The Use of Vee-Diagram Learning Style on Students Entrepreneurial Skills Acquisition and Retention In Construction of a Standard-Variable Resistor in Ilorin, Kwara State.

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Abstract

This quantitative study investigated the impact of the use of vee-diagram learning style on students' entrepreneurial skills acquisition and retention in constructing a standard-variable resistor in Ilorin, Kwara State. The research employed a pre-test, post-test, quasi-experimental, non-equivalent, non-randomized control group design, involving an experimental group exposed to the vee-diagram learning style and a control group taught through conventional methods. The sample of the study included One hundred and thirty-five (135) Senior Secondary Three (SS3) science students from two public co-educational schools in Ilorin. Data was collected using the Physics Creative Ability Test (PCAT), Physics Entrepreneurial Skills Acquisition Test (PESAT) and Physics Entrepreneurial Skills Retention Test (PESRT), validated by experts and assessed for reliability with reliability indices of PCAT, PESAT, and PESRT as 0.89, 0.94, and 0.94 respectively. Statistical analysis used for this study included descriptive statistics (mean and standard deviation), inferential statistics Analysis of Covariance (ANCOVA), and reliability testing using SPSS software version 25.0. Findings indicated a significant difference in entrepreneurial skills acquisition based on students' levels of creative ability, emphasizing the efficacy of the vee-diagram learning strategy. However, no significant difference was observed in retention scores across different levels of creative ability using the same learning strategy. These results underscore the importance of tailoring instructional methods to enhance skills acquisition while considering varied learner capabilities in technical subjects.

Keywords: **Resistor, Vee-Diagram, Style, Entrepreneurial, Skills, Retention.**

Introduction

The high unemployment rate in Nigeria has drawn the attention of the nation as a whole. In the third quarter of 2023, the unemployment rate rose to 5.0 percent, a considerable increase of 0.8 percent from the second quarter of the same year (Aina & Olufemi, 2024). In today's fast-paced world, the capacity to recognize possibilities, think creatively, and manage risk is an invaluable skill. However, there is a worrying disparity between the amount of students learning entrepreneurial skills and the growing demand for them. This lack of experience and education in entrepreneurship can have serious consequences for society as a whole, as well as for individual students.

Gaining entrepreneurial skills has been highlighted as a technique for shaping employable individuals to solve unemployment holistically, since jobless people require more skills to obtain new employment. Above all, it equips students for financial independence and self-employment, as opposed to paid work, where one's earnings are constrained. With paid employment, one makes a living. According to researchers, science education can be used as a tool for the acquisition of skills. That is, skills can be acquired through science education, and skill is the ability to carry out a task with predetermined results often within a given amount of time, energy, or both. Skill is very important in the life of every human being, and certain physics' curriculum topics foster entrepreneurial skills (Okafor, 2018).

Physics is a field of study that examines the principles that govern the universe's structure, the different types of matter, and their interactions (McGregor, 2023; Rayed & Ismael, 2020). Physics, according to Malik et al. (2023), is a science of measurement, and its knowledge has greatly contributed to the production of instruments and devices that are of great benefit to the human race. Within the vast scientific landscape, physics holds a fundamental position. Physics delves into the most basic laws governing the universe, from the tiniest subatomic particles to the colossal expanse of galaxies. A strong foundation in physics equips students with the ability to not only comprehend the world around them but also to harness its potential for novel solutions and advancements. Physics education plays a crucial role in not just fostering scientific literacy, but also in cultivating a range of transferable skills essential for success in the 21st century. One such skill set is entrepreneurship, the ability to identify opportunities and translate them into actionable solutions. By nurturing an entrepreneurial mindset, physics education empowers students to go beyond simply understanding electrical circuits, such as those utilizing standard-variable resistors, but also to envision innovative applications and contribute to economic growth.

This study investigates the use of the Vee-diagram learning style on students' acquisition, and retention of entrepreneurial skills within the context of constructing a standard-variable resistor in Ilorin, Kwara State. The focus is on the construction of standard-variable resistors, a fundamental component in electrical circuits, as a platform for students to develop both their practical physics skills and their entrepreneurial acumen. Vee-diagrams, with their visual representation of relationships and concepts, can potentially enhance student understanding and foster a deeper level of learning that can be readily applied to entrepreneurial endeavors.

The inability of secondary school-leavers to be self-employed worsens the biting unemployment situation in society. The sight of these hordes of unemployed young school-leavers continues to generate varied concerns over the failure of the education system to avail them of appropriate entrepreneurial skills to enable them to become entrepreneurs. Okeke and Egbunomu (2008) opined that the youths should be equipped with appropriate scientific and technological knowledge and skills that will empower them economically to survive in our modern age of science and technology. A way of achieving this is through the acquisition of entrepreneurial skills, some of which are embedded in the physics curriculum for the secondary and tertiary levels of education. Okafor (2018) reported that there are physics concepts that promote entrepreneurial skills, i.e. there are entrepreneurial skills embedded in concepts of physics. However, Ofoha (2011) stated that senior school graduates are not acquiring the necessary entrepreneurial skills for them to be self-employed. Therefore, there is a need to address why students are not acquiring the skills for them to be self-employed after school. Hence, this study seeks to investigate the effects of Vee-diagram learning style on senior school students' entrepreneurial skills' acquisition, and retention on the construction of standard-variable resistors in Ilorin.

Entrepreneurial skill is the ability to create something new with value by devoting the necessary time and effort, assuming the accompanying financial, psychic, and social risks, and receiving the resulting rewards of monetary and personal satisfaction and independence (Olagunju, 2004). Entrepreneurial skill consists of the effective utilization of ideas, information, and facts that help a learner develop competencies needed for firm career commitments such as setting up business, marketing, services, or being productive. Entrepreneurs are wealth creators, employers of labour, and self-reliant, thereby contributing to nation-building. The skills implicit in the secondary school physics curriculum include among others: the ability to construct and use a simple electrical continuity tester, solar collector, telescope, compound microscope, simple transmission system, and so on. (Okafor, 2018)

The knowledge and skills that physics students acquire could be of value by helping them develop entrepreneurial skills for wealth creation. Ismail et al. (2012) stated that the array of possible entrepreneurial skills encompasses the perception of economic opportunity, technical and organizational innovations, gaining command over scarce resources, taking responsibility for internal management and for external advancement of the firm in all aspects. Some entrepreneurial skills as observed by Ismail et al. include; creative thinking,

planning of research, decision-making, organizing, communicating, team building, marketing, managing finance, record keeping, goal setting and managing a business, observing, interpreting the market, exhibiting of knowledge and mastering of skills, ability to communicate, and so on.

The entrepreneurial skills to be considered in this study are those that have to do with technical and innovative skills, including measurement, manipulative, and finger dexterity skills. The measurement skill enables learners to acquaint themselves with accuracy in finding the size, length, quantity, or degree of a substance. Manipulative skill on the other hand enables learners to confidently handle an object with appropriate control and the velocity required to finish the task, while finger dexterity skill allows students to manipulate objects with fingers (Avwiri, 2020). Okeke and Egbunomu (2008) opined that the youths should be equipped with appropriate scientific and technological knowledge and skills that will empower them economically to survive in our modern age of science and technology. A way of achieving this is through the acquisition of entrepreneurial skills, some of which are embedded in the physics curriculum for the secondary and tertiary levels of education. Also, Ismail et al. (2012) stated that the array of possible entrepreneurial skills encompasses the perception of economic opportunity and technical and organizational innovations. Gaining command over scarce resources, taking responsibility for internal management and for external advancement of the firm in all aspects.

The Vee-diagram is a visualization tool used to assist students in understanding their study by reinforcing and guiding their thinking skills (Thiessen, 1992). The Vee-diagram was created within the conceptual and theoretical framework of the student's new knowledge. However, it does not address the linkages between activities and concepts that are required to obtain the desired knowledge (Gowin, 1981). A Vee-diagram provides a solution by merging both theoretical knowledge to be taught or learnt and activities to be performed in a single Vee unit. The theoretical side includes philosophy, theory, principles/conceptual systems, and concepts. Records, transformations, knowledge claims, and value claims are all part of the methodological side Figure 1. The events or items to be studied at the point of the Vee diagram are where knowledge production begins (Gowin, 1981), this point interacts with both sides to achieve the answer to the focus question (Novak & Gowin, 1984). The Vee-diagram is an effective tool for achieving meaningful learning, and it has assisted students in improving metacognition (Ismail & Shejeena, 2022).

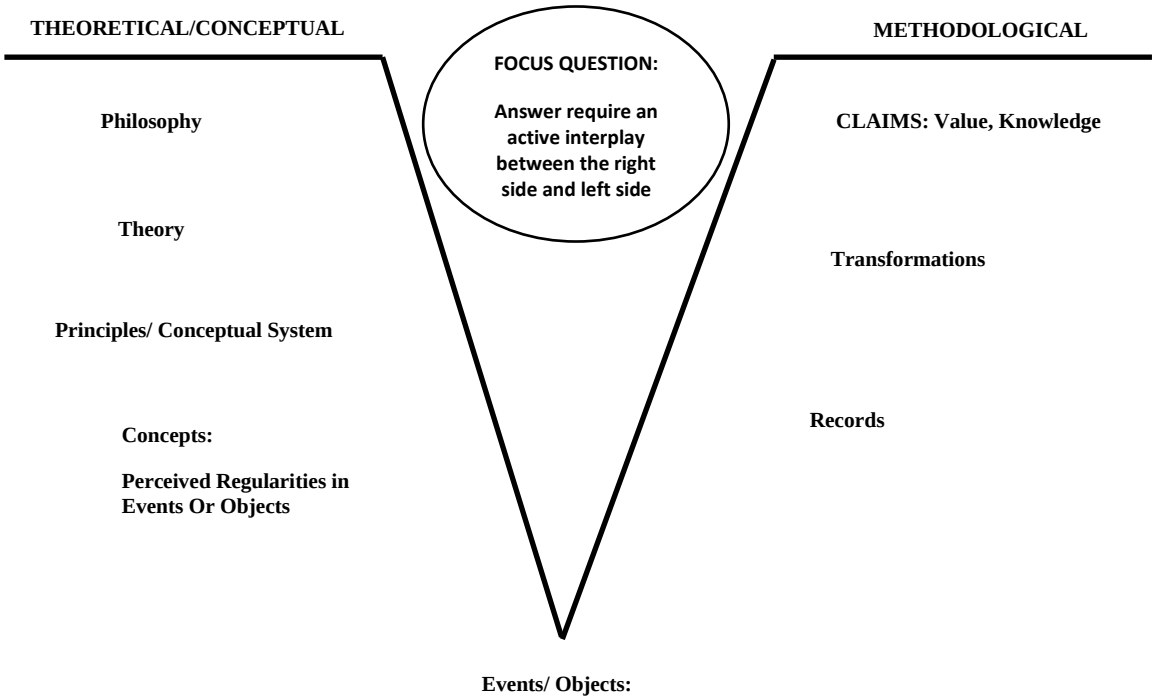

Figure 1: Gowin's Vee Heuristic Device

Retention, according to Olarewaju (2017), is the ability to retain and remember information or knowledge gained after committing it into memory. For instance, Guwam and Gwandum (2017) discovered that using an elaboration approach helps students retain more knowledge of mathematical ideas and have a better understanding of the concepts being taught. This researcher discovered that students who were exposed to constructivist methods of instruction had greater levels of retention than those who were taught utilizing traditional methods of instruction.

Statement of the Problem

Equipping students with both scientific literacy and entrepreneurial skills is crucial for navigating the demands of the modern world. Physics education, while fostering scientific understanding, may not explicitly target the development of entrepreneurial skills. Standard-variable resistors, a key component in electrical circuits, offer a valuable platform for integrating scientific knowledge with practical application. However, traditional teaching methods may not fully optimize student learning and their ability to retain knowledge for entrepreneurial purposes.

Avwiri (2020) investigated students' creative levels and instructional methods in the acquisition of entrepreneurial skills in the rewinding of coils in an electric motor. Also, Ezenwanne (2021) studied the effect of demonstration and problem-solving methods on entrepreneurial skills acquisition in food and nutrition among secondary school students. This

research investigated the potential of the Vee-diagram learning style to address this gap. While the effectiveness of Vee-diagrams in science education is recognized, limited research explores its impact on students' acquisition, retention, and metacognition of entrepreneurial skills within the context of constructing standard-variable resistors. This study aims to bridge this knowledge gap by examining whether the Vee-diagram learning style can enhance students' entrepreneurial skill acquisition in Ilorin, Kwara State, Nigeria.

Purpose of the Study

The main purpose of this study to investigate the effect of the Vee-diagram learning style on senior school students' entrepreneurial skills acquisition and retention in the construction of a standard-variable resistor in Ilorin, Kwara State. Specifically, the study investigated the effect of:

1. Vee-diagram learning style on students' entrepreneurial skills acquisition in the construction of a standard-variable resistor considering students' high, moderate, and low creative ability;
2. Vee-diagram learning style on students' retention of entrepreneurial skills' acquisition in the construction of a standard-variable resistor.

Research Questions

The following research questions were raised and answered.

1. What is the effect of the use of a Vee-diagram learning style on students' entrepreneurial skills acquisition in the construction of a standard-variable resistor considering students' high, moderate, and low creative ability?
2. What is the difference in high, moderate, and low creative students' retention of entrepreneurial skills' acquisition in the construction of a standard-variable resistor using a Vee-diagram learning style?

Research Hypotheses

The following null hypotheses were formulated and tested at the 0.05 level of significance:

H_{01}: There is no significant difference in students of high, moderate, and low creative ability levels in the entrepreneurial skills acquisition when taught with a Vee-diagram learning style in the construction of a standard-variable resistor.

H_{02}: There is no significant difference between the mean retention scores of high, moderate, and low creative students' entrepreneurial skills acquisition in the construction of a standard-variable resistor using a Vee-diagram learning style.

Research Method

This study is a quantitative research and adopted a pre-test, post-test, quasi-experimental, non-equivalent, non-randomized control group research design. This design was considered suitable for the study since it enables the utilization of intact classrooms without interfering with the curriculum. The study involved 1 experimental group and control group B. Schools were classified into experimental group and control group B using a randomization process. Students in experimental group A were exposed to Vee-diagram learning style, while the second group B served as the control group and students in this group were taught using the conventional method. The dependent variables were the students' entrepreneurial skill acquisition, and retention in the construction of a standard-variable resistor, and the independent variables were the treatment, and the Vee-diagram learning style.

The population for this study was fifteen thousand, six hundred and seventy-nine (15,679) science students in senior secondary schools in Ilorin, Kwara State. The sample for this study was 135 students (55 males and 80 females) in the intact class of Senior Secondary Three (SS3) offering physics. The concept (resistance) considered is scheduled in the first term of the third year of the revised edition of the senior secondary school physics curriculum (Federal Republic of Nigeria, 2013), and the content of instruction in this study was limited to standard-variable resistor. A purposive sampling technique was used to select 2 public co-educational schools from the eighty (80) senior secondary schools in Ilorin metropolis. One school was selected from each of the three local government areas that make up Ilorin, that is, Ilorin West, Ilorin East, and Ilorin South. One of the selected schools was assigned experimental groups and the other one was assigned the control group. The selected schools were purposively sampled because they were coeducational. The research instruments that were used for data collection for this study were the Physics Entrepreneurial Skills Acquisition Test (PESAT) and the Physics Entrepreneurial Skills Retention Test (PESRT). PESAT contains two sections (A and B). Section A contained background information about the respondents. Section B contained five procedures on hands-on activities, where measurement skills, manipulative skills, and finger dexterity skills are involved. Each item carries 5 marks. PESRT also contained two sections (A and B). Section A contained background information about the respondent. Section B contains five procedures on hands-on activities, where measurement skill, manipulative skill, and finger dexterity skill were involved. Each item carries 5 marks.

The instruments were validated by 1 expert in test and measurement, Department of Social Science Education, University of Ilorin, Ilorin, Nigeria, 2 senior and experienced secondary school physics teachers, and 1 physics education experts in the Department of Science Education, University of Ilorin, Ilorin, Nigeria to study the construct. They also examined the test content and checked if the instrument content adequately represented the construct. The experts, therefore, requested to do the following:

1. Review and revise the items (if necessary) in line with the objectives.
2. Reword/delete/add items as they consider appropriate.
3. Made general comment(s) on the usability of the instrument.
4. Check the grammatical structure of the test and questionnaire

The inputs and corrections made were utilized to enhance the face and content validity of the instruments. The validity indices of the instruments were calculated for the PCAT, PESAT, and PESRT as 0.76, 0.88, and 0.88 respectively. The reliability of the instruments was determined with the use of a test-retest reliability test. This is to maintain the internal consistency of the test items. Pearson's product-moment correlation at $P < 0.05$ was used to analyze the data collected. The reliability indices obtained for the instruments PCAT, PESAT, and PESRT, are 0.89, 0.94, and 0.94. All the instruments were considered reliable and were used for the research.

The data collected were analyzed using descriptive and inferential statistics. Specifically, the mean and standard deviation were used to answer the two research questions, while, analysis of covariance (ANCOVA) was used to test the hypotheses at a 0.05 level of significance. The data collected from the research were analyzed using Statistical Package for Social Science (SPSS) software, version 25.0.

Data Analysis and Results

Research Question 1

What is the effect of the use of a Vee-diagram learning style on students' entrepreneurial skills acquisition in the construction of a standard-variable resistor considering students' high, moderate, and low creative ability?

Table 1 presents the effect of using a Vee-diagram learning style on students' entrepreneurial skills acquisition in constructing a standard-variable resistor, categorized by students' high, moderate, and low creative ability. Highly creative students (N=1), had a pretest mean score of 44.00, and a posttest mean score of 52.00. The mean gain score of the highly creative student is 8.00, suggesting a high improvement in entrepreneurial skills

acquisition. Moderately creative students had a pretest mean score of 43.08 and a posttest mean score of 46.46. The mean gain score of the moderately creative students is 3.38, indicating that the Vee-diagram learning style positively influenced their entrepreneurial skills, albeit to a lesser extent compared to the high creative ability level students. Low creative students had a pretest mean score of 40.53 and a posttest mean score of 46.80. The low creative students had a mean gain score of 6.27, proposing that the Vee-diagram learning style was effective in enhancing entrepreneurial skills among students with low creative ability. In conclusion, the Vee-diagram learning style enhances students' entrepreneurial skills across different levels of creative ability.

Table 1: The Description of Students' Entrepreneurial Skills Acquisition in Construction of a Standard-Variable Resistor Using Vee-Diagram Learning Style Considering Students' High, Moderate, and Low Creative Ability

Creative Ability Levels	n	Pretest Mean	SD	Posttest Mean	SD	Mean Gain
High	1	44.00	-	52.00	-	8.00
Moderate	13	43.08	9.68	46.46	7.22	3.38
Low	30	40.53	6.54	46.8	7.73	6.27

Hypothesis 1

There is no significant difference in students of high, moderate, and low creative ability level in the entrepreneurial skills acquisition when taught with Vee-diagram learning style in the construction of a standard-variable resistor.

The result in Table 2 reveals that $F(2, 85) = 3.538$, and the calculated value is $0.033(p>0.05)$ which is less than the table value. This indicates that there was a significant difference in entrepreneurial skills acquisition across different levels of creative ability. Therefore, the null hypothesis that there is no significant difference in entrepreneurial skills acquisition among students with different levels of creative ability is not retained.

Table 2: The ANCOVA Analysis Result of Students' Entrepreneurial Skills Acquisition in Construction of a Standard-Variable Resistor Using Vee-Diagram Learning Style Considering the Students' High, Moderate, and Low Creative Ability

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	496.715a	7	70.96	1.71	.117
Intercept	56707.425	1	56707.43	1369.43	.000
Style	53.134	2	26.57	.642	.529
CAL	293.052	2	146.53	3.538	.033
Style * CAL	129.704	3	43.24	1.044	.377
Error	3519.801	85	41.41		
Total	202464.000	93			
Corrected Total	4016.516	92			

a. R Squared = .124 (Adjusted R Squared = .051)

From Table 3, a post hoc analysis shows that the mean difference between students with low and moderate creative ability levels is not statistically significant. Thus, there is no clear evidence of a difference in entrepreneurial skills acquisition between these two groups. Also, the mean difference between students with low and high creative ability levels is not statistically significant at the conventional significance level of 0.05. However, the mean difference between students with moderate and high creative ability levels is statistically significant ($p = 0.042$), indicating that students with high creative ability levels show significantly higher entrepreneurial skills' acquisition compared to those with moderate creative ability levels. These findings provide insights into how creative ability level may influence the effectiveness of the Vee-diagram learning style in enhancing entrepreneurial skills' acquisition in the construction of a standard-variable resistor.

Table 3: Turkey Post Hoc Analysis Result of Students' Entrepreneurial Skills Acquisition in Construction of a Standard-Variable Resistor Using Vee-Diagram Learning Style Considering the Students' High, Moderate, and Low Creative Ability

					95% Confidence Interval	
(I) CAL	(J) CAL	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Low	Moderate	0.98	1.39	0.76	-2.33	4.28
	High	-6.56	3.02	0.08	-13.76	0.64
Moderate	Low	-0.98	1.39	0.76	-4.28	2.33
	High	-7.54*	3.06	0.04	-14.84	-0.23
High	Low	6.56	3.02	0.08	-0.64	13.76
	Moderate	7.54*	3.06	0.04	0.23	14.84

Based on observed means.

*. The mean difference is significant at the .05 level.

Research Question 2

What is the difference in high, moderate, and low creative students' retention of entrepreneurial skills' acquisition in the construction of a standard-variable resistor using Vee-diagram learning style?

Table 4 shows that the posttest mean score of the highly creative student was the highest (52.00), but the retention mean score was 48.00, indicating a retention loss score of 4.00. The standard deviation was not calculated because there was only one student in this group. The posttest mean score of moderately creative students was 46.46, with a retention mean score of 47.46. This group showed a retention gain score of 1.00, with a standard deviation of 5.78 suggesting some variability in retention scores. The low creative students' posttest mean score was 46.80, and the retention mean score was 47.60. The low creative students showed a retention gain score of 0.80, with a higher standard deviation of 6.92 compared to the moderately creative students. The highly creative student had the highest posttest mean score but experienced a decline in retention mean score. Moderately and low creative students both showed retention gains, with moderately creative students having a smaller gain score compared to low creative students. This suggested that while highly creative students initially perform well on posttests, the retention of entrepreneurial skills in

the construction of a standard-variable resistor decreases over time when using Vee-diagram learning style. In contrast, moderately and low-creative students demonstrated improvements in retention, with low-creative students showing slightly higher variability in their retention mean scores.

Table 4

The Description of Students' Retention of Entrepreneurial Skills Acquisition in Construction of a Standard-Variable Resistor Using Vee-Diagram Learning Style Considering Students' High, Moderate, and Low Creative Ability

Creative Ability Levels	n	Posttest Mean	SD	Retention Mean	SD	Mean Gain(Loss)
High	1	52.00	-	48.00	-	(4.00)
Moderate	13	46.46	7.22	47.46	5.78	1.00
Low	30	46.8	7.73	47.60	6.92	0.80

Hypothesis 2

There is no significant difference between the mean retention scores high, moderate, and low creative student's entrepreneurial skills acquisition in the construction of a standard-variable resistor using vee-diagram learning style.

Table 5 reveals the ANCOVA analysis result of students' retention of entrepreneurial skills' acquisition in the construction of a standard-variable resistor using Vee-diagram learning style, considering their creative ability level. From the analysis, $F(2, 40) = 0.275$, and the calculated value 0.761, ($p > 0.05$) which is higher than significance level of 0.05. This indicates that there was no significant difference in mean retention scores among students with different levels of creative ability level when using the Vee-diagram learning style in the construction of a standard-variable resistor. Hence, the null hypothesis 7 is hereby retained, that is, there was no significant difference between the mean retention scores of high, moderate,, and low creative student's entrepreneurial skills acquisition when taught Construction of a standard-variable resistor using Vee-diagram learning style.

Table 5: The ANCOVA Analysis Result of Students' Retention of Entrepreneurial Skills Acquisition in Construction of a Standard-Variable Resistor using Vee-Diagram Learning Style Considering Students' High, Moderate, and Low Creative Ability

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	61.893a	3	20.631	.475	.702
Intercept	3747.920	1	3747.920	86.217	.000
Pretest	49.597	1	49.597	1.141	.292
CAL	23.914	2	11.957	.275	.761
Error	1738.834	40	43.471		
Total	100128.000	44			
Corrected Total	1800.727	43			

a. R Squared = .034 (Adjusted R Squared = -.038)

Discussion

The study revealed that there was a significant difference in entrepreneurial skills' acquisition across different levels of creative ability using Vee-diagram learning strategy in the construction of a standard-variable resistor. This result suggests that the Vee-diagram learning strategy may be more effective for certain levels of creative ability. Teachers or instructors could consider using Vee-diagrams specifically for students with varying creative abilities to optimize skills acquisition in entrepreneurial contexts in the construction of a standard-variable resistor. However, the result underscores the importance of recognizing and accommodating individual differences in learning and abilities. Tailoring instructional strategies based on such differences can enhance learning outcomes. This result is in line with Avwiri (2022) who reported that there was a significant difference in the interaction of the teaching strategies on students' creative ability levels. It differs from the study of Avwiri (2017) and Geoffrey et al. (2022) who reported that there was no significant difference in the interaction of the teaching strategies on students' creative ability levels. However, there was no significant difference in mean retention scores among students with different levels of creative ability level when using the Vee-diagram learning strategy in the construction of a standard-variable resistor. This result implies that Vee-diagram learning strategy provides similar retention of knowledge across different levels of creative ability. Teachers can use it

as a learning strategy for skills' acquisition, knowing that it supports retention of skills regardless of students' inherent creative ability levels. This is also in deviance with Geoffrey et al. (2022) that there was a significant difference in the entrepreneurial skills acquisition level among varied-ability students.

Conclusion

In conclusion, the study found that entrepreneurial skills' acquisition varied significantly across different levels of creative ability when employing the Vee-diagram learning strategy for constructing a standard-variable resistor. However, there was no significant difference in mean retention scores among students with varying levels of creative ability using the same learning strategy. These findings underscore the nuanced relationship between creative ability, learning strategies, and educational outcomes in technical skills' development.

Recommendations

Based on the research findings, it is recommended that educators, learners, and curriculum designers tailor instructional/learning styles, particularly the Vee-diagram learning style, to capitalize on varying levels of students' creative abilities for enhancing entrepreneurial skills' acquisition. Additionally, further investigation into alternative or supplementary learning methodologies may be beneficial to promote improved retention of knowledge and skills among all students, regardless of their creative ability levels in technical subjects like constructing standard-variable resistors.

References

Aina, D., & Olufemi, D (2024, January 19), Nigeria's unemployment rate rises to 15%- NBS, *Punch,* https://punchng.com/nigerias-unemployment-rate-hits-0-8-in-2023-q3-nbs-report/

Avwiri, E. (2017). Creativity of secondary school students: Entrepreneurial skills acquisition in the construction of potentiometer in physics. *International Journal of Science and Technology, 6*(2), 61-75.

Avwiri, E. (2020). Teaching methods and creativity levels of students on the acquisition of entrepreneurial skills in the rewinding of the coil in an electric motor. *Asian Journal of Education and Social Science, 6*(1), 34-42.

Ezenwanne, D. N. (2021). Effects of demonstration and problem-solving method on entrepreneurial skills acquisition in food and nutrition among secondary school students in Anambra. Unpublished Ph. D. Dissertation, Delta State University. Federal Republic of Nigeria. (2013). *National policy on education.* NERDC Press.

Geoffrey, A. A., Wisdom K. T., & Gabriel S. I. (2022). Effect of creative teaching on creative thinking among different-ability upper-basic science students in gboko-town. *African Journal of Science, Technology, and Mathematics Education (AJSTME), 8*(2),182-188.

Gowin, D.B. (1981). *Educating Ithaca,* Cornell University Press.

Guwam, B., & Gwandum, G. S. (2017). Effect of elaboration strategy on students' performance and anxiety in bearings and distance at senior secondary two levels in Plateau State. *Journal of Mathematics Association of Nigeria, Abaccus,42*(2),8-15.

Ismail, O. M., Soladoye, N. L., Bernice, O. L., Oloyede, S. A. & Olawale, A. O. (2012). Gender differences in entrepreneurial skill acquisition: An analysis of informal institutional factors. *Journal of Business and Management, 2*(6),24-30.

Ismail, T., & Shejeena, K. A. (2022). Effectiveness of scaffolded vee-diagram,an instructional strategy for science students at the secondary level. *Manager's Journal of Educational Tech., 8*(4),1-8.

Malik, S., Muhammad, K., & Waheed, Y. (2023). Nanotechnology: A Revolution in modern industry. *Molecules, 28*(2), 661. https://doi.org/10.3390/molecules28020661.

McGregor, S. L. (2023). *Theoretical foundations for global education: Selby*, Pike, Hicks, and Merryfield.

Novak, J. D., & Gowin, D. B. (1984). *Learning how to learn*. Cambridge University Press.

Ofoha, D. (2011). Assessment of the implementation of the secondary school skill-based curriculum to youth empowerment in Nigeria. *Edo Journal of counselling* (1-2), 75-91

Okafor, T. U. (2018). Identification of physics contents that can promote entrepreneurial skills among senior secondary physics students. *Nnadiabule Journal Education in Africa, 3*(2),39-51.

Okeke, E. A. C. & Egbunomu, R. N. (2008). *Challenges of effective implementation of science curriculum for capacity development in Nigeria.* Nnamdi Azikiwe University.

Olagunju, Y.A (2004) *Entrepreneurship and small scale business enterprise in Nigeria.* University Press.

Olarewaju, R. R. (2017). *Effects of cooperative learning strategy with models on academic achievement & retention of biology concepts among prenational diploma students in Kaduna State.* Unpublished Ph.D. Thesis, Department of Science Education, ABU, Zaria.

Rayed, H. H., & Ismael, A. A. B. (2020). Analyzing the content of the physics books in middle school for distinguished schools in Iraq in light of science standards for the next generation (ngss). *PalArch's Journal of Archaeology of Egypt/Egyptology, 17*(7), 11672-11697.

Thiessen, R. (1992). The vee-diagram: A guide for problem solving aims. *Newsletter,* 3-6