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The Evaluation of **OLICO's** WhatsApp Maths Hotline

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Abstract

This report evaluates the effectiveness of the OLICO WhatsApp Maths Hotline, a free digital learning resource aimed at improving mathematics performance among Grade 9 learners in South Africa. The evaluation, conducted by Ukufunda, assessed the uptake, usage, and impact of the Hotline in seven schools across metro township and rural/small-town settings. Using a quasi-experimental research design, the study tracked learners' engagement over an eight-month period (January–September 2024) and analysed their mathematics performance through baseline and endline assessments.

Findings indicate that 31% of eligible learners accessed the service, with varying levels of engagement. High users demonstrated statistically significant improvements in mathematics scores compared to non-users (0.373 standard deviations), particularly in metro township schools (0.507 standard deviations).

The study also found a weak but positive relationship between message volume and performance and touched on learner motivation and barriers to engagement.

Recommendations focus on enhancing the service by improving tutor responsiveness, integrating AI-support, expanding access, and refining engagement strategies. The evaluation underscores the potential of mobile-based interventions in addressing educational disparities but highlights the need for structural improvements to maximise their impact.

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To each of you, thank you for your hard work and commitment. Your contributions have made this evaluation not only possible but impactful.

Acronyms

EQ	Evaluation Questions
ICT	Information and Communication Technology
MT	Metro Township
NGO	Non-Governmental Organisation
OLICO	OLICO Maths Education
RST	Rural / Small Town
UEC	Ukufunda Education Consulting

Executive Summary

This evaluation focuses on the OLICO WhatsApp Maths Hotline, a free service[1] providing learners with access to a variety of mathematics resources and support through WhatsApp. Designed to enhance learner engagement and performance, the Hotline allows users to communicate with tutors, watch instructional videos, complete interactive lessons, and access exam preparation tools.

Background and Objectives

OLICO Maths Education, a non-governmental organization, has established the WhatsApp Hotline as a means of addressing educational disparities in mathematics among South African learners. This service was evaluated across seven schools, encompassing both metro township and rural/small-town settings. The primary goals of the evaluation were to determine the extent to which Grade 9 learners at these schools engaged with the Hotline and assess its impact on their mathematics performance and motivation.

Methodology

The evaluation adopted a quasi-experimental design involving a baseline and endline assessment over an eight-month period (January–September 2024). Learners were categorized into three groups: high users, low users, and non-users, based on the number of messages sent by the learners to the Hotline. Data were gathered through surveys, backend analytics, and assessments, allowing for both qualitative and quantitative analysis. The mixed-methods approach facilitated a nuanced understanding of the service's impact while identifying key barriers and enablers of usage.

[1] Other than that is requires WhatsApp data to access

Key Findings

Uptake and Usage

- Uptake: 31% of eligible Grade 9 learners accessed the Hotline at least once, with uptake varying significantly between schools (from 20% to 62%, with a median uptake of 35%). The (weighted) average across the Metro Township schools and the Rural / Small Town schools was the same.
- Usage: Among users, the average message count was 179.3, reflecting meaningful engagement. However, usage patterns were positively skewed, with most remaining occasional users and fewer learners engaging intensively (e.g., one learner sent 2653 messages during the research period).

Learner Preferences and Barriers

- The "5-a-day" lessons were the most favoured service, appreciated for their structure and consistency. Videos and exam revision challenges also received positive feedback.
- The most frequently mentioned barrier to usage, by far, was access to data. Other constraints were limited access to devices, and delayed tutor responses.

Impact on Mathematics Performance

- High users demonstrated significantly greater improvements in mathematics scores compared to non-users, with a small to medium effect size overall and a medium effect size for metro township learners.
- Correlation analysis revealed a weak but positive relationship between message volume and performance gains, suggesting that engagement plays a role but is not the sole determinant of success.

Motivation for Mathematics

- No significant difference was observed in baseline to endline motivational changes between high users and non-users, indicating that the Hotline alone may not influence learners' intrinsic motivation to improve their mathematics skills.

See Addendum A, *Comparative Effect Sizes*, for additional perspective and context to these evaluation findings.

Limitations

The evaluation faced several limitations, including a relatively short intervention period, self-reported data biases, and the inability to disaggregate backend analytics by specific services accessed. Additionally, the decision of two ex-Model C schools to drop out constrained the diversity of the sample.

Recommendations

To amplify the impact of the OLICO WhatsApp Maths Hotline, several recommendations have been proposed:

- **Enhance Responsiveness:** Consider improving the efficiency of tutors and reducing their response times by integrating more sophisticated automated response journeys and a 'triage' system, especially during peak hours. Explore the potential of AI to assist in this regard.
- **Optimise Engagement:** Building on the popularity of the 5-a-day structure, introduce more gamified elements such as quiz-based activities, and refine certain content. Consider introducing additional progress monitoring and/or leaderboards to sustain learner interest. Integrate strategic messaging with prompts and nudges to encourage regular engagement.
- **Develop Backend Insights:** Employ a data scientist or systems engineer to extract user data to deepen understanding of the user journey and provide guidance for future design and impact monitoring.
- **Integrate into the Classroom:** Investigate direct support for the teacher by using the system for specific homework support and practice. Provide regular feedback on learner progress data to the teacher for remediation or extension.
- **Further Expand Accessibility:** Collaborate with network providers to subsidise data costs or explore zero-rated applications to minimise connectivity barriers.

Conclusion

The OLICO WhatsApp Maths Hotline represents an innovative and successful approach to addressing mathematics education challenges in South Africa. While the evaluation highlights its potential to improve academic outcomes, addressing barriers to usage and

expanding service offerings will be critical for maximizing its effectiveness. By building on the insights gained through this evaluation, OLICO can enhance its service delivery and further its mission to make mathematics accessible and meaningful for all South African learners.

1. Background

OLICO Maths Education (hereafter referred to as OLICO) is a non-governmental organisation (NGO) in operation for about 15 years that aims to offer a sense-making and confidence-building approach that makes maths accessible and meaningful to South African school children.

The OLICO aim to make maths make sense to South African learners is supported by several activities or products, such as:

1. After-school maths clubs for Grade 1-6 learners in Gauteng, Western Cape and Limpopo
2. After-school classes for Grade 7-12 learners in Gauteng and the Western Cape (Limpopo from 2025)
3. Training support to schools in Gauteng, the Western Cape, Free State, KZN, Limpopo and the Eastern Cape
4. Material development (e.g. baseline tests, maths club resources, senior phase tutor guides and learner workbooks, National Benchmark Test practice materials)
5. Applications (e.g. Two-Minute Tango that aims to improve learner fluency in the four basic operations)

However, one of OLICO's key services is the WhatsApp Hotline (hereafter referred to as 'the Hotline'), a free service offered via the communication platform WhatsApp, where learners can:

1. Ask an OLICO tutor any maths question during term time in the hours 14:00 to 22:00, Mondays to Fridays, and 09:00 to 21:00 on weekends.
2. Watch maths video (many from learn.olico.org but also several newly developed ones to shorten the content).
3. Complete a maths lesson (watching a video on a topic and then completes a set of MCQs, set with 3 or 4 levels of difficulty)
4. Access maths worksheets (a list of practice questions on a particular topic)
5. Access a one-pager (a single-page summary doc of the maths sub-topic)

6. Complete exam revision challenges (just before and during midyear and end-of-year examination periods)
7. Access “5-a-day” questions aimed at building fluency and understanding in mathematics

This Hotline is the focus of the evaluation.

2. Scope of evaluation/research

2.1. Evaluation objective

The objective is the evaluation of the OLICO WhatsApp Hotline; primarily determining:

1. its uptake and usage by Grade 9 learners at selected schools that are exposed to the service, and
2. if its usage improves learner performance in mathematics.

2.2. Evaluation design

The evaluation was conducted over a period of 8 months, from January to September 2024. The design was mixed methods in that both qualitative and quantitative data were utilised to answer the evaluation questions.

All the data collected, analysed and reported on were Grade 9 learners of 2024 in a group of eight schools that OLICO has never previously worked in directly, and thus where the prior usage of the Hotline was zero or minimal.

The design of this evaluation is quasi-experimental with two groups: those who used the online OLICO Hotline (the "intervention group") and those who did not (the "comparison group"). All learners completed a baseline assessment to measure their initial math proficiency before being offered access to the Hotline. Hotline usage was optional, resulting in two groups: those who actively engaged with the platform and those who did not. After the intervention period, all learners completed an endline assessment to evaluate their post-intervention performance. The study design allowed for comparisons

between Hotline users[2] and non-users, with changes in performance from baseline to endline serving as the primary outcome measure. This quasi-experimental design provides valuable insights into the platform's potential effectiveness.

Ukufunda Education partnered with OLICO to complete this evaluation. Thus, although all data was analysed and reported objectively, OLICO team members were used extensively to collect the data. The evaluation should thus be thought of as an internal evaluation, supported by an external service provider, rather than an independent external evaluation.

2.3. Evaluation questions

The following are the primary evaluation questions (EQs):

1. **UPTAKE AND USAGE**
    a) What was the uptake of the service amongst the learners?
    b) What was the usage of the service amongst the learners?
    c) Which services on the Hotline were most used by the learners?
    d) What services on the Hotline were considered by the learners to be the most valuable?

2. **MATHEMATICS PERFORMANCE and MOTIVATION**
    a) Did usage of the Hotline affect the mathematics performance of high users compared to non-users?
    b) Did usage of the Hotline improve learner motivation for mathematics?

3. **BARRIERS AND OPPORTUNITIES**
    a) What did learners say were the barriers to their frequent usage of the Hotline?
    b) What strategies did learners suggest would most encourage them to increase their frequency of usage?

[2] In some cases, as explained in more detail in the Methodology chapter, the two groups analysed were high users and non-users.

The data source for each EQ is outlined in the table below.

Table 1: Source of data for each Evaluation Question

EQ#	Evaluation Question wording	Data source
1a.	What was the uptake of the service amongst the learners?	Backend analytics[3]
1b.	What was the usage of the service amongst the learners?	Backend analytics
1c.	Which of the services offered via the Hotline was most used by the learners?	Backend analytics
1d.	What services on the Hotline were considered by the learners to be the most valuable?	Endline surveys
2a.	Did usage of the Hotline affect the mathematics performance of high users compared to non-users?	Baseline and endline assessments
2b.	Did usage of the Hotline improve learner motivation for mathematics?	Baseline and endline surveys, backend analytics, Baseline and endline assessments
3a.	What did learners say were the barriers to their frequent usage of the Hotline?	Endline surveys
3b.	What strategies did learners suggest would most encourage them to increase their frequency of usage?	Endline surveys

3. Methodology

This section outlines each stage of the evaluation process.

3.1. The evaluation activities

1. **Inception meeting (virtual).**

   An hour-long virtual meeting was held in January 2024 at which the proposed evaluation plan and timelines were discussed and agreed upon.

[3] This was collected by OLICO and shared with Ukufunda.

2. **Design of evaluation research instruments.**

   The following research tools were developed by Ukufunda:

   a. **School information sheet:** information about the school, Grade 9 mathematics (e.g. learner numbers), etc.
   b. **Baseline survey** (see Addendum D)**:** a survey instrument mainly covering Likert-scale statements about emotions/attitudes towards mathematics
   c. **Endline survey** (see Addendum E)**:** a survey instrument covering Likert-scale statements about emotions/attitudes towards mathematics and feedback on the Hotline. Certain questions were for all the learners and certain questions – such as those asking for comments on the Hotline – only by those who had used the Hotline at least five times.
   d. **Baseline and endline assessment** (see Addenda B and C)**:** 50-minute Grade 8-level maths assessments that assessed the same maths concepts at baseline and endline, but with different numbers, variables, contexts, etc. The concepts assessed were all key concepts that would be extended in the learners' Grade 9 year.

   All draft instruments were sent to the OLICO management for feedback, which was incorporated as far as was possible. The baseline and endline assessment instruments may be found in Addenda A and B, respectively. The baseline and endline survey instruments may be found in Addenda C and D, respectively.

3. **Pilot of the evaluation research instruments**

   The survey and assessment instruments were piloted by OLICO, using 16 Grade 9 learners from a Diepsloot branch. Consolidated learnings from the piloting process – including feedback from the learners given in focus groups - was incorporated into the instruments as far as was possible.

4. School selections

Nine public schools were selected by OLICO and approached to participate/partner in this research. This may be considered as purposive sampling.

The following indicates the diversity of schools approached to participate in the research:

a. Metro township schools (criteria: mainly black African learner population, Quintile 1-3, located in a metro): three schools
b. Transformed urban ex-Model C schools (criteria: mainly black African learner population, Quintile 5, located in a metro): two schools
c. Rural / Small Town schools (criteria: mainly black African learner population; Quintile 1-3[4]; in a farming area or a settlement with at most 25 000 inhabitants): four schools

All schools were not part of any Grade 8 or 9 mathematics intervention in 2023, beyond that offered to all schools within that province. Similarly, none have been part of any other Grade 9 mathematics intervention in 2024.

Unfortunately, both schools in (b) above dropped out during the year, leaving the other seven schools as the source of the research data in this report. Throughout this report, to support confidentiality, school names are not provided. Instead, the seven schools are referred to as follows:

MT1 (metro township school 1)
MT2 (metro township school 2)
MT2 (metro township school 3)
RST1 (rural / small town school 1)
RST2 (rural / small town school 2)

[4] One of these schools partnered with was a Quintile 5 school

RST3 (rural / small town school 3)

RST4 (rural / small town school 4)

The table below provides some information about the seven research schools:

Table 2: Information on the research schools

School pseudonym[5]	Location (province)	School quintile	No. of Gr 9 learners
MT1	Gauteng	3	308
MT2	Gauteng	2	374
MT3	Gauteng	2	251
RST1	Kwazulu-Natal	3	342
RST2	Kwazulu-Natal	3	365
RST3	Limpopo	2	58
RST4	Kwazulu-Natal	5	217
TOTAL			**1915**

5. Research permissions

This comprised two main activities:

a. Permissions from the Research Directorate in each education department in provinces where research schools were found: Gauteng, Limpopo and Kwazulu-Natal.

b. Permissions from each of the selected schools. These were three-fold:

   i. An agreement between OLICO and the school

   ii. Consent provided in writing by the parents/guardians of each Grade 9 learner for the latter to participate in the research

   iii. Assent provided in writing by the Grade 9 learners to participate in the research

Only those learners for whom consent/assent was obtained from both parties had their data included in this study. The only exception was to determine the uptake

[5] Actual school names are not provided, for confidentiality purposes.

and usage of the Hotline, where data from all Grade 9 learners from the research schools who signed up on the service was considered[6].

6. School launches and ongoing engagement

To ensure that the Grade 9s at the selected schools were made aware of the OLICO Hotline, OLICO conducted a launch at each school. This covered a description of the Hotline and how to access it (Grade 9 learners were able to sign up at the launch, with OLICO team members assisting with any troubleshooting required), and a motivation for using it regularly. At the launch, the names and surnames, plus cell phone numbers, of each Grade 9 learner at the school were also collected.

OLICO signed up a teacher as the Hotline Champion at each school, who encouraged learners several times through the year to use the service. In addition, the OLICO Team also did occasional drop-ins during the research period to remind learners about the offering. Typically, the team would set up a table during break time and invite learners to try out the hotline. Learners were also given pamphlets with reminders on how to access the hotline. This was done to help to drive sufficient usage for (at least) the duration of the evaluation.

7. Decision on the minimum threshold for the number of messages sent

As mentioned, the level of engagement of a learner with the OLICO platform was measured using the number of messages sent by the learner to the platform. This was measured at the back end. It was decided a priori that 200 or more such messages would constitute a meaningful engagement with the platform. This value was thus used as the lower threshold of the 'high usage' group.

[6] This is considered to be ethical since it is data that OLICO collects in the normal course of their work from learners who voluntarily signed up on the service and provided their name, surname and school name.

3.2. Data collection

The table below outlines the data collection processes and which organisation was responsible for which activity.

Table 3: Data collection responsibilities

Description	Lead	Support	
School selection	OLICO	UEC	
Research permissions: PEDs	UEC	OLICO	
Research permissions: schools	OLICO	UEC	
	Creation	**Administration**	**Analysis**
School info sheet	UEC	OLICO	
Instrument: baseline survey	UEC	OLICO	UEC
Instrument: endline survey	UEC	OLICO	UEC
Instrument: baseline and endline assessment (and mark schemes)	UEC	OLICO	UEC
Instrument piloting	OLICO	UEC	

a. **School info sheet (teachers)**
   - Shared online with schools in mid-January 2024
   - Completed and returned by school
   - Key data transcribed by OLICO team on a spreadsheet shared with Ukufunda

b. **Baseline and endline assessment (learners)**
   - Printed and administered in-person by OLICO
   - Baseline in the period 28 February to 8 March 2024; endline in the period 28 August to 11 September 2024
   - Marked by OLICO using mark schemes developed by Ukufunda
   - Data captured by OLICO on a spreadsheet shared by Ukufunda
   - Data cleaned by Ukufunda

c. Baseline and endline survey (learners)

- Printed and administered in-person by OLICO on the same day as the assessments
- Data captured by OLICO on spreadsheet shared by Ukufunda
- Data cleaned by Ukufunda

3.3. Data cleaning and analysis

a. Survey cleaning

The following cleaning processes were undertaken on the survey data:

i. All impossible data entries (e.g., those with values that did not correspond with the possible codes) were replaced with a 'no response'

ii. All survey responses where fewer than five responses beyond the basic demographic data were provided were removed from the dataset to be analysed

iii. In the endline survey, any responses by low users or non-users to the part of the survey for users, were removed

b. Assessment and message totals data cleaning

The following cleaning processes were undertaken on the assessment data:

i. Learners who completed neither or only one of the two assessments were removed from the dataset to be analysed

ii. A search was undertaken at the OLICO backend for the registration date of all the remaining learners (who had completed both the baseline and endline data). Those who had first registered with OLICO before January 2024 were removed from the dataset to be analysed. Also removed were those who registered in January or

February 2024 and had sent more than 50 messages in the pre-research period[7].

iii. The above removals left a dataset that included only those learners with matching baseline and endline assessment scores and who first used OLICO after the beginning of the research period (i.e., the launch at each school) or who had begun using it earlier in 2024 but had had only limited exposure prior to the launch.

iv. The remaining learners were then divided into three groups:

1. Those who never used the OLICO services (the 'non-user' group)
2. Those who had used it but who had sent a total of fewer than 200 messages[8] (the 'low user' group)
3. Those who had used it and who had sent a total of 200 or more messages (the 'high user' group)

c. Power analysis: Sensitivity Tests[9]

A sensitivity test in the context of power analysis determines the smallest effect size that a study can detect, given its actual sample sizes, alpha level, and desired power. These sensitivity calculations were performed post-hoc10 using G*Power (see https://www.psychologie.hhu.de/arbeitsgruppen/allgemeine-psychologie-und-arbeitspsychologie/gpower).

[7] The reason for these removals is to remove so-called contaminated learners who used the OLICO services before the beginning of the research period.

[8] The choice of the 200-message threshold was not arbitrary. An explanation of how it was obtained is provided in the next part of this section.

[9] A sensitivity test in the context of power analysis determines the smallest effect size that a study can detect, given its actual sample sizes, alpha level, and desired power.

[10] It is typically better to run the power calculations prior to starting the study. However, this was not possible since it was impossible to determine how many learners would end up in the non-user or high user groups prior to the research. The key is, however, that the decision of the lower threshold of the high user group was made before any analysis began. In this way, the process is methodologically sound.

The following were the parameters used (for the given sample size):

1. Significance level[11]: α = 0.05
2. Desired power[12]: 0.80
3. Sample sizes: 99 and 608 for the high users and non-users, respectively

The test showed that the Minimum Detectable Effect Size (Cohen's d) was 0.27[13]. This means the sample sizes for the whole group were sufficient for detecting small-to-medium effects with high confidence.

d. Analysis of uptake and usage

The following metrics were calculated:

- Uptake (the percentage of eligible learners who used the service at least once in the research period)
- Usage during the research period (e.g., for the users, the mean and median numbers of messages sent)

e. Analysis of survey data

The surveys contained almost entirely closed-ended questions on demographic data, and Likert-scale statements that the respondents need to respond to. This data was analysed quantitatively using descriptive statistics.

The endline survey contained a few open-ended questions which were analysed qualitatively, using thematic analysis.

[11] This means there is less than a 5% chance of making a Type I error (i.e. false positives). The alpha level controls the likelihood of mistakenly finding a "significant" result due purely to chance, rather than because of an actual effect. Essentially, it's a safeguard that helps ensure that findings are not just random occurrences but are instead likely to be meaningful.

[12] The "power" of a test represents the probability of correctly rejecting the null hypothesis when there is an actual effect—reducing the likelihood of a Type II error, or false negative. In the social sciences, the lowest acceptable power level is 0.80.

[13] Thus, this research can detect differences equivalent to 0.27 standard deviations but not smaller effects.

f. Analysis of changes in academic performance of non-users compared with high users[14]

The assessments were analysed descriptively, to provide means, standard deviations, etc. for the changes in performance at baseline and endline. This was performed for all the data and by school category.

Inferential analysis (t-tests) was also completed overall and by category of school.

g. Analysis of correlation between the number of messages sent and the delta score[15]

For this analysis, only those learners who had used the Hotline during the research period were included.

The assumptions that are required to be met for correlation were tested. In particular:

i. The delta scores and messages sent were tested for normality using the Shapiro-Wilk test. This test showed that neither of the data was not normally distributed.
ii. The same variables were tested for linearity by plotting a scatter plot of the one against the other. The scatter plot showed no clear straight-line pattern

The above findings required the use of Spearman's Rank Correlation Coefficient.

h. Analysis of changes in motivation levels of non-users compared with high users

In both the baseline and endline surveys, learners were required to indicate how strongly they agreed with the statement: "I am motivated to improve my mathematics mark." The response options formed a five-point Likert scale, from 'strongly disagree' to 'strongly agree'.

[14] The results of School RST2 were not included in this analysis due to a concern for their validity.

[15] The results of School RST2 were not included in this analysis due to a concern for their validity.

For similar reasons to those outlined above, only the data for the high users and non-users was analysed. First, the changes from baseline to endline were calculated, to create a 'motivation delta' score for each learner. These motivation scores were analysed descriptively, to provide means, standard deviations, etc. Thereafter, inferential analysis was conducted on these motivation delta scores.

3.4. Limitations

As is the case with any evaluation, there were some limitations.

First, as mentioned previously, all the data collection was conducted by OLICO team members (with Ukufunda providing guidance, the evaluation design, and completing all analysis and reporting). There were some minor data collection issues. For example, at one rural / small town (RST) school, many of the learners from the same class gave very similar incorrect arguments, as though they had been coached by a teacher during the assessment. However, in this case, that school's data was excluded from the assessment data, so it had no influence on the findings. Ukufunda has no concerns that there was any manipulation of the data provided.

Second, the research was completed over a relatively short period (there was a gap of only around six months from baseline and endline in the case of most schools). This limited the chance of an impact being shown.

Third, the OLICO Hotline back end data was not able to provide any indication of which services were accessed by which learners, nor for how long. Accordingly, engagement with the Hotline was based on the number of messages sent by learners to the Hotline, a somewhat limited measure of engagement.

Fourth, there is the potential of self-selection bias. Learners chose whether to use the Hotline, potentially confounding results if users differ systematically from non-users (e.g., in motivation, prior performance, or access to technology). To test one aspect of this, baseline motivation levels of high users and non-users of the Hotline were analysed

using an independent samples t-test. This showed that there were no significant differences in motivation levels between the two groups before the research started[16].

Fourth, the two ex-Model C schools that originally agreed to participate in the research both dropped out before endline, meaning that the research was limited to metropolitan township schools and rural / small town schools.

Fifth, the survey data on aspects like motivation levels is self-reported data by the learners. This may be skewed and lead to social desirability or recall bias. However, most of the data used in this evaluation – such as the usage and assessment data – do not rely on self-reporting but objective data.

4. Findings

The findings are provided as answers to the evaluation questions.

4.1 Uptake and Usage

What was the uptake of the service amongst the learners?

For the purposes of this research, 'uptake' is defined as using the OLICO Hotline at least once between the baseline and endline assessments.

From the data provided from the back end of the Hotline, the uptake was 593 learners. Across all seven schools, this is 31.0% of all the Grade 9 learners at the schools.

[16] Formal reporting of the relevant statistics: t(457) = -0.801, p = 0.424

The table below shows the uptake percentages for each school.

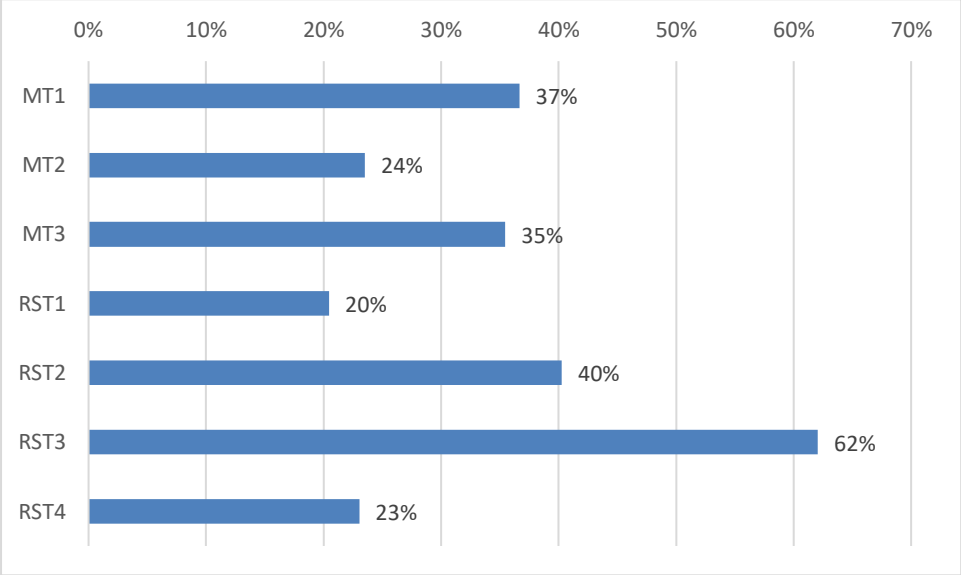


Figure 1: Uptake percentages by school

The greatest percentage uptake was at School RST3, where 62% of the Grade 9 learners used the service. The lowest percentage uptake was at School RST1, where 20% of the Grade 9 learners used the service. The median uptake was 35%. The (weighted) average across the Metro Township schools was 31%, the same as across the Rural / Small Town schools.

What was the usage of the service amongst the learners?

Including all learners, including those who sent no messages, the mean number of messages sent by the 1915 learners at the seven research schools was 55.5. the table on the next page shows the averages and standard deviations by school.

Table 4: Hotline usage, by school and overall

School pseudonym	Maximum no. of messages	Mean no. of messages	Standard Deviation
MT1	2653	59.7	189
MT2	980	47.7	136
MT3	1204	77.2	167
RST1	1118	51.3	164
RST2	832	51.5	103
RST3	1028	156.6	210
RST4	450	24.3	58
Overall	**2658**	**55.5**	**148**

Overall, the school with the highest average usage was RST3, at 156.6 messages per Grade 9 learner. Lowest was RST4, with 24.3 messages per Grade 9 learner.

The table below shows the usage data per school type. The averages are quite similar, with the slightly higher mean for the metro township schools possibly being explained by better internet access and/or access to data/Wi-Fi.

Table 5: Hotline usage, by school type

School type	Maximum no. of messages	Mean no. of messages	Standard Deviation
Metro township	2653	59.6	163
Rural / small town	1118	51.6	132

If one excludes non-users, the average number of messages sent per learner rises to 179.3. The graph on the next page shows a histogram of the number of users within various bands of messages totals. It is a strongly positively skewed distribution, with the highest number of messages in the lowest class (1-100 messages): 286 learners.

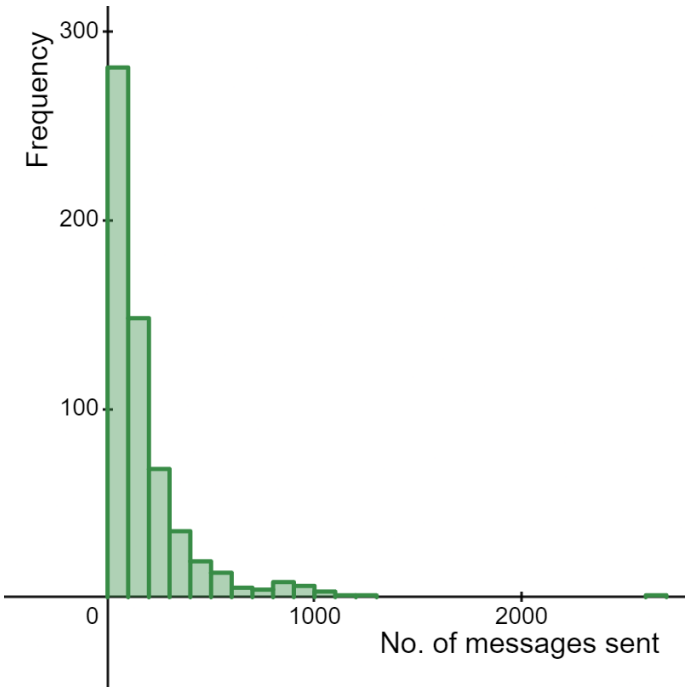


Figure 2: Histogram of usage of all users (n = 593)

Which services on the Hotline were most used by the learners?

The data obtained from the back end was not able to be disaggregated sufficiently to determine which Hotline service the users were using. So, it is not possible to determine which service affected the learners' performance the most.

What services on the Hotline were considered by the learners to be the most valuable?

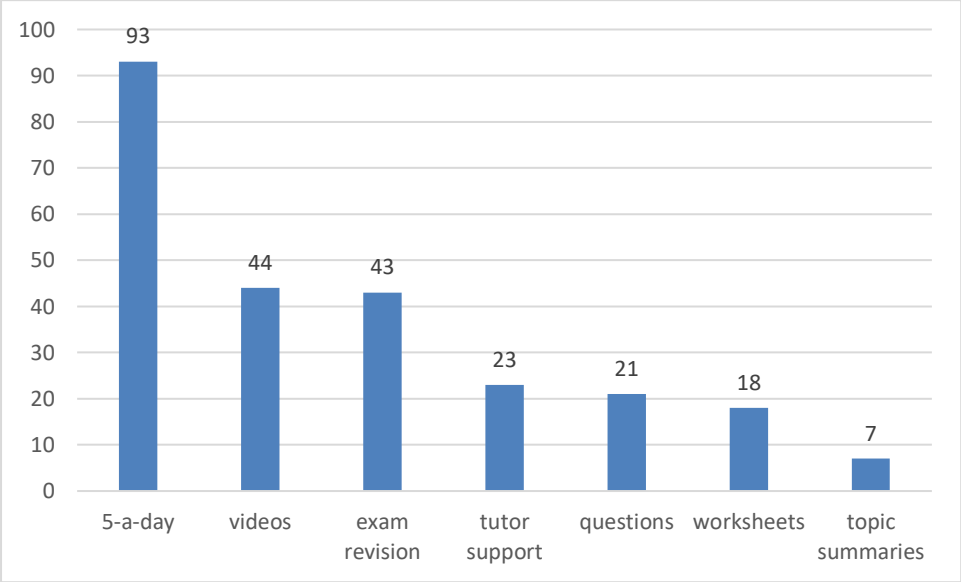


Figure 3: Most useful OLICO service as identified by learner users (n = 249)

The '5-a-day' questions was by some distance considered the most useful service, with 37% of the users selecting it. 18% found the videos most useful, while 17% found the exam revision challenges the most useful.

The direct tutor support came in fourth, with 9% of the vote. It is unknown why this service received relatively few votes, but it might relate to the issues of slow response by the Hotline tutors that was mentioned by several learners elsewhere (see the answer to the next question)

Addendum F contains some illuminating learner quotes explaining why their chosen service was so useful.

4.2 Mathematics Performance and Motivation

Did usage of the Hotline affect the mathematics performance of high users compared to non-users?

All learners

The table below shows some key descriptive statistics for each group overall.

Table 6: Descriptive statistics for the overall performance analysis

Group	No. of learners	Mean score delta	Std. deviation
High users	99	9.5	11.6
Non-users	608	5.4	10.2

A Kolmogorov-Smirnov test showed that the 'mean score delta' data of each group was normally distributed.

The Levene's Test for equality of Variances was significant ($p = 0.028$), meaning that the assumption of homogeneity of variances was violated.

A Welch's t-test was conducted to compare the mean delta scores of the non-users and high users (defined as in the methodology section). The results indicated a significant difference in the scores between the two groups, $t(124) = -3.29$, $p < 0.001$, $d = 0.373$.[17]

This result shows that the average improvement in the mathematics performance of the high users was significantly more than that of the non-users, with a small to medium effect size[18]. The magnitude of the difference between the delta values of the two group means is thus 0.373 standard deviations.

[17] The d-value provided here and elsewhere in the report are the Cohen's d-value effect sizes. Please consult Addendum A for a comparison of the OLICO evaluation effect sizes with those of other interventions.

[18] The thresholds for the effect sizes used throughout this report are those of Cohen (1969): small: d = 0.20; medium: d = 0.50; large: d = 0.80. However, it showed be noted (see, for example, Kraft (2020)), that these

A Spearman's Rank Correlation Coefficient (ρ) was calculated for the two variables of messages sent (the independent variable) and delta score (the dependent variable). A weak but statistically significant positive correlation was found between the number of messages sent to the hotline and the change in math scores ($\rho = 0.16$, $p = 0.013$). This indicates that learners who engaged more with the hotline tended to show greater improvements in their maths scores. However, the modest correlation implies that the impact of hotline use on performance may be limited, and other factors should also be considered.

Metro Township learners

The table below shows some key descriptive statistics for each group.

Table 7: Descriptive statistics for the MT schools' performance analysis

Group	No. of learners	Mean score delta	Std. deviation
High users	54	9.3	11.1
Non-users	379	4.4	9.4

A Kolmogorov-Smirnov test showed that the 'mean score delta' data of each group was normally distributed.

The Levene's Test for equality of Variances was significant ($p = 0.016$), meaning that the assumption of homogeneity of variances was violated.

A Welch's t-test was thus conducted to compare the mean delta scores of the non-users and high users (defined as in the methodology section) of the MT learners. The results indicated a significant difference in the scores between the two groups, $t(64) = 3.07$, $p = 0.002$, $d = 0.507$.

This result shows that the average improvement in the mathematics performance of the high users was significantly more than that of the non-users, with a medium

are too large for education interventions. He proposes, inter alia, that d = 0.20 should be the threshold for a large effect. In such a case, all the effects measured in this research are large.

effect size. The magnitude of the difference between the delta values of the two group means is thus 0.507 standard deviations.

Rural / small town learners

The table below shows some key descriptive statistics for each group.

Table 8: Descriptive statistics for the RST schools' performance analysis

Group	No. of learners	Mean score delta	Std. deviation
High users	45	9.8	12.4
Non-users	229	7.1	11.2

A Kolmogorov-Smirnov test showed that the 'mean score delta' data of each group was normally distributed.

The Levene's Test for equality of Variances was not significant ($p = 0.584$), meaning that the assumption of homogeneity of variances was not violated.

An independent samples t-test was thus conducted to compare the mean delta scores of the non-users and high users (defined as in the methodology section) of the RST learners. The results indicated a non-significant difference in the scores between the two groups, $t(272) = 1.44$, $p = 0.076$[19]. However, the effect size was small ($d = 0.234$) suggesting a small practical difference in test performance.

This result shows that the average improvement in the mathematics performance of the high users, although higher than that of the non-users, was not significantly more than that of the non-users, with a small effect size.

[19] Note that the p-value is just above the conventional alpha level of 0.05. This suggests that while the difference between the two groups was not statistically significant, there may still be a trend toward higher improvement in the mathematics performance of high users compared to non-users in the rural / small town schools.

Did usage of the Hotline improve learner motivation for mathematics?

The assumptions that are required to be met for an independent samples t-test were tested. In particular:

i. The motivation delta scores were tested for normality using the Kolmogorov-Smirnov test. This showed that the distribution of the data of each user group (high users and non-users) was normal[20].
ii. The Levene's Test for Equality of Variances was conducted on the data. The significance value obtained was 0.174, meaning that the assumption of equal variances was not violated.

An independent samples t-test was conducted to compare the mean delta motivation scores of the same two groups. The results indicated a non-significant difference in the scores between the two groups, $t(457) = -0.315$, $p = 0.753$.

This result shows that the average change (from baseline and endline) in the level of motivation of high users to improve their mathematics scores was not significantly different to that of the non-users.

[20] 'Motivation delta' scores and the user groups are defined in the Methodology section.

4.3 Barriers and Opportunities

What did learners say were the barriers to their frequent usage of the Hotline?

The learners who had not used the Hotline at all or at most four times over the research period were asked to identify why they did not use the Hotline. Multiple answers were permitted. The results are shown in the figure below.

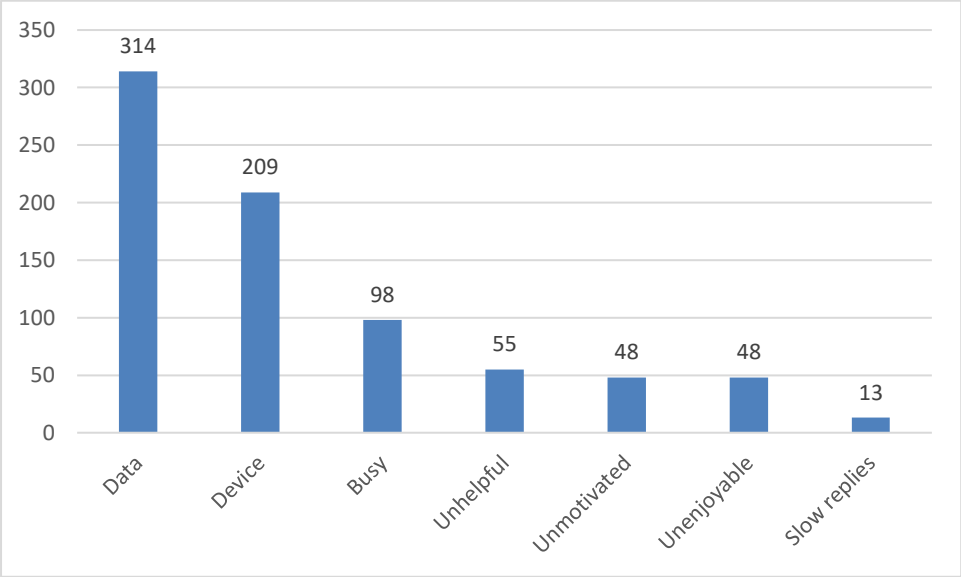


Figure 4: Constraints to using the OLICO Hotline, as identified by non-users (n = 513)

ICT-related issues – lack of a device or data – were by far the most common reasons for not using OLICO. Lack of data was mentioned by 61% of the respondents[21], and the lack of access to a suitable device by 41% of the same.

Being too busy was a distant third, mentioned by 19% of the respondents.

When asked for the "most important" constraint, the order was largely the same as above. 47% cited lack of data as the biggest constraint, and 31% the lack of a device.

[21] It should be noted that access to the Hotline relies only on the user having some WhatsApp data, which is typically much cheaper to purchase than data for general browsing (approximately R30 for 1 GB of data lasting a month, at current prices)

The users were asked for the most important constraint (explaining why they used the service less than they otherwise might have). Their responses are shown in the figure below.

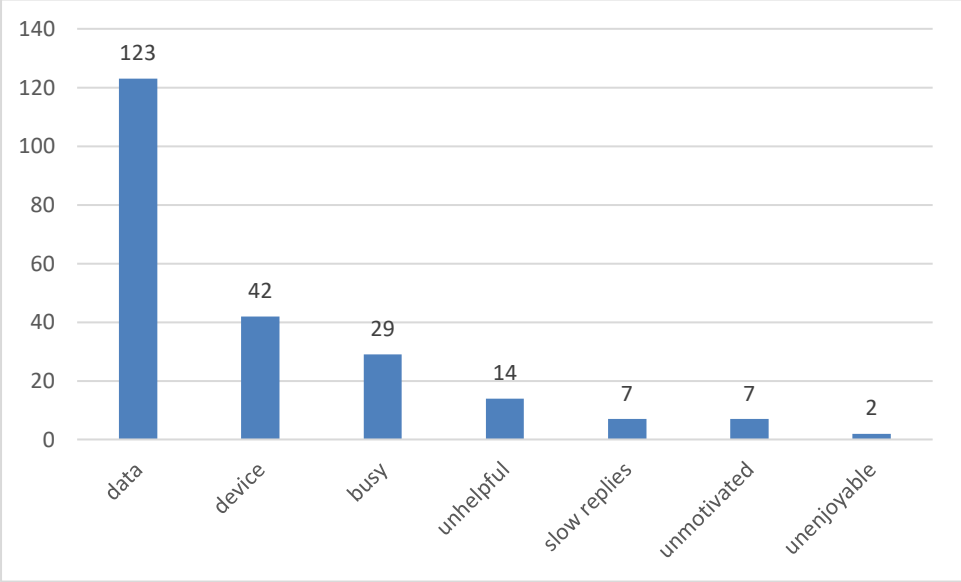


Figure 5: Biggest constraints to using the OLICO Hotline, as identified by users (n = 224)

As for the non-users, the users found lack of data the biggest constraint to Hotline usage (55% said this was their biggest constraint). 19% said a lack of a suitable device and 13% said busy-ness was the biggest constraint, respectively. Other constraints obtained at most 7% of the votes

What strategies did learners suggest would most encourage them to increase their frequency of usage?

Two questions in the endline survey for users provide insight into this question. The first was an open-ended question that asked for the weaknesses of the OLICO Hotline.

There were many no responses, or responses that were unintelligible or off topic. Twenty-four respondents stated specifically that they have not experienced any weaknesses. One learner stated, “I can’t see any weaknesses because they are doing everything in order to help a child to improve [their] marks in mathematics.”

These were the most stated weaknesses, in descending order (number of responses in brackets):

- The tutors don't respond or respond too late (46). For example, "The tutors take a long time to respond/reply to our questions", "OLICO is always responding late or when you're no longer interested in the topic/subject", "It takes time to answer my questions. What you ask today it answers tomorrow", and "They make us wait for a long time to get an answer or even reply"
- The service requires data (18). For example, "it uses data and i don't have enough money to buy data everyday"
- The maths provided was too complicated or confusing (11). For example, "I was so stressed and confused by the answers they asked [for]."
- The explanations provided were insufficient or unclear (6). For example, "They are not good at explaining each and every step"

Other weaknesses mentioned at most three times each are that smart device access is required, it is boring, and the tutor was impatient or unhelpful. One learner stated this: "OLICO makes you choose topics that are only on OLICO. They don't allow you to write the topic you are struggling with."

A second key (open-ended) question asked for recommendations for changes to the Hotline. When the learners responded to this question, it was often through responding to weaknesses previously mentioned. These included:

- Quicker tutor response times (34). For example, "the tutors must answer or help us on time, please." And "They must...reply after 2-3 minutes not after hours"
- Providing data for users or making the service data-free (23). For example, "Maybe it must not use any data. Then I think many people would like to use the OLICO Maths." And "to let the children to continue with their lesson with them [even] when they are out of data"
- More explanations or examples (10). For example, "it should explain and do the things that you ask step-by-step with answers."

- Having the tutors online for more hours a day (8). For example: “on Saturday it doesn’t work and that is only day I get enough time.”

Other suggestions provided at most four times include more easier examples, providing smart devices, setting up competitions with prizes, and allowing for voice notes and/or videos and/or calls on the tutor service (e.g. “Using voice note and voice calls when talking to a tutor”),

5. Conclusion and Recommendations

5.1. Conclusion

The evaluation of the OLICO WhatsApp Maths Hotline has provided valuable insights into its usage, impact, and areas for enhancement. The Hotline demonstrated commendable uptake among Grade 9 learners, with 31% of eligible learners utilising the service. Usage data revealed that while some learners engaged deeply, others faced barriers such as limited access to devices or data.

Even with various access and other issues, the average number of messages sent per learner was a sizeable 55.5, showing that considerable traction was obtained. This is supported by the fact that, of the 593 learners at the research schools who sent messages, the average was 179.3 messages. If the users considered the Hotline service worthless, they would’ve used it much less.

Among those who used the Hotline, the “5-a-day” questions were particularly valued, highlighting their role in consistent practice and reinforcement of math skills. The videos and exam revision were also valued.

Statistical analysis of learner performance showed, overall, a significantly greater improvement in mathematics scores among high users compared to non-users, with a small to medium effect size. When the data was disaggregated by school type, the same finding – with a greater (medium) effect size - was found for learners in Metro Township schools. This indicates that sustained engagement with the Hotline correlates with academic progress. However, the correlation between message volume and

performance improvement (for the users) was weak, suggesting that other factors also influence learner outcomes. On changes in motivation, no significant differences were observed between high users and non-users, pointing to the need for complementary strategies to enhance learners' enthusiasm for mathematics.

While the Hotline's innovative approach to tutoring and resource delivery has been impactful, barriers such as delayed tutor responses and data constraints limit its potential. These findings underscore the importance of addressing technical and accessibility challenges to maximize the Hotline's reach and effectiveness.

5.2. Recommendations

What follows are some practical recommendations for ways of ensuring that the OLICO WhatsApp Hotline can be used by more learners and have greater impact on their mathematical performance.

Enhance Responsiveness

- Improve the efficiency of tutors and reduce response times by integrating more sophisticated automated response journeys and 'triage' systems, especially during peak hours. Requests to the hotline that do not directly require a human response, such as requests for additional resources, video explanations, extension activities and/or further practice, could conceivably remain in the automation system. These requests could be successfully handled by a more sophisticated logic-process or chatbot that diagnoses the user's request for assistance and only passes on the user to a tutor when satisfied that this is the appropriate action. It is worth exploring whether a well-trained AI system and LLM model could serve this purpose and deepen the learning experience in the process.
- An obvious solution to improve responsiveness is to expand the team of tutors to ensure faster response times, particularly during peak usage hours. This would likely require additional budget or developing a volunteer cohort of tutors.

- Introduce adaptive learning pathways to personalise content based on individual learner performance.

Optimise Engagement

- Build on the popularity of the 5-a-day structure and introduce more gamified elements to such as quiz-based activities.
- Consider introducing additional progress monitoring and/or leaderboards to sustain learner interest.
- Refine content and develop more detailed, step-by-step explanations in videos and worksheets to address learners' concerns about clarity.
- Maximise the benefits of the messaging platform with more strategic messaging, prompts and nudges to keep users more regularly engaged.

Develop Backend Insights

- The backend of the WhatsApp platform utilised by OLICO records every single interaction with the Hotline. Deepening the understanding of the user journey, key learning moments and available data-points – such as knowing exactly what service each learner is using - could be valuable in future design work and impact evaluation. One option would be to employ a data scientist or systems engineer to extract and provide access to this user data.
- At a systems level, mass use of the platform could reveal critically important information for system-wide intervention plans. For example, if the data shows that a large proportion of learners don't understand fractions, a district or provincial office could design remediation for this issue and (possibly) use the Hotline as part of the response.
- Developing systems to access and interpret the extensive data available could be useful for a range of different stakeholder i.e. parents; teachers; tutors and departmental officials. There is an opportunity to add multiple layers of sophistication to the current data evaluation and insight practices.

Integrate into the Classroom:

- Investigate direct support for the teacher by using the system for specific homework support and practice. Provide regular feedback on learner progress data to the teacher for remediation or extension purposes.
- Adapt the lessons on the Hotline to support teachers in their own lesson preparation thereby deepening the knowledge base of teachers.

Further Expand Accessibility

- The WhatsApp messaging platform is ubiquitous across all communities in South Africa with more than 90% of SA's internet users estimated to use WhatsApp. Most SA telecom companies also provide dedicated WhatsApp data packages which are significantly more affordable than ordinary data packages. So, although there are clearly gains in availability and cost, the user feedback suggests there's still a need to increase this access further. One option would be to allow learners to send messages to the Hotline via other channels that are data free. One option available in South Africa is the Moya app: https://moya.app/ (although this is limited to text messaging – so, no videos and similar items can be accessed by this means).
- Another option would be to embed a messaging platform in the OLICO website (which is already zero-rated) or create a zero-rated OLICO messaging app that learners can download[22].

These recommendations aim to build on the obvious strengths of the OLICO WhatsApp Maths Hotline, addressing current limitations while broadening its accessibility and enhancing its effectiveness in supporting learners' mathematical development.

[22] This will require the learners to download an app, which some might be resistant to doing, but it removes the main issue claimed by learners as to the reason they do not use the service: the need for data

Addendum A: Comparative Effect Sizes to put the OLICO evaluation findings into perspective

The Cohen d effect sizes for OLICO's impact on academic performance (comparing "high users" to non-users) are as follows (rounded to two decimal places):

- Overall: d = 0.37
- Metro/township schools: d = 0.51
- Rural/small town schools: d = 0.23

A reasonable question would be: how does this compare to the effect sizes from other education interventions?

One well-known meta-analysis of thousands of education interventions is that of Hattie (2018). He categorised interventions to provide a list of the relative effects of different influences on learner achievement. For the OLICO evaluation, the most relevant average effect sizes from Hattie's meta-analysis are:

- Online and digital tools: d = 0.29
- Technology in mathematics: d = 0.33
- Mobile phones: d = 0.37
- Intelligent tutoring systems: d = 0.48

Comparing the OLICO overall effect size with these Hattie-generated effect sizes places the OLICO intervention somewhere near or just above the middle.

However, not all other researchers agree with Hattie's methodology and some would argue this approach results in understating these findings. For example, Kraft (2020) says "many of the research studies included in these meta-analyses used small samples, weak research designs, and proximal outcomes highly aligned to the interventions—all of which result in systematically larger effects (Cheung & Slavin, 2016). Influential reviews by Hattie (2009) continued to incorporate these dated studies and ignored the importance of research design and other study features, further propagating outsized expectations for effect sizes in education research." (p. 242). In other words, he suggests

that the average effect sizes of Hattie are higher than they would be if the methodology around the selection of research to incorporate was tighter.

A change like this would, clearly, make the OLICO research findings more impressive. In fact, if one accepts Kraft's (2020) argument that the thresholds for small, medium and large effect sizes should be reduced, then – by the thresholds he proposes – the overall OLICO effect size would be large.

Addendum B: Baseline Assessment Instrument[23]

SECTION A (Multiple Choice) [10 marks]

For each question, circle the correct answer

1. What is the **LCM** of 8 and 12?
   a. 2 b. 4 c. 16 d. 24

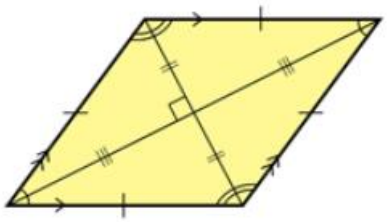
2. What is the value of $\sqrt{36}$?
   a. 4 b. 6 c. 8 d. 18

3. What is the value of -4 – 5?
   a. -9 b. -1 c. 1 d. 9

4. What is the next value in the sequence: 6; 3; 1,5; ...?
   a. 0 b. 0,5 c. 0,75 d. 1

5. What is the value of $3x^2$ if $x = -2$?
   a. -36 b. -12 c. 12 d. 36

6. What is the most accurate name of the shape shown below?



   a. Quadrilateral b. Parallelogram c. Diamond d. Rhombus

7. How many **vertices** does a rectangular prism have?
   a. 4 b. 5 c. 6 d. 8

8. What is the **base** of a triangle that has a height of 5 cm and an area of 30 cm^2?
   a. 5 cm b. 6 cm c. 9 cm d. 12 cm

   What is the **circumference** of a circle with a diameter of 6 cm?

[23] Only the questions are provided, without spacing, to reduce the length of this document. In the actual assessment, learners had an introduction page with instructions, plus place to add name, surname and school name. Further, there was space provided for learners to answer on the question paper.

9. Give your answer as a multiple of π.
   a. 3 π b. 6 π c. 9 π d. 36 π

10. Simplify: $2xy - 3x^2y + yx^2$
    a. $2xy - 2x^2y$ b. $2xy - 3x^2y$ c. $2x^4y^2$ d. It cannot be simplified

SECTION B (Full working)

Question 1 [8 marks]

(a) Simphiwe and Neo agree to divide their profit in the ratio 3 :2.
If their total profit is R1 500, how much should Neo get? (3)

(b) Prime factorise 72. (3)

(c) Rhulane runs a clothing store. She normally sells shorts for R150 but is about to start a '20% off' sale.
How much will the shorts cost on sale? (2)

Question 2 [4 marks]

Simplify the following:

(a) $(2y^3)(-3y)$ (2)

(b) $\dfrac{4t^8 - t^2}{t^2}$ (2)

Question 3 [2 marks]

Expand the brackets and simplify: $4(3x^2 - x) + 2x - 5$ (2)

Question 4 [4 marks]

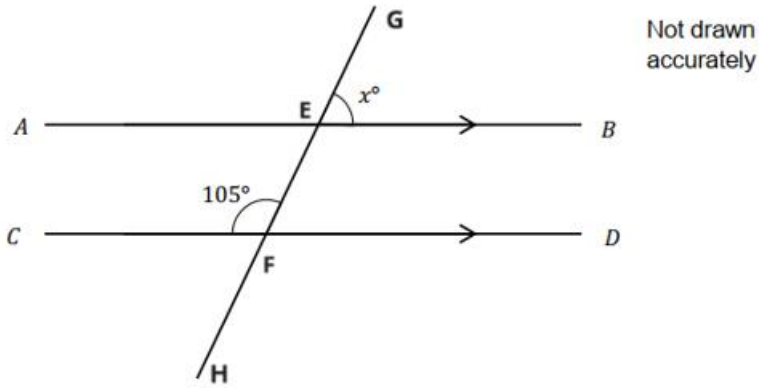
Solve the equations:

(a) $2x - 5 = -7$ (2)

(b) $3(x - 1) = 2 + 4x$ (2)

Question 5 [9 marks]

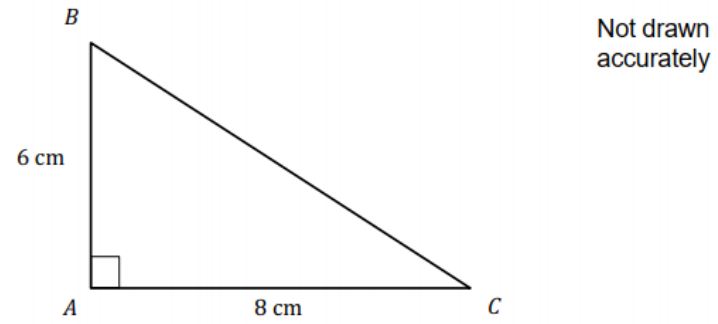
(a) In the diagram below, AB is parallel to CD.



Determine the value of x. Provide a reason each time you use a geometric theorem. (4)

(b) In △CDE, one of the angles is 70°. The other two angles are equal in size. Determine the size of one of these other angles.
No reasons need to be provided. (2)

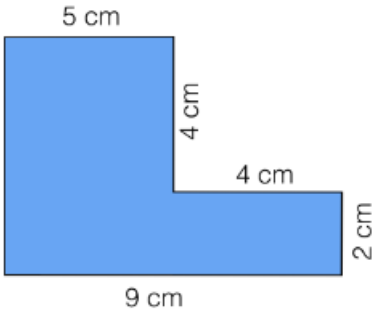
(c) Calculate the length of the missing side BC.



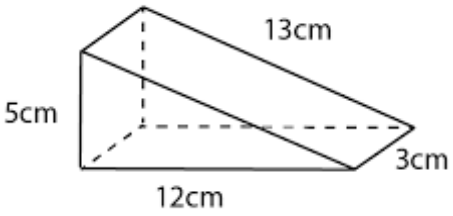
(3)

Question 6 [3 marks]

(a) Determine the area of the shape show below. It consists of two rectangles. (2)



(b) The triangular prism alongside has the dimensions shown.
Given that the area of the front triangle is 30 cm^2, find the volume of the prism. (1)



Addendum C: Endline Assessment Instrument[24]

SECTION A (Multiple Choice) [10 marks]

For each question, circle the correct answer

1. What is the **LCM** of 10 and 15?
   e. 5 f. 15 g. 20 h. 30

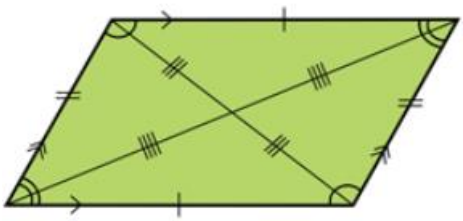
2. What is the value of $\sqrt{100}$?
   e. 8 f. 10 g. 12 h. 50

3. What is the value of: –7 – 2?
   e. -9 f. -5 g. 5 h. 9

4. What is the next value in the sequence: 160; 40; 10; ...?
   e. 2,5 f. 5 g. 8 h. 10

5. What is the value of $4x^2$ if $x = -3$?
   e. -144 f. -36 g. 36 h. 144

6. What is the most accurate name of the shape shown below?



   e. Quadrilateral f. Parallelogram g. Trapezium h. Rhombus

7. How many **faces** does a triangular prism have?
   e. 4 f. 5 g. 6 h. 9

8. What is the **height** of a triangle that has a base of 10 cm and an area of 60 cm^2?
   e. 5 cm f. 6 cm g. 9 cm h. 12 cm

9. What is the **area** of a circle with a diameter of 6 cm?

[24] Only the questions are provided, without spacing, to reduce the length of this document. In the actual assessment, learners had an introduction page with instructions, plus place to add name, surname and school name. Further, there was space provided for learners to answer on the question paper.

Give your answer as a multiple of π.

e. 3 π f. 6 π g. 9 π h. 36 π

10. Simplify: $2xy - 2x^3y - yx^3$

e. $2xy + 2x^3y$ f. $2xy - 3x^3y$ g. $2x^4y^2$ h. It cannot be simplified

SECTION B (Full working)

Question 1 [8 marks]

(a) Dakalo and Sam agree to divide their profit in the ratio 2: 3.
If Dakalo gets R1000, how much should Sam get? (3)

(b) Prime factorise 108. (3)

(c) Thabang runs a clothing store. He normally sells shirts for R120 but needs to increase their price by 25%.
How much will the shirts cost after the price increase? (2)

Question 2 [4 marks]

Simplify the following:

(a) $(-4y^3)(3y)$ (2)

(b) $\dfrac{4t^{12} - t^3}{t^3}$ (2)

Question 3 [2 marks]

Expand the brackets and simplify: $2(x - 3x^2) + 3x - 12$ (2)

Question 4 [4 marks]

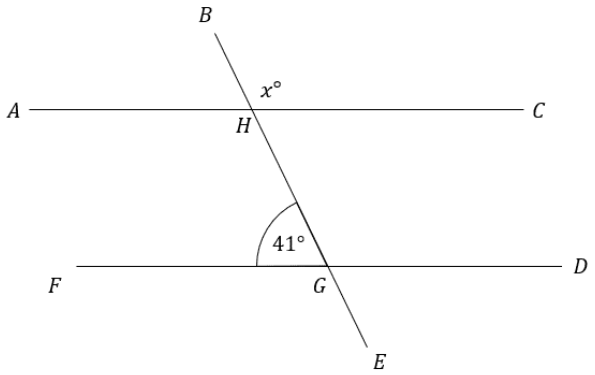
Solve the equations:

(a) $3x + 6 = -15$ (2)

(b) $10 - 5x = 4(2 - x)$ (2)

Question 5 [9 marks]

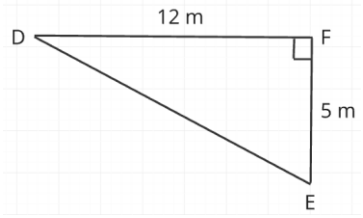
(a) In the diagram below, AC is parallel to FD.



Determine the value of x. Provide a reason each time you use a geometric theorem. (4)

(b) Find the size of x in the quadrilateral alongside.
No reasons need to be provided. (2)

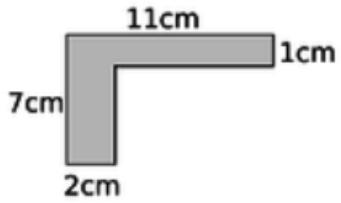
(c) Calculate the length of DE. The sketch is not drawn to scale.



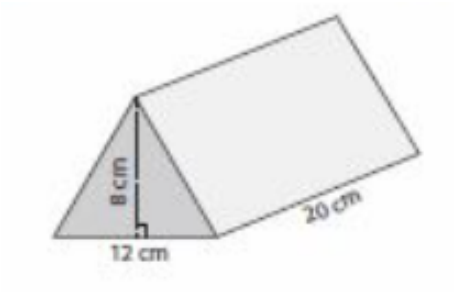
(3)

Question 6 [3 marks]

(a) Determine the area of the shape show below. It consists of two rectangles. (2)



(b) The triangular prism alongside has the dimensions shown.
Given that the area of the front triangle is 48 cm^2, find the volume of the prism. (1)



Addendum D: Baseline Survey Instrument

- This is a baseline instrument – we know that you have probably not used the OLICO Hotline yet.
- Completion of this survey is voluntary.
- We ask for your name and surname so that we can compare your responses now with those in about 7 months' time (when you will be asked to complete an endline survey).
- We will not show your individual responses to the Principal or your teacher(s), nor will we report individual responses with your name.
- If answer options are given, circle the most accurate answer.
- This survey will probably take about 12-15 minutes to complete.

First Name			
Surname			
School:		**Class:**	
Personal cell number (if applicable):		**Cell phone service provider(s) [if applicable]:**	
Gender: ☐ Male ☐ Female ☐ Non-binary		**Date of Birth**: **DD** ☐☐ **MM** ☐☐ **YYYY** ☐☐☐☐	

1. **Which is correct for you?**

I own a cell phone	I do not own a cell phone but can borrow one to use	I never or seldom can get access to a cell phone

2. ***[Answer this question if you own or can borrow a cell phone. If you do not, skip to question 3]***

a. Can your cell phone access the Internet?	Yes	No

<table>
<tr><td>b. Do you have a contract, or do you use prepaid?</td><td colspan="2">Contract</td><td colspan="2">Pre-paid</td></tr>
<tr><td>c. What is the make (e.g. Samsung, Motorola) of the cell phone you use?</td><td colspan="4"></td></tr>
<tr><td>d. Where do you <u>usually</u> get your data and/or airtime from?</td><td colspan="2">I buy the data/airtime myself</td><td colspan="2">Someone else buys the data/airtime for me</td></tr>
<tr><td rowspan="3">e. How much do you usually spend on airtime and data (combined) <u>per month</u>?

[if you do not buy data or airtime, circle ‘not applicable’]</td><td>Less than R20</td><td>R20-R29</td><td>R30-R39</td></tr>
<tr><td>R40-R49</td><td>R50-R80</td><td>R80-R120</td></tr>
<tr><td>More than R120</td><td colspan="2">Not applicable</td></tr>
</table>

3. For each statement, circle the most accurate response for YOU.
This is about what you BELIEVE or THINK. There is no right or wrong answer.

a. I love mathematics	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
b. I am good at mathematics	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
c. I work hard on my mathematics when in class	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
d. I work hard on my mathematics when at home	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
e. I am motivated to improve my mathematics mark	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
f. I have no idea what to do to improve my mathematics mark	Strongly disagree	Disagree	Neutral	Agree	Strongly agree

4.

(a) What was your Grade 8 Mathematics score/mark in your November 2023 report? [if you did Grade 9 in 2023, give that maths score]

0-19%	20-29%	30-39%	40-49%	50-59%	60-69%	70-79%	80-100%

(b) What results are you aiming to achieve for Grade 9 Mathematics (in 2024)?

0-19%	20-29%	30-39%	40-49%	50-59%	60-69%	70-79%	80-100%

5. How much time <u>per week</u> do you <u>usually</u> spend on maths homework (outside class)?

None	1-29 minutes	30-59 minutes	1-2 hours	More than 2 but less than 3 hours	More than 3 but less than 4 hours	4 hours or more

6. If you are struggling with understanding maths, where or from whom do you get help? ***Please circle <u>all</u> options that you use often*.**

Friends	A family member	Teachers (in school time)	After-school or Saturday classes	Other *(please write the source of your help in this box)*

7. How easy is it for you to find help if you are struggling with understanding maths?

Very easy	Somewhat easy	Somewhat difficult	Very difficult

Thank you very much for taking the time to complete this questionnaire.

Addendum E: Endline Survey Instrument

- Completion of this survey is voluntary.
- We ask for your name and surname so that we can compare your responses now with those from about 7 months ago (when you were asked to complete a baseline survey).
- We will not show your individual responses to the Principal or your teacher(s), nor will we report individual responses with your name.
- If answer options are given, circle the most accurate answer OR tick the small option block you select.
- This survey will probably take about 20-30 minutes to complete.

First Name			
Surname			
School:		**Class:**	
Personal cell number:		**Cell phone service provider(s):**	
Gender: ☐ Male ☐ Female ☐ Non-binary		**Date of Birth**: **DD** **MM** **YYYY**	

1. **For each statement, circle the <u>most accurate response for YOU</u>.**
   This is about what you BELIEVE or THINK. There is no right or wrong answer.

a. I love mathematics	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
b. I am good at mathematics	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
c. I work hard on my mathematics when in class	Strongly disagree	Disagree	Neutral	Agree	Strongly agree

d. I work hard on my mathematics when at home	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
e. I am motivated to improve my mathematics mark	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
f. I have no idea what to do to improve my mathematics mark	Strongly disagree	Disagree	Neutral	Agree	Strongly agree

2. How much time <u>per week</u> do you <u>usually</u> spend on maths homework (outside class)?

None	1-29 minutes	30-59 minutes	1-2 hours	More than 2 but less than 3 hours	More than 3 but less than 4 hours	4 hours or more

3. How often have you used the OLICO Maths WhatsApp Hotline since February/March?

Never	Once or twice	3 or 4 times	5-8 times	9-12 times	13-20 times	20 or more times

If you used the OLICO Maths WhatsApp Hotline 4 or fewer times since February/March, please answer Question 4 and Question 5 and then stop writing.
If you used the OLICO Maths WhatsApp Hotline 5 or more times since February/March, please skip to Question 6 and continue from there.

4. (a) What <u>stopped you</u> from using the OLICO Maths WhatsApp Hotline? (select ALL that apply)

☐ getting a cell phone or other device to use was difficult	☐ I could not afford the data costs	☐ I did not have enough time (I was too busy)
☐ I did not find the service enjoyable	☐ I did not find the service helpful	☐ I am unmotivated to do extra work
☐ other (please specify): _____		

(b) Which of the answers to the previous question was the most important reason for not using the OLICO Maths WhatsApp Hotline?

5. Please suggest any changes to the OLICO Maths WhatsApp Hotline that might encourage you to use it.

Continue with the survey only if you used the OLICO Maths WhatsApp Hotline at least 5 times.

6. How did you usually access the OLICO Maths WhatsApp Hotline?

My own cell phone	A borrowed cell phone	A tablet, laptop or PC

7. Select the service on the Hotline that you found the most helpful.

Tutor support	Videos	Questions	Worksheets
Topic summaries	Exam revision challenges	5-a-day lessons	

8. Please explain your answer to the previous question (i.e., explain why it was the most helpful).

9. What stopped you from using the OLICO Maths WhatsApp Hotline more often than you have? (select ALL that apply)

☐ getting a cell phone or other device to use was difficult	☐ I could not afford the data costs	☐ I did not have enough time (I was too busy)
☐ I did not find the service enjoyable	☐ I did not find the service helpful	☐ I am unmotivated to do extra work
☐ other (please specify): _____		

10. Which of the answers to the previous question was the <u>most important reason</u> for not using the OLICO Maths WhatsApp Hotline more than you did?

11. For each statement, circle the <u>most accurate response for YOU</u>.
This is about what you BELIEVE or THINK. There is no right or wrong answer.

a. I have enjoyed using the OLICO Maths WhatsApp Hotline	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
b. Using the OLICO Maths WhatsApp Hotline has helped me understand my mathematics better	Strongly disagree	Disagree	Neutral	Agree	Strongly agree

12. Below are pairs of adjectives that are opposites. You have experienced the OLICO Maths WhatsApp Hotline service for some time. Please <u>choose where YOU think the service fits</u>.
Circle the number from 1 to 7 you choose, one for each row.

Helpful	1	2	3	4	5	6	7	**Unhelpful**
Amateurish	1	2	3	4	5	6	7	**Professional**
Discouraging	1	2	3	4	5	6	7	**Motivating**
Desirable	1	2	3	4	5	6	7	**Undesirable**
Confusing	1	2	3	4	5	6	7	**Clear**
Inviting/exciting	1	2	3	4	5	6	7	**Boring**

13. (a) Has using the OLICO Maths WhatsApp Hotline <u>motivated you</u> in your study of mathematics?

☐ yes, a lot	☐ yes, a little	☐ it has not affected my motivation	☐ it has demotivated me

(b) Please <u>explain</u> your answer to the previous question.

14. What, in your opinion, are the <u>strengths</u> of the OLICO Maths WhatsApp Hotline?

15. **What, in your opinion, are the <u>weaknesses</u> of the OLICO Maths WhatsApp Hotline?**

16. **Please suggest any <u>changes</u> to the OLICO Maths WhatsApp Hotline that you feel will make it better.**

17. **Please provide your <u>response to the following statement</u> by circling what most accurately reflects your opinion:**

    I would recommend the OLICO Maths WhatsApp Hotline service to my friends.

Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree

Thank you very much for taking the time to complete this questionnaire.

Addendum F: Learner quotes on the 'most useful' service

These are some illuminating learner quotes explaining why their chosen service was so useful.

Tutor support

- "[If] I was struggling with a sum and i asked the tutor to help me with it, and she did help me and it was helpful"
- "Because the tutor explains and then gives you work to do after that they check your answers if they are correct or wrong"
- "I learnt what i wanted when i wanted"
- "They are always online and if you need help you find it right now"
- "Because if I get [a] wrong answer, they will do corrections for me so that I can see my mistakes"
- "Tutors answer the questions you've asked, and they show you steps to get a particular answer."

Videos

- "Because I understand more when they explain to me in videos"
- "Because a video shows all the steps, and it explain everything about that calculation"
- "I can learn from them that how to write the steps"
- "Every day I'm interested in a new challenge and if I'm unable to complete it, it sends a video that teaches me well."
- "Because videos are more like teachers in class"
- "You get more understanding than talking to someone you don't see"

Questions

- "Every question that [they asked] would help me fully understand the methods on how you can do it."

Worksheets

- "Because I could practise maths more often"
- "because i can select topic that I struggle [with] when i am doing maths"

Topic summaries

- "It made me understand topics that were longer and difficult to understand"

Exam revision challenges

- “I was able to learn more about how questions are asked in exams, and I was able to answer them easily when I was writing”
- “The questions they ask are very helpful and they are sometimes similar to those in an exam”

5-a-day questions

- “I've been practising the Geometry and when I got it wrong, they were correcting me to understood.”
- “I even found our previous topics that we did [which] I did not understand”
- “They give you different questions day”
- “One topic a day not all topics in one day”
- “5-a-day lessons taught me to learn from my mistakes”
- “If you got the wrong answer, they will explain to you [how to] calculate to find the right answer”
- “It was helpful because when I’m not replying [to] them, they sent a message to remind me, and they say ‘don’t give up’”
- “5-a-day lesson always come with [an] interesting quiz game”

Addendum G: References

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