

# **Improving the quality of education in Mozambique through the use of educational technologies and machine learning: impact assessment on Mozambican schools.**

Francisco Manuel Rodrigues Siueia

[francisco.siueia@gmail.com](mailto:francisco.siueia@gmail.com)

United Methodist University of Mozambique

## **Abstract**

This research on machine learning in Mozambican schools is being conducted to assess the impact of technology on improving the quality of education in this country. The methodology used involves a literature review on the use of educational technologies and machine learning in developing countries, followed by interviews with teachers and school administrators to determine the needs of Mozambican schools and the barriers to successful technology implementation. Next, we experimented with different educational technologies to determine which are most effective in improving student achievement and reducing the learning gap. The research aims to measure the impact of technology on student learning through performance tests and teacher evaluations. Results include the identification of effective educational technologies and best practices for implementation in Mozambican schools. Barriers and opportunities for the successful implementation of technology can also be identified, as well as the need to improve teacher training regarding the use of technology in the classroom. Investment in educational technologies can be demonstrated as a way to improve the quality of education in developing countries such as Mozambique, resulting in significant improvements in student learning and school performance.

## **1. Introduction**

In an era dominated by rapid technological advancements, it is critical to harness these tools to foster education development. This is particularly imperative for developing countries like Mozambique, where the quality of education can be significantly improved through the incorporation of educational technologies and machine learning. The Republic of Mozambique, located in southeastern Africa, faces numerous challenges in its education system, ranging from inadequate infrastructure,

lack of resources, to limited teachers' training, among others. In this light, this paper proposes an innovative approach to tackle these issues: the use of educational technologies boosted by machine learning. We argue that these technologies, if properly integrated into the education system, can dramatically enhance the teaching-learning process, thereby improving the overall quality of education in Mozambique.

The focus of this research will primarily revolve around the impact assessment of these technologies on Mozambican schools, through a multi-layered analysis that evaluates the transformative potential of machine learning and educational technologies on pedagogical practices, administrative efficiency, and student performance.

## **2. Materials and Methods**

### **2.1. Machine Learning**

“Machine learning is a subset of artificial intelligence that focuses on developing algorithms and models that allow computers to learn from data without being explicitly programmed” (Cardoso, 2023).

### **2.2. Education And Machine Learning**

There are plenty of other business implementations of machine learning, lot of them are in education area. Some of interesting areas are:

Fairly Test and Grade Students (Machine learning may assist in the development of computerized adaptive assessments.) The machine learning-based evaluation provides teachers and educators with continuous guidance about how the student performs, the help they need, and their success against their learning objectives.)

Predict Student Success (Predicting student performance is a fantastic application of machine learning. The machine learning model will identify shortcomings in each pupil by ‘learning’ about them and suggesting ways to better, such as adding further lectures or reading more literature.)

Things to support teachers and institutions (Machine learning based algorithms can help with classification of students handwritten assessment papers)

Boost Retention (Machine learning, such as learning analytics, may also aid retention.) By finding students who are 'at risk,' schools will reach out to them and provide them with the support they need to succeed.)(Kommula & Prasad, 2021pp. 1345-1346)

### 2.3. Utilization Of Machine Learning For Students In Education Sector

Four categories that clearly discuss the use of ML in Education sector are:

**Improving student retention:** schools will spot and contact the kids early by finding students at risk and helping them succeed. The retention of students is an important feature of many registration schemes. Almost all segments of academic or school measurements are affected: credibility, finance, rating. In particular, the retention of students has been one of the most critical aspects for managers in universities. There are few research that have established models to forecast and explain the reasons behind the declining number of students.

**Grading students:** Machine learning can graduate students by eliminating human prejudices. Some recent examples include the usage of supervised machine learning in text classification for the prediction of final courses for students in certain classes, and the ability to recognise students at risk of course failure with classified messages from ML.

**Testing students:** The machine learning evaluation gives instructors, students and parents continuous updates on how the student succeeds, how they require guidance and how they advance towards their learning objectives.

**Predicting student performance:** Machine learning (regarding the amount of studies in science databases) probably benefits greatly from its capacity to anticipate student success. The technology will detect shortcomings and recommend strategies to strengthen them through "learning" about each pupil, such as extra practice testing. (Kommula & Prasad, 2021, pp. 1346-1347)

### 3. Statistical Overview

As of 2021, the rate of utilization of educational technologies in Mozambican schools was relatively low. Fewer than 20% of schools were reported to have adequate access to computers, and less than 10% of teachers had received training in computer literacy and the use of educational technologies.

The use of machine learning in education is even less common. As of 2021, no formal programs or initiatives were integrating machine learning technologies into the classroom on a wide scale.

According to the INCM, based on the data obtained from the survey conducted in 2022 on 12,510,571 individuals who own a mobile phone, with a minimum age of 16 years, the average usage of mobile telephony services is 54.5% of the population in rural areas and 45.5% in urban areas. From this number, the higher percentage belongs to men, at approximately 59.2%, and 40.8% for women. The young population constitutes the majority of mobile telephony service users, with the age group between 20 to 24 years being the largest, at around 14.1%, followed by the age group 25 to 29 years, at approximately 12.2%.

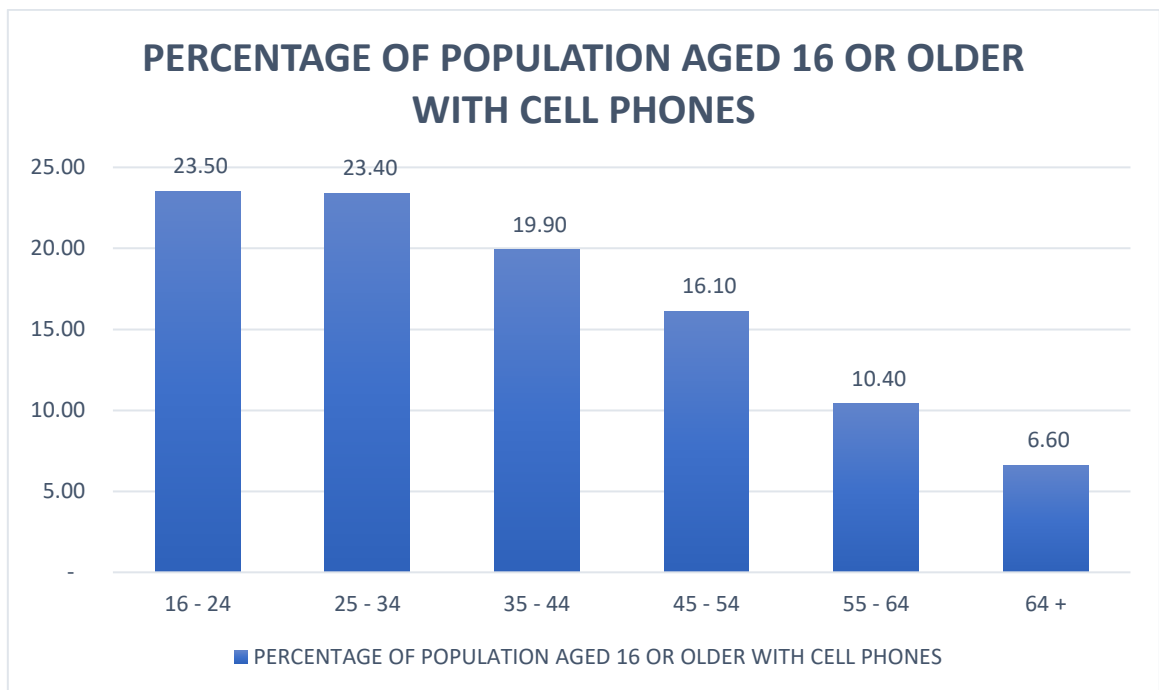


Figure 1 Percentage of population age 16 or older with cell phones

## Majority Of Consumers Use Prepaid Services

The INCM also states that the majority of mobile phone users in the country opt for prepaid services, reaching a percentage of around 99% of the consumer base. The research findings also indicate that telephony consumers frequently use their mobile phones for voice calls, with 99.5% making calls every month, even though they also use other services such as SMS messages, which reaches around 71% of users.

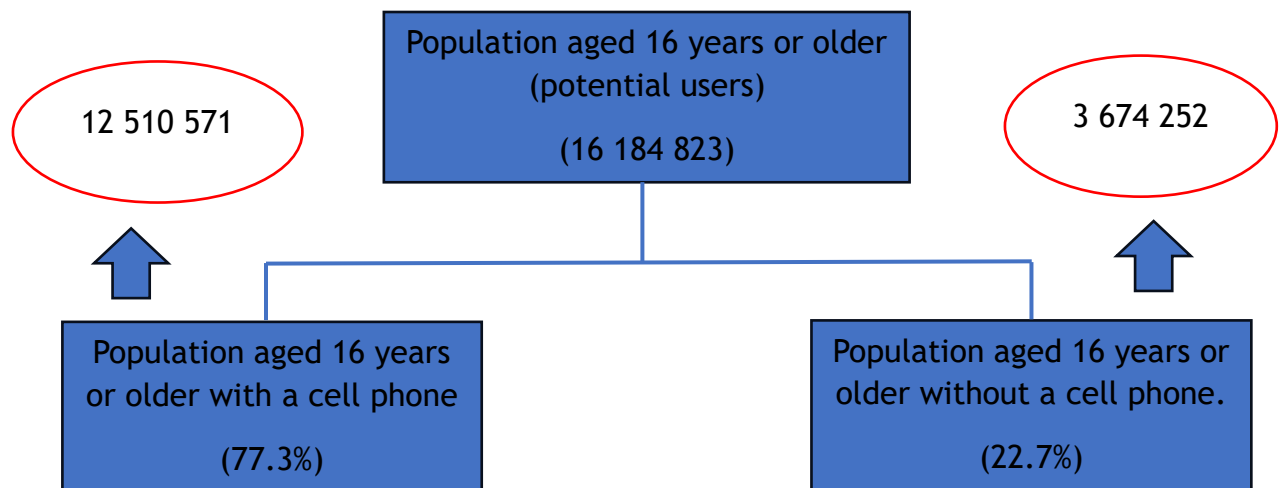


Figure 2 Population aged 16 years or older with and without cell phones

However, the importance of improving these figures is increasingly recognized. The government of Mozambique has expressed commitment towards enhancing digital literacy and fostering the integration of technologies in education. Therefore, this research is timely and necessary for providing an impact assessment of these initiatives.

## 4. Expected Results

We anticipate that the implementation of educational technologies and machine learning in Mozambican schools will result in several significant improvements.

Foremost, these technologies could revolutionize teaching methodologies, allowing for more personalized and effective learning experiences. By harnessing the power of machine learning, teachers can track student progress in real-time, identify areas of weakness, and adapt their teaching strategies accordingly.

In addition, we expect that these technologies will facilitate administrative tasks, thus allowing educators to focus more on their primary task: teaching. This would, in turn, enhance the efficiency and effectiveness of the school system.

Furthermore, the inclusion of these technologies in the education system could foster a culture of continuous learning among students, a crucial attribute in today's ever-changing world. It will also equip them with digital literacy skills, vital in this increasingly digital global economy.

Lastly, we project that the deployment of these technologies will contribute to narrowing the rural-urban education gap. Given that these technologies can be accessed from anywhere, students in remote areas will have the same learning opportunities as those in urban regions.

## 5. References

Kommula, C. & Prasad, B. V. V. S. (2021). Utilization of Machine Learning for Students in Education Sector. ISSN: 2349-6002.

Instituto Nacional das Comunicações de Moçambique (INCM). (2023). Divulgados resultados do inquérito sobre utilização de telefonia móvel em Moçambique. Available in: <https://www.incm.gov.mz/index.php/sala-de-imprensa/noticias/563-divulgados-resultados-do-inquerito-sobre-utilizacao-de-telefonia-movel-em-mocambique> . Accessed on August 5, 2023.

Cardoso, O. (2023). Data Science and Machine Learning: What's the difference?. Available in: [https://vigeversa.com/inteligencia-artificial/data-science-machine-learning/?gclid=Cj0KCQjwib2mBhDWARIsAPZUn\\_LXN38A\\_bkvLY3P1mzlopKcQEYUpuvSdhVlylhsnwl3xQ4iZxg16bAaAuugEALw\\_wcB](https://vigeversa.com/inteligencia-artificial/data-science-machine-learning/?gclid=Cj0KCQjwib2mBhDWARIsAPZUn_LXN38A_bkvLY3P1mzlopKcQEYUpuvSdhVlylhsnwl3xQ4iZxg16bAaAuugEALw_wcB) . Accessed on August 5, 2023.