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EFFECTS OF PROJECT-BASED LEARNING ON UNIVERSITY STUDENTS' FINANCIAL LITERACY IN DIGITAL LEARNING ENVIRONMENTS

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ABSTRACT

This study investigated the effectiveness of project-based learning for enhancing financial literacy among students in digital learning environments. The research aimed to determine how PBL could contribute to meaningful improvement in students' financial knowledge and skills within e-education and virtual classrooms. Employing a quasi-experimental design, the investigation included both experimental and control groups consisting of 100 students aged 18 to 22 years over a four-week intervention. The control group engaged in traditional instruction on financial literacy topics, while the experimental group participated in structured PBL activities tailored to apply financial concepts in practical settings. Both groups completed a pre-test and post-test assessment featuring ten questions that addressed various aspects of financial literacy, such as budgeting, investing, financial planning, and debt management. To further understand students' perspectives on the PBL approach, survey responses were collected from the experimental group. Results indicated that students in the experimental group achieved a 25% improvement in budgeting and savings. Beyond budgeting, the PBL group also demonstrated gains in investment knowledge, financial planning abilities, and debt management understanding. These findings offer empirical support for the role of PBL in developing not only knowledge but also practical competencies relevant to financial decision-making.

INTRODUCTION

Globally, the relevance of financial literacy in the field of education can never be over emphasized. People need to be equipped with knowledge and relevant skills that will help

them make financial decisions that affects them in the increasingly complex global economic system. Perhaps, this was why Cong (2021) posits that financial stability and stability among people in any given society can be achieved through financial literacy skill because the present world is fast-paced with a more complex financial decisions among stakeholders. Therefore, different kinds of financial products and services, needs to be navigated by individuals bearing in mind that financial literacy is a major vehicle to do so. In the words of Al Mulhim, and Eldokhny (2020) financial literacy deals with ability of individuals to apply the basic knowledge of financial concepts more particularly investing and saving. This means that financial literacy is beyond mere understanding of basic financial concepts. It however appears that financial behavior of people such as debt management, saving and investing are significantly impacted by financial literacy in real world situations. Using education as a platform to teach financial literacy goes a long way to develop in people good financial habits. Through this, people avoid the long term effects of financial mistakes now and in the long run. In addition, it seems that the advantages of financial literacy goes beyond financial stability of individuals to economic stability. This is why Muraina, Hojapoji and Amao, (2025). opines that informed financial decisions for stable economic development are made by individuals through financial literacy. It is also through financial literacy that financial inequality are salvaged in the society because financial literacy encourages financial inclusion among different categories of people in any given society. This is because financial literacy provides people with financial knowledge and skills which are needed for effective utilization of financial services. Differently stated, Biazus, and Mahtari (2022) states that financial literacy programme is very effective among young people because it inculcates in them the knowledge and skills needed for financial growth and economic survival in the 21st century. This shows that teaching financial literacy in schools or academic environment will enhance economic literacy and people will understand the more, the complex affinity between relationship between financial literacy and economic issues such as economic growth, inflation and interest rate. Again, when financial literacy is incorporated into the educational system, economic literacy is promoted and people learn to make informed decisions that influence their financial goals and also promotes financial wellbeing. In this vein, Vovchenko, Lytvynova., Tsekhmister, Hoshovska, and Vichalkovska (2022)., posits that there is a positive relationship between financial literacy and financial wellbeing because people with financial literacy have good financial outcomes. This assertion entails that people tend to achieve financial well-being and also strengthen their overall quality of life when

financial literacy are taught in educational institutions through traditional approaches and e-learning platforms.

There appears to be a paradigm shift to e-learning in education because of advent of emerging technologies which creates room for flexibility and accessibility in learning opportunities. However, the use of e-learning tends to be characterized by some challenges and one of such problems is problem related to student engagement. According to Castro-Vargas, Cabana-Caceres, and Andrade-Arenas (2020) student engagement is a major factor that determines the level of success of e-learning. Consequently, it is needful for teachers to use different teaching and learning strategies to enhance students' engagement and motivation. To do effectively, requires the use of interactive elements, encouraging collaboration among students and providing regular feedback. Despite the pros of incorporating e-learning in teaching financial literacy in education, many learners are still struggling with the absence of structure and face to face interaction (Wang (2022). In this vein, Kobets, Honcharov, Tsekhmister, and Shapovalova, (2019) affirms many students feel disconnected from their teachers and colleagues which tend to hinder their engagement and motivation. This means that video conferencing tools, online discussion forums as well as other forms of communication technologies can be adopted by teachers in order address this issue to some extent. Moreover some of the students lack access to technical support and relevant technologies to facilitate e-learning. To leverage this assertion, Faqing. (2020) posits that one of the major issues that frustrates and hinder students is technical issues and this indicates that it is needful for teachers to proactively provide instructions that are very clear, deal with technical issues and also offer technical support but all the same, students need to be disciplined and self- motivated. According to Gao (2020), for students to succeed in e-learning environment, it is very necessary that they set their goals, manage their time prudently and stay motivated. Hence, it can be very interesting when teachers help students to develop these skills through the provision of guidance on how they can prudently manage time, set clear expectations, offer regular encouragement as well as the use of good and regular feedback mechanisms; this becomes more easier through the use of project based learning (Hamad, Tairab, Wardat, Rabbani, AlArabi, Yousif, 2022).

The importance of project based learning in the development of skills can never be underestimated because it provides students real-world applications and hands-on learning experience. In this respect, Ukratalo, Buranga, Ichsan, Kaihena, and Eddy (2025) states that students are able to develop different relevant skills more particularly communication skills, collaboration and problem solving skills through a powerful approach known as project-

based learning. When students are directed by teachers to work on relevant and meaningful projects, they understand the subject matter and apply their knowledge in different practical ways (García-Rodríguez Ruiz-Rosa, and Gutiérrez-Tao, 2021). It is through project based learning that students learn the necessary for financial and economic survival in the 21st century. Some of these skills include: problem solving skills, creative skills and critical thinking skills which aid students to become effective and productive professionals in the society. Another forms of skills students develop through project based learning include: teamwork, communication and time management. Perhaps, this is why Okoronkwo and Dike (2025) posits that leadership, collaboration and communication skills are developed through the use of project based learning and students can never become success in their personal and professional life without these skills. In addition, students develop a growth mindset and special love for learning through the use of project based learning. In this vein, Jina (2022) states that students are encouraged to take learning ownership and also develop a sense of autonomy and agency when they utilize project based learning. Through the use of project based learning, students examine topics and issues based on their interests and they develop much love for learning in a more flexible and accessible way.

Statement of the Problem

There is total transformation regarding the way and manner education is delivered because of the increasing prevalence of digital classrooms. However, despite this change, financial education appears to be inadequate and woeful. It seems that students graduate without acquiring the required knowledge and skills that will help them to effectively management their finances, overcome the complex challenges of the digital economy and make informed financial decisions. To this end, it appears that people with financial literacy tend to do well financially in terms of saving and investment for futuristic purpose and they are able to manage their debts unlike those people without financial literacy. Unfortunately, financial education is still a neglected aspect of education despite its relevance to individuals and the world at large. Besides, how to integrate financial education effectively into digital classrooms is yet to be understood by educational stakeholders and as a result, there are many difficulties in adapting financial education into digital classroom environment. Furthermore, educational stakeholders appears to lack understanding regarding the way digital technologies impacts financial education which makes it needful to examine how digital technologies can be used to strengthen financial education. From the researcher's observation, most of the studies carried out financial literacy were mainly focused on the entire population or

traditional classroom setting and students in digital classrooms were excluded. Consequently, there is paucity of experimental research on the effectiveness of project based learning (PBL) in enhancing financial literacy among students within digital classrooms and education environments; hence, the need for the study.

Research Aim

The general aim of this study is to investigate the effectiveness of project based learning (PBL) in enhancing financial literacy among students within digital classrooms and education environments.

Research Questions

The following research questions guided the study:

1. To what extent does project-based learning improve students' financial literacy in a digital learning environment?
2. How do students perceive the use of PBL for learning financial concepts in e-education settings?
3. What are the differences in financial literacy outcomes between students who engage in project-based learning and those who follow traditional instruction methods?

Literature Review

Definitions and the Importance of Financial

One of the vital life skills that help people to make informed financial decisions that affects them id financial literacy. In the words of Lazić, Knežević, and Maričić (2021), financial literacy is refers to the ability of individuals to make good and reasonable decisions regarding their financial choices, prudent management of financial resources as well as how to use their money. Similarly, Lei (2020) states that financial literacy means the capacity to utilize the skills and knowledge regarding the use of money for financial well-being. This implies that people make sound financial decisions when they are financially literate. In addition Ma, and Yang (2021) stresses that financial literacy is simply the methods and principles to manage and acquire assets and income. In this vein, one can infer that people become financial stable through financial literacy programmes because it the basic knowledge and skills they acquire towards the making informed financial judgment that determines their financial behaviour. Perhaps, this is why Mark (2022) states that financial literacy is the ability to effectively manage financial income and investment, understand financial variables which aid them to achieve financial security and stability.

Differently stated, many studies have that financial literacy is very important to everybody in the society. According Migdad, Joma, and Arvisais (2021), financial literacy help people to manage their finances, achieve financial stability and as well make informed decisions. This means that financial literacy is connected to wealth accumulation and greater retirement planning. It is through financial literacy that wealth inequality can be explained better in the society. Saving, debt management, savings, budgeting and investing are they areas of financial literacy. The point being stressed is that financial literacy is closely associated to financial success and better financial outcomes are commonly found with people with higher levels of financial literacy (Lu, 2020). When it comes to money management, financial literacy reduces stress and anxiety among individuals. In this regard, Luo (2020) affirms that stress levels tend to differ among people who know how to save, use and invest money and those who do not have such knowledge and skills. Therefore, financial literacy is more likely to help people reduce expenses, increase their savings as well as making good financial decisions (Wang, 2021). For people to become literate in terms of finance, they need to seek for financial education more particularly through online courses, workshops and professional guidance from experts who are financial advisors. In this regard, Page (2021) maintain that it is through financial education that financial literacy and financial behavior of people are effectively improved. When people acquire basic financial skills, knowledge and competencies, they become capable to handle their financial lives and once they can handle their financial lives, financial stability and security will not be far from them.

Theoretical Frameworks

Constructivism

The study adopted constructivism to advance its argument. Constructivism was propounded by Lev Vygotsky (1896-1934) and Jean Piaget (1896-1980) in 1970. The theory states that passive recipients of information are not learners. The theory suggest that learners actively construct their own understanding and knowledge. This means that it through social interaction and active experience that learners construct their own knowledge and meaning of any variable. In constructivist approach, learners are very active in discussions, learning process, hands on activities and reflections through which they construct and develop their own knowledge and understanding about a particular variable.

This study is related to the effectiveness of project based learning (PBL) in enhancing financial literacy among students within digital classrooms and education environments. This is because it is through financial education programmes that learners are encouraged to

actively participate in the learning process which help them to construct their own knowledge and understanding of different financial variables and practices through social interactions and hands-on experiences. To achieve this effectively requires the use of project based learning because it encourages learners to examine and find out best financial practices and concepts in an interactive and collaborative learning environment.

Experiential Learning Theory

Experiential learning theory was propounded by David Kolb in 1984. This theory states that direct experience and reflection are the major ways by which learning occurs. The learning process is characterized by reflective observation cycle of concrete experience active experimentation and conceptualization of abstract. This shows that learners should be engaged actively in the learning process reflecting and experiencing on concrete experiences. This theory is related to the present study that deals with the effectiveness of project based learning in enhancing financial literacy among students within digital classrooms and education environment. This is because financial education programs are usually provided to learners which serves as a platform for them to engage in direct experiences and one of search approach is exponential learning. Is potential learning therefore allows learners to apply financial variables and practices in a more practical and meaningful.

Prior Studies on Financial Education in Digital Environment

Over the years, researchers have conducted many studies on financial education because of its relevance in digital environment more particularly in the 21st century. Some of the findings however show that financial knowledge and behaviour is positively impacted through financial education programme. According to Parrado-Martínez, and Sánchez-Andújar (2020) financial knowledge and downstream behaviour is affected by financial education. Differently stated, studies have also shown that online financial education programme is very effective in the digital context. In this vein, the findings by Santyasa, Rapi, and Sara (2020) states that there is financial education in educational institutions have positive effect on financial knowledge with a little effect on financial attitude of students. It was deduced that intensive treatments and small class sizes are very crucial in promoting financial literacy. Regarding digital financial literacy which is also very important in the digital context, one can infer that it is a person's financial literacy level of understanding on matters dealing with digital technology (Ruiz-Rosa, Taño and García-Rodríguez (2021). Many studies also reported that digital financial literacy positively impacts spending

behaviours and saving attitude of individuals. Besides, experiential learning approaches such as interactive simulations and gamification are revealed to enhance financial education outcomes. In the words of Zulaeha and Marpaung (2020) financial education can be enhanced through active learning approaches which includes discussions and group exercises. Conclusively, studies carried out by researchers in the past on financial education more particularly in the digital environment showed that financial education enhances financial behaviour in the digital context.

Project Based Learning in Other Disciplines

Other disciplines have adopted project based learning in enhancing teaching-learning process even beyond financial education with many studies showing that project based learning is effective in promoting learning outcomes of students. In different academic disciplines such as Science, Technology, Engineering and Mathematics (STEM), it clearer that project based learning enhances critical thinking, collaboration and problem solving skills (Zhang, 2022). In addition, Yuting, (2022) states that there is significant improvement in the creativity and design thinking in engineering education through the use of project based learning. According to Yun. (2022) students' engagement, motivation and autonomy in learning was shown to improve in language education sequel to the positive impact of the use of project based learning. Project based learning therefore enhances communication skills, cultural awareness and students language proficiency in language education. In another view, Ying (2022), notes that project based learning promotes students pitching skills, business planning and opportunity recognition. In health education, project based learning has been used to enhance teamwork, clinical skills and critical thinking. In Nursing Education, Yang (2020), shows that the use of project based learning enhanced communication, collaboration and patient care skills of the students in the discipline. Therefore project based learning is considered effective because of its ability to provide learners with opportunities for collaboration, hands-on learning, feedback and real-world experiences. When students work on meaningful and relevant projects, they become motivated, engaged and invested in their learning (Yanan, 2020). By way of recapitulation, it is clear that project based learning is one of the effective ways to promote learning in any academic discipline as it enhances academic achievement of students, create employment opportunities for the students and also help them to develop relevant skills for survival in the 21st century. Through the incorporation of financial education, the benefits of project based learning in terms of promoting the financial

literacy of the students as well as preparing them for real-world problems are leveraged by educators.

Gaps in Research

So many studies carried on financial literacy have shown that there exist several gaps in knowledge which makes it needful to conduct further study. One of these gaps is paucity of experimental research regarding the effectiveness of project based learning (PBL) in enhancing financial literacy among students within digital classrooms and education environments. In addition, while many researches have revealed that financial literacy impacts spending behaviors and saving to a high extent, there is need to carry out more studies on its impact. No doubt, there is need to use experimental studies to critically examine the cordial affinity between financial literacy and financial behaviors. Through this, educators and educational policy makers will have a valuable insights regarding how they can property redesign effective financial literacy programmes in the digital environment. More so, there is lack of understand on the relationship between financial literacy in education and financial behaviour of individuals when it comes to gender gap. Hence, it is still difficult to conclude on the relationship between financial literacy in education and financial behaviour of men and women without a thorough study. The affinity between financial literacy and financial inclusion is not well explained and understood which entails that more research needs to be carried out to determine how to promote financial inclusion through financial literacy programmes. To cover this apparent gaps in knowledge makes the study needful.

METHODOLOGY

No research can proceed without methodology because of the critical roles methodology plays in scientific studies. To carry out this study effective, a quasi-experimental design was employed which comprise of pre-test and post-test. In this respect, two groups were formed. They are the experimental group and the control group. Project based learning approach was exposed to the experimental group while the traditional approach was used to give instruction to the control group. The study participants was made up of 100 students with age bract 18-22 years. These participants were enrolled in a personal financial course in Nnamdi Azikiwe University, Awka. Regarding the selection criteria, students who are yet to be taken on personal financial course were used for the study. Although the groups were randomly assigned, they were also compared in terms prior knowledge of financial literacy and demographic variables. 4 weeks were used for the intervention and during this period, the

participants in the control group were taught financial literacy topics such as investing, saving, budgeting and debt management. On the other hand, participants in the experimental group were given instruction to work on Project Based Learning Projects that involved the creation of a financial plan for a hypothetical individual that is comprehensive. Students involved in the project were instructed to apply financial tools and concepts more particularly investment and budgeting analysis to real-world scenarios. Online financial calculators and spreadsheet software were the digital tools and platforms used support the project. More so, 10 questions that covered the various areas of financial literacy was used to assess students financial literacy for the pre-test and post-test. Three experts in educational measurement and evaluation validated the test. In addition questionnaire was used to determine how students perceive the use of PBL for learning financial concepts in e-education settings. Cronbach alpha method was employed by the researchers to assess the reliability estimate of financial literacy measurement tool. The results indicated that the internal consistency was for each subscale was good enough to conduct the study which include 0.82, 0.85, 0.78 and 0.80 for budgeting, investing, debt management and financial planning. The overall score was 0.90 which implies that the entire scale was deemed excellent for the study. In this study, the researchers used 20 participants to conduct a pilot study with the aim of testing the financial literacy measurement tool and project based learning intervention. A lot of changes were addressed regarding the guidelines for project based learning as well as financial literacy questionnaire which led to improved relevance and clarity. Both groups were given the pre-test and post-test as part of the data gathering process. The experimental group's survey responses were gathered. T-tests were used to compare the outcomes of the two groups. Following that, the experimental group's qualitative data for student comments and reflections was also gathered. This led to further perspectives on the efficacy of the project-based approach. Through this, further insights were provided regarding the effectiveness of project based approach.

Table 3.2 ANOVA Comparison Training Courses.

Component	Sum of Squares	Df	Mean Sqre	F	Sig
Debt Management	12.45	3	4.15	2.98	0.035
Budgeting	15.62	3s	5.21	3.45	0.019
Investing	10.23	3	3.41	2.56	0.058
Financial Planning	18.90	3	6.30	4.12	0.008

The result show that there were significant differences financial planning, budgeting, debt management and investing across training courses

Table 3.3: Cohen's d effect size.

S/N	Variable	Size	Effect
1	Budgeting	0.62	Medium __
2	Investing	0.75	Medium
3	Debt Management	0.48	Small
4	Financial planning	0.92	Large s

The findings show that project based learning indicated a significant impact on financial literacy more particularly in financial planning.

Table 3.4. Assessment of pre-experimental and post-experimental testing outcomes.

Variable	Average score before	Average Score After	Standard deviation before	Standard deviation after	Standard error before	Standard effort after
Experimental Group	7.6	8	1.21	.90	.17	.13
Control Group	6.6	6.4	1.58	1.51	.22	.21

Project-based learning is more effective at improving financial literacy, according to estimates made using SPSS. Additionally, a chart was used to illustrate the comparison data.

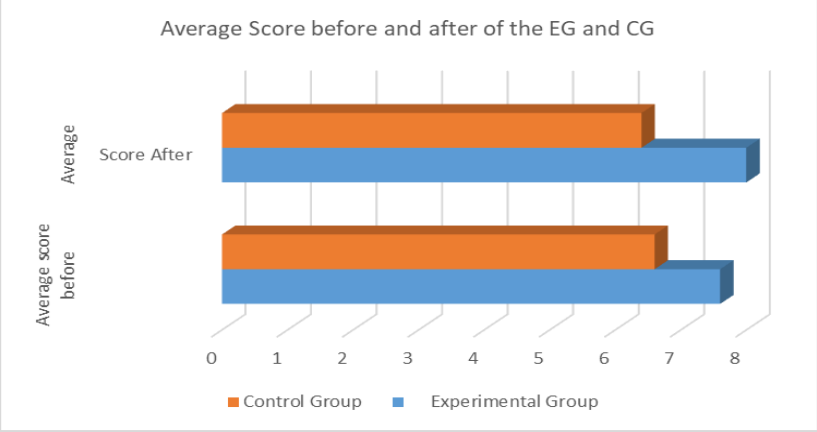

Figure 1. Assessment of normal scores before and after for the EG and CG.

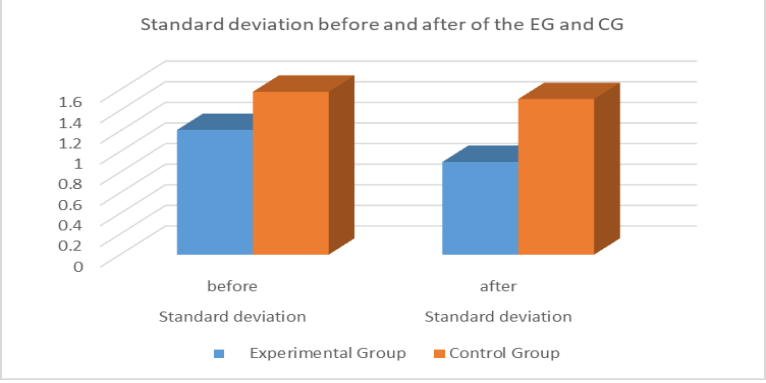

Figure 2. Assessment of standard deviation of average scores before for the EG and CG.

According to the chart used to visually represent the results in Figure 1-2, the EG performed better than the CG participants on a number of financial literacy-related issues.

Table 3.5. The student survey data.

S/N	Feedback form	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)
1.	Project based learning advances my understanding of financial variables	27	63	4	6
2.	I use financial variables to real life situations in terms of the impact of project-based learning	44	39	7	10
3.	Project based learning adopts my professional setting skills	32	49	13	6
4.	Project based learning is actual	41	48	5	6
5.	Project based learning makes me an active learner	31	55	11	3
6.	Project based learning helps me developing autonomy	38	59	2	1
7.	Project based learning helps my academic equality	43	46	9	2
8.	Project based learning aids all learners	43	52	3	2
9.	Project based learning help preparing for real-world applications	46	40	8	6
10.	Project based learning is a valued approach for learning financial concepts	13	79	5	3

According to the data in Table 3.5, the majority of research participants in the experimental group had favorable opinions about the application of project-based learning to the teaching of financial concepts in classrooms.

Table 3.6. t-test Investigation on the alterations in financial literacy results amid students who engage in project-based learning and those who follow traditional instruction methods.

Variable	No	Mean	SD	t-value	df	Sig. (2-tailed)	α-level	R
Experimental Group	50	8	.90	6.45	98	.001	0.05	Significant
Control Group	50	6.4	1.51					

Table 3.6 demonstrates that scholars in the EG had a substantially advanced mean score than students in the CH. The outcomes of the investigation were presented in four figures. The experimental group achieved a mean score of 8.0 (SD = 0.90) compared to 6.4 (SD = 1.51) in the control group, with a statistically significant difference ($t = 6.45$, $p < .001$, Cohen's $d = 1.29$). This large effect size exceeds findings reported by Wei et al. (2020) [1], who documented a medium effect ($d = 0.67$) in their PBL intervention study. While the control group's standard deviation score marginally dropped to 1.51, it shows reduced score variability.

DISCUSSION

The findings of the study are discussed in accordance with the research questions

The first findings of the study showed that project based learning had significant positive effect on financial literacy of students. This means that project-based learning improve students' financial literacy in a digital learning environment to a very high extent. To support this result Xuezhi (2022) agreed that students learn and apply financial literacy skills in real world scenarios when they are taught financial literacy using project based learning approach. This finding is also consistent with the findings by Wei, Yongquan, and Miao (2020) who reported that the use of project based learning in financial education positively impacts students' financial attitude and behaviour to very high extent.

The second findings of the study revealed that students had positive perception regarding the use of project based learning for learning financial concepts in education settings. This is because over 80% of the students agree that project based learning approach enhances financial literacy by helping them to apply financial variables in real-world situations. This result is in tandem with the findings of Wardat, Belbase and Tairab (2022) who posited that students' attitude and perception towards the use of project based learning in teaching-learning process was very positive. Similarly, this findings are related to the finding by Xiaolei (2021) who affirmed that major of the students prefer to use project based learning in financial literacy programmes.

Finally, the findings of the study showed that there is significant differences in financial literacy outcomes between students who engage in project-based learning and those who follow traditional instruction methods. This is because the experimental group outperformed the participants in the control group on different topics that deal with financial literacy. In this vein, the findings by Wei, Yongquan, and Miao (2020) agreed that students who were taught financial literacy using project-based learning performed better than those that learnt

financial literacy using traditional approach to learning. This result is also consistent with the findings by Xu (2022) who stated that there was a significant differences in financial literacy performance between students in rural areas who engage in project-based learning and those who follow traditional instruction methods in the same location.

Implications

This study has significant implications for educators, digital learning designers, and educational institutions. The results of the study indicate that project-based learning will function more effectively when combined with digital tools and platforms. Teachers and school administrators should also successfully educate and learn financial literacy in a digital environment through project-based learning. Therefore, it is expected of teachers to design projects that motivate students to apply 21st-century financial concepts such as debt management, investing, saving, and financial planning to actual scenarios. With the help of this approach, students can get more information and practical experience in making prudent financial decisions. The results of the study demonstrated how crucial it is to get students ready for success in their programs for professional and personal growth. This is achieved by helping students develop the financial literacy abilities required to handle the intricate problems of the contemporary world.

4. CONCLUSION

It is generally believed the use of project project-based learning in financial education will foster the outcomes of financial literacy among students. improves students' comprehension of the fundamentals of financial literacy, according to research. This method increases the effectiveness of teaching financial subjects in a digital setting and encourages pupils to have a positive attitude toward learning about money. The experimental group confidently outperformed the control group in a variety of categories, demonstrating that students who worked on financial projects did better than those who studied using conventional methods. The findings highlight the viability of using a project-based approach to help schoolchildren increase their financial literacy, which may be helpful to educators and education administrators. According to the study, educators may affect how well students learn by creating assignments that inspire them to use what they have learned about debt management, investing, saving, and financial planning in their everyday lives. In this way, pupils get the practical skills that will help them become financially literate in the future. Future researches could examine the long term effects of project based learning as it affects financial behaviour

and retention of students to enhance better understanding of project based learning in fostering financial literacy.

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