Teaching literacy and numeracy in lower primary of Lessons from Central Sub Region of Uganda

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Abstract: Over a decade there is a growing of teaching literacy and numeracy in Primary Schools of Central Sub-Region Districts in Uganda. The study focused on two main components is very fundamental in education system that is literacy and numeracy. The academic performance these two in primary education plays a crucial role in obtaining further educational opportunities. Despite increased focus on addressing the inequality gaps in access to education, a number of studies have shown that children living in poor families with mothers who have low educational attainments experience less success, both in school and later as adults in the workforce, than children living in more advantaged circumstances. This paper analyses the effect of mothers' education on the numeracy and literacy learning outcomes among children in Central Sub-Region Districts of Uganda. The Learning Assessment survey, we explore the influence of maternal education on learning outcomes of the thematic curriculum in Uganda. The findings showed that the proportion of children who demonstrated the ability of competently reading and comprehending a story of primary two levels increased with increasing maternal education. Whereas only 13.6% of the primary four children whose mothers had never been to school were able to read and comprehend a story (the highest level in literacy assessment), more than four times (50.7%) of the children whose mother had above senior four qualification had similar abilities. A similar trend was seen with performance in numeracy where 31.9% of primary four children whose mothers had no education at all were able to attain the highest numeracy level, compared to 59.1% for children whose mothers' level of education. It was further observed that slightly more than one in three (35.6%) of the primary one/two children whose mothers had never been to school were completely non numerate compared to less than one in ten (9.0%) of the children whose mothers had studied beyond senior four who were non-numerate. Given the changes in access to schooling and impact on learning yielding from the global COVID 19 pandemic, whereas the data mined was collected before this pandemic, there is need for reflection on the home-schooling approach being proposed by government and other stakeholders considering that this is likely to benefit more children whose mothers have higher levels of education than those with less education.

Keywords: Maternal Education, Learning Outcomes, Numeracy, Literacy, Data Mining, Uganda

Introduction

The article examined the thematic curriculum offered as aftermath of covid-19 era in Ugandans primary schools in particular focusing on teaching literacy and numeracy in lower primary classes of Central Sub-Region Districts in Great Masaka region. The study comprehensively examined a number of Primary Schools that were implementing the thematic curriculum that involved teaching literacy and numeracy in primary schools of rural communities (Bates, 2023). The study analyzed the viability leaning materials and their outcomes of pupils in lower primary schools. The study also assessed ensures in place to instill and building a strong literacy culture in primary school classes in central sub-Region of Uganda. It also aims to provide equal access to affordable vocational training, to eliminate gender and wealth disparities, and achieve universal access to a quality higher education (Badran et al., 2023). Equal access to education opportunities, the type or quality of schooling, resourcing/financing learners' achievement in primary education in Uganda. It clear therefore that, literacy and numeracy plays a crucial role in obtaining further educational opportunities. Childhood education not only affects the achievement and happiness of a person at the individual level, but also shapes the labor force quality and capacity of innovation to determine the potentiality of the development of a nation (Leaderman et al., 2021). An academic outcome in primary education plays a crucial role in obtaining further educational opportunities. A number of studies have shown that children living in poor families with mothers who have low educational attainments experience less success, both in school and later as adults in the workforce, than children. Living in more advantaged circumstances Maternal education is a key driver of education attainment of children (Çetinkaya, 2018), (Akpan et al., 2023). It has been further revealed that the children of teen mothers who are able to go back to school and complete their education do show improvements compared to children of mothers who are unable to continue going to school (Bates, 2023). This further shows that whatever levels a mother goes back to school; her educational achievement has a direct positive impact on the learning outcomes of her children whether born to her before or after attaining higher educational levels (Akpan & Kennedy, 2020). The effect of parental education has also been found crucial in learning a foreign language. Akpan & Kennedy, (2020) studied 1352 students' performance in Iran and found that third graders whose fathers and mothers held secondary and higher education certificates performed significantly higher than those having parents with primary education in learning English as a foreign language. Against this backdrop, the team thought to mine the assessment data exploring

the effect of maternal education on the learning outcomes of learners (Felder & Brent, 2024). The Central Sub-Region Comprised of 10 districts that includes Lyantonde, Rakai, Kyotera, Lwengo, Masaka, Kalungu, Bukomansimbi,Kalangala, Gomba and Sembabule districts. It is clear the education system of Uganda entirely depends on economy, environment and political will of the government. A **MAP OF UGANDA INDICATING THE STUDY AREAS OF CENTRAL SUB-REGION**
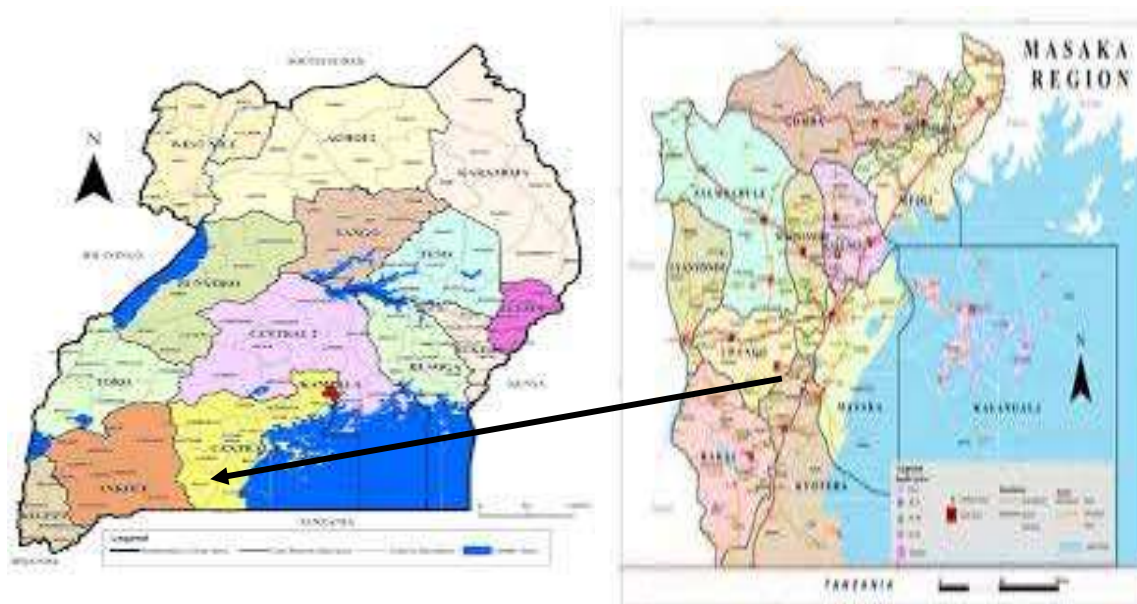
 (Source: adopted Google Maps, 2024)

Methodology

This study employed a parallel mixed methodology adopted coupled with a case research design that enabled collection of quantitative and qualitative data and arriving at in-depth of the ultimate reality of the study variable under investigations. This paradigm shift is suitable and explains the source of data, the analytical framework and data analysis (Lüdtke et al., 2023), (D. L. K. F. N. Ahmed, 2023). The study carried out two sets of data from primary sources the primary schools in the Central sub-region of Uganda Learning Assessment (A. Ahmed, 2022). The entire study covered eighth learning assessment literacy and numeracy that was successfully undertaken in 324 sampled primary schools from a total of ten (10) Districts s in August, 2024. The survey conducted engaged research preventative scientifically selected to represent the rest of rural primary schools. The study sampled consisted of primary data from 950 research assistants areas, involving into the survey Primary Schools. The study section of the data set engaged with 45,676 Children and the second set involved of whom 29,430 were aged 6-16 years. The entire survey study engaged these, 8,372 respondents were in primary one and two (P1-P2) and 3,405 in primary four (P4) respectively. All these were drawn for assessment analysis is based on the scientific sampled techniques Primary Schools within Central Sub-Region Districts of Uganda. The reason for selecting those in the primary one and two was that a lot of work has been emphasized at these lower class levels where thematic curriculum is implemented. The thematic curriculum has a competence based integration grounded into the pedagogy practices literacy and numeracy activities (Republic of Uganda, 2020). The selecting out the primary four children is because this is the class of transition from the lower primary thematic curriculum to a more subject-based curriculum with a focus on use of English as the language of instruction in primary Schools of Central Sub-Region Districts of Uganda

The findings from these representatives were Based on the Ugandan education system, age six (6) is the official age of entry into primary one classes and if the learner went through the system without disruption, then they would be in senior four at the age of sixteen years. However, due to other factors (like working mothers, household poverty, distance to the nearest primary school), children's age of entry in school varies whereby some children begin Primary one as early as 6 years and others begin late at the age of 8 years while other repeat classes (Payleitner, 2020), (Experts, 2022)

The assessments aim at generating evidence on learning outcomes in basic literacy and numeracy that can be used to influence policy action, reforms and practices towards improving learning outcomes. The survey involved assessing all children regularly residing in the household whether in or out of school using a simple primary 2 test in literacy and numeracy as well as collecting background information on the children and household. Data on selected was collected including that on the quality of drinking water, health and nutrition. Detailed explanation on the methodology can be obtained from eighth learning assessment report (Aliev et al., 2019)

The assessment tests in literacy and numeracy are benchmarked against the Uganda Primary 2 curriculum. While developing tests competencies in order of increasing difficulty are distinguished. For the literacy, tests assessed a child's competence by determining their ability to; recognize alphabet letters recognize and read commonly used words, read a short sentence and their ability to read a

short story and comprehend it (Experts, 2022). The numeracy test assesses basic skills in terms of counting and matching, number recognition, operations with whole numbers and every day mathematics in form of word problems. During the assessment, each child is graded according to the highest level achieved. However, it is notable that, both fundamental competencies, non-reader and non-numerate levels are established to categorize children who are unable to recognize letters of the alphabet or count and match and are regarded the lowest gradable level. The mined data categorizes the different learners by their level of performance in both literacy and numeracy.

Data analysis

The analysis compared learning outcome assessment among children in primary one and two combined and those in primary four with maternal education. At the bivariate level the final learning outcome of the child either in literacy or numeracy was cross-tabulated with the maternal education (Comber & Brunsdon, 2020). To show the differences in the learning outcome, more emphasis for literacy was placed on those who attained the story reading and the non-literate while for the numeracy, emphasis was placed on non-numerate and those able to do division (Experts, 2022). An unadjusted binary logistic regression in which mothers is education was the independent variable while ethno mathematics and the three bonus questions were the dependent variables was run. The results are presented as odds ratios with the corresponding significance levels.

The binary logistic regression model takes

According to (Cotton, 2024) documented and undocumented daily experience shows that the impact of family socio-economic status on children's academic achievement is not direct, but rather through the following two paths. First, families with relatively high socio-economic status will strive to secure quality educational opportunities for their children. Such opportune moments provided by key rural primary schools and markets in the system, this in turn will influence their academic achievements positively. Secondly, these key schools are the ones with excellent teachers. In turn, these learners not only have a direct impact on learning outcome but are also affected by the learning attitudes and behaviors through teachers and peers (A. Ahmed, 2022). The result is that better future learning outcomes and further educational opportunities. Thirdly, family socio-economic status affects children's learning behavior and academic performance by affecting parents' educational expectations towards children and their educational participation. Parents' educational expectations and behavioral support for children are, to a certain extent, also affected by their socio-economic status, resources availability and parents' ability.

This analytical framework is a slight modification from (Barton & Woolley, 2017). Based on existing literature, this paper, has mined the (Brymer, 2022). Uganda data to try and explain the learning outcomes of children based on their mothers' level of education (maternal education). Whereas the formulation of this analytical framework used data from China, a country with different socio-economic and demographic characteristics to Uganda, it is very practical to the Ugandan situation.

The analytical framework for this paper is displayed

The framework shows that the outcome for this analysis is learning competency in numeracy and literacy. There are direct and indirect factors that affect the learning outcomes of children in the central sub-region of Uganda. Those that affect the child directly include the child's learning behavior, parents' educational participation, and educational opportunities available (Cotton, 2024). On the other hand, family social economic status is a background factor which can go through any of the three to affect the learning outcomes, for example, if the family belongs to the lower social economic status (SES), it may be hard in the era of online learning to afford a computer/tablet or smartphone (Leaderman et al., 2021). Lack of the any of these gadgets may impair a brilliant learner from achieving their potential. This analytical framework has not been implemented fully in this paper because not all the variables can be found in the dataset for example child learning behavior since assessments do not collect data on child learning behavior or differences in educational opportunities. Little information is available on parental participation.

Results of the study

In order to understand the effect of education on the child's learning competences, mothers' level of education was categorized into six groups. Those who had never been to school at all, those who stopped in lower primary (primary one to primary four- P1-P4), those in upper primary (primary five to primary seven- P5-P7), those who never completed secondary, (senior to senior three- S1-S3), those who completed ordinary level (senior four- S4) and those who were educated beyond senior four and above S4. The study shows the distribution of learners in P1-P2 and P4 by their mothers' educational level.

The distribution of children by maternal education shows that most children, had mothers who had acquired upper primary education. The findings also indicates that one in every five children (20.8%), had mothers who had never been to school. On the other hand, slightly more than one in four, had mothers who had stopped in lower primary (27.2%). Less than 20% of the children had mothers who were educated beyond primary seven (S1-S3 8.8%, S4 4.9%, and above S4 2.3%). These results have a lot of implication on the performance of children. This needs deeper reflection more so in the light of the education sector response to the Covid-19 pandemic in which home schooling and learning materials are being distributed and parents are expected to assist their children learn at home (Republic of Uganda, MoES, 2020). Whereas some schools have been allowed to open, home schooling is going to take become another way of instruction even after Covid-19 comes to the end. The survey of 2024 assessment of learning outcomes in numeracy and literacy among children aged 6-16 years was benchmarked on primary two standard works.

Literacy Outcome for P1-P2 and P4 children by Maternal Education

Findings of the study displays the proportion of children aged 6-16 years in P1-P2 combined, and those in P4 who were categorized as non-readers and could hardly read anything from the tasks given. A non-reader in this context implies a child with hardly any

mastery of reading (Patay-Horváth, 2023). Among the primary one and two children, the proportion of those who could not read anything was highest among children whose mothers had never acquired any education (52.5%) and lowest among children whose mothers had above senior four level of education (13.3%). The same trend is observed among the primary four learners, were about 8.3% of the primary four pupils whose mothers had never been to school were classified as non-readers while just 3% of the those whose mothers had been educated above senior four were classified as non-readers. The ability to read a story was the highest level that would be reached by a learner in relation to the literacy assessment. Results indicate that less than one percent of children in primary one and two whose mothers had never been to school were able to read a primary two story. However, this proportion grows exponentially as the mothers' education increases. Slightly more than one in ten children in primary one and two were able to read a story whose mothers had above senior four level of education (Açıkgöz & Acar, 2022). Looking at primary four children overall 7.1% of children were categorized as non-readers. However, the category of children contributing most to this result are children whose mother had never attended school (8.3%), those whose mothers stopped in lower primary (7.6%), and those whose mothers were in upper primary (7.5%). It is surprising to note that only 13.6% of the children in primary 4 whose mothers had never been to school were able to read a primary two story. On the other hand, one in two of primary four pupils whose mothers had an education level of senior four and above were able to read a story.

Results regarding numeracy are not different from those of literacy except that if one draws a trend line, the gradient for literacy will be stiffer than of numeracy. Among P1-P2 children whose mothers had never been to school, 35.6% did not reach the lowest numeracy level that required counting and matching numbers (0-10). This proportion declines gradually among children whose mothers had lower primary (30.5%), upper primary (26.1%) to the lowest proportion among those whose mothers had been educated beyond senior four (9%).

Among P4 children whose mothers had never been to school, the trend is not smooth (Bates, 2023). However, there is a lot to note. None of the P4 children whose mothers had education above senior 4 was at the non- numerate level. Overall, about one in thirty among P4 children can be classified as non-numerate. The proportion of non-numerate children being high among mothers with upper primary education being higher than that of mothers without any level of education or lower primary is a surprise and requires further investigation. This can be by looking at data for others years to see if a similar trends or results will be noticeable. However, though the differences are observed, they are not statistically significant.

Numeracy Outcome for P1-P2 and P4 Children by Maternal Education

While reading a story and answering the comprehension questions is the highest level in literacy, division is the highest level of numeracy assessed by (Machiavelli et al., 2023). Among the primary one and two children, there was a gradual rise in the proportion of children who reached the division level. Among children whose mothers had never been to school, about one in twenty-five (4.2%) reached the level of division while among those whose mothers had been educated above senior four, slightly more than one in ten was able to reach this maximum level. This is similar to what was observed in relation to performance in literacy (12.3%) and numeracy (12.9%), that is, slightly more than one in ten of the primary one and two children were able to carry out division and story reading tasks.

Among the primary four children, a reasonable number reached the division level irrespective of the mothers' level of education. However, there are still noticeable differences. Whereas 31.9% of children whose mothers had never been to school were able to reach the division level, this raises to almost double (59.1%) among children whose mothers had acquired education above senior four in Central Sub-Region Districts in Central Uganda.

Ethno mathematics and additional questions

In addition to literacy and numeracy, there were four additional general knowledge /problem solving questions that are asked of every child being assessed (Lynch et al., 2024). The Ethno mathematics question and a set of three additional general knowledge questions which needed logic and application of day to day experiences in problem solving including identifying and naming shapes were further administered to the children. The bivariate analysis between these four additional questions and maternal education is displayed in the study findings.

Performance outcome in Ethno Mathematics

In relation to ethno mathematics, the proportion of those who could do the ethno mathematics question did not follow a specific pattern. Nonetheless, there is some evidence to suggest that the higher the maternal education the higher the proportion of those who could do the ethno mathematics tasks (Machiavelli et al., 2023). The results for the set one and set three question which was concerned with the identification of objects showed a similar pattern with ethno mathematics but at lower proportions. For example, 62.2% and 46.8% compared to 65.6% and 58.9% of the children passed ethno mathematics and set one question among mothers with no education and those above senior four levels respectively. Performance on the two problem solving questions which mostly assessed logical reasoning reveal that maternal education has an influence on the children's abilities (Dubeck et al., 2021). This revealed the largest percentage points gap of between 28% and 40% in this category of questions whose mothers had never been to school and children whose mothers educated beyond senior four.

Binary logistic regression

In order to explain further the differences in the performance, we carried out an unadjusted logistic regression with maternal education as the independent variable and Ethno mathematics and additional questions as the dependent variable. The results are

displayed in the findings of the survey. Children whose mothers had never been to school were taken as the reference category. The performance in ethno mathematics by P1-P2 children and that of P4 children reveals some interesting results different from those observed as the bivariate level. For the P1-P2 children, considering those whose mothers had never been to school, significant differences in performance in ethno mathematics are observed after the mothers who completed primary school. The implication is that performance in ethno mathematics does not differ among children born to mothers who have never been to school and those in lower primary and upper primary though still results shows that even the little education received is important (Felder & Brent, 2024). Results are statistically significant when between children whose mothers have never been to school and those with above primary education. Among the primary four children, a significant difference was only observed among the children whose mothers have higher education that is above senior four (p=0.004). The meaning for this is that in primary four, performance in ethno mathematics does not vary much by the maternal education especially that this was primary two standard questions.

For the additional general knowledge questions revealed, children in primary one and two showed that they comprehended these questions better when mothers had some level of education than their counterparts whose mothers have never been to school. The odds ratios from the logistic regression show that the higher the maternal education the higher the ratios implying that as the maternal education increases, the better the performance even in the general knowledge /problem solving questions (Experts, 2022).

On the other hand, little difference is observed in the learning outcome between a mother who has never been to school and those with lower primary education among the primary four children. In general, irrespective of the class of the child, little difference has been observed on these set of four questions, no differences were registered between children born to mothers who have never been to school and those who stopped in lower primary. Overall major differences in learning outcomes are observed among children when mothers are beyond primary.

Discussion

The research question to be answered by the study was "Does the performance (literacy numeracy and ethno mathematics) of learners in primary one (P1) / primary two (P2) and learners in primary four (P4) differ by maternal education of the mother". Awan (2013) says that education is the most important factor which plays a leading role in human resource development (Education, 2021). It promotes productive and informed populace and creates opportunities for the socially and economically deprived sections of society. Numerous studies such as Gooding (Thompson & Weisbrod, 2023)have revealed parental education more so maternal education to be a strong predictor of children's education and behavior outcomes. With 22% of Ugandan women compared to 16% of men having no education (Uganda Bureau of Statistics- UBOS, 2017), it is worth investigating the effect of maternal education on learning outcomes of children. Mining the Uwezo Uganda data is one way in which this effect has been demonstrated in light of using evidenced based results. Mining the Uwezo Uganda data has been able to show that in terms of education outcome, children whose mothers have never been to school and those with lower primary are among most vulnerable. If the country is to get out of illiteracy and innumeracy to achieve SDG 4, there is need to come up with a special program to assist these children. There will be no development if these children are not assisted and as a country, it is the beginning of dualism. Similarly, according to Hernandez and Napierala (2014), policies and programs aimed at increasing educational and economic opportunities usually target the less advantaged especially those with low income (Badran et al., 2023). These analysis shows that not only poverty should be targeted but that is just part of the problem hence the need to look at other factors like parental education especially maternal education. Educational programs that aim improve education outcome by targeting the poor but not looking at the entire child will yield limited impact or take long to be realized without consideration of developing policies that promote women's education (Harper et al., 2018). To focus simultaneously on both children and mothers will foster long-term learning and economic success for low- income families. Improving the maternal education should be the best way to improve learning outcomes of children. This will therefore bring in another aspect; how do we maintain children in the school especially the girl child in the era of universal primary education and universal secondary education. There is need to brake this cycle if Uganda is to develop.

Whereas the study was conducted in 2018 just before COVID19 pandemic, there are a lot of lessons that can be learned in this new normal, especially in Uganda which has had long period of school closure. Since the beginning of Covid19 (March 2020), the government has been encouraging home schooling for learners due to the lock down of country. Considering the importance of maternal education and with over 80% of the children in Uganda. The study find out that people who have not gone beyond primary seven, this cause a lot of concern finding out the numeracy and literacy levels in central region of Uganda. The lower levels of maternal education make it had for the parents especially the mothers to guide the children.

Conclusion

In mining the data, we have been able to explore the effect of maternal education on child performance by looking at the literacy and numeracy outcomes of children. We have explored the three areas of assessment done in the survey that is literacy, numeracy and comprehension. The results from the mined data show that as maternal education increases the likelihood for the child to reach a higher level of assessment increases.

There were two hypotheses to be tested based in this paper. The first one was that there is no difference in literacy, numeracy and ethno mathematics among P1/P2 learners by maternal education. Results presented in Table 2, 3, and 4 and figures 2a, 3a and 3b showed that performance among the P1/P2 pupils varied by the maternal education. We therefore reject the null hypotheses and accept the alternative that there is a difference in the P1/P2 pupils in literacy, numeracy and ethno mathematics by the maternal education.

The second hypothesis was that there is no difference in literacy, numeracy and ethno mathematics among P4 learners by maternal education. Like the first hypothesis, results presented in Tables 2, 3, and 4 and Figures 2b, 3b, and 4b show that the performance among P4 learner varied by maternal education.

Recommendation

The article recommended that, data mining and utilization in the ministry of education and sports to inform the education and other relevant stakeholders. The source of data for this paper was the annual learning assessment, conducted in 2024. However, Uganda has more than datasets each having more than 80,000 learners. This is a big resource which researchers have not yet exploited to explain different reasons for declining levels of education in Uganda. Uganda should try as much as possible to popularize this data to the general public including researchers, academicians and policy makers since it is easily available free from. This data can be mined for further analysis and will generate a lot of knowledge for the country.

Additional analysis: More data mining to look at maternal education controlling for other factors like household socio-economic status, rural–urban residence and should be carried. Another study can mine the performance of children living with their biological mothers controlling for maternal education with those not living with their biological mothers.

Government policy: Data was collected on child attendance of Early Childhood Education. This is in line with the government policy on promoting Early Childhood Education. Data can be analyzed further and provide critical insights which can be used to inform policy. Similarly, further analysis of this data can be used to report on the Primary School. There is need for further analysis on learning outcome to inform policy and make meaningful decisions in this regard.

This study has demonstrated the importance of maternal education, the government through either the Ministry of Education and Sports or Ministry of Gender Labour and Socio Welfare should resume adult studies that used to take place in the 1970s. However, these adult studies should target the use of technology to help parents, especially mothers. It can cover basics like creating and having an email, how to use online platform and so on. There were some important variables which could enrich analysis. We are proposing that one or two questions can be added to the assessment tool to enrich this analysis like mother female caretaker occupation. This is because an educated working mother may not have enough time to be with her children like an educated mother who is not working.

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