance by receiving rapid feedback (Aubin, 2023). Wiggins (2012) says: **"Less teaching plus more feedback is the key to achieving greater learning."**

Table 4 also shows that the treatment was particularly successful for male students, who performed better academically in the experimental group. Thus, it can be said that giving students immediate feedback during teaching and learning has no impact on either the learning of male or female students. The study's findings also demonstrate that the performance scores of both

male and female students in the experimental group were identical to those of the control group. This shows that gender is a nonsignificant variable for students learning outcomes while using immediate feedback. The results are consistent with those reported by Achor, Imoko and Ajai (2010). In their studies, Abdu-Raheem (2012), Mirjam, Heikamp, and Trommsdorff (2013), and Ndukwu & Ndukwu (2017) found the achievement scores of male and female pupils to be equal. According to Ndukwu & Ndukwu (2017), male and female low achievers exposed to the immediate feedback technique did not significantly differ in their achievement scores. However, this result contradicts the findings of Muthukrishny (2010) and Amongne (2015), which reported significant results in preferring male students among male and female students. This study shows that gender and immediate feedback strategies do not have a significanteffect on student achievement. This indicates that immediate feedback (treatment) and no other factors are what lead to pupil learning achievement.

This result is in line with Eze (2003) findings, which claimed that there is no relationship between feedback and gender that affects students' progress. This research suggests that immediate feedback is beneficial to both genders, indicating that prompt feedback can reduce the achievement gap between male and female students. According to Ndukwu & Ndukwu (2017), the interaction effect of gender and immediate feedback on low-achieving pupils' math achievement was not significant

Conclusion

Offering immediate feedback to students has allowed for improvement in students' knowledge, expertise, and self-confidence because it enables in identifying gaps and shortcomings in learning process (Hathila, Baria, Damor & Mahajan, 2023). The findings of this study suggest that immediate feedback can help students close the performance gap between their present and desired goal levels by encouraging self-motivation, self-regulation, and self-efficiency (Aubin, 2023). Furthermore, it is very powerful and effective in the clarification of students' doubts, correction of errors or mistakes, identification of mastery learning gaps, bridging the gender differences in students' learning outcomes and motivating students to learn properly. Notwithstanding the usefulness of feedback, complaint from college students is that they do not receive immediate feedback in their learning process. Therefore this study recommends that classroom teachers should allow and encourage their students to lead and participate actively in teaching and learning in the classroom using active learning techniques, project-based learning, self-assessment, and self-discovery. Therefore, the teacher acts a learning facilitator and consultant in the classroom.

The curriculum for pre-service teachers should include immediate feedback as a learning strategy, and prospective teachers should be shown how to use immediate feedback strategies in the classroom by teacher training institutions, such as colleges of education and technology and faculties of education in universities. The stakeholders in the educational sectors should arrange for in-service training programs, workshops, and seminars on how to apply immediate feedback mechanisms in teaching and learning processes for in-service teachers. School curriculum planners and lesson planners should have student activities and teacher activities share steps by steps with immediate feedback. This will enable students to succeed, study regularly and achieve better results. Lastly, teachers in the classroom need to be prepared and eager to help their students, following Norris and Schuhl's (2016) advice to use assessment questions when students are stuck and advance questions when students are ready to go beyond the standards.

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Conflict of Interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Ethics Statement

This study does not require ethical approval since it focuses on the effects of using immediate feedback as a teaching strategy and does not involve any direct intervention, manipulation, or

collection of personal data from human subjects. However, the research instrument was reviewed and approved by the Centre for Research and Development (CERAD) Ethics Assessment Committee of Bamidele Olumilua University of Education, Science, and Technology.

Author Contribution

The author conceived the idea, developed the materials, carried out the data collection, and wrote the manuscript. The author also read and approved the final manuscript.

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