

# In-service teachers' perception of ICT preparedness: Challenges and remedies to implementation of mathematics curriculum

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## *Abstract*

The study investigated the perception of 205 purposively sampled senior secondary in-service Mathematics teachers on Information and Communication Technology (ICT preparedness, challenges, and remedies to the implementation of the Mathematics curriculum in Lagos State. It adopted the descriptive survey research design using a 19-item self-developed questionnaire with Cronbach's Alpha reliability coefficient of 0.87. Multiple-column bar charts were used to analyse the three research questions that guided the study. The result showed that more than 95% of in-service Mathematics teachers are deficient in their use of ICT tools in class due to insufficient exposure to both offline and online applications of ICT facilities during training. Consequently, there was a 95-100% lack of requisite skills for Microsoft Word, PowerPoint, Microsoft Excel, Corel draw packages, and online video conferencing for Mathematics instruction. It also found that ineffectiveness in the use of ICT gadgets could be mitigated with adequate provision of laptops and other ICT gadgets which include functional projectors, regular supply of electricity, CCTVs as well as capacity-building programs for talent exhibitions. It was recommended that the Lagos State Ministry of Education should ensure that Mathematics laboratories are adequately equipped with functional online and offline ICT gadgets in all Senior Secondary Schools; school administrators in conjunction with the Department of Curriculum should strive to re-train mathematics teachers, ensure regular supply of electricity, and provide free data for online activities. Moreover, Mathematics teachers should make it a norm to improvise ICT tools and engage in capacity building ICT programmes for self-development.

**Keywords:** In-service teachers', ICT preparedness, challenges and remedies, Mathematics curriculum.

## Introduction

It is noted that in spite of the indispensable roles Information and Communication Technology (ICT) has played in unraveling the challenges militating against the implementation of Mathematics Curriculum globally, it has not been given its rightful place with respect to the implementation of Mathematics Curriculum in Lagos State (Lavonen *et al*, 2012). For this reason, it was echoed by Ejoh (2020), that the Mathematics curriculum has been disseminated for decades without the use of ICT tools in many private and public-owned senior secondary schools across the State. This is actually counter-productive too, the five key objectives of education as stated in the National Policy on Education encompass the building of (i) a free and democratic society;( ii) a just and egalitarian society; (iii) a united strong, and self-reliant nation; (iv) a great and dynamic economy, and (v) a land full of bright opportunities for all citizens (FRN, 2013).

In retrospect, the third objective as stated above cannot be realistically actualized in Nigeria as a nation that cannot produce innovative, competent, efficient, and self-reliant Mathematics teachers in the use of ICT appliances (Igbokwe, 2015). As cited by Amaele (2003) in Adedeji (2018), a teacher is an individual who helps a learner acquire skills, attitudes, ideas, and knowledge for the creation of desirable changes in behaviours. Teachers being the hub around which the entire learning system revolves, desire and deserve consistent training and re-training programs year-in-year-out. If the quality of teachers' preparation is not given urgent attention, a nation like Nigeria would simply be daydreaming about becoming self-reliant in the future. For instance, schools that are deficient in computer laboratory attendants usually produce hard and soft copies of their documents in business centers, irrespective of how sensitive they appear to be (e.g. examination question papers, testimonials, and results), neither the teachers are too busy nor there are no ICT facilities, but for their gross inefficiency and incompetency in the use ICT tools.

This negative trend became more evident in the spate of COVID-19 that halted all academic activities throughout the year 2020, which inadvertently exposed institutional readiness to showcase the high level of preparedness to experiment with in-service teachers' usability of ICT tools in practical terms. While countries renowned for the utilization of ICT tools quickly switched with the speed of light from face-to-face classes to virtual platforms, the opposite was the case among many schools in Lagos State and Nigeria at large. However, some weeks into the pandemic precisely during the lockdown. Lagos State government put up some online presentations for WAEC candidates.

When it became obvious that the majority of Mathematics classes were suddenly truncated, it was indeed a massive exposé of the lack of preparedness and incompetent use of ICT tools for Mathematics instructors at all levels. It evidently implied that in-service Mathematics teachers could not cope with such a sudden transition from traditional face-to-face instruction to conventional means of disseminating Mathematics lessons precisely at the secondary level. Although, Lagos State did not completely go hibernated in efforts to provide moral and intellectual palliatives. In the heat of the pandemic, one of the interventions applied to salvage the situation was to put up some weeks of audio-visual online Mathematics lessons, anchored by some selected in-service Mathematics teachers via Lagos State Television. Apart from the fact that the measure was short-lived, students in the rest classes had little or no benefits from the exercise which was devoid of student-teacher participation and meaningful interaction.

As a matter of fact, the lesson contents were not pre-recorded in form of software for offline application by candidates who could not afford to attend any class or unavoidably misses out. Lavonen et al (2012) considered application software as a set of instruments that enable students and teachers to accomplish their tasks more efficiently. Reflecting on this position, on one hand, hard wares such as projectors which are useful for lesson delivery; offline soft-wares are veritable and dynamic tools for the typesetting of documents, carrying out spreadsheet calculations and graphics designing were not effectively used. On the other hand, online software such as google drive, zoom, go-to-meeting, google classroom, Microsoft teams, and skype for real-time instructions and test administration were prioritized.

A major challenge to the successful use of itemised ICT tools in the implementation of the mathematics curriculum by in-service teachers is the paucity of ICT experiences as undergraduates (Otikor, 2018). Many of these in-service teachers are helpless with the situation because they were not bequeathed with requisite ICT skills for the teaching of mathematics content during their undergraduate days. For in-service teachers to successfully overcome mountain-like challenges and catch up with the educational needs of society, adequate preparation is required. Granted, some must have been drilled with ICT knowledge, such acquired skills require consistent application in practical ways. On the contrary, many in-service teachers lack desirable learning experiences to achieve success in the classroom. In order to meet up to expected standards and international best practices, it is necessary for competency in ICT usage to go beyond content knowledge, to the practical application of skills. Another impediment to curriculum implementation is the deplorable

state of available ICT laboratories or ill-equipped gadgets (Agommuoh & Ifeanacho, 2013). This is even more discouraging for the handful of in-service teachers who may be coerced by parents of pen pals to go extra mile for self-development on the application of ICT gadgets.

A better understanding of the components of ICT can be seen in the outline made by Otikor (2018) as broadcasting media, intelligent and transmission systems, networking, monitoring, and audio-visual units, devices, and application software that allow people, governments, non-profit making agencies and businesses to work together in the digital world. In recent years, ICT usage has become an essential part of the education sector. Teaching and learning have greatly improved due to the application of ICT. For example, students' achievement in Mathematics has been up-scaled with the utilization of ICT. It has also enhanced teamwork and conceptual understanding of the basic concept of Mathematics. In this context, ICT would be seen as all the online and offline parameters used in speeding up the process of telecommunications.

However, it is not an understatement that in-service teachers cannot exhibit un-acquired ICT skills, while it is disheartening that the academic atmosphere is characterized by formidable obstacles to the implementation of the mathematics curriculum as entrenched in the national policy of education (FRN, 2013). So, to make effective use of ICT tools during teaching practice, in-service Mathematics teachers ought to be given adequate preparation to cope with any future challenges. It is against this backdrop that this study focused on in-service teachers' ICT preparedness, challenges, and remedies in disseminating the senior secondary school Mathematics curriculum.

This study has a critical and pertinent review of conventional issues on teachers' preparedness with respect to IT gadgets in Lagos State and Nigeria at large, for every senior secondary school leaver to have a minimum of credit pass in Mathematics for a smooth transition to the next academic level. Notwithstanding, the use of conventional instructional strategies for the implementation of the mathematics curriculum has not been enforced. In fact, to date, some basic Mathematics concepts are still ambiguously abstract to many students, perhaps due to many years of exposure to traditional teaching approaches. Most students in Lagos State do not graduate with the mathematics skills needed for gainful employment and economic self-reliance, possibly due to insufficient use of technology in Mathematics classes. Most schools lack an online interface for students who for health or family reasons evaded any face-to-face contact. Besides, teachers are not ready to electronically apply ICT gadgets when teaching some complex geometric shapes

that cannot be taught traditionally. Hence there is a ripple effect on students' level of preparedness for the use of ICT tools and learning outcomes in Mathematics.

Empirically, Otikor (2018) set out to determine the extent to which in-service Mathematics teachers were prepared to use ICT to enhance classroom instruction. It was discovered that the teachers were not at all, taught how to apply ICT tools during classroom instruction besides not being equipped with functional computer systems. About three years earlier, Mapolelo and Akinsola (2015) accented to the view that the memories of in-service teachers from the school years are a central factor influencing Mathematics related beliefs, and therefore wished that pre-service teachers' attitude towards Mathematics are better enhanced during training. This corroborated with the report of Ejoh (2020) who investigated the influence of technology in Mathematics classrooms on the motivation, attitude, and achievement of students who had completed SSCE. It was understood that students taught in high technology classrooms were significantly higher in motivation, attitude, and achievement scores than those in low technology classrooms. This obviously showed that technology integration in the teaching and learning of Mathematics had a positive influence on learning outcomes, bringing about positive social change as students gain more skills needed for economic self-reliance.

In another study that peered into teachers' confidence and preparedness to teach in the middle-school context after their university education, Hudson (2009) found the need for increased consideration of pedagogical approaches and the preference attached to theories and academic practices. This idea was supported by Eickelmann, Gerick, and Koop (2017), who did not just conduct comparative research to identify academic factors that either backup or hinder the use of ICT tools in secondary school mathematics classes but went further to examine the relationship between ICT usage and students' performance in Mathematics. The results showed that apart from teacher inability, academic factors played a relevant and major role in the integration of ICT into teaching and learning across the educational systems.

The report of Lavonen, et al (2012) showed the importance of clarifying the needs, constraints, and pedagogic use of ICT materials since in-service Mathematics teachers are usually in high motivation to use ICT in their teaching activities. In addition to being motivated to use modern equipment and innovative teaching methods, mentors were ready to render necessary assistance when needed. From a slightly different line of thought, Bozkurt (2016) identified that student teachers are committed and confident in the value of ICT in Mathematics teaching and

specifically discovered that poor access to facilities, limited encouragement from mentors, irregular use of ICT, lack of links in the scheme of work, and time constraint are among the barriers inhibiting the student teachers' use of ICT. This could mean that the readiness level of mentors to provide needed assistance has a lot of positive influence on teachers' effective use of ICT gadgets.

However, the Organisation for Economic Co-operation and Development (OECD, 2006, 2009) addressed some challenges with respect to ICT usability and the daily experiences of students outside the school setting. There was an incidence of negative reports of teaching practices due to poor application of curriculum guidelines; inordinate and unskillful use of ICT tools by in-service teachers, inability to showcase competence during class activities; poor support towards the educational use of technology despite the availability in schools; there are enough teaching and learning materials, especially with a focus on using ICT in science education. Notwithstanding, Eickelmann, Gerick, and Koop (2017) spotted in-depth country-specific cross-national future challenges related to the field of using technologies to enhance the teaching and learning of Mathematics

To address the identified ICT-related challenges, Adedeji (2018) believed that the revitalization of in-service mathematics teachers through innovation is necessary. These new changes could come in form of capacity building to enhance knowledge and productivity. This is in line with what López et al (2019) reported as findings, that flipped classroom is a pedagogical innovation for achieving great potential in Mathematics. The study found that the application of flipped learning produced better learning output, motivation, skills, and an increase in graphic representation than the traditional approach. Similarly, Dahal, et al (2020) opined that virtual teaching and learning tools, innovative techniques, and methodologies are helpful for both synchronous and asynchronous pedagogical teaching and learning of Mathematics in online and distance modes of education.

It is important to note that the identified panaceas are clear evidence that when the challenges eventually emerge later, they might not be inevitable, no matter the magnitude; and that irrespective of teachers' level of ICT preparedness, availability, usability, and challenges, there could be light at the end of the tunnel.

Hence, this study specifically focused on:

1. investigating the extent to which in-service teachers are prepared to utilize ICT tools in disseminating the mathematics curriculum in Lagos State;

2. Determining key ICT-related challenges faced by in-service teachers in the course of disseminating senior secondary school Mathematics curriculum in Lagos State; and
3. Examining possible remedies to the ICT related challenges faced by in-service teachers in teaching of Mathematics in Lagos State.

To achieve these objectives, three research questions were raised to guide the study.

1. Are in-service mathematics teachers prepared to use ICT tools in the implementation of senior secondary school Mathematics curriculum in Lagos State?
2. In the cause of curriculum implementation what challenges do in-service mathematics teachers face in the use of ICT tools in Lagos State?
3. What are the likely solutions to the challenges facing in-service teachers in the use of ICT tools in disseminating the mathematics curriculum in Lagos State?

This study adopted the descriptive survey research design and purposively sampled a total of 205 in-service Mathematics teachers out of all the senior secondary schools in the six education districts in Lagos State. It concentrated only on Mathematics teachers because other subject teachers, for example, in-service computer science teachers may differ in the level of exposure and familiarity with offline and online ICT tools and instruction while receiving training. The 19-item self-developed questionnaire which has a Cronbach's Alpha reliability coefficient of 0.865 was divided into three parts A, B, and C. Part A contains seven items that elicited their responses on ICT preparedness. Part B contains five items on the challenges faced as in-service teachers, while part C contains seven proposed remedies to the ICT-related problem of implementing a Mathematics curriculum. The instrument was administered and retrieved within a duration of 30 minutes and the research questions were addressed with the aid of percentages and a multiple-column bar chart.

## Results and discussion

### In-service Mathematics Teacher's preparedness to the use of ICT tools

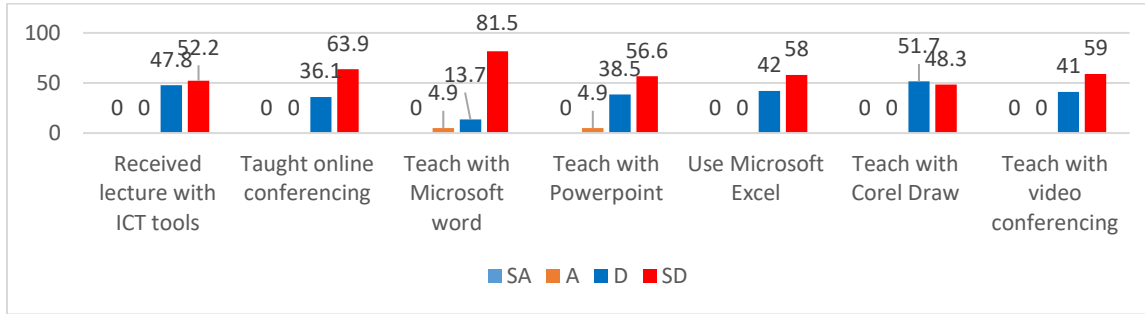


Fig 1: in-service Mathematics teachers' readiness to use ICT tools

The multiple column bar-chart in Fig 1 shows that besides the third and fourth items with 4.9% of agreement, the respondents are 95% to 100% in disagreement with all the items in section A, though positively worded. This implies that they were never taught with offline ICT tools as undergraduates. In like manner, they were not at all equipped with online video conferencing skills. Little wonder while it revealed 95.1% deficiency in the use of Microsoft word, 95.1% lack of ability to use PowerPoint, and 100% in ability to apply Microsoft Excel, Corel Draw packages, and online video conferencing for mathematics instruction in their various schools. However, since none of the respondents were exposed to offline and online use of ICT tools, it is likely that the 4.9% who can either use Microsoft Word or PowerPoint skills must have curiously acquired the knowledge outside the mathematics department. The finding is not at variance with that of Otikor (2018) who discovered that teachers were never taught how to reach with ICT materials during classroom instruction. This may not go well with Mapolelo and Akinsola (2015) who believed that teachers' attitudes toward mathematics ought to be enhanced during training through memory improvement. It corroborated with Ejoh (2020) who concluded that students are significantly motivated in attitude and achievement by high technology environment. The sustainability of teachers' motivation toward modern use of technology rest on mentors' readiness to render necessary assistance Meisalo, et al (2010). This means that having zero level of exposition to the use of ICT equipment while in training is not the end of the road for serious and dedicated in-service Mathematics teachers. If a few in-service teachers could go the extra mile to acquire ICT skills and yet not experiment with their acquired knowledge in class, it implies that the issue is far beyond their level of preparedness. However, it does not in any way imply that the mathematics



curriculum cannot be disseminated with ICT tools. So, besides the poor level of preparedness, what other factors are germane to the deprived use of ICT tools in the implementation of the mathematics curriculum at the secondary level?

### Challenges encountered by in-service Mathematics teachers in the use of ICT tools

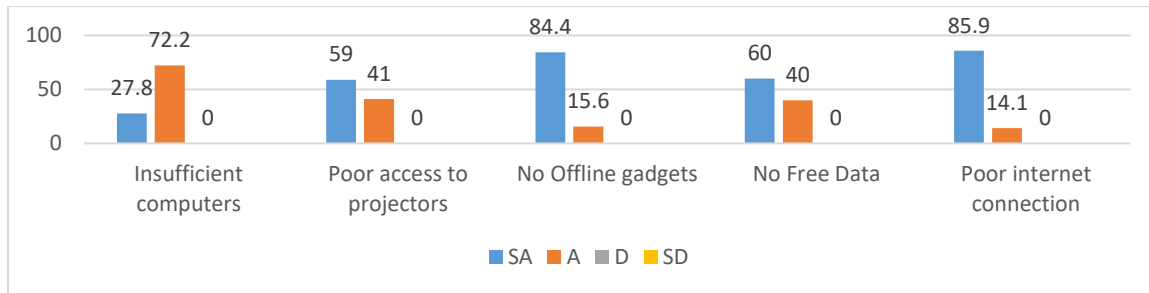


Fig 2: Challenges to the use of ICT tools in disseminating Mathematics curriculum

The output obtained in Fig 2 shows 100% agreement with all the statements in part B of the instrument, though negatively worded. About 27.8% and 72.2% of the respondents strongly and simply agreed respectively that computers are not sufficiently available in their Mathematics laboratory. Even where there are few accessible computers, 100% of them agreed that there are no projectors for lesson presentation. Besides, the schools completely lack supportive offline gadgets like recordable CDs or audio equipment that could serve as substitutes. To worsen matters, none of the respondents experienced the provision of free data, and where they manage to personally purchase data, the unstable network is usually discouraging. This agrees with the report of Bozkurt (2016) who identified that though some teachers are committed and confident in the use of ICT in the teaching and learning of Mathematics, they lack access to facilities and are not adequately encouraged by mentors. This implied that the mentors' readiness to provide needed assistance highly influences teachers' effective use of ICT gadgets. This is supported by the report of OECD (2006), which outlined the incidence of negative teaching practices due to poor application of curriculum guidelines; unskillful use of ICT tools, incompetence during class activities, and too much attention to science education facilities. What measures can be adopted to remedy the ugly and pathetic situation to catch up with the demands of the 21<sup>st</sup>-century academic tasks?

### Anticipated solutions to challenges facing in-service teachers in the use of ICT tools

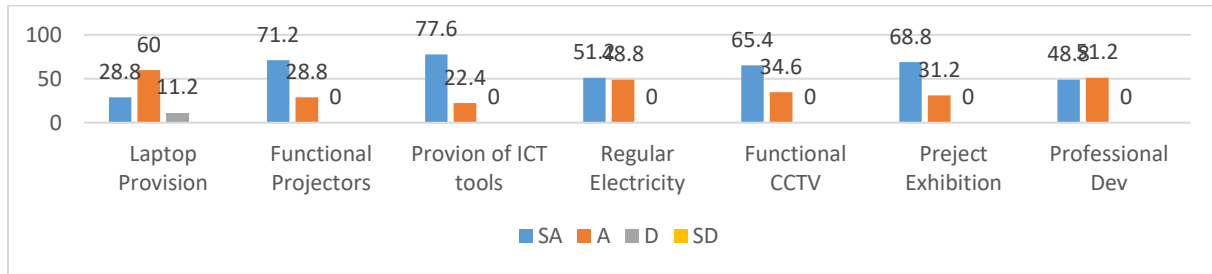


Fig 3: Remedies to Challenges facing in-service teachers in the use of ICT tools

The result in Fig 3 depicts that 11.2% believe that provision of laptop is insufficient to curb the curricula implementation problem. This is because computer systems cannot function in isolation. They cannot be used for effective class activities independent of other gadgets. That may be the reason why adequate provision of ICT tools precedes any other form of palliatives that could cushion the challenges facing the smooth implementation of Mathematics curriculum. In hierarchical order, the ICT materials that are of great importance include functional projectors, CCTVs, and laptops, while the none concrete materials are project exhibition programs, regular supply of electricity, and professional development programs for capacity building. This finding corroborates with that of Adedeji (2018) who believed that innovation by capacity building to enhance knowledge and productivity is the key to revitalization of in-service Mathematics teachers. In like manner, López et al (2019) agreed that a flipped classroom is a veritable tool for successful innovation for producing better learning output and instilling great potential in mathematics teachers. Dahal, et al (2020) also believed that classrooms can be flipped virtually through synchronous and asynchronous teaching strategies. However, the identified panaceas are clear evidence that when the challenges eventually emerge later, they might not be inevitable, no matter the magnitude; and that irrespective of teachers' level of ICT preparedness, availability, usability, and challenges, there could be light at the end of the tunnel.

### Conclusion

The study discovered that ill-prepared in-service mathematics teachers that are incapable of applying ICT tools in disseminating the mathematics curriculum are in the majority in Lagos State. This is largely due to insufficient exposure to both offline and online use of ICT facilities while in the teacher preparatory stage. Hence there is a gross lack of requisite skills for the use of Microsoft Word, Powerpoint, Excel, Corel packages, and online video conferencing for

Mathematics instruction in their various schools. Although, an insignificant number is capable of applying Microsoft Word and PowerPoint packages. This was occasioned by a lack of computers, projectors, and free data for online presentations in most Mathematics laboratories. In-service teachers also face the battle of connectivity even where there is the availability of free or purchased data. It is strongly believed that cushioning the negative effects of ineffective use of ICT gadgets on Mathematics curriculum implementation lies in adequate provision of laptops and other essential ICT materials such as functional projectors, regular supply of electricity and CCTVs as well as capacity-building programs for talent exhibitions.

### **Recommendations**

To align with academic best practices globally, based on the findings it was recommended that the Lagos State Ministry of Education should ensure that Mathematics laboratories are adequately equipped with functional online and offline ICT gadgets in all senior secondary schools. Also, to meet up the curricula objectives of Mathematics education, school administrators in conjunction with the department of curriculum should strive to re-train mathematics teachers, maintain the available ICT tools, ensure a regular supply of electricity, and provide free data for online activities. In addition, to assist the less privileged among teachers, the non-governmental organization should donate ICT tools and provide accessible Wi-Fi for secondary school Mathematics teachers in the State. Similarly, Mathematics teachers should be ready to make needed sacrifices by improvising ICT tools and engaging in affordable capacity-building ICT programs for self-development.

### **Suggestions for further studies**

For the sake of future investigation, this study was delimited to the use of ICT gadgets and in-service teachers' perception of the implementation of the mathematics curriculum. It was suggested that future studies can explore intervening variables such as school levels, school type, teachers' gender, and students' learning outcomes which this study failed to capture.

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