2024 LEAP Challenge

LEAP

Project Host:

Koloso

Fellows:

Drew Edwards, Social Entrepreneur Fellow

Tzipi Horowitz-Kraus, Research Fellow

Catherine Lebel, Research Fellow

Laura White, Team Lead, Social Entrepreneur Fellow

TABLE OF CONTENTS

Executive Summary 3

- Introduction 3
- Organisation's role & strength 4
- Need summary 4
- Solution summary & next steps 5
  - Deliverable 1: Research-based product development roadmap 6
    - Introduction 6
    - Trust is an important mediating factor to student participation in digital quizzes 7
    - The impacts of digital quizzes are heterogeneous across student sub-groups, suggesting its beneficial to target certain populations 8
    - Combining digital assessment with AI-guided tutoring could increase the impact of a digital assessment intervention 9
    - Sharing assessment information with parents requires careful partnership, product, and business model design 10
    - Conclusion: Applying the literature to the Koloso product development roadmap 11
      - Current priorities 11
      - Potential future priorities 12
  - Deliverable 2: Research Framework 13
    - Literature review 13
      - The benefit of using computerized programs to boost academic skills 13
      - Existing software for assessment and training arithmetic skills: What is out there? 14
      - Koloso in the classroom: Educators (teachers' and principals') perspective 16
      - Koloso in the classroom: Stakeholders' perspective 16
    - Recommendations for data presentation: Koloso 17
      - Existing data analytics: Principals and teachers 17
      - Existing data analytics: Additional metrics 19
      - Additional data that can be collected to evaluate Koloso 20
  - Deliverable 3: Sales Strategy 21
    - Stakeholder Persona Framework 22
    - Market Analysis and Sizing 26
  - 3.1 Market Segmentation 26
  - Total Addressable Market (TAM) Analysis 27
  - Market Value Calculation 28
  - Strategic Market Expansion Considerations 28
  - School Database Development 29
  - References 31

Executive Summary

Introduction

In Zambia, a staggering 98% of 15-year-olds fail to achieve the minimum PISA-D proficiency level in mathematics (OECD, 2017). Across sub-Saharan Africa, learning poverty rates exceed 90% (World Bank, 2024).

Behind these statistics are tens of millions of young lives with limited opportunities and unfulfilled potential - and with rapid population growth placing increasing pressure on already fragile systems, the region is facing a “growing educational crisis” (World Bank, 2025). In response, UNESCO, African Union, and United Nations Children’s Fund (2025) have called for better educational data that is relevant, accessible, and understandable to stakeholders.

Koloso, a Zambian-owned and operated enterprise, helps to address this need by generating, analysing, and distributing reliable learning data in real-time to teachers, parents, school leaders, and policymakers. As a result, Koloso enables teaching, managing, and directing for improved learning outcomes and catalyzes sustainable, systemic change that delivers positive impact at scale.

The Koloso approach leverages digital innovation through high-frequency, low-impact gamified assessments that take just two minutes to complete but yield powerful insights. These insights flow in real-time to every stakeholder in the educational ecosystem: teachers can target instruction with precision, students can focus their efforts where most needed, parents can provide informed support at home, and policymakers can allocate resources based on evidence rather than intuition.

Currently focusing on primary and secondary mathematics - where the learning crisis is most acute - Koloso aims to become sub-Saharan Africa's most affordable and contextually appropriate formative assessment platform across the entire school curriculum, delivering the data that can transform how education systems respond to the region's most pressing challenge.

Organisation's role & strength

Koloso has the potential to drive improved quality of education in resource-constrained environments through a simple but powerful approach: converting brief student interactions into actionable insights that can drive change at all levels of the educational system.

At the heart of the system is the **Koloso Challenge** - a daily quiz game accessible via mobile and web applications. Students have two minutes to answer ten curriculum-aligned questions that are selected based on their grade level, curriculum requirements, and their teacher's instructional plan. This approach generates robust learning data with minimal disruption to classroom time - and can be used as a homework assignment.

What really sets Koloso apart is how this data is transformed into customised insights for every stakeholder in the educational ecosystem:

- **Teachers** receive real-time, detailed analytics on individual and class-wide learning, allowing them to identify learning gaps immediately and deliver targeted instruction where it's most needed
- **Parents** gain real-time visibility into their child's topic-by-topic performance, fostering increased engagement in learning, and meaningful home-school partnerships
- **School leaders** access comprehensive dashboards showing performance trends across classrooms and subjects, facilitating resource allocation and instructional leadership
- **Policymakers** obtain aggregated, anonymized data that reveals systemic patterns, supporting evidence-based decision making at regional and national levels

This multi-level approach has generated remarkable market validation: within a few months of its commercial launch, Koloso has already secured almost 10,000 users from 25 subscribing schools and NGOs in Zambia and South Africa - indicating substantial demand for its solution.

As the Koloso community expands, the organization's intention is to evolve from being solely a data consumer (learning from evidence) to becoming a data provider - creating a substantial repository of learning data in Sub-Saharan African contexts that can inform research, resource allocation, and policy development throughout the region.

Need summary

Having gone to market in October 2024, Koloso is in a pivotal phase of development as it learns from its first customers. Koloso needed support interpreting customer feedback to:

- Refine its sales strategy, so that it can continue to grow and attract investment; and

- Prioritise new features and product developments that are most likely to increase student learning: the primary goal of Koloso's customers.

In particular, Koloso sought to draw on the literature of low-tech digital assessment interventions in the Global South to create a research-based product development roadmap.

Furthermore, Koloso needed a research framework to define the claims it can make with its existing data and to plan for further evidence-generation and evaluation efforts, ultimately equipping Koloso to ensure it's achieving its vision of eradicating learning poverty in Sub-Saharan Africa.

Solution summary & next steps

Koloso's engagement with LEAP has resulted in actionable insights across three deliverables: a research-based product development roadmap, a research framework, and a refined sales strategy. Drawing from these deliverables, the LEAP team has agreed the following recommended actions with Koloso:

Research-Based Product Development Roadmap
This deliverable details relevant existing research, highlighting trust, heterogeneity of outcomes, how best to involve parents, and the potential role of artificial intelligence. Key recommendations are:

1. **Conduct qualitative interviews with teachers, parents, and/or students** to help determine which factors influence participation rates (e.g., trust) among some schools and/or subgroups, which features are the most popular or least popular, and future changes that would help improve the app.
2. **Collect data on parent/family/student demographics** to determine if there are different effects of Koloso on students with different characteristics (e.g., family income level, student gender, etc.). This can inform changes to the app so that it may best serve diverse groups.
3. **Help parents to accurately interpret student performance data** to enable an understanding of student learning.
4. **Consider developing an AI-guided experience** of feedback and quiz problem selection, facilitated with teacher input, to increase student learning.

Research Framework
This deliverable reviews prior research relevant to app-based assessment and intervention. It then provides recommendations to better display existing data, collect new data, and conduct a rigorous assessment of app effectiveness. Key recommendations are:

1. **Collect/calculate/present additional data**, such as student reaction time, to highlight a different aspect of student performance.
2. **Identify individual and group performance on specific questions** to highlight potential areas of strength or weakness.
3. **Conduct a randomized controlled trial (RCT), quasi-experimental design, or pre-post assessmen**t to make conclusions about the effectiveness of the app on desired outcomes (e.g., teacher preparation time).
4. **Incorporate demographic data** (from research-based product development roadmap recommendation #2 above) into these analyses to identify and address discrepancies by gender, income, etc.

Sales Strategy

This deliverable consists of stakeholder persona outlines for teachers and parents at local and international private schools in Zambia, as well as a market database with potential customer schools across Sub-Saharan Africa. Key recommendations are:

1. **Develop flexible value propositions** that address core stakeholder needs across segments:
    a. Teachers: Emphasize how Koloso reduces assessment workload for teachers while providing actionable insights to improve student outcomes.
    b. Parents: Focus on how real-time data enables timely, personalized support for their children.
2. **Expand and leverage the customer database** as a strategic asset for growth. Expand the database with knowledge of schools in Zambia in the private school market segment and eventually the government school segment. Use this data to identify high-potential prospects, optimize outreach timing, and tailor communications.
3. **Utilize the value propositions and database list to refine sales strategies for each respective segment** to reach decision-makers effectively. Combine direct engagement with school leadership, teacher workshops, and digital communication channels to build relationships and provide ongoing support to all stakeholders.
4. **Prioritize product development** based on core user needs while maintaining flexibility. Focus on developing features according to the product roadmap. Then establish a roadmap for expansion to additional subjects beyond mathematics.

Deliverable 1: Research-based product development roadmap

Introduction

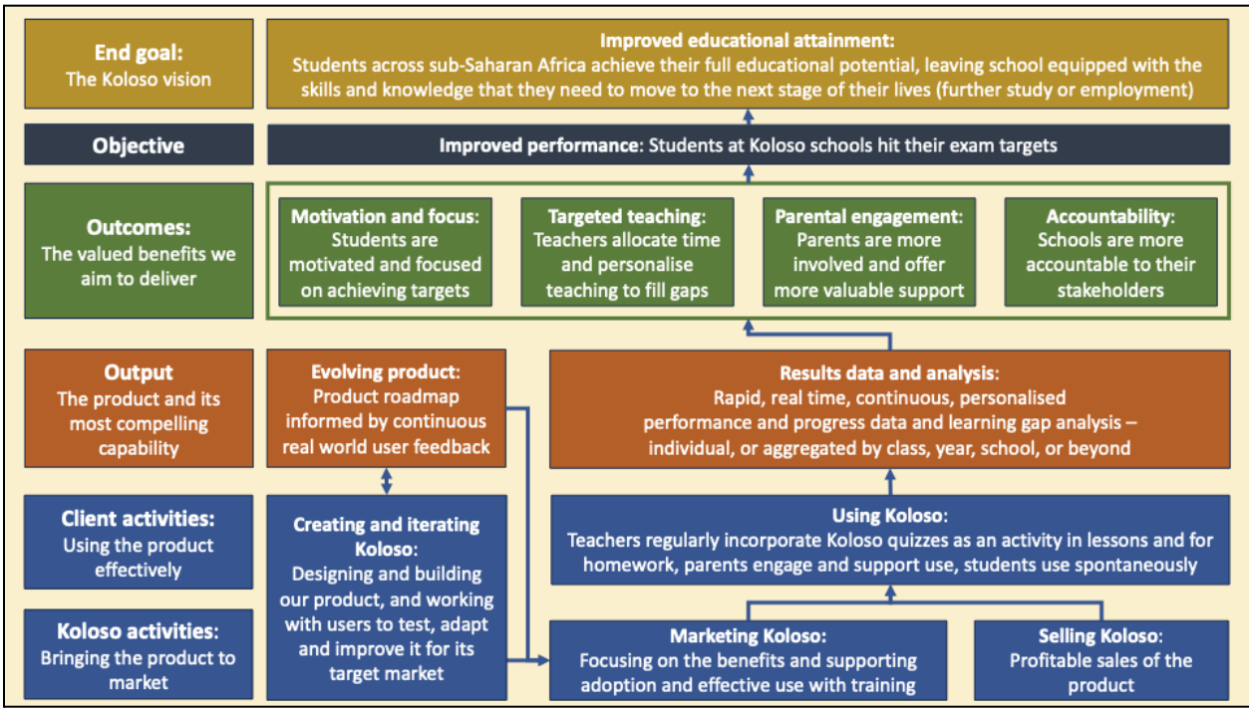
The goal of the research-based product development roadmap is to enable Koloso to identify possible new features or programming for its product offering that, based on the existing

literature on low-tech educational assessment interventions, contribute to improving targeted instruction practices in teachers and/or learning improvements in students.

Koloso also requested that the LEAP team review published research on artificial intelligence (AI)-guided tutoring and sharing educational assessment data with parents, as both were already being considered among Koloso's product development priorities. Fellows identified eleven relevant studies on low-tech digital educational assessment interventions, AI-powered chatbots, and sharing information with parents in Cameroon (2), Botswana (1), Kenya (4), Zambia (1), Nigeria (1), and Ghana (2).

After reviewing the studies, the Fellows identified the following insights for Koloso's product development roadmap, highlighting where the insights connect to Koloso's theory of change (Figure 1).

Figure 1: Koloso theory of change



Trust is an important mediating factor to student participation in digital quizzes

Trust in the organisation delivering the quizzes had an impact on whether students participated in the quizzes in several studies, suggesting implications for the assumption that students use Koloso spontaneously. Poon et al. (2019) delivered practice quizzes via SMS and WhatsApp to 546 high school students in Cameroon in the month prior to the national graduation exam, but only achieved an average quiz response rate of 19.5%. Qualitative surveys with students revealed that students were distrustful of the organization shown as sending the quizzes and

respondents recommended hosting an in-person conference to introduce the quiz and the organization's goals (noting that they often either missed the organisation's introduction message at the beginning of the intervention, or did not pay it much mind). In a following scale-up study using SMS quizzes only, Poon et al. (2020) were able to achieve higher participation rates, with 45.6% of students in the treatment group participating in at least one quiz, compared to 36.4% of students in the SMS treatment group of the 2019 study. The authors state the increased participation may be due to greater efforts to introduce the quiz and the organization sending it, as well as new efforts to equip students to verify the organization's legitimacy; students in the scale-up study received a series of introductory messages about the quizzes, were reminded that participation was free and would not cost any airtime, were reminded of the organization and its recruitment process prior, and were provided contact details for a staff member to answer any questions and a physical address of the organization's offices (Poon et al., 2020).

Similarly, Angrist et al. (2020) evaluated two low-tech educational interventions with 4,500 elementary school-aged students in Botswana during the COVID-19 pandemic. The study included two treatment arms: one in which families received SMS text messages with numeracy "problems of the week," and another in which families received live 15-20 minute phone calls from instructors to walk through the problems. The intervention was delivered by Young 1ove, one of the largest NGOs in Botswana, which had been delivering educational interventions in schools in the study. While not explicitly explored in the study, the fact that a well-known NGO already engaged in the schools was responsible for delivering the intervention provides another indication that trust in the organisation is important for digital quiz participation; seventy one percent of the households for whom Young 1ove had contact phone numbers for opted to participate in the intervention.

The impacts of digital quizzes are heterogeneous across student sub-groups, suggesting it could be beneficial to target certain populations

While an emerging field, the literature included in this deliverable found that the impacts of digital assessment interventions on student learning is mixed. Following Poon et al.'s (2020) nine-week, 4 times per week multiple choice quiz intervention for 500 Cameroonian students in preparation for their secondary school graduation exam, students in all experimental groups performed about the same on the exam as students in the control group. Kizilcec and Chen (2020) found in their study of 93,819 Kenyan students in grade 6, 9, and 12 using Shupavu 291, an SMS mobile learning platform that combines short tutorials with quizzes, that "a small cluster of highly engaged students exhibits adaptive learning behaviors and strong performance on assessments, but [no] evidence of learning gains." In contrast, Jordan et al. (2024) found that an SMS-based literacy lesson and quiz intervention in Kenya for children in grades 1-3 resulted in improved literacy learning outcomes as measured by the ASER reading scale. Angrist et al. (2020) also found that their SMS-based "problems of the week" intervention resulted in improved numeracy learning outcomes for the treatment groups in their study of 4,500

Botswana primary school children as measured by an ASER test. Students who received both the problems of the week and a live phone call to walk through the problems showed particularly strong improvements, indicating the possible added value of incorporating an educator in the edtech intervention rather than delivery through technology alone.

Some of the study findings suggested that a reason for the mixed effects of digital assessment interventions could be that they have a bigger impact for certain subgroups based on the following student characteristics:

- Growth Mindset: Kizilcec & Goldfarb (2019) found in a survey of 1,000 Kenyan high school students on Shupavu 291 that students with a growth mindset performed significantly better on quizzes than those without. These students spent more time on each assessment, increasing their likelihood of answering assessment questions correctly. They concluded that "Results suggest that cultivating a growth mindset can motivate students in a resource-poor context to excel in a mobile learning environment."
- Gender: In two of the studies, girls outperformed boys on the mobile learning assessments (Kizilcec & Goldfarb, 2019; Angrist et al., 2020). However, Angrist et al.'s analysis found that boys benefited more from the low-tech support as they tend to start the intervention with lower numeracy levels.
- Baseline Performance: Angrist et al. (2020) found that in particular, combining SMS "problems of the week" with a walk through phone call had large learning benefits for low-performing students.

This insight has important implications for Koloso's assumptions about improved student performance.

Combining digital assessment with AI-guided tutoring could increase the impact of a digital assessment intervention

In addition to Angrist et al.'s (2020) study demonstrating the impact of combining SMS "problems of the week" with phone call walkthroughs on student learning, two studies on the emerging field of generative AI-guided tutoring shed light on the potential for tech-enabled tutoring to increase student learning.

Henkel et al. 's 2024 study of RORI, an AI-powered math tutor accessible via WhatsApp, found that grade 3-9 Ghanaian students in the treatment group made learning gains equivalent to an extra year of learning compared to the control group. De Simone et al. (2025) found in their experiment providing generative AI-powered English tutoring as part of a teacher-facilitated after-school program that students assigned to the program significantly outperformed on an assessment of English, AI Knowledge, and digital skills compared to students who were not in the program. Further, students in the program also performed better on end-of-year curricular exams, including in topics beyond those covered in the intervention. Ultimately, De Simone et al. (2025) found that the intervention produced learning gains equivalent to nearly two years of typical learning in six weeks. Considering the potential for such significant learning gains, this

insight has important implications for Koloso's iteration activities as it works to incorporate impactful emerging technologies.

Sharing assessment information with parents requires careful partnership, product, and business model design

Recent studies have explored the effectiveness of notifications and the involvement of the parents in the child's progress aimed at enhancing parental engagement and improving children's educational outcomes in diverse low-resource settings. These studies yielded important insights into both their potential benefits and unintended consequences. Poon et al. (2019) found that parents played a gate-keeping role and generally did not view mobile phones as tools for learning; they concluded these views and the parents' role negatively impacted participation rates in student engagement in the quizzes.

It's possible that parent attitudes shifted following the COVID-19 pandemic, as other studies following the pandemic suggested parents had willingness to engage with their children with digital learning and assessments. Angrist et al. (2020) found that their intervention increased the proportion of families engaging with their child on educational activities per week by ten to eighteen percentage points. Further, in a study delivering short stories to 2nd and 3rd grade students in Zambia via SMS, Ome & Menendez (2022) found that the messages reminded parents to give children time to read. Combined with monthly meetings that encouraged parent behavior change, the SMS intervention resulted in "a positive impact on reading skills between 19 and 28 percent of a standard deviation depending on the measure used."

However, a study by Aurino and Wolf (2024) found "divergent and unintended" effects from engaging parents of school-age children in Ghana, challenging the assumption that engaging parents consistently leads to more educational support. Parents in the study were sent messages providing information, reminders and suggestions of practical and non-academic activities to engage with their children's education, but the effect of these messages varied widely depending on parents' levels of schooling. As a result, parents who lacked formal schooling decreased their engagement and children's school attendance declined. Drawing from qualitative interviews with the participants, Aurino and Wolf found that parents who lacked formal schooling interpreted the messages "as a signal that they were not supporting their children well enough," and speculate "the program might have made [the parents who lack formal schooling]'s own education and resources limitations more salient, without removing other barriers, leading to overall disengagement." As edtech organisations like Koloso consider sharing information with parents, Aurino and Wolf's study suggests it is important to take parent characteristics into account when designing communications with parents.

A further study highlighted the possibility of unintended consequences for schools of providing student performance information to parents, illuminating stakeholder risk created by increased accountability. Gray-Lobe et al. (2024) provided parents of primary school students in Kenya with weekly SMS messages on either growth mindset or personalized student performance information. The SMS message outreach, regardless of type, led to improved test scores,

particularly among low-performing students, but inadvertently led to an increased rate of student exit from the schools by 4.6 to 5 percentage points, with exits concentrated among the high achieving students. Given the high rates of school participation in Kenya, the authors predict that these exits are to schools that parents perceive as higher quality. Gray-Lobe et al. conclude "When parents update their understanding of education production through engagement programs, they become more sensitive to perceived school quality differences." Therefore, while it may further student learning to engage parents by sharing student performance information from digital quizzes, it is important for organisations like Koloso to take into account the effect that sharing this information may have on other stakeholders, such as the schools themselves.

Collectively, these findings underscore that while parental involvement by sharing information holds considerable promise for improving educational outcomes in resource-constrained environments, careful consideration must be given to contextual factors such as parental education and school market dynamics to avoid unintended negative consequences and ensure equitable educational gains.

Conclusion: Applying the literature to the Koloso product development roadmap

The insights from the literature described above provide helpful direction for Koloso as it considers its current and future product development roadmap priorities.

Current priorities

Koloso has just launched its "linked parents" feature within the Koloso for Schools product, giving parents access to a summarised version of their child's dashboard in order to track the child's learning performance and progress. Based on the literature reviewed, we recommend collecting data on parent demographics to determine if there are divergent effects of sharing this information based on parent socioeconomic background. We also recommend that Koloso takes measures to communicate clearly that the purpose of sharing the information is to enable the parent to understand their child's current level of learning, rather than critique their level of support for their child. Further, we recommend that Koloso takes steps to remove as many barriers as possible for parents to accurately interpret both the purpose of sharing student performance information and the information itself. Additionally, the literature suggests it is reasonably likely parents will draw conclusions about teaching quality from reviewing the performance information, and we recommend that Koloso considers how such an effect might impact the customer it targets. For example, low-performing schools would have a disincentive to share student performance information, but high-performing schools and government ministries would face different incentives.

The insight that growth mindset, or the belief that one can increase one's intelligence, is associated with stronger quiz performance could also be incorporated into features that Koloso has recently launched (Kizilcec & Goldfarb, 2019). Awards can now be issued to students or whole classes based on progress, and the language around those awards can be written to reinforce the concept that intelligence is malleable. Koloso now also provides a graph in the

student dashboard showing game scores over the term, and it may be technically possible to include a growth mindset message for students who improved over the course of the term. A message to the effect of “You were able to increase your knowledge over the course of the term by practicing the quizzes” could encourage a growth mindset in students.

Koloso is also planning to provide AI-guided lesson planning prompts for teachers to help them interpret student performance information on Koloso and plan targeted instruction for students. Two studies in the literature showed learning gains equivalent to 1 and 2 years of learning, respectively, by providing AI-guided tutoring directly to students. Koloso could consider developing an AI-guided tutoring experience of feedback and quiz problem selection, facilitated with teacher input, to potentially increase student learning. An example of such an experience is the AI-generated, personalised animated video explanations Koloso is considering within its app.

Potential future priorities

A clear take away from the literature was that trust in the organisation perceived to deliver the quizzes was crucial to student participation in the quizzes. If increasing participation becomes a priority, we recommend that Koloso engage in qualitative interviews to determine if trust is a factor in low participation among some schools and/or subgroups. If so, Koloso could implement trust-building features and programming like those noted in the literature, such as working through entities that already enjoy a high level of trust, providing contact information, or holding orientation workshops.

Given that some of the literature found heterogeneous effects of digital quiz interventions on student subgroups, we also recommend that Koloso collects subgroup data on students, including their gender, their baseline level of learning before starting to use Koloso, and whether they possess a growth mindset. Gender and baseline level of learning data could help Koloso understand whether its intervention has different levels of impact on student learning based on these characteristics, and enable it to target customers and test new features accordingly to generate the most impact possible. Growth mindset data would allow Koloso to find if students with a growth mindset also perform better on Koloso quizzes, and relay that information back to schools to help administrators and teachers appreciate the importance of growth mindset to learning.

Deliverable 2: Research Framework

Literature review

The goal of this literature review is to describe the scientific evidence of digital assessments and interventions in the field of arithmetic for children, including the benefits and challenges that

currently exist in the field. Such a review enables Koloso to understand its position within the wider field. A specific emphasis on the role of the education system (teachers, principals), parental engagement, and stakeholders in the child's success was made given Koloso's focus on empowering stakeholders within the system with formative assessment data.

The benefit of using computerized programs to boost academic skills

Several studies have examined the impact of computer-based educational programs on students' academic performance across various age groups. For instance, a study involving 62 at-risk preschool children assessed the effects of the Headsprout Early Reading program on early reading and oral language skills. Children using Headsprout Early Reading made greater gains in early reading skills, as measured by the Test of Early Reading Ability (TERA-3), and in oral language skills, as measured by the Test of Language Development-Primary (TOLD-P:3), with large effect sizes reported (Huffstetter et al., 2010).

In another study, 286 high school students aged 16–18 years were surveyed to understand the influence of various computer-related factors on academic achievement. The study found that computer use, employment motivations, and mothers' education positively affected academic achievement, while enjoyment attitudes, school environment, interest motivations, and loneliness had negative influences (Cunha et al., 2022). Additionally, a study examined the prevalence of excessive technology use among secondary school students and its association with academic performance. The findings indicated that 35.8% of students used their screen devices for at least 5 hours a day, and about 18.6% had moderate-to-serious symptoms of problem technology use. Heavy technology use was associated with lower academic performance and lower levels of school connectedness in both males and females (George et al., 2022).

Schools can benefit significantly from integrating structured computer-based intervention programs into their curricula. A growing body of evidence suggests that these interventions are particularly beneficial for children struggling with arithmetic. **Teachers** can leverage these tools to provide individualized instruction, allowing students to work at their own pace and receive immediate feedback on their performance (Li & Ma, 2010). These interventions also support executive function development, which is crucial for mathematical learning (Sánchez-Pérez et al., 2018).

For **principals**, investing in technology-supported math instruction can lead to overall improvements in school-wide mathematics achievement. The evidence suggests that problem-solving-based programs and tutoring interventions yield the most significant benefits, particularly for low-performing students (Ran et al., 2020). By adopting evidence-based digital tools, schools can create a more engaging and effective learning environment for students at all levels of mathematical proficiency.

Arithmetic skills are challenging to assess using electronic tools, and there is a limited number of electronic tools that enable them. Alhadi and colleagues (2022) provide a systematic research synthesis on the use of Digitalized Interactive Components (DICs) within Computer-Based Assessments (CBAs) for mathematics among K-12 students. The review analyzed ten studies meeting predefined criteria to evaluate the types, effectiveness, and implications of various interactive digital tools employed during assessments. The reviewed studies were grouped into two primary categories: language assistance tools (e.g., pop-up glossaries, read-aloud features) and problem-solution construction tools (e.g., drag-and-drop, interactive response tools), all in the context of arithmetic abilities in the age group of K to 12 graders.

Findings indicate mixed results regarding DIC effectiveness. Language assistance tools generally showed positive effects for English Language Learners (ELLs) and students with disabilities, although certain implementations were found to slightly inhibit performance due to increased cognitive demands or inefficient designs. Interactive tools designed for solution construction showed inconsistent outcomes, with minimal performance differences compared to traditional pen-and-paper assessments. It was observed that older students benefited more consistently from DICs, whereas younger children sometimes experienced difficulty due to tool complexity or usability issues.

It is important to highlight the notable limitations in existing literature, such as the scarcity of empirical studies on DICs' effectiveness, the lack of validation for many widely used assessment tools, and the absence of comprehensive analyses of how specific student characteristics (e.g., socio-economic status, gender, special needs) influence the effectiveness of DICs. The review calls for more rigorous research, emphasizing the necessity for systematically designed, validated digital assessment tools that accurately measure mathematics performance without introducing unintended bias or increased cognitive load, particularly for disadvantaged student populations (Alhadi et al., 2022).

Intervention programs in arithmetic, on the other hand, have been extensively studied, particularly for children with mathematical learning difficulties (MLD). A meta-analysis by Benavides-Varela et al. (2020) reviewed 15 randomized controlled studies including 1,073 children aged 5 to 12, speaking various languages. The interventions analyzed included digital-based tools such as computer-assisted tutoring and educational videogames, with training durations ranging from 4 to 12 weeks and session lengths of 15 to 40 minutes. The study found that these interventions improved mathematical performance with a mean effect size of 0.55, although no additional advantages were observed for videogame-based approaches over tutoring programs (Benavides-Varela et al., 2020)

Another study by Räsänen et al. (2009) tested two computer-assisted interventions (The Number Race and Graphogame-Math) on 30 Finnish kindergarten children (ages 5–6) with low numeracy skills. The programs trained number sense and numerical comparison, with daily 15-minute sessions over three weeks. While both interventions significantly improved number

comparison skills, they had limited effects on arithmetic performance (Räsänen et al., 2009). Similarly, Rauscher et al. (2016) examined Calcularis, a program designed to enhance spatial number representation and arithmetic skills in German-speaking primary school children aged 7–10. The program involved 24 training sessions of 20 minutes over 6–8 weeks. Results showed significant improvements in subtraction and number line estimation compared to control groups (Rauscher et al., 2016).

A broader meta-analysis by Ran et al. (2020) assessed the effects of computer technology interventions on low-performing K-12 students' math achievement. The study analyzed 45 independent effect sizes from 31 empirical studies, covering 2,044 students. The interventions included problem-solving systems, tutoring, game-based learning, and computerized practice. The most effective intervention was problem-solving systems (effect size = 0.86), followed by tutoring (effect size = 0.80), game-based intervention (effect size = 0.58), and computerized practice (effect size = 0.23). Overall, the study confirmed a moderate but significant effect of computer technology on mathematics achievement (Ran et al., 2020). Another meta-analysis by Küçükalkan et al. (2019) focused specifically on children with mathematical learning difficulties, evaluating the effectiveness of computer-based instruction. The study, which included 1,364 children in the experimental group and 926 in the control group, found that computer-based interventions significantly improved arithmetic skills in children with MLD. The most effective programs were those that provided individualized instruction and immediate feedback (Küçükalkan et al., 2019). The study by Sánchez-Pérez et al. (2018) examined the effectiveness of a computer-based training program that combined mathematics tasks with working memory training. Conducted with primary school children in Spain, the study involved multiple training sessions embedded in school routines. The results revealed improvements in executive functions, such as non-verbal IQ and inhibition, as well as better school performance in both math and reading (Sánchez-Pérez et al., 2018)

The systematic review by Li & Ma (2010) analyzed 85 independent effect sizes from 46 studies involving 36,793 learners in K-12 settings. Their meta-analysis found that computer technology had a statistically significant positive effect on math achievement. The strongest effects were observed when computer-assisted instruction was used together with official teacher-based instruction. Additionally, students with special needs benefited more than their peers in general education (Li & Ma, 2010). Finally, a study by Wilson et al. (2009) evaluated the effects of The Number Race on kindergarteners, demonstrating positive outcomes in number sense development. Additional research on game-based learning approaches indicated that these interventions were particularly useful in improving numerical fluency but less effective for higher-order problem-solving skills (Wilson et al., 2009)

However, the outlined interventions do not allow the tailored, individualized progress of each child into a newly learned topic. The outlined programs also do not include an educator-friendly interface that allows tracking the child's progress, such as in K*oloso.*

Koloso in the classroom: Educators (teachers' and principals') perspective

Koloso is a software designed to provide the learning data that teachers and other key players in the education system need to work towards improved learning outcomes. Koloso acquires data through a two-minute, ten-question, curriculum-aligned daily quiz to help teachers identify individual and group learning gaps in their class so that they can take timely remedial action in the form of more targeted instruction. Quiz questions are all coded, relating to a specific curriculum learning objective. The teacher sets the teaching plan for the term, so that Koloso knows which topic (and therefore, which learning objectives) are being taught in class on any given day.

Each quiz comprises:

- Six questions from "active" topics (those being taught in class on the day of the quiz);
- Two questions from "completed" topics (those already taught during the current academic year); and
- Two questions from foundation topics (addition, subtraction, multiplication and division).

Each child has a target of playing two Koloso quizzes each school day (Monday to Friday), meaning that they are playing 10 games and answering 60 active topic questions each week. When students answer a question there can be three possible outcomes: they answer correctly, they answer incorrectly, or they can choose to "skip" the question.

In addition to the ability to privately train on arithmetic skills and the providence of feedback without judgement, Koloso uniquely provides the ability to 1) progress in arithmetic topics individually - children can progress from one topic to the other upon success; 2) Increase practice - there is no limitation to the time allowed for training per day; 3) Identify learning difficulties- teachers and parents can identify learning difficulty in math, if the child is unable to progress. To summarize, Koloso uses gamified, high-frequency, low-impact assessment to help teachers, students and parents to track individual performance and progress against curriculum learning objectives.

Koloso in the classroom: Stakeholders' perspective

Koloso provides individual and class-aggregated topic-by-topic learning data to teachers and school principals. This data can also be anonymised and aggregated so that individuals in the Ministry of Education, or other external stakeholders, can receive an immediate and accurate understanding of where the children in a specific city or country are, in a given arithmetic topic.

In the next section of this deliverable, we will provide the existing and recommended data presentation for students' outcomes after training with Koloso, as well as provide recommendations for collecting evidence on Koloso's support for teachers.

Recommendations for data presentation: Koloso

At present, Koloso measures:

- The number of questions that each person gets correct/incorrect/skips (by topic)
- The total time to complete each game
- The number of games played per day/week

The number of questions that students get right is categorized into above target (8-10/10), at target (5-7/10) and below target (0-4/10). This information is tracked weekly for display and visualization.

Existing data analytics: Principals and teachers

Data analytics for principals currently present performance (number of students with below/average/above scores), progress (score ranges per week over the last 12 weeks; figure below), and participation (total number of games played per week for the last 12 weeks).

Data analytics for teachers is similar to that for principals, but also enables categorization by specific topic area (e.g., Addition, Subtraction, Sets), or analysis of an individual student (showing number of topics below/at/above target; see Figures 1 and 2 below).

Figure 2. Current Display of Performance Data

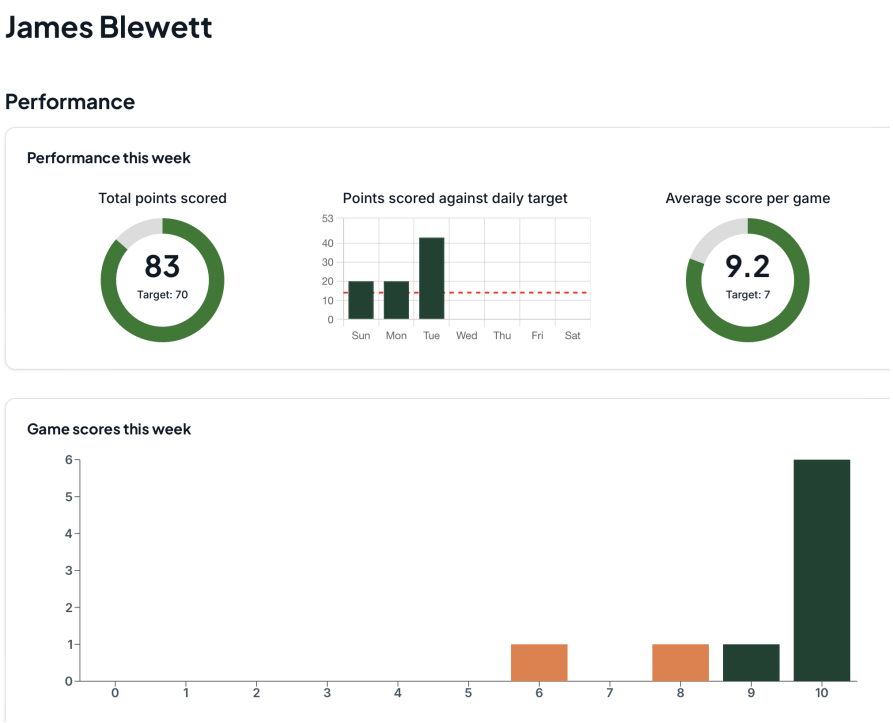
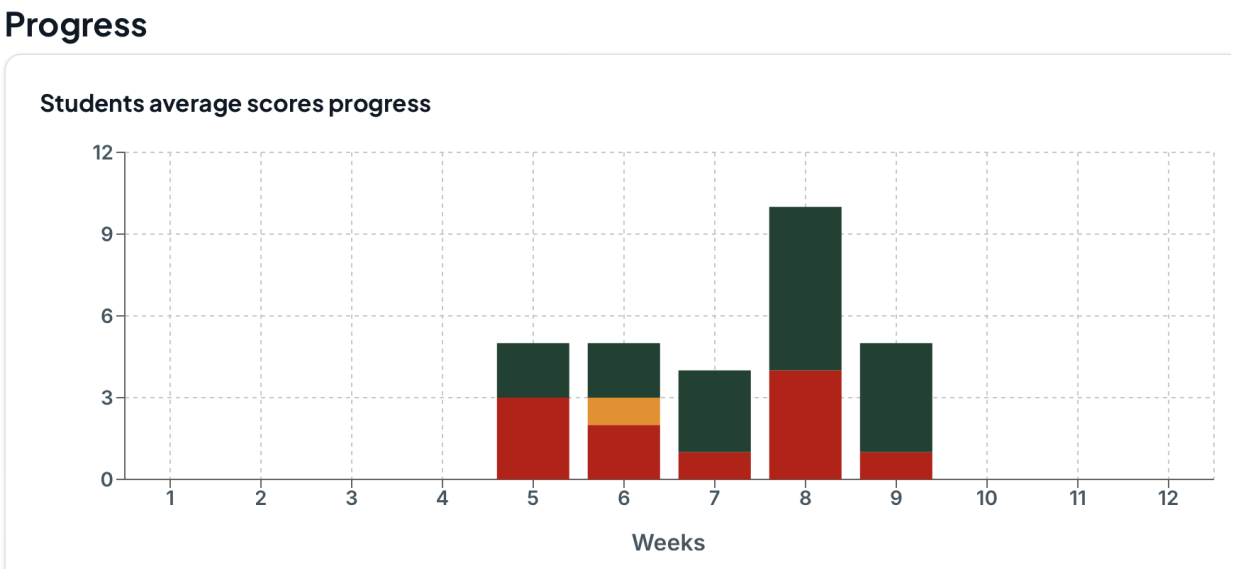


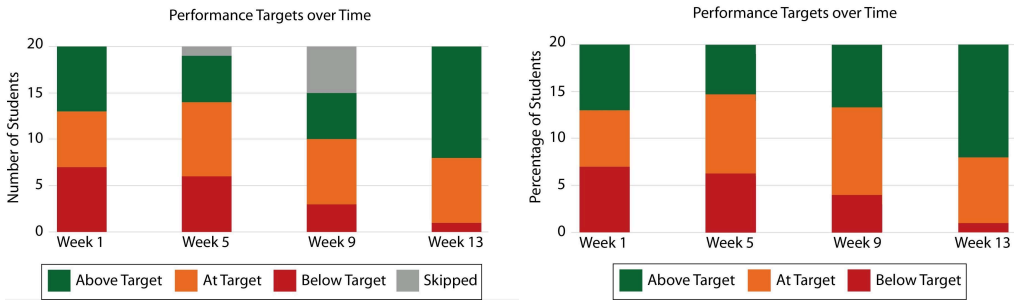
Figure 3. Current Display of Progress Data



To demonstrate student progress over time, several options are recommended below:

1. **Calculate a percentage of students performing below/at/above, in order to more easily visualize progress.** Instead, you could display students who did not participate in a different colour. Figure 3 demonstrates this recommendation.

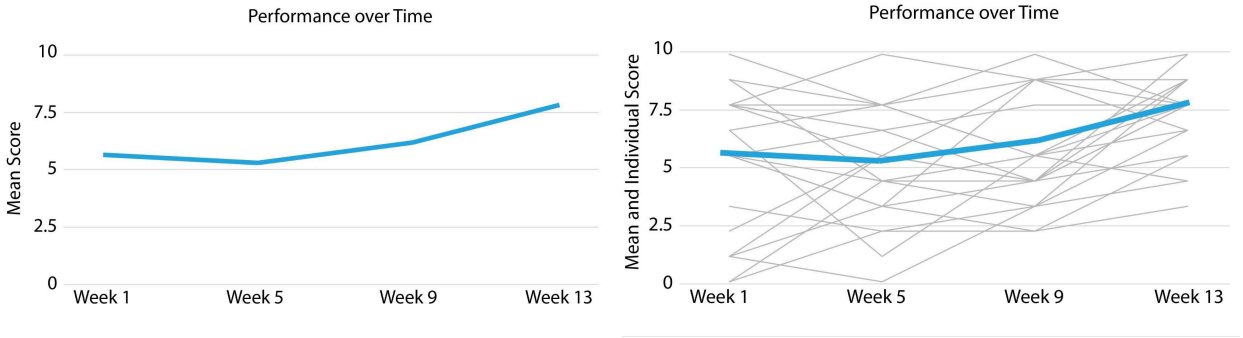
   Figure 4: Potential tweaks to display of progress data (right: including skips; left: calculating percentage)



2. **Display the effect of training per class or student over time.** In Figure 4, the plot on the left displays the mean score across all students, over time. The plot on the right shows the same mean score, but this time with individual student performance in the background (light gray lines). This shows the variability among students. For the left plot,

you could add the option to click on an individual student (their line) to get more detailed information about their performance over time.

Figure 5: Displaying the effect of training per class or student over time



Existing data analytics: Additional metrics

Many other metrics and analytics may be of interest to teachers that could be **calculated from existing data.** Options include:

1. Enable teachers to identify the questions that students most commonly get wrong, so they can identify areas for further instruction.
2. Calculate reaction time for individual items (or average reaction time for the whole test). Reaction time provides the opportunity to detect automaticity in performance. In other words, it is not only important to have the accuracy level of the child but also how fast and fluently the child performed the task. All plots above can be replicated with information regarding the speed of responses (in milliseconds). Ideally, children will get more accurate and also faster over time.
3. Benchmark results against curriculum expectations, or other metrics.
4. Enable interfacing with school data, so Koloso use and results could be compared with exam scores, or other measures of interest (e.g., could compare results by sex, class, location).

Additional data that can be collected to evaluate Koloso

For more powerful data, consider **collecting additional information**. The key purpose of Koloso is to support teachers, yet there is no current data from which this can be measured.

The gold standard for testing Koloso's effectiveness would be a randomized controlled trial (RCT) where evaluators would compare outcomes for a group using the app to a group not using the app. This would allow Koloso to confidently say that the intervention has a significant effect on outcomes of interest (e.g., children's test performance, teacher preparation times). In designing an RCT, LEAP Fellows recommend that:

1. Koloso ensures that the desired outcome(s) and research question(s) are very clear before starting an RCT. For example, one could ask whether Koloso reduces teacher planning time.

2. Teachers/classes/schools are randomized to either the intervention group (Koloso) or a control group. As long as the sample size is sufficiently large, this helps ensure that important characteristics are matched between groups (e.g., type of school, class size, average test scores, etc.).

3. Since Koloso depends on teachers understanding and applying insights from the app and its learning data, this would be incorporated into the RCT. The RCT would then be testing the effectiveness of the app used by teachers who understand it versus teachers who are not using the app.

If randomization is not feasible, **quasi-experimental designs are also possible**. This is a research study in which evaluators compare schools/classes where teachers use Koloso to schools/classes where teachers do not use Koloso. In quasi-experimental designs, it is critical that groups be matched on key characteristics, so conclusions can be based on the effect of the app, rather than characteristics of the individuals or school. For example, if the experiment compares children's math performance in a private school using Koloso to a community school not using Koloso, the results may be due to school differences, rather than the app itself.

A third, easier option, is a **pre-post test**. The LEAP Fellows would recommend a survey for teachers that is administered both before using Koloso, and after using Koloso for a specific period of time (e.g., one school year). This questionnaire would ask about their preparation time, confidence with lesson planning, ability to identify struggling students, and assessing student progress. Evaluators could also ask questions about teacher satisfaction, their favourite features, student engagement, etc., that may be useful for refining the app.

Fourth, **collecting reaction time data** (i.e. the time it takes for children to respond) will be helpful in three ways:

1. The teacher will be able to determine if the performance of the child is automatic. This can be determined by examining the accuracy level against the time it takes the child to respond;
2. Reaction time data will enable Koloso to recognize impulsive children who respond fast but inaccurately (a profile usually found in children with ADHD), and
3. The teacher will be able to identify children whose responses are slow, which may also indicate a slow speed of processing. Those children may benefit from early prompts prior to the class itself.

The Graphs related to reaction times can be displayed next to the accuracy-based graphs and will provide complementary information to these graphs.

There are many resources to help with planning and executing an RCT, quasi-experimental design, or pre-post tests. See, for example, journal articles (e.g., Bhide et al., 2018) and prior LEAP reports (Bizoza Bigirimana et al., 2022).

Deliverable 3: Sales Strategy

Introduction

Koloso is at a pivotal moment in its growth journey. Having successfully launched its formative assessment solution in September 2024 and secured early adoption in Q1 of 2025 of subscribing schools and NGOs in Zambia and South Africa, the company now faces the strategic challenge of scaling its business model while maximizing educational impact.

This sales strategy analysis aims to provide Koloso with a framework for systematically expanding its market presence, targeting high-potential customer segments, and refining its go-to-market approach. The analysis integrates insights from stakeholder research with market sizing estimates to create an actionable roadmap that aligns with both Koloso's commercial objectives and its mission to improve learning outcomes through data-driven assessment.

The research conducted for this analysis focused on four key areas:

1. **Stakeholder understanding**: Through structured interviews with teachers and parents across international and local private schools done by Koloso, we developed comprehensive customer personas with two important stakeholders in the school sales process that capture the distinct needs, challenges, and technology contexts of Koloso's decision-makers.
2. **Market segmentation and sizing**: We identified five distinct market segments for Koloso's solution and gathered available data to estimate the total addressable market (TAM), despite significant challenges in accessing comprehensive school data across African markets.
3. **School Database Development:** We created a structured database of potential customer schools, focusing initially on international schools with plans to expand to mid-tier private schools in Zambia. The database serves as both a practical sales tool and a strategic asset for understanding the education market across Africa.

Our methodology combined qualitative stakeholder research, market database development, competitive analysis, and financial modeling to ensure recommendations are both strategically sound and practically implementable within Koloso's resource constraints. While focused primarily on the immediate opportunity in Zambia, the analysis also considers pathways for regional expansion and vertical growth into additional educational segments.

This analysis acknowledges the distinctive challenges of the African educational technology market, including limited publicly available data, significant variation in infrastructure and

resources across schools, and the complex decision-making dynamics within educational institutions. Despite these challenges, the findings reveal substantial opportunities for Koloso to scale its impact by strategically targeting segments where its solution can deliver the most value.

Stakeholder Persona Framework

The development of stakeholder personas is a foundational, routine activity for Koloso's sales team to build a sales strategy from. These personas provide structured insights in the needs, motivations, and constraints of key decision makers and users across different school environments, enabling more targeted product development, marketing, and sales approaches.

How the stakeholder personas were developed
Our team developed a stakeholder survey for the team to fill out based on their experience with stakeholders. The survey is designed to be used in structured interviews that extend beyond demographic characteristics, but also deeper insights into stakeholders' goals, challenges, decision making processes, technology access (given the medium of Koloso's product), and specifically prods around perspectives on assessment. The survey is nuanced and inherently reflective in nature.

Ideally, with enough time and resources, these stakeholders could be gathered by segment as focus group discussions. Given our time constraints, the team reflected based on their years of experience and combined this with selected field observations. Critically, the team quickly called out that stakeholder perspectives vary significantly across customer segments - the realities for teachers between international schools, local private schools, and government schools vary significantly. These included:

Digital divide reality: The research revealed substantial differences in technology access, comfort, and infrastructure between international and local private schools. While international school stakeholders have reliable access to devices and connectivity, local school stakeholders face significant constraints including data costs, power outages, and limited device access.

Assessment purpose alignment: Teachers across all segments value assessment as a tool to identify student needs, but their specific objectives vary. International school teachers focus on personalized teaching and differentiation, while local private school teachers prioritize helping students pass standardized exams.

Data visualization needs: All stakeholders express interest in learning data, but their capacity to interpret complex visualizations differs significantly. International school teachers and parents are comfortable with sophisticated dashboards, while local school stakeholders need simpler, more directive presentations.

Time constraints: Teachers across all segments face significant time pressure, creating a strong potential value proposition for Koloso's time-saving assessment approach, though the specific pain points vary by context.

Parent engagement variations: Parents across segments express interest in their children's learning data but differ in how they would use this information and what formats would be most accessible to them.

Core insights across stakeholder segments

Teacher Personas

International school teachers are well-qualified educators (often with Master's degrees) who entered teaching as a vocation and view international teaching as a career advancement opportunity. They are comfortable with technology, use multiple platforms daily, and spend considerable time on assessment and marking during evenings and weekends.

- Key Needs:
  - Reduction in assessment workload without sacrificing quality
  - Actionable insights to personalize teaching for diverse student needs
  - Integration with existing school systems and teaching approaches
- Pain Points:
  - Time-consuming assessment and marking processes
  - Vague curriculum requirements (particularly IB)
  - Managing students from diverse cultural backgrounds
- Technology Context:
  - High comfort level with digital tools
  - Personal computer/laptop in classroom
  - Reliable internet connectivity
  - Experience with various educational platforms
- Current Assessment Practices:
  - Regular formative and summative assessments
  - Open to quiz-based assessment but want diverse question types
  - Identification of student needs through written assessment and observation
  - Significant time spent on preparation and marking
  - Value guidance on teaching approaches based on assessment results
- Strategic Implications:
  - Emphasize workload reduction and actionable insights in marketing
  - Develop varied question types aligned with international curricula
  - Provide professional development on data-driven teaching adaptation

Local private school teachers often entered teaching due to university placement rather than first choice, with their primary goal being job security. They measure success by students passing exams and face significant resource constraints including lack of books and teaching materials, requiring them to teach concepts abstractly.

- Key needs:
    - Tools that help students pass standardized exams
    - Simple, clear guidance on supporting struggling students
    - Solutions that work within resource constraints
- Pain Points:
    - Adapting to new curriculum requirements
    - Limited time for lesson preparation
    - Data costs and power outages (up to 17 hours daily)
- Technology Context:
    - Limited experience with digital technology beyond WhatsApp and Facebook
    - Primary device is mobile phone, rarely laptops
    - Expensive data costs and unreliable connectivity
    - Challenges with device charging due to frequent power outages
- Current assessment practices:
    - Focus on memory-based tests and repetition. Care about progress through internal examinations, but are often summative.
    - Identify struggling students through ability to recall definitions
    - Limited differentiation based on assessment results
- Strategic Implications:
    - Develop mobile-optimized interfaces with simple visualizations
    - Create clear action guidance based on assessment results
    - Address connectivity challenges through offline functionality
    - Provide extensive onboarding support focused on practical implementation

Parent Personas

International school parents are well-educated professionals with active involvement in their children's education. They value uninterrupted educational progress aligned with international standards and are concerned about whether schools provide sufficient individualized attention.

- Key Priorities:
    - Personalized attention to their child's learning needs
    - Clear communication about academic progress
    - Education aligned with international standards
    - Want to identify both strengths and areas for improvement
    - Value early problem identification before issues become serious
- Decision Making Process:
    - Trust school's opinion on educational approaches
    - Evaluate schools based on child happiness and academic outcomes
    - Rely on teacher and school head for educational advice
    - Follow child's preferences for optional resources
- Technology Attitude:
    - High comfort level with technology and have multiple devices

    - Monitor children's device time and may be concerned about excessive screen time
- Strategic Implications:
    - Position parent access as providing actionable insights, not just data
    - Emphasize early identification of learning gaps
    - Include specific guidance for supporting learning at home

Local private school parents are educated professionals who value academic achievement, passion for learning, and character development. They face financial challenges with private education costs and are concerned about curriculum relevance, teaching effectiveness, and individualized attention.

- Key priorities:
    - Academic achievement and character development
    - Effective, engaged teaching methods
    - Value for money in educational investment
- Decision Making Process:
    - Primary decision makers for school choice
    - Influenced by research, data, and positive results in other students
    - Evaluate schools based on teacher engagement and child happiness
- Technology Attitude:
    - Comfortable with technology and have their own smartphone device
    - Believe technology makes education more engaging
- Strategic Implications:
    - Value real-time information versus end-of-term reports
    - Prefer simple, summarized data presentation
    - Willing to pay small fee for learning insights
    - Develop clear communication about educational value

Conclusions

It is essential to note that these insights should continue to be iteratively tested both within the process of feature development and rollout, but through at least an annual revisitation of the stakeholder persona questions. In future interactions, the sample size could be further validated by a variety of approaches including widening the sample of responses by more individual interviews with stakeholders or utilizing focus group discussions or utilizing a net promoter score survey to target meaningful interviews.

Market Analysis and Sizing

Understanding the size, composition, and dynamics of the educational market in Sub-Saharan Africa is essential for Koloso's strategic planning and resource allocation. This section provides an analysis of key market segments, estimates of the total addressable market, and insights into the challenges and opportunities of market data collection in the region.

3.1 Market Segmentation

Based on our research and analysis of the educational landscape, we have identified five distinct market segments that represent potential customers for Koloso's assessment solution.

The premium/international private schools segment consists of high-fee institutions (often $5,000+ USD per term) offering international curricula such as Cambridge or IB. These schools are well-resourced with reliable infrastructure, high teacher-to-student ratios, and strong technology integration. Examples include Lusaka International Community School (LICS) and American International School of Lusaka. Decision-making in these institutions typically involves professional school leadership teams with dedicated IT departments. While this segment demonstrates high willingness to pay, it represents a smaller total market size.

Mid-tier private schools form a segment of moderate-fee institutions ($500-2,000 USD annually) following enhanced national curricula. These schools maintain adequate basic resources with mixed technology integration and typically focus on academic excellence. Examples include Thea School and Baobab College. Decision-makers in this segment are often owner-operators or small management teams. This segment offers an attractive balance of reasonable resources and larger market size, making it particularly promising for Koloso's expansion.

The community schools with external support segment consists of low-fee or subsidized schools receiving funding from NGOs, foundations, or corporate sponsors. These institutions are generally resource-constrained but benefit from specific improvement initiatives, though they experience variable technology access. Notable examples include schools supported by organizations like USAID, UNICEF, or corporate social responsibility programs. Decision-making in these schools typically involves school leadership working in partnership with external funders. The opportunity in this segment is closely tied to donor priorities and impact measurement requirements.

International opportunities represent organizations operating across multiple African countries with education programs. These entities typically employ standardized approaches with an emphasis on scalable solutions and strong impact measurement. Examples include Be That Girl and Bridge International Academies. Decision-making is often centralized with program management teams coordinating country-level implementation. This segment offers potential for large-scale deployment through single procurement decisions, making it strategically valuable for rapid scaling.

Future segments with potential for Koloso include public schools following national curricula, tertiary institutions such as universities and colleges, and adult education providers focused on professional development. These segments represent significant potential scale but will require tailored product adaptations and different sales approaches as Koloso matures.

Total Addressable Market (TAM) Analysis

Developing accurate market size estimates for educational technology in Sub-Saharan Africa presents significant challenges. Unlike many developed markets, comprehensive school

directories with detailed information are often unavailable or outdated. Data is scattered across government ministries, educational associations, and international organizations, frequently with inconsistent formats and definitions. Furthermore, the private education sector in many African countries is growing and changing rapidly, with schools opening, closing, and changing classification, making it difficult to maintain current information.

To address these challenges, our market sizing approach combines both top-down population-based analysis and bottom-up institutional research using multiple sources, including official databases, industry association membership lists, international curriculum provider directories, and expert interviews with education sector specialists.

Top-down Market Validation for Sub-Saharan Africa

Our comprehensive analysis of private school enrollment across Sub-Saharan Africa reveals a substantial total addressable market:

- Total private school enrollment across 42 Sub-Saharan African countries: 24.26 million students
- Primary language distribution: English (11.24 million), French (7.46 million), Portuguese (1.44 million), Arabic (1.62 million), and other languages (2.5 million)

The largest private education markets in the region include Nigeria (4.36 million students), Ethiopia (2.46 million), DRC (1.98 million), Tanzania (1.3 million), and South Africa (1.2 million). Koloso's initial target markets of Zambia (400,000 students), South Africa (1.2 million), Kenya (1.08 million), Botswana (60,000), Zimbabwe (320,000), and Nigeria (4.36 million) together represent a substantial opportunity of 7.42 million students across English-speaking countries with relatively developed private education sectors.

One unique operational feature of Koloso is their ability to adapt both language and curriculum on the platform. Given this, their addressable markets expand dramatically including French-speaking, Portuguese-speaking, and Arabic-speaking Africa reveal a strong ability to feasibly address nearly all of this market.

Market Value Calculation

When considering the entire market (24.26 million private school students), the total addressable market is substantial. At Koloso's current pricing tiers ($3-6 per student annually), this represents a total addressable market value of $72.8-145.6 million USD annually across the region, depending on pricing tier adoption rates.

For Koloso's immediate target segment of mid and high-tier private schools (estimated at 30% of the total private school population or approximately 7.28 million students), the addressable market value ranges from $21.8-43.7 million USD annually, depending on pricing tier adoption rates.

Strategic Market Expansion Considerations

The regional data reveals significant opportunities for strategic expansion:

1. English-Speaking Markets: With 11.24 million students in English-speaking countries, Koloso can leverage its existing English-language platform to expand across similar educational systems without significant localization costs.
2. French-Speaking Markets: The substantial French-speaking student population (7.46 million) represents a significant secondary expansion opportunity.
3. Regional Clustering: Strategic expansion could target geographically proximate countries with similar educational systems, such as the East African community (Kenya, Uganda, Tanzania) with a combined 3.32 million students or nearby Southern African states (Botswana, South Africa, Zambia, and Zimbabwe) with a combined 1.98 million students.
4. Population Centers: Nigeria, Ethiopia, and DRC together represent 8.8 million students, offering significant scale but also unique market entry challenges.

This multi-sourced, validated approach provides a solid foundation for strategic decision-making while acknowledging inherent limitations in data precision in these rapidly evolving markets. As Koloso collects more market intelligence through its ongoing sales and partnership activities, these estimates will be continually refined to provide increasingly accurate market sizing.

Serviceable Obtainable Market (SOM) for the Next Fiscal Year

The total non-government school population in Zambia is approximately 1,400,000 students. Of these, 980,000 students at affordable non-state community schools, 420,000 students across mid and high-tier private school segments which are a core beachhead market in Zambia. Given the success for Koloso in the past two financial quarters in this market and first mover advantage, we assume a realistic market penetration ceiling of 50% for this type of educational technology, Koloso's serviceable obtainable market (SOM) comprises approximately 210,000 students across premium and mid-tier private schools.

From the premium private school segment, we project capturing 5 schools (representing approximately 30% of this top-tier segment), with an average student population of 300-500 per school. This represents a realistically obtainable user base of approximately 2,400 students with an estimated annual revenue of $13,500 USD based on Koloso's $6/child/year silver pricing tier.

Within the larger mid-tier private school segment, we anticipate securing 60 schools (approximately 30% market penetration), averaging 400 students each. Of these, pricing can vary. We estimate that 30% of this market can afford the $6/child/year silver pricing tier, while the remainder would opt for the $3/child/year basic pricing tier. This creates an obtainable user base of approximately 24,000 students, with 7,200 students at the silver tier ($43,200 USD) and 16,800 students at the basic tier ($50,400 USD), yielding a combined projected annual revenue of $96,600 USD.

Beyond the beachhead market, there is a sizeable community schools segment; it is estimated that there are 75 schools in Zambia with external support and that have appropriate funding to implement Koloso, with an average student population of 400 per school. Targeting a 30%

market penetration of this segment, we expect to secure all 25 schools with approximately 10,000 students, generating an estimated annual revenue of $30,000 USD based on the $3/child/year basic pricing tier.

In aggregate, our projected SOM for the next fiscal year encompasses 90 institutions with approximately 36,400 student users, representing a realistic revenue target of $137,100 USD in the first year. This represents the initial phase of market capture within Zambia. When considering the expanded regional opportunity across East and Southern Africa, of which Koloso has already found success in the market, opportunities abound in neighboring markets as well. A conservative multiplication factor of 5-7x the Zambian market suggests a potential additional revenue opportunity of $685,500-$959,700 USD in the region.

These estimates represent a conservative assessment based on current market conditions and pricing assumptions. Actual market potential could be significantly higher as Koloso demonstrates impact and develops solutions for additional segments such as public schools and tertiary institutions. As Koloso advances in its roadmap and subsequent product offering, the premium and mid-tier private schools also offer opportunities for upsell features into a new gold tier that the team is planning to offer.

School Database Development

To support targeted sales efforts and strategic decision-making, we developed a comprehensive database of potential customer institutions with a primary focus on international schools, which offer both the strongest cashflow potential and the most publicly accessible information for research purposes.

The database has been structured according to "Tidy Data" principles (Wickham, H., 2014), creating a highly usable resource that can be readily integrated with various systems including CRM platforms like Salesforce, backend site development using Python, or analysis through tools such as R. This forward-looking design ensures the database will remain valuable as Koloso's technical infrastructure evolves.

The fundamental structure organizes information with each row representing a single school observation and columns capturing key filtering attributes and operational data. The database allows the sales team to filter potential targets by market segment (international schools, private local schools, government schools) and curriculum type, while also providing fields for sales process information such as point of contact details and engagement notes.

A notable strength of the database is the inclusion of tuition range information, particularly for international schools. This data serves as a valuable proxy for financial capacity and potential willingness to pay, similar to the margin indicators identified in other research. The pricing data creates opportunities for strategic approaches to sales, including the potential for systematic price discrimination based on a school's per-student revenue, allowing Koloso to optimize pricing across different customer profiles.

Beyond the current focus on international schools, the database structure supports ongoing expansion to include mid-tier private schools, community schools, and other segments as Koloso's market penetration deepens. The modular design facilitates regular updates and enrichment as new information becomes available through sales activities and market research.

Current coverage includes approximately 200 institutions across Sub-Saharan Africa, with the most comprehensive data available for international curriculum schools in urban centers. The database contains varying levels of detail on institution basics, classification data, size metrics, infrastructure assessment, decision-maker information, financial indicators, and competitive context.

The current database provides a solid foundation, but Koloso should next focus on expanding it to include mid-tier private schools within Zambia. These schools represent a significant market opportunity with reasonable resources for technology adoption. The team should gather basic information such as school name, location, approximate size, and contact details, then gradually add details about decision-makers and technology infrastructure as they engage with these schools.

To get the most value from this database, Koloso should keep it updated with notes from sales conversations, track which schools show the most interest, and record what features matter most to each school. This information will help the team focus their efforts on the schools most likely to become customers and tailor their sales approach to each school's specific needs. As Koloso grows, this carefully maintained database will become an increasingly valuable tool for finding new customers and understanding the education market across Africa.

References

Alhadi, M. A. A., Zhang, D., Wang, T., & Maher, C. A. (2022). Digitalized interactive item components in computer-based-assessment in mathematics for K-12 students: A research synthesis. In A. E. Lischka, E. B. Dyer, R. S. Jones, J. N. Lovett, J. Strayer, & S. Drown (Eds.), *Proceedings of the Forty-Fourth Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 1939–1949). Middle Tennessee State University.

Angrist, N., Bergman, P., Brewster, C., & Matsheng, M. (2020). Stemming learning loss during the pandemic: A rapid randomised trial of a low-tech intervention in Botswana. Retrieved from: https://ssrn.com/abstract=3663098

Aurino, E., & Wolf, S. (2024). A 'smart buy' for all? Unequal and unintended consequences of a messaging program for child education (UB Economics Working Paper No. 461). University of Barcelona, University of Pennsylvania.

Benavides-Varela, S., Zandonella Callegher, C., Fagiolini, B., Leo, I., Altoé, G., & Lucangeli, D. (2020). Effectiveness of digital-based interventions for children with mathematical learning difficulties: A meta-analysis. *Computers & Education,* 157: 103953.

Bhide, A., Shah, P.S., Acharya, G. (2018). A simplified guide to randomized controlled trials. *Acta Obstetricia et Gynecologica Scandinavica,* 97(4): 380-387.

Bizoza Bigirimana, F., Kincaid, L., Lebel, C., Tsuji, S. (2022). CFK Africa Final Report, LEAP report for 2022.

Cunha, M., Coutinho, C., & Neves, A. (2022). The impact of computer use and motivations on high school students' academic achievement. *Frontiers in Psychology*, 8(2327): 1-14.

De Simone, M., Tiberti, F., Mosuro, W., Manolio, F., Baron, M., & Dikoru, E. (2025). From chalkboards to chatbots: Transforming learning in Nigeria, one prompt at a time. *Education for Global Development.* Retrieved from: https://blogs.worldbank.org/en/education/From-chalkboards-to-chatbots-Transforming-learning-in-Nigeria

Fuchs, L. S., Fuchs, D., Hamlet, C. L., Powell, S. R., Capizzi, A. M., & Seethaler, P. M. (2006). The effects of computer-assisted instruction on students with learning disabilities. *Learning Disabilities Research & Practice*, 20(2): 93-104.

George, M. J., Odgers, C. L., & Sameroff, A. (2022). Problematic Technology Use and its Association with Academic Performance in Secondary School Students. *Computers & Education*, 53(1): 64-78.

Gray-Lobe, G., Kremer, M., de Laat, J., Mbonu, O., & Scanlon, C. (2024). Nudging parents out the door: The impacts of parental encouragement on school choice and test scores. *Working Paper.* University of Chicago.

Gray-Lobe, G., Kremer, M., de Laat, J., Mbonu, O., & Scanlon, C. (2024). Nudging parents out the door: The impacts of parental encouragement on school choice and test scores (Working Paper). Retrieved from: https://ombonu.github.io/nudging_parents_out_the_door.pdf

Henkel, O., Horne-Robinson, H., Kozhakhmetova, N., & Lee, A. (2024). Effective and scalable math support: Experimental evidence on the impact of an AI- math tutor in Ghana. In: Olney, A.M., Chounta, IA., Liu, Z., Santos, O.C., Bittencourt, I.I. (eds) Artificial Intelligence in Education. Posters and Late Breaking Results, Workshops and Tutorials, Industry and Innovation Tracks, Practitioners, Doctoral Consortium and Blue Sky. AIED 2024. Communications in Computer and Information Science, vol 2150. Springer, Cham. https://doi.org/10.1007/978-3-031-64315-6_34

Huffstetter, M., King, J. R., Onwuegbuzie, A. J., Schneider, J. J., & Powell-Smith, K. A. (2010). Effects of a Computer-Based Early Reading Program on the Early Reading and Oral Language Skills of At-Risk Preschool Children. *Journal of Educational Psychology*, 102(1): 235–248.

Jordan, K., Myers, C., Damani, K., Khagame, D., Mumbi, A. & Njuguna, L. (2024). Supporting equitable access to learning via SMS in Kenya: Impact on engagement and learning outcomes. *British Journal of Education Technology,* 1-23

Kizilcec, R. F., & Chen, M. (2020). Student Engagement in Mobile Learning via Text Message. In Proceedings of the Seventh ACM Conference on Learning @ Scale (L@S '20). *Association for Computing Machinery*, New York, NY, USA, 157–166.

Kizilcec, R. F., & Goldfarb, D. (2019). Growth Mindset Predicts Student Achievement and Behavior in Mobile Learning. In Proceedings of the Sixth. ACM Conference on Learning @ Scale (L@S '19). *Association for Computing Machinery*, New York, NY, USA, Article 8: 1–10.

Küçükalkan, K., Beyazsaçlı, M., & Öz, A. Ş. (2019). Examination of the effects of computer-based mathematics instruction methods in children with mathematical learning difficulties: A meta-analysis. *Behaviour & Information Technology,* 38(9): 913-923.

Li, Q., & Ma, X. (2010). A meta-analysis of the effects of computer technology on school students' mathematics learning. *Educational Psychology Review, 22(3)*, 215-243.

Ome, A. & Menendez, A (2022). Using SMS and parental outreach to improve early reading skills in Zambia. *Education Economics*, 30:4, 384-398.

Ome, A., & Menendez, A. (2021). Using SMS and parental outreach to improve early reading skills in Zambia. *Education Economics, 29*(4): 384-398.

Poon, A., Giroux, S., Eloundou-Enyegue, P., Guimbretiere, F., & Dell, N. (2019.) Engaging High School Students in Cameroon with Exam Practice Quizzes via SMS and WhatsApp. *Proceedings of CHI Conference on Human Factors in Computing Systems,* 482: 1-13.

Poon, A., Giroux, S., Eloundou-Enyegue, P., Guimbretiere, F., & Dell, N. (2020). Baccalauréat Practice Tests in Cameroon: The Impact of SMS-Based Exam Preparation. P*roceedings of the 2020 International Conference on Information and Communication Technologies and Development*, 18: 1-12.

Ran, H., Kasli, M., & Secada, W. G. (2020). A meta-analysis on computer technology intervention effects on mathematics achievement for low-performing students in K-12 classrooms. *Journal of Educational Computing Research,* 59(1): 119-153.

Räsänen, P., Salminen, J., Wilson, A. J., Aunio, P., & Dehaene, S. (2009). Computer-assisted intervention for children with low numeracy skills. *Cognitive Development,* 24(4): 450–472.

Rauscher, L., Kohn, J., Käser, T., Mayer, V., Kucian, K., McCaskey, U., Esser, G., & von Aster, M. (2016). Evaluation of a computer-based training program for enhancing arithmetic skills and spatial number representation in primary school children. *Frontiers in Psychology, 7*: 913.

Sánchez-Pérez, N., Castillo, A., López-López, J. A., Pina, V., Puga, J. L., Campoy, G., González-Salinas, C., & Fuentes, L. J. (2018). Computer-based training in math and working memory improves cognitive skills and academic achievement in primary school children. *Frontiers in Psychology,* 8*:* 327.

Schunk, D. H., & Pajares, F. (2021). Self-Efficacy Theory and Motivation in Digital Learning. *Journal of Educational Research*, 114(4): 376-391.

Smith, J. A., & Reeves, T. C. (2019). The Role of Principals in the Adoption of Educational Technology. *Educational Technology Research and Development*, 67(3): 503-525.

Tamim, R. M., Bernard, R. M., Borokhovski, E., Abrami, P. C., & Schmid, R. F. (2020). The effectiveness of technology-assisted learning: A meta-analysis of the literature. *Journal of Research on Technology in Education*, 52(3): 1-17.

UNESCO, African Union, & United Nations Children's Fund. (2025). Transforming learning and skills development in Africa: 2nd continental report. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000393250

Wickham, H. (2014). Tidy Data. Journal of Statistical Software, 59(10), 1–23. https://doi.org/10.18637/jss.v059.i10

Wilson, A. J., Dehaene, S., & Räsänen, P. (2009). Adaptive number training in kindergarten: The Number Race. *Journal of Experimental Child Psychology,* 103(4): 408-424.

World Bank. (2025). World Bank to boost foundational learning outcomes in Eastern and Southern Africa for more than 70 million children. Retrieved from https://www.worldbank.org/en/news/press-release/2025/02/20/world-bank-to-boost-foundational-learning-outcomes-in-eastern-and-southern-africa-afe-for-more-than-70-million-children

Zambia Ministry of General Education. (2021). Findings from Zambia's experience in PISA for Development. Retrieved from https://www.exams-council.org.zm/wp-content/uploads/2021/09/PISA_D-Zambia.pdf