

Applicationn Of Hausa Proverbs And Aphorisms In Teaching Scientific Concepts, Laws And Principles On Achievement In Basic Science Concepts Among Junior Secondary Schoolstudents In Katsina State, Nigeria

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Abstract:

This study investigated the effect of the application of Hausa (Mother Tongue)proverbs and aphorisms in teaching scientific concepts, laws and principles on achievement in Basic Science concepts among junior secondary school students in Katsina state, Nigeria. A total sample of 240 junior secondary school students were drawn, using stratified random sampling procedure, from the population of all the students offering Basic Science in Katsina state. A short case survey and Quasi-experimental research designs were adopted for the study. The instrument used for data collection was Basic Science Concepts, Laws and Principles Achievement Test (BCLPAT), comprising of 30 item objective questions on the application of Scientific Concepts, Laws and Principles. The statistical tools used for data analysis were Percentages, Chi-square, Mean and Standard Deviation and T-test statistics. The result of the study showed that students taught application of Hausa(Mother Tongue) proverbs and aphorisms in teaching scientific concepts had significantly higher achievement than those taught using the conventional English language. Therefore, the use of Hausa (Mother Tongue) proverbs and aphorisms in teaching scientific concepts, laws and principles had a significant effect on students' academic achievement when compared to the use of English Language. Among the recommendations proffered was that teaching of scientific concepts, laws and principles in basic science at junior secondary school level should go along side using Hausa (Mother Tongue)proverbs and aphorisms for easy clarification, understanding and higher achievements in Katsina State, Nigeria.

Keywords: *Hausa, proverbs, English language, scientific concepts, application, basic science, achievement.*

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I. Introduction

Science as a content of knowledge and process of obtaining knowledge about the environment has undergone series of reforms in efforts to make its understanding and application easier and simplified. In Nigeria, science was initially studied as separate subjects of Biology, Chemistry and Physics by science beginners in the first years of Secondary School Education. Later, the science curriculum changed to Integrated Science for Science beginners which emerged in Nigeria by the year 1968 as a result of world - wide reform movements to improve science education (Ado, 2012). At that time (1968), the West African Examination Council (WAEC) invited Science Teachers Association of Nigeria (STAN) to assist in reviewing its Biology, Chemistry and Physics syllabi. Thus a three curriculum development committees were created who developed a solid foundation for the three science subjects called Integrated science to be taught in the first two years of the then five years Secondary School Education Policy in Nigeria (Ado, 2012). The duration for studying Integrated Science later changed to three years due to 6-3-3-4 Education policy in Nigeria, which later changed to three upper basic science due to the Nigerian 9-3-4 education policy of 2008 (Ibrahim and Muhammad, 2015). Following the decision of the Federal Government of Nigeria to introduce the nine year basic education programme, and the effort to attain the Millenium Development Goals (MDGs) by the year 2015, and to implement the National Economic and Empowerment Development Strategy (NEEDS), as value orientation, poverty eradication, job creation, wealth generation and using education to empower the citizens', it became necessary that the existing primary and junior secondary schools curriculum be reviewed (Ibrahim and Muhammad, 2015). The National Council on Education (NCE) at its meeting in December, 2005 in Ibadan, Nigeria, directed the National Educational Research and Development Council (NERDC) to review, re-structure and re-align the then existing curriculum for primary and junior secondary schools to fit into the 9-year Basic Education Programme in Nigeria, to have Lower Basic Education Curriculum as Primary 4-6 and Upper Basic

Education Curriculum as Junior Secondary School 1-3, which have list of subjects including Basic Science (NERDC, 2007).

The National Policy on Education in Nigeria (NPE, 2013) stated that one of the objectives of Junior Secondary School (JSS) Education is to provide the child with diverse basic knowledge and skills for entrepreneurship and educational advancement. The design of the curriculum was based on the idea of spirality of themes, which are arranged from year one to year three. The thematic approach to content organization was adopted and the major re-curent themes are :

- 1 You and your environment.
- 2 Living and non-living things.
- 3 Science and development.
- 4 You and energy.

These themes were sub-divided into topics in a way that science is presented in an integrated manner from JSS first year through to JSS three, for each year. The themes have topics along with performance objective, content, activities, materials and evaluation guide (National Teachers Institute of Nigeria, NTI,2012). According to the NTI (2012) there are certain things that may be bothering teachers such as why one student understand a science concept, law or principle easily while another student in the same class needs explanations over and over again, and some times other students may not understand the same. One of the basic fact that hinder students from understanding basic science contents, laws and principles is lack of making them participate in activities that they see as useful to them in real life (NTI,2012), for instance, to ask a Katsina town student, who is a Hausa native/tribe from northern Nigeria, to draw a model of a train to demonstrate mode of transportation, which he has never seen in real life.

Despite the importance of basic science as a solid foundation and prerequisite for further studies in Biology, Chemistry, Physics and related disciplines, literature has shown a continuous decline in the performance of students at Junior Secondary School Basic Science Examinations. Literature has also shown that the language used for teaching basic science, which is English language, most times makes it difficult for these lower level secondary school students to comprehend the science concepts, laws and principles. According to Onotere (2009) difficulties are often associated with the acquisition of a second language, which is believed that this is the background insight into the declining rate of poor performance in sciences. However, language is an important medium of communication through which a learner understands and comprehend issues and ideas in the classroom. According to Oxford Advance Learners Dictionary (2024) Language is the principal method of human communication, consisting of words used in a structured and conventional way and conveyed by speech, writing or gesture. It is a system of communication used by a particular country or community. Language is a crucial tool through which information, concepts, skills and values as well as other subjects are transmitted (Ndukwe, 2005). Therefore, language is very important in the process of learning as an instrument of thought and creativity (Ndukwe, 2005). Language, especially native language, otherwise called Mother Tongue (MT) which is a vehicle for expressing the culture of a society, play an important role in affecting learning of every subject within the society and was found to improve students understanding and achievement in schools. Fafunwa and Afolayan (1982) opined that the child's Mother Tongue is natural to him like mother's milk. Chomsky (1975) stated that the child is capable of generating infinite number of sentences in his native language, which shows that the child's creative potentials will be high when he is learning or taught with his mother tongue. Literature has shown that many countries including Nigeria have shown that Mother Tongue significantly enhanced knowledge and achievements, and improved reflective thinking and creativity.

Problem of the Study

Literature has shown the importance of basic science as prerequisite for further studies in sciences and related science disciplines such as medicine and agriculture. However, despite several researches conducted and implemented to improve effective instruction and students performance, yet, students could not show convincing impact on the students' academic achievement in basic science. Therefore, this study was set to find out whether application of Hausa proverbs and aphorisms will have any effect on the junior secondary school students in basic science

Research Questions

1. Are there Hausa proverbs and aphorisms that collocate with scientific concepts,laws and principles in the basic science national cor-curriculum ?
2. Is there any significant difference between achievement of students taught scientific concepts, laws and principles in basic science using hausa proverbs and aphorisms and those taught using conventional English language ?
3. Is there any gender difference between experimental and control groups ?

Research Hypotheses

The following hypotheses were postulated to be tested by the study :

HO₁ There are no Hausa proverbs and Aphorisms that collate with Scientific Concepts, Laws and Principles in Basic Science national core curriculum.

HO₂ There is no significant difference between achievement of students taught scientific concepts, laws and principles in Basic Science using Hausa Proverbs and Aphorisms and those taught using the Conventional English Language.

HO₃ There is no gender difference between the experimental and control groups.

II. Methodology

The study was in two parts. The first part was a short-case survey using 30 basic science teachers, was used to find out whether there are Hausa proverbs and aphorisms that collocate with basic science concepts, laws and principles. The second part was a pre-test, post-test quasi-experimental design used to find out the effect of the application of Hausa proverbs and aphorism in teaching basic science concepts, laws and principles on achievement among junior Secondary School (upper basic) III in Katsina, Nigeria.

III. Data Analysis And Discussion Of Results

The data collected from the field after the experiment was conducted is sorted, organized and used to find answers to research questions and test the hypotheses.

Research Questions and Hypotheses

Research Question 1: Are there Hausa proverbs and aphorisms that collocate with scientific concepts, laws and principles in the Basic Science Core-curriculum?

Table 1.0: Basic Science Teachers' Opinions on Scientific Concepts Collocation Issues (n = 30)

SN	Scientific Concepts	Hausa Proverbs & Aphorisms	Agree (%)	Disagree (%)
1	Concept of Heredity	Gadon halittar iyaye.	27 (90.0)	03 (10.0)
2	Principle of Heredity	Maison d'an k'warai ya auri isassa. Mugu d'an masara ana goyonka kana goyo/gemu	28 (93.3)	02 (6.7)
3	Concept of Matter	Inda abu yake nan ake ganinsa.	28 (93.3)	02 (6.7)
4	Principle of Solid	Maihak'uri ya kan dafa dutse harma ya sha romonsa. Dutsen da ke cikin ruwa bai san ana rana ba	29 (96.7)	01 (3.3)
5	Principle of Liquid	Ruwa masu aiki sannu. Mangyad'a baka barci.	27 (90.0)	03 (10.0)
6	Principle of Gas	Iskar hadari ta d'auki d'aki bare maratayi aikin banza. Yawo kamar k'amshi.	26 (86.7)	04 (13.3)
7	Change of State	Kyandir sandar banza da yasha wuta sai ya narke.	28 (93.3)	02 (6.7)
8	Concept of energy	Mai k'arfi shike aiki. K'arfi jarin maishi, tsohuwa da ta karya k'afar sauro. K'arfi kamar shari'a, Alamar k'arfi tana ga maik'iba.	29 (96.7)	01 (3.3)
9	Source of Energy	Rana mai rabawa kowa aiki. Hantsi lek'a gidan kowa. Hantsi a shaka da lura.	27 (90.0)	03 (10.0)
10	Law of Thermodynamics	Motsi yafi laɓewa. Tafiya sannu-sannu kwana nesa.	30 (100.0)	00 (000.0)
		Cumulative aggregate	279 (93.0)	21 (7.0)

The table 1.0 presents the opinions of 30 Basic Science teachers on the collocation of Hausa proverbs and aphorisms with various scientific concepts, laws, and principles. The results showed that 90% of the teachers agreed that the Hausa proverb "Gadon halittar iyaye" (Inheritance from parents) collocates with the concept of heredity. 93.3% of the teachers agreed that the Hausa proverbs "Maison d'an k'warai ya auri isassa" (To get a noble child, marry a noble woman) and "Mugu d'an masara ana goyonka kana goyo/gemu" (The inherent young maize, still on the parent plant but have started producing bears) collocates with the principle of heredity. 93.3% of the teachers agreed that the Hausa proverb "Inda abu yake nan ake ganinsa" (Where something is, that's where it is seen) collocates with the concept of matter. Therefore, the teachers have shown a high level of agreement (96.7%, 90%, and 86.7%, respectively) Also, the Hausa proverbs such as "Maihak'uri yakan dafa dutse harma yasha romonsa" (i.e. a patient person can boil a stone until it becomes soft then he drinks its soup), "Dutsen dake cikin ruwa bai san ana rana ba (i.e. stone under sea water do not know whether there is sun). "Ruwa masu aiki sannu" (Water works at slow pace), "Man gyad'a baka barci (i.e. groundnut oil

do not solidify) and "Iskar hadari ta d'auki d'aki bare maratayi aikin banza" (stormy wind has blown up a room, not to talk about a useless hung material); Yawo kamar k'amshi (i.e. free movement like odour) all collocates with the principles of solid, liquid, and gas, respectively.

93.3% of the teachers also agreed that the Hausa proverb "Kyandir sandar banza da tasha wuta saita narke" (useless stick of candle that melts when it is brought close to fire) collocates with the concept of change of state. 96.7% of the teachers agreed that Hausa proverbs such as "Mai k'arfi shike aiki" (The strong one is the one who works), "K'arfi jarin maishi, tsohuwa da ta karya k'afar sauro" (Strength is a benefit of its owner, just like when an old woman breaks the leg of mosquito), "K'arfi kamar shari'a" (Strength like law) and "Alamar k'arfi tana ga mai k'iba" (The sign of strength is seen in fat people) all collocates with the concept of energy. 90% of the teachers agreed that Hausa proverbs like "Rana mai rabawa kowa aiki" (The sun shares work to everybody), "Hantsi lek'a gidan kowa" (Morning sun light shines in every body's house), and "Hantsi a shaka da lura" (There must be care when sitting under morning sunshine) all collocates with the concept of source of energy. Finally, all the teachers (100%) agreed that the Hausa proverbs "Motsi yafi lab'ewa" (Movement is better than remaining hidden) and "Tafiya sannu-sannu kwana nesa" (Slow and steady wins the race) all collocates with the law of thermodynamics. All overall, the cumulative agreement among the teachers on the collocation of Hausa proverbs and aphorisms with the scientific concepts, laws, and principles was 93%.

The findings suggest that there is a strong collocation between Hausa proverbs and aphorisms and the scientific concepts, laws, and principles covered in the Basic Science Core-curriculum. The high level of agreement among the teachers indicates that Hausa cultural knowledge, as expressed through proverbs and aphorisms, can be effectively integrated into the teaching and learning of basic science. This approach can improve students' learning and retention of scientific concepts, laws and principles and enhancing high achievement in Basic science. The results highlight the potential for incorporating indigenous knowledge systems, such as Hausa proverbs and aphorisms, into the formal education system.

Ho1. There is no significant difference between Hausa proverbs and aphorisms that collocate with scientific concepts, laws and principles usage in the Basic Science teaching and the conventional English terminologies used.

Table 2: Chi-square results of difference between Hausa proverbs and aphorisms collocation with scientific concepts

Items	N	Chi-square value	Df	p-value	Alpha	Decision
Hausa proverbs and aphorism in science concepts	30	6.605	9	0.678	0.05	Accept Ho ₁

Table 2 presents the results of chi-square analysis conducted to test the null hypothesis (Ho1). The calculated chi-square value is 6.605 at degrees of freedom of 9, the p-value obtained from the analysis is 0.678 at alpha level of 0.05. Since the p-value (0.678) is greater than the alpha level (0.05), we fail to reject the null hypothesis (Ho1). This means that there is no statistically significant difference between the usage of Hausa proverbs and aphorisms and the usage of conventional English terminologies in the teaching of scientific concepts, laws, and principles in the Basic Science. The results suggests that Hausa proverbs and aphorisms can be used interchangeably with conventional English terminologies in the teaching of scientific concepts, laws, and principles in the Basic Science. This indicates that the integration of Hausa cultural knowledge, as expressed through proverbs and aphorisms, can be an effective approach to science education, as it does not significantly differ from the conventional teaching methods.

The acceptance of the null hypothesis (Ho1) implies that Hausa proverbs and aphorisms can be effectively incorporated into the Basic Science curriculum, as they do not present a significant difference in their usage compared to conventional English terminologies. Thus, the chi-square analysis suggests that Hausa proverbs and aphorisms can be used alongside conventional English terminologies in the teaching of scientific concepts, laws, and principles in the Basic Science curriculum, without any statistically significant difference in their usage and effectiveness.

Research Question 2: Is there any significant difference between achievement of students taught scientific concepts, laws and principles in the Basic Science using Hausa proverbs and aphorisms and those taught using the conventional English Language?

Table 3: Difference in achievement of students taught scientific concepts using Hausa proverbs & aphorism and those taught using conventional method

Groups	Number	Mean	Std.dev	Mean difference
Experimental	120	24.71	2.779	10.925
Control	120	13.78	4.830	

The table 3 presents the results of the comparison between the achievement of students taught scientific concepts, laws, and principles in Basic Science using Hausa proverbs and aphorisms (experimental group) and those taught using the conventional English language (control group). Experimental group (Hausa proverbs and aphorisms) has a Mean of 24.71 and Control group (Conventional English language) has a Mean of 13.78. The mean difference between the two groups is 10.925, with the experimental group scoring higher than the control group. The students taught scientific concepts, laws, and principles using Hausa proverbs and aphorisms (experimental group) achieved significantly higher scores compared to the students taught using the conventional English language (control group). The findings suggests that there is significant difference between experimental and control groups in favour of the experimental group.

The results highlight the potential benefits of incorporating indigenous language, such as Hausa proverbs and aphorisms, into the basic science education. This approach can lead to a more inclusive, culturally responsive, and effective science education, ultimately improving student learning and achievement in science. Thus, the finding suggest that the use of Hausa proverbs and aphorisms in the teaching of scientific concepts, laws, and principles in the Basic Science curriculum can significantly improve student achievement compared to the conventional English language approach.

Ho2. There is no significant difference between achievement of students taught scientific concepts, laws and principles in Basic Science using Hausa proverbs and aphorisms and those taught using the conventional English Language.

Table 4:t-test results of difference in achievement of students taught scientific concepts using Hausa proverbs & aphorism and those taught using conventional method

Groups	Number	t-cal	Df	p-value	Alpha	Decision
Experimental	120	21.477	238	0.000	0.05	Reject Ho ₂
Control	120					

Table 4 presents the results of the t-test analysis conducted to test the null hypothesis (Ho2).

The calculated t-value is 21.477, at degrees of freedom of 238, p-value obtained from the analysis is 0.000 at alpha level of 0.05. Since the p-value (0.000) is less than the alpha level (0.05), we reject the null hypothesis (Ho2). This means that there is a statistically significant difference between the achievement of students taught using Hausa proverbs and aphorisms and those taught using the conventional English language. The results suggest that the use of Hausa proverbs and aphorisms in the teaching of scientific concepts, laws, and principles in the Basic Science curriculum led to significantly higher student achievement compared to the conventional English language approach. The rejection of the null hypothesis (Ho2) indicates that the integration of Hausa cultural knowledge, as expressed through proverbs and aphorisms, can be an effective and beneficial approach to science education.

This finding supports the potential for incorporating indigenous knowledge systems into the formal education system, as it can lead to improved student learning outcomes and a more culturally responsive curriculum. Thus, the t-test analysis indicates that there is a statistically significant difference in the achievement of students taught scientific concepts, laws, and principles in Basic Science using Hausa proverbs and aphorisms compared to those taught using the conventional English language. This finding supports the integration of indigenous knowledge systems, such as Hausa proverbs and aphorisms, into the formal education system to enhance student learning and promote a more culturally responsive approach to science education.

Research Question 3: Is there any gender difference between the experimental and control group?

Table 5: Gender Difference in achievement between experimental and control groups

Group	Gender	Number	Mean	Std.dev	Mean difference
Experimental	Male	60	25.25	2.809	1.013
	Female	60	24.23	2.708	
Control	Male	60	15.62	5.142	3.667
	Female	60	11.95	3.712	

Table 5 presents the results of the analysis on the gender difference in the achievement of students taught scientific concepts, laws, and principles in Basic Science using Hausa proverbs and aphorisms (experimental group) and those taught using the conventional English language (control group). The results showed that in the experimental group, the mean for male is 25.25 while that of female is 24.23 with mean difference of 1.013. The control group results showed that the mean for male students is 15.62 while the female students have 11.95 with mean difference of 3.667 which is a larger difference compared to the experimental group. The smaller mean difference between male and female students in the experimental group suggests that the use of Hausa proverbs and aphorisms in the teaching of scientific concepts, laws, and principles may have a more equitable impact on the achievement of both genders. The larger mean difference in the control group

indicates that the conventional English language approach may have a more pronounced gender-based disparity in student achievement.

Thus, the results suggest that the use of Hausa proverbs and aphorisms in the teaching of scientific concepts, laws, and principles in the Basic Science curriculum may have a more equitable impact on the achievement of male and female students compared to the conventional English language approach. This finding highlights the potential of incorporating indigenous knowledge systems into the formal education system to promote gender-inclusive and culturally responsive science education.

Ho₃. There is no significant gender difference between the experimental and control groups.

Table 6: t-test results of Gender Difference in achievement between experimental and control groups

Group	Gender	Number	t-cal	Df	p-value	Alpha	Decision
Experimental	Male	60	2.018	118	0.046	0.05	Reject Ho ₃
	Female	60					
Control	Male	60	4.478	118	0.000	0.05	
	Female	60					

Table 6 presents the results of the t-test analysis conducted to test the null hypothesis (Ho₃). The t-calculated for experimental group is 2.018 and for control group is 4.478 at degree of freedom of 118 for both, p-value for experimental group is 0.046 while for control group is 0.000 at alpha of 0.05. Since both the t-calculated values are less than the alpha value, we reject the null hypothesis (Ho₃) for both groups. The results suggest that there is a statistically significant gender difference in the achievement of students in both the experimental and control groups. However, the rejection of Ho₃ for both groups indicates that the nature and magnitude of the gender difference may differ between the two groups. Thus, the t-test analysis indicates that there is a statistically significant gender difference in the achievement of students in both the experimental group (Hausa proverbs and aphorisms) and the control group (conventional English language). However, the nature and magnitude of the gender difference may differ between the two groups, with the experimental group showing a smaller gender-based achievement gap compared to the control group.

The results from data analysis revealed that the integration of Hausa proverbs and aphorisms into the Basic Science curriculum can lead to improved student learning outcomes and a more equitable learning environment, particularly in comparison to the conventional English language approach. This highlights the potential benefits of incorporating indigenous knowledge systems into formal education to enhance science teaching and learning and improve students achievements. The study investigated the impact of the application of Hausa proverbs and aphorisms in teaching scientific concepts, laws, and principles in Basic Science compared to conventional English language. The findings revealed that a significant majority of teachers agree that Hausa proverbs and aphorisms effectively collocate with scientific concepts, demonstrating the potential of culturally relevant pedagogy in science education.

Students taught using Hausa proverbs and aphorisms achieved significantly higher scores than those taught using conventional English, highlighting the effectiveness of culturally relevant teaching methods. The use of Hausa proverbs and aphorisms minimized gender disparities in student achievement, promoting equitable learning outcomes. Conventional English language instruction resulted in more pronounced gender disparities in academic performance, particularly favoring male students. The finding that 93% of teachers agree with the collocation of Hausa proverbs and scientific concepts aligns with studies emphasizing the importance of culturally relevant pedagogy. For instance, Ladson-Billings (1995) argues that culturally relevant teaching can improve student engagement and understanding by connecting new knowledge to students' cultural backgrounds. In the context of Nigerian education, using Hausa proverbs can make scientific concepts more relatable and easier to grasp for students familiar with the language and culture. The high levels of agreement for specific concepts like the Law of Thermodynamics (100%) suggest that certain proverbs may be particularly effective in conveying abstract scientific principles.

This finding is supported by research indicating that using metaphors and analogies rooted in students' cultural contexts can enhance comprehension of complex ideas (Aubusson, Harrison, & Ritchie, 2006). The acceptance of the null hypothesis (Ho₁) that there is no significant difference between the usage of Hausa proverbs and conventional English terminologies is in line with studies suggesting that culturally relevant materials can be as effective as traditional ones. For instance, a study by Gay (2010) found that culturally responsive teaching strategies do not compromise academic rigor and can lead to comparable or even superior educational outcomes.

The finding that students taught using Hausa proverbs and aphorisms (mean = 24.71) outperformed those taught using conventional English (mean = 13.78) aligns with evidence that culturally relevant teaching strategies can significantly enhance academic achievement. This is supported by a meta-analysis by Banks and Banks (2016), which found that students learn better when instruction is tied to their cultural context. The substantial mean difference (10.925) between the two groups suggests that the integration of culturally familiar

content in science education can bridge gaps in understanding and retention, as noted in studies on the impact of culturally relevant pedagogy on student performance (Hammond, 2015). The rejection of Ho₂ indicates a statistically significant difference in achievement, confirming the effectiveness of using Hausa proverbs and aphorisms in teaching. This is consistent with research by Culturally Relevant Education Research and Advocacy (2015), which found that students exposed to culturally relevant teaching materials showed significant improvements in academic performance.

The small mean difference (1.013) in the experimental group suggests that culturally relevant teaching methods can help minimize gender disparities in academic achievement. This finding resonates with studies indicating that inclusive teaching practices can create equitable learning environments for both male and female students (National Education Association, 2017). The larger mean difference (3.667) in the control group underscores the persistence of gender disparities when conventional methods are used. Research by UNESCO (2012) highlights that traditional teaching methods often fail to address the specific learning needs of different genders, leading to unequal academic outcomes.

The statistically significant gender difference in the experimental group, despite being minimal, suggests that while Hausa proverbs and aphorisms benefit all students, slight variations in impact may still exist. This is consistent with findings by Sleeter (2011), who notes that culturally relevant teaching generally benefits all students but may have differential impacts based on individual student backgrounds. The significant gender difference in the control group aligns with extensive research indicating that conventional teaching methods often exacerbate existing gender disparities in educational achievement (OECD, 2015). The findings collectively underscore the efficacy of using culturally relevant teaching methods, such as Hausa proverbs and aphorisms, in improving academic performance and minimizing gender disparities.

IV. Conclusion

The findings of this research provide compelling evidence for the integration of Hausa proverbs and aphorisms into the Basic Science curriculum. The high level of agreement among the Basic Science teachers on the collocation of Hausa cultural knowledge with scientific concepts, laws, and principles suggests that this approach can be an effective and culturally responsive way to teach basic science. The comparison of student achievement between the experimental group (Hausa proverbs and aphorisms) and the control group (conventional English language) further reinforces the potential benefits of this approach. The significantly higher scores achieved by the students in the experimental group indicate that the use of Hausa proverbs and aphorisms can lead to improved learning outcomes and a deeper understanding of scientific principles.

Moreover, the analysis of gender difference in student achievement reveals that the integration of Hausa proverbs and aphorisms may have a more equitable impact on both male and female students, reducing the gender-based achievement gap observed in the control group. This finding highlights the importance of incorporating culturally relevant and inclusive teaching methods to promote gender equity in science education. The statistical analyses conducted in this study further validate the significance of the findings. The lack of a statistically significant difference in the usage of Hausa proverbs and aphorisms compared to conventional English terminologies suggests that this approach can be seamlessly integrated into the existing curriculum.

The statistically significant differences in student achievement between the experimental and control groups, as well as between genders within each group, underscore the potential impact of this approach on learning outcomes. The findings of this research demonstrate the value of integrating Hausa proverbs and aphorisms into the Basic Science curriculum. This approach can lead to improved student learning, a more equitable learning environment, and the preservation of Hausa cultural heritage. The results of this study have important implications for the development of culturally responsive and inclusive science education in Nigeria and beyond.

V. Recommendations

Based on the findings of this research, the following recommendations are proffered:

1. The Ministry of Education and curriculum development agencies should consider incorporating Hausa proverbs and aphorisms into the Basic Science curriculum. This integration can help to create a more culturally relevant and engaging learning environment for students.
2. Pre-service and in-service teacher training programs should include modules on the use of Hausa proverbs and aphorisms in science education. This will equip teachers with the necessary knowledge and skills to effectively integrate this approach into their teaching practices.
3. Textbooks, lesson plans, and other instructional materials should be developed that incorporate Hausa proverbs and aphorisms alongside the conventional scientific terminologies and concepts. This will ensure that the cultural knowledge is seamlessly integrated into the teaching and learning process.

4. The implementation of the Hausa proverbs and aphorisms approach should be piloted in selected schools, with a comprehensive evaluation of its impact on student learning outcomes, engagement, and overall effectiveness. The findings from these pilot studies can inform the further refinement and scaling up of the approach.
5. The development and implementation of the Hausa proverbs and aphorisms approach should involve close collaboration with Hausa cultural experts, linguists, and community leaders. This will ensure that the cultural knowledge is accurately represented and appropriately integrated into the science curriculum.
6. The findings of this research should be widely disseminated to education stakeholders, including policymakers, school administrators, teachers, and the broader community. This will help to raise awareness and garner support for the integration of Hausa cultural knowledge into the education system.
7. The successful integration of Hausa proverbs and aphorisms into the Basic Science curriculum can serve as a model for the incorporation of other indigenous knowledge systems into various subject areas. This can contribute to a more inclusive and culturally responsive education system across Nigeria.

By implementing these recommendations, the education system in Nigeria can leverage the rich cultural heritage of the Hausa people to enhance the teaching and learning of science, ultimately improving student outcomes and promoting the preservation of indigenous knowledge.