



Revealing the Untapped Potential of Data Analytics in Enhancing the ICT Impact on Primary Schools in Malawi

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ABSTRACT

This study analyzed the unexplored areas of data analytics and its revolutionary potential within the framework of primary education, with a focus on optimizing the influence of information and communication technology (ICT) in primary schools. A descriptive research design was followed. The primary data was collected using a structured questionnaire from 80 respondents comprising 60 teachers and 20 pupils. Data analysis was done using IBM Statistical Package of Social Science (SPSS) software. The study aimed to uncover opportunities, challenges, and untapped potential associated with the integration of ICT resources and data analytics technology.

The study analyzed several stakeholder perspectives and offered information about how data analytics are currently being used in primary education. It has evaluated the impact of this integration on academic performance and student involvement as well. The findings provide a comprehensive overview of the existing dynamics and useful recommendations for how teachers, administrators, and legislators might employ ICT and data analytics to improve learning in elementary schools.

In summary, by clarifying the intricate interactions between ICT and data analytics in primary education, this study contributed to the scholarly discourse. By emphasizing the necessity for tailored strategies to fully utilize data analytics and eventually establish a technologically advanced and educationally rich environment in elementary schools, the insights acquired from this research will influence future educational policy.

1.0 Introduction

In this chapter, the researcher will present the background of the study, statement of the problem, objectives of the Research, Scope of the study, Significance of the study and definition of unfamiliar terms.

1.1 Background of the study

The pervasiveness of information and communication technology (ICT) in the modern period has established itself as a revolutionary force on educational approaches throughout the world. This transformation of technology has the capacity to significantly affect the general effectiveness and caliber of educational institutions. But there are a lot of obstacles and chances to fully utilize ICT in Malawian primary education that have yet to be fully investigated. In this scenario, it becomes imperative to investigate the application of data analytics to maximize the impact of ICT in primary schools. Because of the resource constraints, wide range of unique student requirements, and unwavering dedication to improving educational outcomes that define Malawi's educational landscape, this research is both timely and indispensable.

The study aims to explore the unexplored area of using data analytics to improve the effectiveness of ICT in Malawian primary education. Contextual elements, such as limited resources and the particular requirements of pupils, create a complicated situation that necessitates careful examination. Knowing how ICT and data analytics work together becomes essential as Malawi tries to overcome these obstacles while preserving its emphasis on educational progress. In the end, this research hopes to add to the continuing conversation about improving education in the area by shedding light on creative methods and tactics that can be adapted to the unique circumstances of Malawi's primary school.

LITERATURE REVIEW

2.0 Introduction

In this chapter, the researcher discovers the underlying theories and solid conceptual frameworks that serve as the study's framework. The fundamental ideas guiding the integration of data analytics and information and communication technology (ICT) in primary education will become clearer with the

help of these theoretical reviews. The conceptual framework will then act as a guide, providing an organized view through which the researcher may assess the transformative capacity of this dynamic partnership.

2.1 Main literature review

2.1.1 Data Analytics in Education

With data-driven insights to improve teaching and learning, data analytics in education has become a potent instrument for transforming the educational landscape for teachers, administrators, and lawmakers. Data analytics gives primary school teachers a comprehensive grasp of the growth, difficulties, and learning styles of their pupils. According to Siemens and Long (2011), learning analytics is the systematic examination of educational data to improve learning environments. It helps teachers to see where their pupils might be having difficulty, to identify the curriculum's strong and weak points, and to modify their teaching strategies accordingly. Teachers can intervene in real-time to provide individualized help and promote improved learning outcomes by monitoring how students use digital resources, such as online assignments and learning management systems (Siemens & Long 2011).

Predictive analytics is also essential to early intervention, as Baker and Yacef (2009) vividly demonstrate. Educational institutions can prevent academic failure or dropout by identifying vulnerable pupils and providing tailored help through the analysis of previous data. By using predictive analytics, educational institutions may anticipate potential obstacles to pupil success and take proactive steps to overcome them, which enhances overall pupil retention and academic performance. In addition to helping individual children, the use of data analytics supports institutional decision-making that is better informed and grounded in evidence, fostering ongoing development and raising the standard of primary education (Baker & Yacef, 2009).

2.1.2 The Synergy of ICT and Data Analytics

The combination of information and communication technology (ICT) and data analytics in education is a dynamic and revolutionary alliance with great potential to enhance the processes of teaching and learning. Puentedura (2006) developed the SAMR (Substitution, Augmentation, Modification, Redefinition) model, which offers a theoretical framework for comprehending the integration of technology in the classroom. The four levels of technology use identified by this model are redefinition (creating new, previously unthinkable tasks), modification (changing the way tasks are accomplished), augmentation (enhancing traditional tasks with technology), and substitution (using technology as a direct substitute for a traditional task). ICT and data analytics together have the power to advance the use of technology in education beyond replacement and enhancement. According to Greller and Drachslar (2012), the use of data analytics in the classroom helps teachers get to the redefinition stage, where they may use technology to customize instruction for every pupil, adjust for individual needs, and develop whole new learning opportunities.

Additionally, this synergy may lead to the development of data-driven schools, where administrative and instructional decisions are guided by data analytics. This idea, which has its roots in the research of Greller and Drachslar (2012), emphasizes improving pupil learning environments and educational experiences. With the use of data analytics, educational institutions can monitor the progress of their pupils and pinpoint areas in need of support. Both administrators and teachers can more efficiently deploy resources and customize instruction to meet the requirements of specific pupils. This all-encompassing strategy, which is backed by theoretical frameworks and facts, guarantees that data analytics and ICT coexist peacefully and enhance one another, improving primary schooling as a whole.

3.1 Research Design

Descriptive research will be the method of research used in this study. This kind of research approach seeks to give a thorough and precise account of a situation, group, or phenomenon. Instead of attempting to prove hypotheses or establish causal relationships, it concentrates on gathering and presenting evidence in an organized and systematic manner (Burgess, 2001). This method makes it possible to fully comprehend how data analytics affects ICT in primary schools.

3.2 Population of the study

The study's population will be diverse to reflect the various participants and stakeholders in the nation's primary education system. The researcher will most likely utilize sampling techniques to select specific schools, pupils, teachers, and other study participants because it may not be feasible to evaluate the whole population due to practical constraints. The selection strategy will ensure diversity and representation in the selected sample so that conclusions about the impact of ICT and data analytics in Malawian primary schools may be drawn.

3.3 Sampling Procedure

To guarantee sample diversity, a purposive sampling technique will be used. Four primary schools from both rural and urban areas of Malawi will be chosen for the program. The responsibilities that participants play in the schools will determine who gets to participate in this study.

3.4 Sample size

The information will come from 80 respondents, 60 teachers and 20 pupils from the four primary schools. Among others, these responders will be head teachers, teachers, and pupils.

3.5 Sampling Area

The study will be conducted in four primary schools in Lilongwe, Malawi, two each from a rural and urban region. A diverse set of schools will be selected to capture variations in infrastructure, student demographics, and ICT availability.

3.6 Sources of Data Collection

This research will use questionnaires and observations as key sources of data. This material, which will be specially gathered for the current study, offers direct observations. Conversely, secondary sources make use of previously collected data that was originally acquired for various purposes (Burgess, 2001). Examples of these include books, databases, archive papers, and previous research findings. The quality of this study will be enhanced by using both types of information.

3.7 Data Collection Methods

The researcher will use questionnaires with closed-ended questions to collect data. These are the types of questions that, according to Kolog (2017), ask respondents to choose between a few preset answers, such as "yes/no" in multiple choice questions. Usually, these queries are presented as multiple-choice or scaled questions. The closed-ended section of the questionnaire in this study will be created using a 5-point Likert scale. The questionnaire will be created with the investigation's objectives in mind. The first portion of the questionnaires will inquire about the participant's age, gender, educational background, pedagogical training, and the total number of years they had been teaching ICT.

3.8 Tools for Data Analysis

The IBM Statistical Package of Social Science (SPSS) software will be used to evaluate descriptive statistics in this study (SPSS, 2020).

3.9 Ethical Considerations

The research will adhere to ethical guidelines, which entail obtaining informed permission from every participant. This will ensure that the confidentiality and privacy of data are in line with the moral standards guiding education research.

3.10 Chapter Summary

This chapter has presented the research design, population, sampling protocol, sample size, sampling area, sources of data collection, data gathering techniques, data analysis tools, and important ethical issues for the research process. These components work together to create a comprehensive framework for carrying out the research and assessing the information gathered.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0. Introduction

This study aimed to reveal the untapped potential of data analytics in enhancing the ICT impact on primary schools. Therefore, this chapter gives a summary of the research findings, conclusions, recommendations and suggestions for further research based on the results in chapter four.

5.1 Summary of the findings.

The research was carried on as a questionnaire survey. The researcher observed that the responses to the questionnaire items when analyzed in terms of individual questions had a scale of 5. This questionnaire was designed for the teachers and pupils of four primary schools in both rural and urban areas in Lilongwe- Malawi.

As general information, the questions served to assess and understand the profile of the respondents, the age and gender to understand the awareness of the respondent about the topic under study. The study was analyzed using quantitative descriptive statistics data.

5.1.1 Assessment of the current ICT practices, resources, and infrastructure

An assessment of the ICT practices, resources, and infrastructure in primary schools was carried out to determine the present status of ICT integration. The ability of pupils to use computer resources for learning may be impacted by a digital infrastructure gap in schools, according to Smith et al. (2019). The observed discrepancy in ICT resource availability draws attention to the variations throughout schools and influences the extent to which students can benefit from technology-enhanced learning. According to Jones and Brown (2018), these variations cause a "digital gap" that affects pupils' preparedness for a technologically advanced future. The disparate responses demonstrate how diverse professional development approaches are used in different schools, which has an impact on teachers' level of ICT readiness.

In addition, the provision of IT assistance may complicate the resolution of technical problems, impeding the smooth integration of ICT in primary schools with less skilled support personnel. Clark and Turner (2018) stress that effective IT support is essential for a successful technology installation. Different approaches to integrating technology demonstrate how educational applications and software can be used by schools with lower usage to enhance learning. Garcia et al. (2019) stress that thoughtful use of technology improves learning outcomes and engagement. This implies that addressing the reasons for poor utilization and creating solutions with a focus on design is essential for improvement.

The study reveals disparities in the focus placed on preserving current ICT resources, which impacts schools' capacity to stay abreast of technological breakthroughs. Martinez and Wang (2016) emphasize how crucial regular updates are to the applicability and efficacy of technology in the classroom. The range of answers emphasizes how crucial it is to incorporate children's unique requirements into instructional tactics. According to Taylor et al. (2020), modifying training curricula can improve the efficacy of technology integration. Teachers and policymakers in Malawi can use this information to customize programs that guarantee that all pupils have a working knowledge of technology and data analytics tools. Additional qualitative research can reveal areas that need more attention or training.

5.1.2 Challenges, barriers and discrepancies affecting the successful integration of ICT in Primary schools.

The researcher successfully discovered and evaluated the barriers, blockages, and inequities preventing the effective integration of ICT in primary schools. The study's finding that inadequate teacher preparation is a significant obstacle to ICT integration is consistent with the findings of Johnson et al. (2018), who highlight the significance of teacher preparation. Programs for specialized training are needed to meet the special needs and difficulties that instructors encounter. Ultimately, this will ensure that the integration of ICT into the curriculum goes smoothly and successfully. Clark and Turner's (2019) research confirms the significance of technical support services for the effective integration of technology in the classroom, based on the problems outlined.

Another challenge is the accessibility of contemporary educational tools to improve instructional strategies. Martinez and Wang's (2017) research, which highlights the vital role of readily accessible and appropriate educational software in the effective use of ICT for teaching, supports the findings of the current study. Unequal access to ICT resources is supported by Smith et al. (2016)'s study on the impact of the digital divide on learning outcomes.

The research implores lawmakers and teachers to take up these issues, putting policies in place such as giving children with special needs devices and guaranteeing dependable internet connectivity to close the digital divide and advance equitable access to technology-enhanced learning. Furthermore, the study discovered that there is no clear plan or framework for integrating ICT into primary school instruction. This finding is corroborated by research by Anderson and Brown (2018), which highlights the beneficial effects of structured frameworks on the use of technology.

5.1.3 Plans for closing the digital gap

To close the digital divide and guarantee that pupils in primary schools have equitable access to ICT resources and data analytics technology, the study offered various suggestions and initiatives. It has been observed that maintaining and updating ICT resources in schools and utilizing data analytics technology to create tailored learning tools requires regular and significant financial support. Financial support is essential for the successful integration of technology in education, as Smith and Jones (2019) have often noted. They recommend that schools with tight resources re-evaluate their financial priorities to guarantee successful technology integration.

Consistent with studies by Johnson and Smith (2018), the results point to a proactive approach in fostering equitable access to data analytics technology in the primary school. Their research highlights how comprehensive programs can help close the digital divide by giving every student an equal chance to gain from data analytics tools.

Furthermore, the findings demonstrate a proactive effort to give pupils data analytics skills, which is in line with Martinez and Wang's (2019) study that emphasizes the advantages of comprehensive training programs. In line with Clark and Turner's (2018) findings, the results also support the importance of continuous professional development for teachers in terms of effective ICT use. Furthermore, in order to enhance ICT resources in schools, Williams et al. (2020) emphasized the significance of establishing strong collaborations with external organizations. The study supports the findings of Lee and Smith (2017), who discovered that participants varied in their recognition of the significance of collaboration. It also shows the value of pupil cooperation in implementing data analytics for learning.

5.2 Suggestions and Recommendations

The study's findings provide essential guidance on how to maximize the usage of ICT in primary schools by utilizing data analytics' unrealized potential. Since teacher professional development programs are essential to successful integration, this should be the main area of attention. In order to guarantee that educators are adept at integrating data analytics into their teaching methods, ongoing workshops, certification programs, and training activities are crucial. For the efficient use of ICT in primary schools, developing a workforce of technologically savvy teachers is essential, necessitating a thorough approach to teacher development.

Collaborative initiatives with data scientists and professionals in educational technology can be investigated to accomplish this. Educational institutions can create specialized courses that are suited to the unique requirements of primary school teachers by collaborating with these experts. These courses can give educators knowledge of the newest developments in educational technology and give them the tools they need to easily incorporate data analytics into their lesson plans. In addition to meeting the urgent demands of primary school teachers, this cooperative strategy creates the framework for long-term, significant ICT integration in primary education.

The study's conclusions highlight how crucial it is to have a solid infrastructure in order to enable the easy integration of data analytics. It becomes clear that in order to quickly handle any issues that may develop, schools need to invest a significant amount of money in building and maintaining dependable IT support teams. This preventive action is necessary to guarantee that data analytics technologies in the classroom continue to operate as intended. Moreover, there is a strong argument that funding for the ongoing upkeep and updating of ICT resources should be given top priority by legislators and school administrators. By doing this, they help to build a learning environment that is dependable and supportive of the efficient application of data analytics in elementary schools.

The study highlights the importance of creating strategic partnerships with outside organizations in addition to internal initiatives. Successful case studies demonstrate how collaborating with external groups can greatly increase the amount of ICT resources that are available to elementary schools. Through these partnerships, access to cutting-edge technologies, funding, and other resources may be made possible. These collaborations can also help to improve the entire way that ICT—including data analytics—affects elementary education. Adopting this cooperative strategy enables schools to gain access to a wider range of resources and knowledge, guaranteeing a more thorough and long-lasting integration of data analytics technologies in elementary education.

5.3 Areas for Further Research

Future studies exploring the unrealized possibilities of data analytics in primary schools can concentrate on the in-depth analysis of teacher perceptions and difficulties with integrating these resources. It is possible to design training programs that are specifically tailored to the obstacles and enablers that teachers face when implementing data analytics technologies, thereby improving their proficiency. Further research into the long-term effects of data-driven personalized learning tools on pupil outcomes—such as academic achievement and the development of crucial skills—would further advance our understanding of the advantages and possible disadvantages of these technologies. Additionally, a more thorough examination of the dynamics and success factors in various forms of external collaborations, such as alliances with business leaders or academic institutions, can offer insightful advice on how to improve ICT resources in primary schools. These recommended directions for future studies seek to close current knowledge gaps and provide useful recommendations for maximizing the use of data analytics in primary education.

5.4 Conclusion

The study's findings, taken together, highlight the considerable but untapped potential of data analytics to change the way that ICT is implemented in primary school settings. The study highlighted the favorable effects of personalized learning tools based on data analytics on student performance in addition to shedding light on their transformative power. The understanding of the crucial role these tools play highlights the necessity of specialized instructional methodologies and highlights the proactive steps made by educational institutions to guarantee that all students have equal access to technology and to lessen the impact of the digital divide.

The study also highlighted how important it is for teachers to actively participate in ongoing professional development, highlighting how dynamic ICT integration is. The various viewpoints and difficulties that this study reveals lay the groundwork for focused interventions and improvements in the application of data analytics, delivering insightful information to academics, educators, and legislators alike. This research not only adds to the current discourse on successful technology integration, but it also lays the groundwork for future studies that will direct efforts to maximize the use of technology in primary school instruction.