

## Original Article

**Pre-Service Teachers' Self-Efficacy in The Use Of Open-Source Software For Learning In Lagos State**Falade Ayotunde <sup>\*1</sup>, Aladesusi Gboyega Ayodeji<sup>2</sup>

1. Department of Educational Technology University of Ilorin, Ilorin Nigeria

2. Department of Educational Technology University of Ilorin, Ilorin Nigeria Iran

Received: 2022/06/22

Accepted: 2022/10/22

**Abstract**

Open Source Software brings about a powerful learning environment, and it transforms the learning and teaching process in which students deal with knowledge in an active and self-directed way. However, over-reliance on conventional methods, lack of awareness, skills, knowledge, among others, are factors militating against the adoption of OSS for learning. This study examines the self-efficacy in the use of open-source software for instruction among undergraduate pre-service teachers in Lagos State. The population for this study were pre-service teachers in all universities in Lagos State. Purposive sampling technique was used to select the universities from where the student samples were drawn based on public universities that are on campus. The instrument for data collection was an adapted questionnaire. Descriptive and Inferential statistics were used to answer the research question and test the stated hypothesis with the aid of statistical product and service solution (SPSS) version 20.0 at 0.05 level of significant. The findings indicated that undergraduates have low self-efficacy in the use of open-source software for instruction. Also, significant difference exists between male and female pre-service teachers' self-efficacy on OSS for instruction in Lagos State.

This study concluded that most pre-service teachers in Lagos State did not have the skills necessary to use OSS for learning. Therefore, the study recommended that government should organise training for pre-service teachers on the use of OSS for learning.

**Keywords**

Self-efficacy, Open-Source Software, ICT, Gender and Constraints.

**Introduction**

In today's rapidly evolving world, technology has become an integral part of our daily lives. It has transformed various industries, and education is no exception. The integration of technology in education has revolutionized traditional teaching methods, enhancing the learning experience for students and empowering them with the skills necessary for success in the digital age (Daneji, Ayub, Jaafar, & Khambari, 2018). One of the purposes of adopting technology in contemporary education is to provide learners with different chances to learn at their own pace and convenience. Integrating technology into teaching and learning is of considerable value because when technology is being used effectively, it has the potency to make learning meaningful. Within a decade, technology has transformed teaching and learning. One of the primary benefits of technology integration in education is its ability to engage and motivate students. Traditional teaching methods often struggle to captivate the attention of digital natives who have grown up surrounded by technology. By incorporating interactive multimedia, simulations, and gamification into lessons, educators can create dynamic and immersive learning experiences that foster student engagement and enthusiasm (Shweta & Janace, 2020).

In recent years, the integration of technology in education has become increasingly prevalent,

offering new possibilities for teaching and learning. One significant aspect of this integration is the use of open-source software, which refers to software that is freely available and can be modified and redistributed by users. Open-source software has gained attention as a potential tool to enhance teaching and learning experiences due to its flexibility, cost-effectiveness, and adaptability to various educational contexts (Hennessy et al., 2022). Lagos State, located in Nigeria, is a dynamic and populous region with a rapidly growing education sector. The state recognizes the importance of incorporating technology in education to prepare students for the demands of the digital age. Therefore, it is crucial to examine the self-efficacy of pre-service teachers in Lagos State regarding the use of open-source software for learning.

Self-efficacy, as conceptualized by Sikka (2023) refers to an individual's belief in their ability to perform specific tasks successfully. In the context of this study, pre-service teachers' self-efficacy represents their perceived competence in utilizing open-source software effectively as a pedagogical tool. Understanding pre-service teachers' self-efficacy in using open-source software is essential because it can significantly influence their willingness to integrate technology into their classrooms in the future. Research on pre-service teachers' self-efficacy in technology integration has been conducted in various settings globally. However, there is a need for more localized studies that explore the specific factors influencing pre-service teachers' self-efficacy in using open-source software in the Nigerian context, particularly in Lagos State. This study aims to address this gap by investigating the self-efficacy of pre-service teachers in Lagos State regarding the use of open-source software for learning. Specifically, the study: (i) determine the pre-service teachers' self-efficacy in the use of open-source software for learning; (ii) examine the gender difference on pre-service teachers' self-efficacy in the adoption of open-source software for instruction;

The study adopted quantitative surveys research design. The survey assessed pre-service teachers' self-efficacy levels in using open-source software, their perceived barriers and facilitators, and their prior technology-related experiences. The findings of this study will contribute to the existing body of knowledge on pre-service teachers' self-efficacy in using open-source software for learning. The results will inform teacher education programs, educational policymakers, and relevant stakeholders in Lagos State about the specific areas that require attention and support to enhance pre-service teachers' self-efficacy in utilizing open-source software effectively. Ultimately, this research aims to contribute to the improvement of technology integration in education and the overall quality of teaching and learning experiences in Lagos State.

## Literature Review

### Concept of ICT in Education

Information and communication technology is a force that has transformed many aspects of people's way of life. Considering disciplines such as medicine, tourism, travel, business, law, banking, engineering and architecture, the impact of ICT in the past two or three decades has been immense. Information and communication technology (ICT) is a necessary component of today's world; learning with technology has become essential in today's teaching and learning processes. Technology is one of the most versatile and significant elements in the present educational system. It serves as an instructional facilitator and better learning objectives (Bhattacharjee & Deb, 2016).

concept of ICT in education recognizes the potential of technology to transform traditional teaching and learning methods by providing new opportunities for collaboration, engagement, and access to information (Kaushik, 2019).

21st-century students live in a technology and media-rich environment where they have access to an abundance of information, new, powerful digital tools, and the ability to collaborate and communicate with others. Consequently, students need to be able to portray critical thinking, problem-solving, effective communication, among others, with the online world. Then, it is

tempting to believe that the simple way to address ICT development is by providing students with computer devices. Indeed, there has been a good deal of government policy based on the assumption that access to ICT is the key to achieving success. There is no doubt that accessibility is a necessary precondition (Keane, 2012). Providing students with mobile devices such as netbooks, iPods, tablets, and laptops will not develop critical thinking skills in students. Providing students with these devices in a classroom will not enhance their learning performances but rather their engagement in learning. Therefore, how ICT devices are utilised in the classroom is very important. It is important to note that what teachers get the students to do in the class emerges as the most influential component of the accomplished teachers' repertoire, rather than what the teacher does explicitly. Students must be actively involved in their learning, focusing on multiple paths to problem-solving and communication skills (Keane, 2012).

### **Concept of Open-Source Software in Education**

Open-source software (OSS) in education refers to the use of software with an open-source license in educational institutions, classrooms, and learning environments. Open-source software is developed collaboratively by a community of developers who freely share the source code and grant users the rights to view, modify, and distribute the software. This concept has several implications and benefits for education. Open-source software is a subset of information and communication technology, which helps reduce purchasing software. However, despite the benefit in the initial purchase price of software, deploying software requires a total cost beyond the initial purchase price (UNESCO, 2019). Open-Source Software is not a software brand but a software development philosophy where computer software source code is openly available for others to adopt or adapt. The source code and other rights are usually reserved for copyright holders provided under a software license that permits users to study, change, and improve the software (Ukachi, 2012).

The software market is rapidly changing; the industry gains increasing importance and competitive advantage to secure global recognition. Software firms play a crucial role in creating, practical use, and spreading knowledge for businesses in the economic sphere (Kim & Park, 2018). Also, the software industry is one of the key players in creating new opportunities through its convergence with traditional sectors such as automobile manufacturing, shipbuilding, and energy. For this reason, companies are demanding the development of rapid, low-cost, and highly efficient software, and interest in open-source software (OSS) is rapidly increasing. OSS is different from commercial software in revenue generation; commercial software firms will not release source code and prohibit its modification, duplication, and distribution without due legal process. Commercial software developers charge for services including programming, training, and technical support; OSS involves releasing source code to the public without charging a fee (Kim & Park, 2018). OSS is free to use and modify; its source code can be redistributed free of charge. Kavanagh (2004) suggested that OSS can be defined as software whose source code is freely available to the public and can be used, copied, and distributed with or without modification.

Open-source software is an inherent effort by a set or team of programme developers, who make available a source code one can easily modify and use according to needs. Open-source software has many advantages over proprietary software. However, most computer users use proprietary or pirated software due to less awareness about the importance and uses of open-source software (Mittal & Singh, 2013). The use of technology in all sectors has become pervasive, more so in the education sector. In educational institutions, both instructors and students utilise technology in learning, creating new artefacts and researching further developmental possibilities that technology may have in the future. One of the significance of OSS is that it is produced through voluntary participation and contributions. For this reason, an increasing number of individuals and firms are utilising OSS for various purposes stably and co-

effectively. Kim and Park (2018) argued that the numerous benefits of OSS have led to the transitioning of organisations' software strategies away from the use of commercial software and towards OSS. Despite these developments, however, there is a lack of research on user behaviour and OSS usage. The majority of existing studies have limited their attention to the initial acceptance behaviour of companies or general users. These studies have concentrated on the benefits of OSS and users' intention to use it in terms of systems, services, and information quality. However, few empirical studies on OSS usefulness and satisfaction focus on the OSS quality factor.

### **Student Teachers' Self-efficacy and Technology Use**

A self-efficacious teacher operates as a critical factor in a generative system of human competence. Teacher's self-efficacy relates to the beliefs teachers hold about their own perceived capability in undertaking particular teaching tasks. Bandura (1977), cited by (Lopez-Garrido, 2020) defines self-efficacy as an individual belief in one's abilities to organise and execute a course of action to produce given attainments. Self-efficacy, therefore, influences thought patterns and emotions that enable classroom actions. In the context of education, teachers' self-efficacy is considered a powerful impact on teachers' overall effectiveness with students (Pendergast, Garvis, & Keogh, 2011). The support and training given to the self-efficacious teachers help strengthen the development of teachers' self-efficacy, which is essential for producing competent, committed and enthusiastic teachers. Through the formation of human behaviour, self-efficacy has contributed immensely to people's motivation and accomplishments. Conversely, low sense of self-efficacious teacher is associated with laziness, depression, anxiety, and helplessness. Taştan, Davoudi, Masalimova, & Bersanov, (2017) stated that self-efficacy is vital in psychological and physical health outcomes. For instance, people with high self-efficacy reported lower perceived work stress and strain levels and reported less physiologic stress response. Conversely, low self-efficacy was significantly related to high stress, anxiety, and depression within the occupational literature. Moreover, high self-efficacy influenced job satisfaction and well-being positively but had a negative influence on turnover rates.

Teachers with low self-efficacy also have low self-esteem and harbour pessimistic thoughts regarding their ability to accomplish their goals. Therefore, self-efficacy levels can enhance or impede motivation. Self-efficacy is a motivational construct based on the self-perception of competence rather than the actual level of expertise. It has often been used as an independent variable in research and correlated with best practices by teachers and student learning (Tweed, 2013). When thinking about performance on a specific task, self-efficacy can have a strong influence on decisions. A task may be chosen according to the degree of self-efficacy. It is suggested that individuals who perceive a task or innovation as difficult will be slow to embrace the new technology. This indicates that a teacher's self-efficacy could significantly impact how successful they are at implementing a new classroom technology.

Asing-Cashman, Gurung, Limbu, and Rutledge (2014) examined the digital native pre-service teachers' perceptions of their competency, attitude, and pedagogical intention to use Free and Open Source Tools (FOSTs) in future teaching careers. Respondents were pre-service teachers registered in an educational technology course. Structural equation modelling was done on collected data obtained using a questionnaire. Findings indicated that pre-service teachers' computer competency was a significant predictor of their attitude toward using technology. However, high scores on their computer competency indicate strong stances towards using free and open-source tools in their teaching.

## Methodology

### Research Design

The researcher adopted descriptive research of the survey type for the conduct of this study. The research involved collecting quantitative information using a validated questionnaire filled by pre-service teachers to describe their awareness, self-efficacy, perceived ease of use, and challenges affecting the use of open-source software for instruction. The data collected using the questionnaire was statistically analysed using descriptive and inferential statistics to draw meaningful research conclusions.

### Population, Sample and sampling Techniques

The population for this study were pre-service teachers in all universities in Lagos State. The target population were 300 levels of pre-service teachers in the selected universities. The purposive sampling technique was used to select the universities from where the student samples were drawn based on public universities that are on campus. Proportional sampling technique was employed to select the sampled respondents from each sampled university based on their estimated population using the Research Advisor sample size table at 0.05 margin error. Finally, a simple random sampling technique was used to select 300 respondents from sampled universities.

**Table1.** List of Universities in Lagos State, Pre-Service Teachers' Population and Sample Size

S/N	Universities	Pre-Service Teacher' Population	Sample Size
1	University A	785	157
2	University B	715	143
	<b>Total</b>	<b>1500</b>	<b>300</b>

### Registrars' Office of Respective Institutions, (2020).

A researcher-designed questionnaire titled "Pre-service Teachers' Awareness, Self-Efficacy and Perceived Ease of Use of Open-Source Software" was used to collect data for this study.

### Validation of the Research Instrument

The questionnaire was subjected to both face and content validity to check the arrangement of items and questionnaire items if they are in-line with the major purposes of the research by three lecturers in computer science and five educational technologists at the University of Ilorin. Based on their observations and suggestions, necessary modifications were carried out to produce the final draft of the questionnaire.

### Reliability

The instrument was tested on 20 randomly pre-service teachers from the University of Ilorin, not part of the sampled study. The data gathered from the pilot study were analyzed to check for the internal consistency of the instrument. The instrument was tested using Cronbach alpha. The Cronbach's alpha value for pre-service teacher's awareness of open source software is 0.73, pre-service teacher's self-efficacy in the use of OSS for instruction is 0.65, perceived ease of use is 0.84, and challenges of using OSS is 0.58

### Data Analysis Techniques

The data obtained using the administered questionnaire were analysed using descriptive and inferential statistics. Frequency count, percentages, and bar charts were used to organise the respondents' demographic information; frequency counts and percentages were used to answer research questions one, two, three, and four. The three hypotheses were tested using independent t-test at 0.05 significant level.

## Results

**Data Analyses**

## Descriptive Information

Information on the number and percentages of respondents based on gender and name of institutions are presented in Tables 2 and 3. They are further illustrated with relevant bar charts depicted in Figures 1 and 2.

**Table 2.** Distribution of the Respondents according Gender

Gender	Frequency	Percentage
Male	210	70%
Female	90	30%
Total	300	100.0

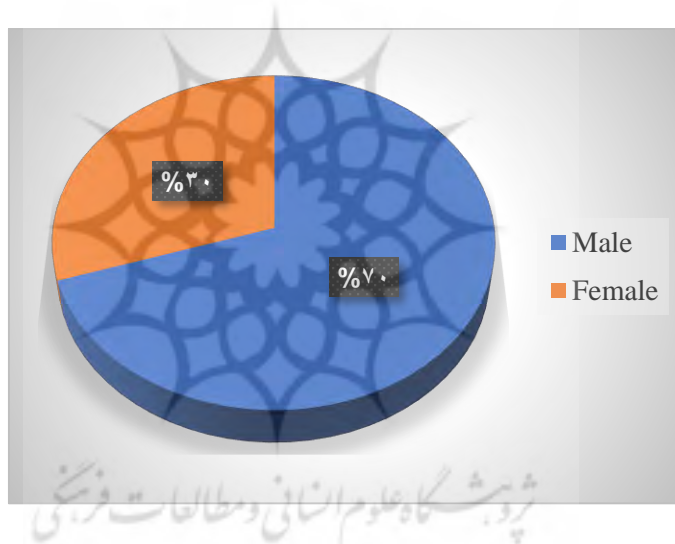
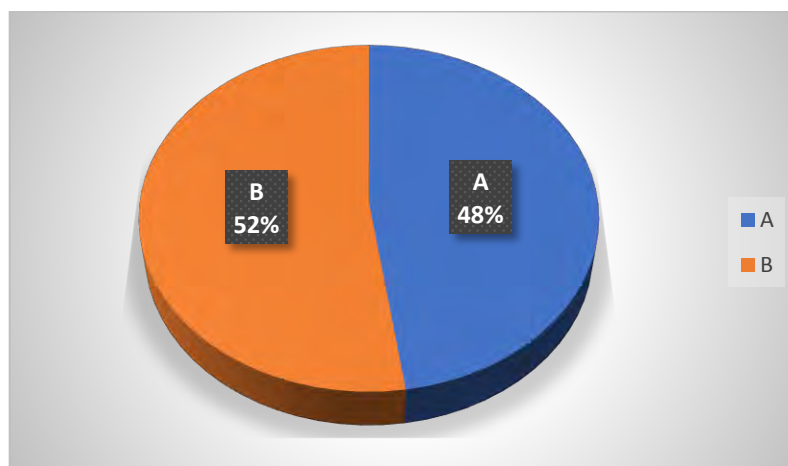
**Figure 1:** Pie Chart on Gender

Table 2, revealed that 210 respondents representing 70% were male while 90 respondents representing 30% were female. Therefore, it implies that the majority of the respondents were male.

**Table 3.** Distribution of the Respondents according to Name of Institutions

Name of Institutions	Frequency	Percentage
A	143	43.3
B	157	56.7
Total	300	100



**Figure 2.** Pie Chart Respondents by Institutions

Table 3 revealed that 143 respondents representing 47.67% were pre-service teachers A, 157 respondents representing 52.33% were pre-service teachers B.

**Research Question One:** How do pre-service teachers rate their self-efficacy in adopting OSS for instruction?

**Table 4.** Frequency and Percentage Distribution of Preservice Teachers Self-Efficacy of Open Source Software for Learning

S/N	Statement	SA		A		D		SD	
		F	%	F	%	F	%	F	%
1	I feel confident that I understand free and open-source software (OSS) well enough to maximise their use in my learning	70	23.3	100	33.3	90	30.0	40	13.3
2	I am confident of my ability to evaluate OSS softwares for teaching and learning	50	16.7	100	33.3	140	46.7	10	3.3
3	I feel self-assured that I have the skills necessary to use OSS software for instruction.	40	13.3	110	36.7	120	40.0	30	10.0
4	I will generally teach my subject content effectively using OSS software.	40	13.3	120	40.0	130	43.3	10	3.3
5	I am sure I can develop creative ways to cope with patented software constraints (lack of funds) and continue to teach effectively with OSS software	60	20.0	80	26.7	130	43.3	30	10.0
6	I can help students when they have difficulty with the OSS software use in my classroom	40	13.3	110	36.7	130	43.3	20	6.7
7	I feel confident that I can mentor my students in the appropriate use of OSS software to learn their subjects.	70	23.3	90	30.0	90	30.0	50	16.7
8	I feel confident that as time goes by, my ability to address my students' needs for learning using OSS software will continue to improve.	110	36.7	60	20.0	120	40.0	10	3.3
9	I will be responsive to students' learning needs during teaching using OSS software.	70	23.3	100	33.3	110	36.7	20	6.7
10	I feel confident about selecting appropriate OSS technology resources and software products to improve my teaching and learning.	80	26.7	110	36.7	100	33.3	10	3.3

Table 5 revealed, the respondents' opinions on undergraduate student-teachers self-efficacy of open-source software for learning in Lagos State. One hundred seventy respondents representing 56.67%, agreed that they understand OSS well for learning while 130 respondents representing 43.33%, disagreed. It indicated that most pre-service student-teachers don't understand OSS well for learning in Lagos State. 150 respondents representing 50.0 percent agreed that they could evaluate OSS for learning, while 150 respondents disagreed. In addition, 150 respondents representing 50% agreed that they have the skills to use OSS software for learning, while 150 respondents representing 50% disagreed. A total of 160 respondents representing 53.33%, agreed that they teach their subject content effectively using OSS software, while 140 respondents representing 47.67%, disagreed.

One hundred forty respondents representing 46.67%, agreed that they could develop creative ways to cope with patented software constraints and continue to teach with OSS software, while 160 (53.33%) respondents disagreed. A total of 150 respondents representing 50%, agreed that they could help students when they have difficulties with OSS software, while 150 respondents representing 50%, disagreed. One hundred sixty respondents representing 53.33%, agreed that they could mentor students in the appropriate use of OSS software to learn their subjects, while 140 respondents representing 46.67%, disagreed. One hundred seventy respondents representing 56.67%, agreed that they feel confident at times goes and have the ability to address students' needs for learning using OSS software, while 130 respondents representing 43.33%, disagreed. A total of 170 respondents representing 56.67%, agreed that they would be responsive to students need during teaching using OSS software, while 130 respondents representing 43.33%, disagreed. One hundred ninety respondents representing 63.33%, agreed that they feel confident in selecting appropriate OSS software to improve their teaching and learning, while 110 (36.67%) respondents disagreed. Therefore, it indicated that pre-service student-teachers could use OSS software for learning in Lagos State.

Hypothesis one: There is no significant difference in the pre-service teachers' self-efficacy of OSS for instruction based on gender.

**Table 5.** Influence of Gender on Preservice Teachers Self-Efficacy on OSS for Instruction in Lagos State

Variable	N	$\bar{x}$	SD	Df	t-cal.	Sig
Male	210	2.43	0.96	298	2.59	0.01
Female	90	2.11	0.99			

Table 5 revealed, that male respondents had higher self-efficacy score related to OSS in instruction, they had ( $\bar{x} = 2.43, \pm 0.96$ ) compared to female students with mean value ( $\bar{x} = 2.11, \pm 0.99$ ), with t-test results,  $t(298) = 2.59, p > 0.05$ . The results in this table imply a significant difference between male and female pre-service teachers' self-efficacy on OSS for instruction in Lagos State, favouring male pre-service teachers. Therefore, the hypothesis that there is no significant difference between male and female pre-service teachers' self-efficacy on OSS for instruction is rejected. Therefore, implying a significant difference between male and female pre-service teachers' self-efficacy on OSS for instruction in Lagos State.

## Discussion

The study further revealed that the pre-service teachers are confident using OSS for learning in Lagos State because they feel assured of having the skills necessary to use OSS software for learning. In addition, they have the confidence to teach subject content effectively using OSS, also feel confident that as time goes by, they will have the ability to address students need for learning using OSS. The difference in the pre-service teachers' self-efficacy in the use of OSS for learning in Lagos state was such that self-efficacy greatly impact the use of OSS for instruction among the pre-service teachers. These findings are similar to the findings of Asing-Cashman,



Gurung, Limbu, and Rutledge (2014), which indicated high self-efficacy on the part of pre-service teachers in their perceptions of their skills, attitude, and pedagogical intention to use free and open-source tools (FOSTs) in their future teaching career.

The gender differences in the pre-service teachers' self-efficacy on OSS for learning in Lagos State were established in the hypotheses stated in this study. First, from the analysed data, it was deduced that there was significant differences between male and female pre-service teachers' self-efficacy in the use of OSS for learning in Lagos State in favour of female teachers. On the other hand, the self-efficacy finding favoured the male pre-service teachers. These differences may be largely due to understanding the issues, not the reality on the ground. Second, the finding on gender differences contradicts the findings of Yusuf and Balogun (2011), which indicated no significant difference between male and female pre-service teachers in the self-efficacy rating of their ability to use ICT tools for learning. However, the findings on gender differences agree with Vedres and Vasarhelyi (2019), which indicated that women are severely marginalised in software development because they are disadvantaged, while men are also disadvantaged along an interquartile range of the female pattern.

### **Conclusion and Recommendation**

Based on the study on pre-service teachers' self-efficacy in the use of open-source software for learning in Lagos State, several key findings have emerged. Overall, pre-service teachers demonstrated a moderate level of self-efficacy in using open-source software for learning. This indicates that they have a certain degree of confidence in their ability to effectively utilize open-source software in educational settings. This study therefore, recommended that Female pre-service teachers should be encouraged to acquire the skills and knowledge necessary to use OSS for learning. One contributing factor to pre-service teachers' self-efficacy was their prior experience and familiarity with technology. Those who had previous exposure to open-source software or had received training in its use tended to display higher levels of self-efficacy. This suggests that targeted training and exposure to open-source software during their teacher education programs could enhance their self-efficacy in this area. Furthermore, the study identified specific areas where pre-service teachers felt more confident in using open-source software, such as content creation and organization, instructional delivery, and student assessment. On the other hand, they reported lower levels of self-efficacy in troubleshooting technical issues and adapting software to diverse learner needs. These findings highlight the need for comprehensive training programs that address these specific areas of concern.

Recommendations: Based on the conclusions drawn from the study, the following recommendations are proposed:

1. **Teacher Education Programs:** Teacher education programs in Lagos State should incorporate comprehensive training on the use of open-source software for learning. This training should provide hands-on experience, opportunities for practice, and guidance on troubleshooting common technical issues. By equipping pre-service teachers with the necessary skills and knowledge, their self-efficacy in using open-source software can be enhanced.
2. **Professional Development:** Continuous professional development opportunities should be provided to practicing teachers to improve their self-efficacy in using open-source software. Workshops, seminars, and online courses can be organized to update their knowledge and skills, focusing on specific areas identified in the study where self-efficacy was lower.
3. **Collaboration and Support:** Establishing a network of educators and experts who are proficient in open-source software can foster collaboration and support among teachers.

Creating platforms for sharing best practices, resources, and troubleshooting techniques can contribute to the development of a supportive community that boosts teachers' self-efficacy and addresses challenges they may face.

4. Research and Evaluation: Further research should be conducted to explore the long-term effects of pre-service teachers' self-efficacy in using open-source software. Evaluating the impact of training programs and identifying factors that contribute to sustained self-efficacy will provide insights for future improvements in teacher education and professional development initiatives.

By implementing these recommendations, the educational landscape in Lagos State can be enriched with effective and confident teachers who utilize open-source software to enhance teaching and learning experiences for their students.

## References

- [1] Adokiye, A. O. (2013). Teacher preparation and vision 20:2020: The challenges ahead. *Mediterranean Journal of Social Sciences*, 4(5), 81-87.
- [2] Akindutire, I. O., & Ekundayo, H. T. (2012). Teacher education in a democratic Nigeria: Challenges and the way forward. 1.
- [3] Akpan, C. P., Ntukidem, P. J., Epkiken, W., & Etor, R. (2009). The Challenges of Teacher Education in Nigeria. *International Journal of Internet Education*.
- [4] Al Abikya, W. B. (2021). Lessons Learned for Teacher Education: Challenges of Teaching online Classes During Covid-19. What can Preservice Teachers tell us? *Revista Argentina de Clínica Psicológica*, 30, 110. doi:10.24205/03276716.2020.4011
- [5] Al-Hajri, R., Al-Mukhaini, G., & Ramalingam, R. (2017). Adoption of free and open source software using alternative educational framework in college pf applied sciences. *Free and Open Source Software Conference (FOSS-17)*, 1 - 4. Muscat, Oman: Author. Retrieved from <https://pdfs.semanticscholar.org/aa7b/69579180ffbaa051752df527308782aad7df.pdf>
- [6] (2012). All about open source: An introduction to open source software for government IT (version 2.0). London: UK Government ICT Strategy. Retrieved from [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/78959/All\\_About\\_Open\\_Source\\_v2\\_0.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/78959/All_About_Open_Source_v2_0.pdf)
- [7] Alzub, A. F. (2021). The Assessment of Information and Communication Technology in. *Educational Research Association*, 12(1), 32-45
- [8] Amuno, A. (2019). The five types of systems software. Retrieved from <https://turbofuture.com/computers/The-Five-Types-of-System-Software>
- [9] Anjaneyulu, P., Biradar, K., Gopinath, S., & Naik, J. K. (2017, August 2-4). Awareness and Use of Open Source Software Among The Library Professionals in Bangalore City: A Study. 11th International CALIBER-2017.
- [10] Arzt, N. H., & Berry, M. (2019). Open Source and Public Health: Building on a Tradition of Collaboration. *Medical Research Achieves*, 7(12), 2.
- [11] Asing-Cashman, J. G., Gurung, B., Limbu, Y. B., & Rutledge, D. (2014). Free and Open Source Tools (FOSTs): An empirical investigation of pre-service teachers' competencies, attitudes, and pedagogical intentions. *International Journal of Teaching and Learning in Higher Education*, 26(1), 66-77. Retrieved from <https://files.eric.ed.gov/fulltext/EJ1043024.pdf>
- [12] Australian Government. (2017). Understanding emerging technologies. Retrieved from <https://www.industry.gov.au/data-and-publications/australias-tech-future/introduction/understanding-emerging-technologies>
- [13] Ayres, C. (2018, June 28). ConnectUs. Retrieved from 7 main advantages and

- disadvantages of open source software: <https://connectusfund.org/7-main-advantages-and-disadvantages-of-open-source-software>
- [14] Badarch, D. (2011). ICT in teacher education: Policy, open educational resources and partnership - Foreword. Proceedings of International Conference IITE-2010 (pp. 6 - 7). Moscow: UNESCO Institute for Information Technologies in Education. Retrieved 10 20, 2019, from <https://iite.unesco.org/pics/publications/en/files/3214684.pdf>
- [15] Bakare, A. A., & Olaniyi, E. T. (2017). Use and Application of ICT in Teaching and Learning for Quality Higher Education in Nigeria. A Literature Analysis, 1. Retrieved March 4, 2017, from <http://doi.org/10.15580/GJER.2017.2.020617017>
- [16] Bal-Taştan, S., Davoudi, S. M., Masalimova, A. R., Bersanov, A. S., Kurbanov, R. A., Boiarchu, A. V., & Pavlushin, A. A. (2018). The impacts of teacher's efficacy and motivation on student's academic achievement in science education among secondary and high school students. *EURASIA Journal of Mathematics, Science and Technology Education*, 14(6), 2353-2366. doi:<https://doi.org/10.29333/ejmste/89579>
- [17] Bhattacharjee, B., & Deb, K. (2016). Role of ICT in 21st century's teacher education. *International Journal of Education and Information Studies*, 6(1), 1 - 6. Retrieved 10 20, 2019, from [https://www.ripublication.com/ijeis16/ijeisv6n1\\_01.pdf](https://www.ripublication.com/ijeis16/ijeisv6n1_01.pdf)
- [18] Bhura, S. (2019, April 29). Open Source Victoria. Retrieved from Benefits of open source in education: <https://www.myschoolserver.com/open-source-benefits-education/>
- [19] Bond, M., Katja, B., & Kerres, M. (2020, January 22). Mapping Research in Student Engagement and Educational Technology in Higher Education: a Systematic Evidence Map. *International Journal of Educational Technology in Higher Education*, 17.
- [20] Borg, W. R., & Gall, M. D. (1989). *Educational research. An introduction* (5th ed.). White Plains, NY:: Longman.
- [21] Buffett, B. (2014). How IT can contribute to changing organizational culture. Factors influencing open source software adoption in public sector national and international statistical organisations. Dublin.
- [22] Cho, Y. C. (2015). Exploring factors that affect usefulness, ease of use, trust, and purchase intention in the online environment. *International Journal of Management and Information Systems*, 19(1), 21-36. doi:<https://doi.org/10.19030/ijmis.v19i1.9086>
- [23] Daneji, A. A., Ayub, F. M., Jaafar, W. M., & Khambari, M. N. (2018). Influence of Students' Perceived Ease of Use, Perceived Usefulness and Time Spent Towards Students' Continuance Intention Using MOOC Among Public University Students. 115. Atlantis Press. Retrieved from <http://creativecommons.org/licenses/by-nc/4.0/>
- [24] Danurdoro, K., & Wulandari, D. (2016). The impact of perceived usefulness, perceived ease of use, subjective norm, and experience toward student's intention to use internet banking. *Jurnal Ekonomi dan Studi Pembangunan (JESP)*, 8(1), 17-22. doi:<http://journal.um.ac.id/index.php/jesp/article/view/5268/1941>
- [25] Danurdoro, K., & Wulandari, D. (2016). The Impact of Perceived Usefulness, Perceived Ease of Use, Subjective Norm, and Experience Toward Student's Intention to Use Internet Banking. ISSN (P) 2086-1575 E-ISSN 2502-7115
- [26] Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 319-340.
- [27] Davis, F. D. (2014, 3 13). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. 319, 48-109
- [28] Ekpiken, W. E., & Ukpabio, G. U. (2014). Repositioning Teacher Education in Nigeria for Sustainable National Development. *Emerging Trends in Educational Research and Policy Studies*.
- [29] Faisal, P., & Zainul, K. (2020). Information and Communication Technology Effectiveness in Distance Education Systems. *international Journal on Engineering*

- Business Management, 12. doi:10.1177/184797020911872
- [30] Faith, B., Robert, T., & Berdou, E. (2018, November). Towards a More Gender-inclusive Open Source Community. Digital Impact Alliance.
- [31] Garrett, P. (2018, October 25). Emerging Technologies in Higher Education: A Case for Putting Learning First. Retrieved from Concordia University: <https://education.cu-portland.edu/blog/leaders-link/higher-education-emerging-technologies/>
- [32] Ghavifekr, S., & Quan, T. Y. (2020). Utilization Technology, Knowledge, and Smart Systems in Educational Administration and Leadership. doi:10.4018/978-1-7998-1408-5.ch015
- [33] Gichiara, C. M., Kahonge, A. M., & Miriti, E. K. (2012, December). Adoption of Open Source Software by Organizations – A Framework for Kenya. *International Journal of Computer Applications*, 59, 7.
- [34] Government of Ontario. (2019). Open source software. Ontario: Government of Ontario. Retrieved 10 20, 2019, from <https://www.ontario.ca/page/open-source-software>
- [35] Gupta, D., & Surbhi, B. (2018). Adopting free and open source software (FOSS) in education. *i-manager's Journal of Educational Technology*, 14(4), 53 - 60. Retrieved from [https://www.researchgate.net/publication/324893991\\_Adopting\\_free\\_and\\_Open\\_Source\\_Software\\_foss\\_in\\_Education/download](https://www.researchgate.net/publication/324893991_Adopting_free_and_Open_Source_Software_foss_in_Education/download)
- [36] Hallstrom, J. O. (2016, August 8). IoT and the Campus of Things. Retrieved from Educause review: <https://er.educause.edu/articles/2016/8/iot-and-the-campus-of-things>
- [37] IBM. (nd). IBM technology support services for Linux and Cloud Open-Source Software (OSS). Retrieved August 1, 2021, from <https://mainline.com/services/managed-maintenance-support/ibm-support-services-for-linux-and-cloud-open-source-software-oss/>
- [38] Innovation PIE. ((n.d.). Open source software. Prince Edward Island: Innovation PIE. Retrieved 10 20, 2019, from [http://www.gov.pe.ca/photos/original/IPEI\\_ebiz\\_oss.pdf](http://www.gov.pe.ca/photos/original/IPEI_ebiz_oss.pdf)
- [39] Kass, K. D. (2014). Computer self-efficacy: Instructor and students' perspectives in a university setting. Graduate These and Dissertations 14183, Iowa State University. Retrieved from <https://lib.dr.iastate.edu/etd/14183>
- [40] Kaushik, D. (2019, September 1). Role of ICT for Better Mathematics. *Shanlax International Journal of Education*, 7(4), 19-28. <https://doi.org/0.34293/education.v7i4.641>
- [41] Keane, T. (2012). *Leading with Technology*. 34.
- [42] Kim, S., & Park, H. (2018). Do Female Employees at Small and Medium Enterprises Perceive Open Source Software Usefulness and Satisfaction Differently from Male Employees? A Survey Analysis. Retrieved September 25, 2018
- [43] Kuechler, V., Gilbertson, C., & Jensen, C. (2012). Gender Differences in Early Free and Open Source Software Joining Process. 8th International Conference on Open Source Systems (OSS), Hammamet, (pp. 78-93). Tunisia. doi:01519076
- [44] Kumari, S. (2020, February 18). Redefining Historical Research Through. *UGC Care Journal*, 40.
- [45] Kavanagh, P. (2004). *Open Source Software: Implementation and Management*. Burlington: Elsevier Digital Press.
- [46] Kuechler, V., Gilbertson, C., & Jensen, C. (2012). Gender Differences in Early Free and Open Source Software Joining Process., 8, pp. 78-93. Hammamet. Retrieved May 5, 2017
- [47] Lakhan, S. E., & Jhunjhunwala, K. (2008). *Educause Quarterly*. Academia has adopted open source software for some online learning initiatives because of addresses persistent

- technical challenges.
- [48] Lakhan, S., & Jhunjhunwala, K. (2008). Open Source Software in Education. 31(2). Retrieved from <http://creativecommons.org/licenses/by-sa/3.0/>
- [49] Lee, A., & Carver, J. C. (2014). FLOSS Participants' Perceptions about Gender and Inclusiveness: A Survey.
- [50] Lopez-Garrido, G. (2020). Self-efficacy theory. Retrieved August 1, 2021, from Simply Psychology: <https://www.simplypsychology.org/self-efficacy.html>
- [51] Manyilizu, M., & Gilbert, G. M. (2015). The use of ICT between Male and Female Teachers in Secondary Schools in Tanzania, a Case of Dodoma Municipality. *International Journal of Education and Research*, 3.
- [52] Mittal, P., & Singh, J. (2013). A survey on open source software using. *International Journal of Computer Trends and Technology (IJCTT)*, 4(4), 833 - 838. Retrieved July 31, 2019, from <http://ijcttjournal.org/Volume4/issue-4/IJCTT-V4I4P180.pdf>
- [53] Mittal, P., & Singh, J. (2013). *International Journal of Computer Trend and Technology (IJCTT)*. 833.
- [54] Mittal, P., & Singh, J. (2013). A Survey on Open Source Software using Questionnaire. *International Journal of Computer Trends and Technology (IJCTT)*, 4(4).
- [55] Oduor, M., Honkavuori, J., & Janika, P. (2012). Use of Open Source Software for Educational Purposes.
- [56] Ogunyinka, E. K., Okeke, T. I., & Adedoyin, R. C. (2015). Teacher education and development in Nigeria: An analysis of reforms, challenges and prospects. *Educational Journals*, 4(3), 111-112.
- [57] Opensource.com. (n.d). What is open source? Retrieved from Opensource.com: <https://opensource.com/resources/what-open-source>
- [58] Pardeep, M., & Jatinderpal, S. (2013). A Survey on Open Source Software using Questionnaire. *International Journal of Computer Trends and Technology (IJCTT)*, volume4Issue4, 833.
- [59] Pendergast, D., Garvis, S., & Keogh, J. (2011). Pre-Service Student-Teacher Self-efficacy Beliefs: An Insight Into the Making of Teachers. *Australian Journal on Teacher's Education*, 36(12).
- [60] Pezer, M., Lazić, N., & Odak, M. (2017). Free and open source software in the secondary education in Bosnia and Herzegovina. 2017 40th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO) (pp. 882-886). Opatija, Croatia: Institute of Electrical and Electronics Engineers. doi:10.23919/MIPRO.2017.7973546
- [61] Picha, G. (2018, October 17). Effective Technology Use in Math Class. Retrieved from Edutopia: <https://www.edutopia.org/article/effective-technology-use-math-class>
- [62] Powell, W. E., Hunsinger, S. D., & Dawn, M. B. (2010). Gender Differences within the Open Source Community: AN Exploratory Study. *Journal of Information Technology Management*, 29.
- [63] Ratheeswari, J. K. (2018). Information Communication Technology in Education. *Journal of Applied and Advanced Research*, 3. Retrieved April 18, 2018
- [64] Schutz, M., Khan, N., & Chand, A. (2005). A baseline survey on free and open source software (FOSS) in the South Pacific: Knowledge, awareness, and usage. The University of the South Pacific. Suva, Fiji Islands: USP Library Cataloguing-in-Publication Data. Retrieved from <https://www.semanticscholar.org/paper/A-baseline-survey-on-free-and-open-source-software-Schutz-Khan/06c184ba7a101f4576622bc348165df8b463d7f1>
- [65] Shweta, R., & Janace, B. (2020). Technology in Education: Learning Opportunities for Teachers and Students. *Journal of Family & Consumer Sciences*, 112(1), 46-50(5). doi:<https://doi.org/10.14307/JFCS112.1.46>

- [66] Sivo, S. A., Ku, C.-H., & Acharya, P. (2018). Understanding how University Student Perceptions of Resources Affect Technology Acceptance in Online Learning Courses. *Australasian Journal of Educational Technology (AJET)*, 4, 34.
- [67] Struyk, T. (2017). An introduction to application software. Retrieved from <https://www.techopedia.com/2/28350/personal-tech/software-applications/an-introduction-to-application-software>
- [68] Szymkowiak, A., Melovic, B., Marina, D., Jeganathan, K., & Kundi, G. S. (2021, May). Information Technology and Gen Z: The Role of Teachers, the Internet, and Technology in the Education of Young People. 65, 1. Retrieved from <https://doi.org/10.1016/j.techsoc.2021.101565>
- [69] Taştan, S. B., Davoudi, S. M., Masalimova, A. R., & Bersanov, A. S. (2017). The Impacts of Teacher's Efficacy and Motivation on Student's Academic Achievement in Science Education among Secondary and High School Students. *EURASIA Journal of Mathematics, Science and Technology Education*.
- [70] Thankachan, B., & Richard, D. M. (2017). Challenges of Implementing Free and Open Source Software (FOSS): Evidence from the Indian Educational Setting. *International Review of Research in Open and Distributed Learning*, 18.
- [71] Tillaev, A. I. (2020). Improving the Teaching of "Information Technology" in Higher Education on the Basis of Multimedia Technologies. *Journal of Critical Review*, 7(11), 3. Retrieved May 16, 2020
- [72] Tweed, S. (2013). Technology Implementation: Teacher Age, Experience, Self-Efficacy, and Professional Development as Related to Classroom Technology Integration. *Classroom Technology Implementation, Self-Efficacy, Professional Development*. East Tennessee.
- [73] Ukachi, N. B. (2012). Awareness, availability and utilization of open source software in Nigerian libraries: the way forward. *International Research Journal of Library, Information and Archival Studies*, 1(1), 001 - 009. Retrieved from [https://www.researchgate.net/publication/267704768\\_Awareness\\_availability\\_and\\_utilization\\_of\\_open\\_source\\_software\\_in\\_Nigerian\\_libraries\\_the\\_way\\_forward/download](https://www.researchgate.net/publication/267704768_Awareness_availability_and_utilization_of_open_source_software_in_Nigerian_libraries_the_way_forward/download)

پژوهشگاه علوم انسانی و مطالعات فرهنگی  
پرتال جامع علوم انسانی



#### COPYRIGHTS

© 2023 by the authors. Licensee PNU, Tehran, Iran. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution 4.0 International (CC BY4.0) (<http://creativecommons.org/licenses/by/4.0>)