

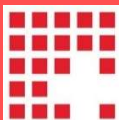
RESEARCH REPORT

EduLution Programme

Zambian Grade 7 National Exams 2019

Authored by:

Dr. Christoph Pimmer and Dr. Florian Brühlmann



SNBI

Schweizerisches Netzwerk für Bildungsinnovation
Swiss Educational Innovation Network

In den Ziegelhöfen 43 · 4054 Basel · Switzerland
Telefon +41 (0)78 843 53 81 · www.snbi.ch/en · info@snbi.ch

ABSTRACT

EduLution offers an after-school learning programme that supports primary school learners in disadvantaged areas in Zambia, Namibia and South Africa. Learners use tablet PCs to engage with content and interactive exercises and their self-paced learning is guided and facilitated by trained coaches. This research report analyses the impact of EduLution's programme on the mathematics performance in Zambia's Grade 7 exam.

The analysis compared learners of the EduLution programme with the entire cohort of learners from the regions in which EduLution operates regarding their performance in the Grade 7 exam in 2019 (n=134'534). The Grade 7 exam is a national assessment for Zambian learners at the end of the primary school and is thus a useful means to compare different cohorts of learners.

The comparison was based on a percentile calculation which classifies learners within a scale of 100: the best learners are at the 99th percentile and the poorest performers are at the first percentile. The analysis shows that EduLution learners scored pronouncedly higher than the entire cohort: Considering all active learners from the EduLution programme (who studied 120 hours or more, n=1369), the median EduLution learner was at the 70th percentile. This means that she or he performed better than 70% of the entire cohort. In comparison, the median learner of the entire student cohort was at the 50th percentile. The difference between the 50th and the 70th percentile means a substantial advance of 20 percentile ranks of the median EduLution learner. Even if all EduLution learners are considered (including these who studied less than 120 hours in the EduLution programme) the advance of the median EduLution learner remains substantial with 15 percentile ranks.

Moreover, the engagement with 8 to 13 exercises from the EduLution programme was linked to an improvement of one percentile rank in the regression analyses. Taken together, the findings permit the conclusion that the participation in the EduLution programme is associated with markedly higher mathematics scores in the Grade 7 exam.

In the Management Summary, the key findings of the analysis are outlined and in the Technical Report the detailed statistical results are reported to make the approaches and conclusions traceable according to established research standards.

MANAGEMENT SUMMARY

Background and programme

Eduktion is a social enterprise which offers an after-school learning programme to support primary school learners in townships and rural areas in Zambia, Namibia and South Africa. Learners use tablet PCs to engage with content and interactive exercises and their self-paced learning is guided and facilitated by trained coaches.

Research questions

The goal of this analysis was to evaluate the potential impact of the Eduktion programme on learners' numeracy skills. The specific research questions are:

- **Research question 1:** Does the performance of learners from the Eduktion programme in the national Grade 7 mathematics exam differ from the performance of the entire learner cohort, and if so, to what extent?
- **Research question 2:** Is the specific engagement of learners with the Eduktion programme, such as working on exercises or time spent with the programme, linked to improvements in their Grade 7 mathematics performance?

Approach, method and sample

The statistical analyses methods included a percentile comparison and statistical significance tests for question 1 and various forms of regression analyses for question 2. The analysis was based on two different data sets, which were provided by Eduktion to the research team. The first data set contained information about learners (facility, exam number, gender, date of birth) and their performance in the national Grade 7 exams in the three provinces in which Eduktion operates (n=157'152). Data for this set was provided by the respective District School Inspectors. In addition, the Eduktion coaches confirmed and verified this information for the Eduktion learners in Grade 7. The second data set was obtained from the digital Eduktion platform which tracks learner activities. This set involved more detailed information of the Eduktion learners (n=1997), containing information on the learners (age, gender) and their context (province, cluster, school type, facility, environment etc.), their use of the Eduktion programme (number of exercises, number of hours engaged) and their results in the 2019 Grade 7 exams. Both samples were joined and then cleaned and explored. From the full data set obtained from the School Inspectors, 1258 observations were excluded because the age of the learner was below 10 or above 22 which indicated errors in the data entry process. For the percentile comparison to be counted as an active Eduktion learner, an engagement of at least 120 hours with the programme was required. 120 hours was derived from the projected number of hours a learner should be on the programme assuming consistent attendance over a given year. Learners drop in and out of the programme for various reasons, such as changes in class schedules and class enrolment or altered family situations. This led to the exclusion of 617 learners (31%) from the Eduktion data set for the main percentile comparison.

Total sample: The resulting sample included 155'267 learners. Of these, 134'534 actually participated in the Grade 7 exam. Fifty-two percent were female and 48% male, who were,

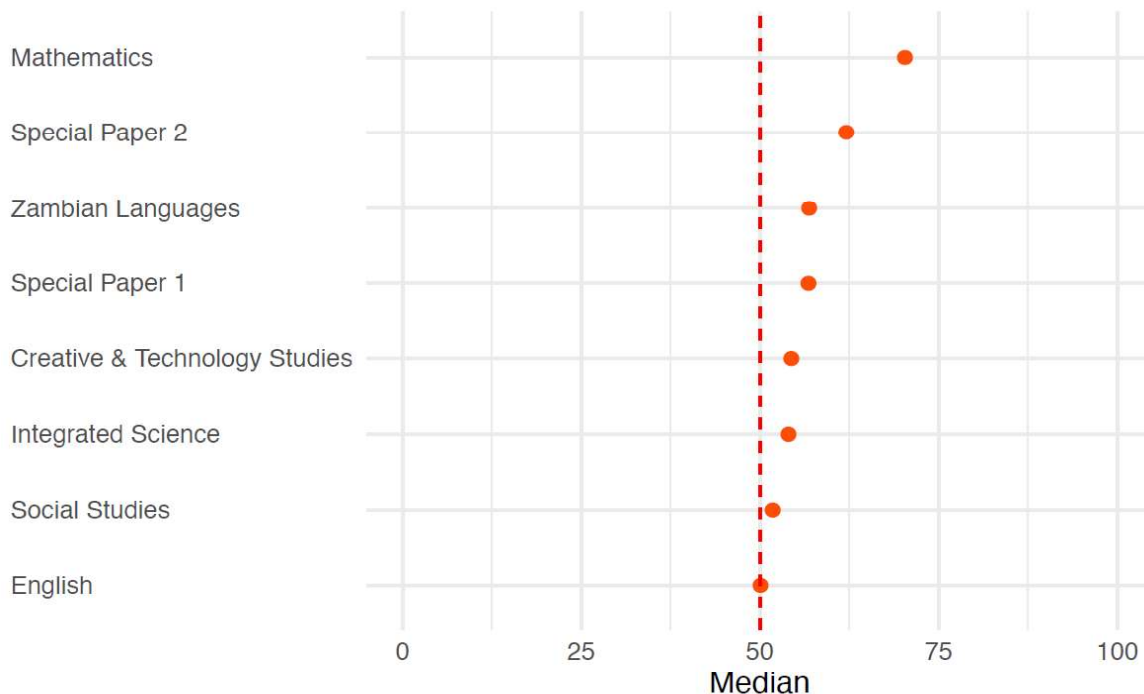
on average 14.8 years old. 29% were from the Eastern province, 19% from the Western province and 52% from Lusaka.

Edulution learners: From the Edulution cohort which was compared to the entire student cohort for the percentile comparison, 1369 participated in the Grade 7 exam. They were on average 14.8 years old, 52% of whom were female and 48% male. 55% were from urban areas and 45% from rural environments. 31% came from the Eastern province, 67% from Lusaka and 2.4% from the Western province. The majority of learners attended government-run schools (60%), followed by faith-based schools (23%), community schools (17%).

Results: Impact of Edulution programme on mathematics score

With respect to research question one, the results show that learners from the Edulution programme scored pronouncedly higher in the Grade 7 mathematics exam than learners from the entire regional cohort, and this difference was statistically significant. In detail, the median learner in the Edulution programme was at the 70th percentile. Percentiles are learners’ ranks expressed on a scale of hundred, with the best learners being at the 99th percentile and the worst at the 1st percentile. The 70th percentile of the median Edulution learner means that her or his performance was superior than the performance of 70% of the entire learner cohort. Moreover, it is an advance of 20 percentile ranks compared to the median learner of the entire learner population, who is at the 50th percentile. (Figure 1).

Figure 1: Edulution learners’ median (red points) vs median of entire cohort (dashed vertical line)



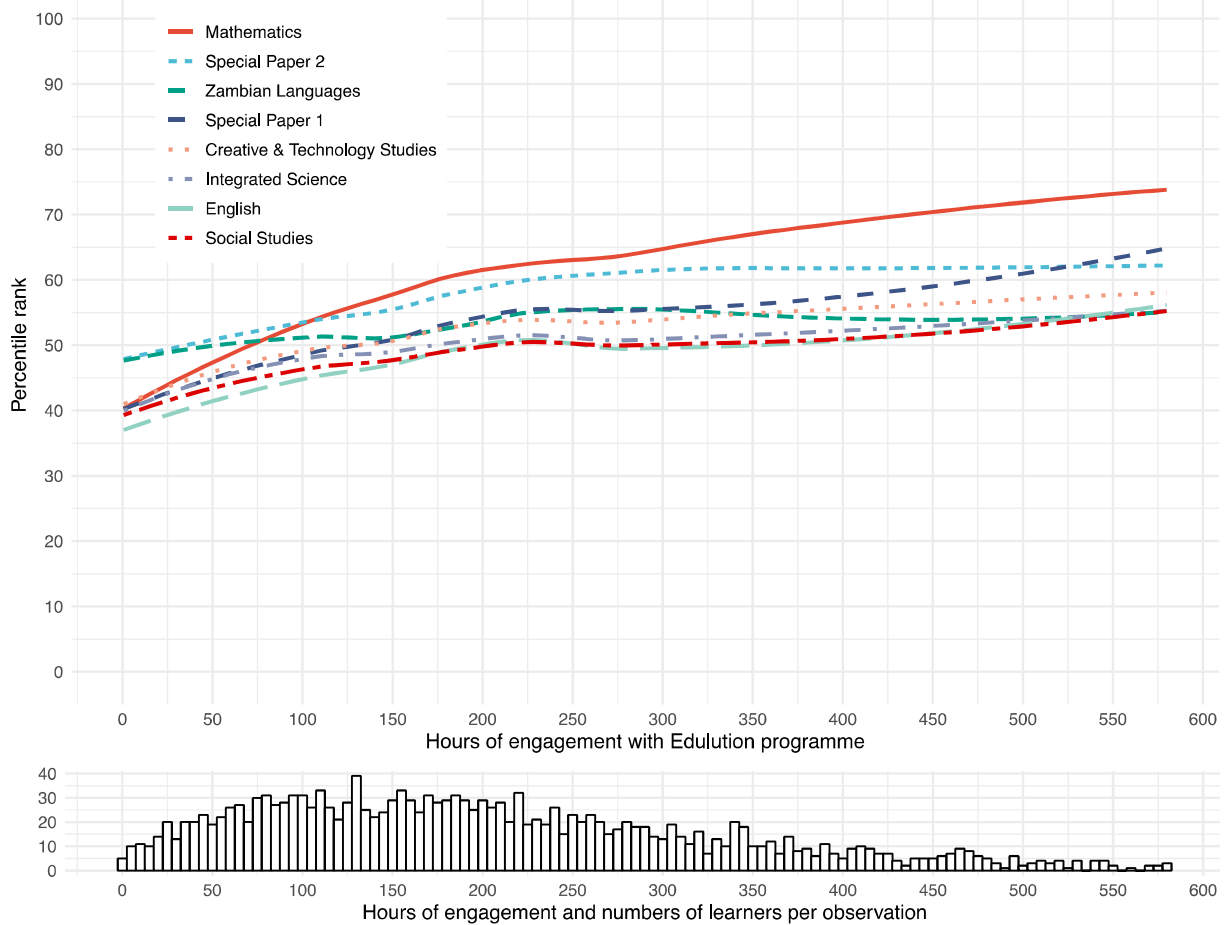
Data from 2019 in percentile ranks. N = 1369.

Compared to the other subjects, the advance of Edulution learners' scores relative to the entire cohort was most pronounced in mathematics, which underpins the positive impact of the Edulution programme (See Figure 1). The median Edulution learner was also at significantly higher percentiles regarding the Special Paper 1 and 2, Zambian languages and Creative & Technology Studies than the median learner from the entire cohort. The advance regarding the Special Papers 1 and 2, which test logical reasoning, can possibly be explained by the cross-cutting effects from the increase in mathematical skills. In contrast, no statistically significant differences were observed for the subjects English, Integrated Sciences, and Social Studies. (English literacy is a subject which has been integrated into Edulution's programme, but less than 5% of the cohort examined in this study was part of this programme).

Regarding research question 2, regression analyses suggest that the specific engagement of learners with the Edulution programme is linked to concrete improvements in their Grade 7 mathematics score. The strongest engagement predictor of learners' mathematics performance was the number of exercises. In detail, the engagement with 8 to 13 exercises in the Edulution programme was associated with an improvement of one percentile rank (drawing on robust linear regression and on lasso regression, respectively). The hours of engagement with the Edulution programme also predicted learners' success in the mathematics exams, although to a lower extent. In addition to variables related to the engagement with the programme, also socio-demographic and contextual factors were associated with mathematics performance including gender, age, type of school, and whether the learning centre was in an urban or a rural area. In detail, being older or female was associated with a lower score, as was attending a school in a rural environment or a faith-based school. (However, no causality can be implied, as, for example, it might be the case that faith-based schools operate in particularly disadvantaged areas).

Finally, we have visualised the relationship between hours of engagement with the Edulution programme and the development of learners' percentiles (Figure 2). There is a relative steep curve that indicates a strong improvement in mathematic scores between zero and 200 study hours spent in the Edulution programme (red line). The curve continues to trend upwards and learners' engagement of 200 hours and more is linked to a further improvement of percentile ranks. The percentiles reached for some other subjects also increase with the hours of engagement in the Edulution programme, most notably Special Paper 1 and 2; yet not as strong as mathematics. In contrast, the percentile development of Zambian languages is unrelated to the engagement with the Edulution programme, which makes perfect sense because the subject is not covered by the programme and it is unlikely to benefit from any cross-cutting effects from the mathematical skills development.

Figure 2: Percentiles matched with hours engaged in the Edulution Programme



Limitations

Firstly, the comparison of Edulution learners with the entire cohort of learners from the provinces in which Edulution operates was not the result of a randomised sampling process of learners or schools but drew on the existing Edulution cohort, which restricts the causal interpretation. In other words, it cannot be statistically excluded that schools which work with Edulution are generally more privileged than others and thus the learners' higher ranks could not be exclusively attributed to the Edulution programme. However, the fact that Edulution explicitly targets schools and learners in disadvantaged settings, together with the finding that Edulution learners' performance in subjects other than mathematics were much closer to the ones of the entire cohort, points to the comparability of the two cohorts. Secondly, in the regression analyses that calculated the extent to which the engagement with the Edulution programme was linked to higher percentile ranks, we controlled for some but not for all possible influencing factors. For example, we did not account for parental support, the socio-economic wellbeing of the learners' families or the cognitive capabilities of individual learners. For example, learners with higher levels of parental support, typically from families with a higher socio-economic status, could have possibly been motivated by their parents to engage in exercises and, additionally,

supported by their parents in the learning process. This means that, potentially, part of the learning gains might be attributed to other factors, such as parental support, and not exclusively to the Edulution programme.

Disclosure

The authors were mandated by Edulution to conduct this analysis. The data analysis and the development of this report was carried out independently.

Conclusion

The mathematics performance of the median Edulution learner (who worked for at least 120 hours in the programme) differs significantly from the performance of the median learner of the entire cohort, with an advance of 20 percentile ranks. This is an indicator of the Edulution programme's *efficacy*. Even if all Edulution learners are taken into account (including those who studied less than 120 hours in the programme) the difference between the median learners remains substantial, with an advance of 15 percentile ranks of the median Edulution learner. This indicates the *effectiveness* of the Edulution programme. Moreover, the engagement with a number of 8 to 13 exercises from the Edulution programme was linked to an improvement of one percentile rank in the regression analyses. Despite limitations inherent in the individual research methods, taken together, the findings permit the conclusion that learners' participation in the Edulution programme is associated with markedly higher mathematics scores in the Grade 7 exam.