

**AN INVESTIGATION INTO THE SCHOOL INFRASTRUCTURE AND
PREPAREDNESS IN IMPLEMENTING THE PROPOSED GOVERNMENT TABLET
PROJECT FOR STANDARD ONE PUPIL'S : A CASE STUDY OF KINANGOP SUB
-COUNTY, NYANDARUA COUNTY, KENYA**

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ABSTRACT

The Government, in 2013, proposed to implement a tablet project for ICT integration in education so as to improve the quality of education in Kenya. The study therefore sought to establish the viability of this project by looking into whether teachers had the necessary ICT skills and the availability of the necessary infrastructure. The study concluded that primary schools in the Sub-County had adequate storage facilities. It was also established that all schools within are connected to mains electricity and the study concluded that the internet connectivity was poor in over half the schools. The study also noted that teachers in primary schools had ICT skills but there is need to further train teachers to enhance teaching and learning, and to raise education standards. The lack of ICT skills, time and disinterest in ICT needs to be addressed to improve the perception and attitudes of teachers towards ICT use

Keywords: ICT infrastructure, storage, tablet, internet connectivity, electricity, teacher preparedness

1.1 Background of the Study

According to Farrell (2007), Kenya promulgated a National ICT policy in January 2006. Its primary aim was to improve the livelihoods of Kenyans by ensuring the availability of easily accessible, efficient, reliable and affordable ICT services. He adds that the MoE developed the Kenya Education Sector Programme (KESSP) in 2005 that featured ICT as one of the priority areas with the aim of mainstreaming ICT into the teaching and learning process. Gakuo (2010) concurs by saying “Kenya has placed emphasis on the importance of ICT in the Education Sector Support programme (KESSP) and National Strategy for Education”. According to Makori (2012), in the knowledge based economy of the 21st century, ICT is one of the emerging factors that have not only great and growing influence in the society, organizations and institutions but also all aspects of people’s lives. It is also the prime motivation behind the change in scholarly and professional activities in higher education and thus integrating ICT in teaching and learning is a priority in Kenya’s education reform agenda.

ICT is often seen as an indispensable tool in imparting knowledge in the society as confirmed by Leach (2005), who states that “ICT is an essential aspect of teaching, affording new and transformative models of development that extend the nature and reach of teaching and learning wherever it takes place”. For developing countries, it has been seen as a way to integrate into the increasingly globalized world. To achieve the goal of integrating ICT in teaching and learning, the Ministry of Education and Technology has partnered with New Partnership for Africa’s Development (NEPAD) and other agencies and institutions like e-schools, Computer for Schools (CFSK) and Kenya Cyber Schools so as to implement ICT in education. In 2009, the Ministry of Education (MoE) launched the Computer for Schools programme whereby five public primary and secondary schools in every district were financed to purchase and install ICT facilities as well as train the teachers in ICT integration

in education. The programme was supposed to go on until all public schools embraced ICT in education. Unfortunately this has not been accomplished.

The current Jubilee Government has pledged to enhance ICT in education by providing a tablet to every pupil joining class one with effect from January, 2014. This was said by the President of Kenya, Uhuru Kenyatta, in his inaugural speech to the nation. This is expected to go on for the next eight years until all primary school learners are exposed to e-learning. This is a very noble idea which, if properly implemented, will vastly improve education quality and standards. Due to the importance of ICT in society, and possibly in the future of education, it is necessary to find out how prepared schools are to embrace the tablet project before it is rolled out. Balanskat, Blamire & Kefal (2006) argue that “although educators appear to acknowledge the value of ICT in schools, difficulties continue to be encountered during the process of adopting the technologies”. This has led to low or no use of the ICT by administrators, teachers and pupils. Some of the difficulties leading to this fact include wanting security measures in many schools coupled with poor ICT skills among the teachers. Unreliable internet connectivity is another difficulty. An EMIS survey (2003/2004), by the MoE indicated that 70% of primary schools lacked functional telephones because many parts of Kenya and thus had no internet connectivity. Mwangi (2011) identifies a number of infrastructure challenges ICT in education in Kenya.

These challenges include lack of qualified teachers, insecurity, and lack of or slow internet connectivity, and inadequate storage facilities for the devices. There is also fear among many teachers that computers will render them irrelevant in class, coupled with lack of initiative the community around the schools.

In Africa, there are some countries like Rwanda which have already embraced e-learning by implementing the One Laptop per Child (OLPC) Project. Bakuramutsa (2012), states that “the project was first piloted between 2008 and 2009, with ten thousand laptops distributed to

pupils in P4, P5 and P6. In 2010, another one hundred thousand laptops were given out. Out of these, sixty five thousand were distributed to pupils in P4, P5 and P6 pupils in one hundred and twenty schools”. Seventy more schools had been supplied with another 35,000 laptops by June 2013. By August 2013, four hundred schools had benefited from the project. He adds that it was projected that by 2017, about half a million laptops would have been distributed to pupils across the country. The ultimate goal was to reach all one millions pupils between P4 and P6.

Bakuramutsa (2012) goes on to state that implementing the One Laptop per Child in schools was a real process. To start with, the schools were fitted with electricity as it would be required to power the laptops. Those schools that were far away from the electricity grid were fitted with solar panels. Secondly, the schools were connected to the internet and a wireless local area network. The connectivity enables learners to download the Rwanda curriculum, e-books and other learning materials to improve their skills. Teachers were trained in ICT skills to enable them teach using the laptops. In each school, the head teacher and one teacher were trained for one week in Kigali. For the first two days, the teachers were taught how to use the computer while the other three days were used on teaching the methodology of teaching using computer while the other three days were used on teaching the methodology of teaching using computers. These trained teachers were supposed to go and teach all the other teachers in their schools and thus to ensure that all the teachers had the necessary ICT skills (Bakuramutsa, 2012).

Afterwards, each school was visited by One Laptop per Child Team who worked with the teachers and pupils for five days. One of the five days was spent on community sensitization. The community was told why laptops were put in the schools, the impact they should have on the pupils and why it was important for Rwanda to embrace e-learning. This sensitization enabled the community to own the project. The One Laptop per child project has enabled

teachers to enhance the understanding of the concepts so that learners can focus on innovation and creativity. This kind of learning is known as constructionism or learning by doing (Bakuramutsa, 2012). Judging by the success of the Rwanda One Laptop per Child Project, it is clear that with proper planning, the tablet project is viable. Kenya should learn from Rwanda by providing the infrastructure, and ensuring the security of the tablets. The community should also be sensitized on the importance of the project so that they can understand and own it. Adequate funds should also be set aside for the project as it is very expensive. It is also necessary for the project to be rolled out in phases until all pupils throughout the country are provided with tablets for e-learning. This will raise the quality of education in Kenya and also ensure equity in the education system.

In Kenya, the Kilgoris Kindle Project is an example of ICT in education. The project was started by Jon McCormark and his wife Caren when they toured Kenya. They met a Kilgoris villager and gave him a donation of four schools, multiple churches and a tea farm later. The Kilgoris Project provides education and food to the children of a Maasai village in Southwest Kenya.

It operates schools, provides food and clean water in partnership with the community. The aim is to foster economic development in the area (McCormark, 2012). He states that the Kilgoris Project operates five schools which have a population of 450 pupils. Previously, the pupils had no access to text books as they had no library. They had very few textbooks, and thus the project solved this problem in 2012 by partnering with World Reader and rolling out kindles in one of the schools. The kindles have been integrated into the daily routine in both kindergarten and elementary classes. This has enabled the children to read more and to post better grades, to the excitement of their parents. As a result of this, there has been a rise in the school enrolment. In June 2012, the population stood at 208 pupils but by 2014 it had risen to 360 pupils.

The Kilgoris Project has uploaded African textbooks (in English and Kiswahili) onto the kindles for the children to read. Previously, many of the children had never seen a textbook. As more books are brought and translated, they are uploaded onto the kindles every year. World Reader, in conjunction with local Kenyan publishers, ensures that the books contain content that is relevant to the learners. The kindles have enabled the pupils to access and read very many English and Kiswahili books. Consequently, the quality of the education that they get has improved leading to better academic performance. Many of the children have been able to join various professions.

1.2 Statement of the Problem

The fundamental problem motivating this research was the urgent need to understand how viable the Government's tablet project for all children joining class one in public schools really was. Given is beginning to embrace ICT use, the study sought to look into whether or not the government was ready to take this step and if so, what benefits the country will reap from the use of ICT as we move towards achieving Vision 2030. Although the tablet project is noble in improving the quality of education in Kenya, certain issues need to be addressed before it can be successfully implemented. These issues include establishing whether schools in Kinangop Sub-County have the necessary infrastructure like classrooms, storage rooms, electricity, internet connectivity as well as security.

1.3 Objectives of the Study

The study is based on the following objectives;

- i. To establish whether there was sufficient storage space for the tablet project in public primary schools in Kinangop Sub-County.
- ii. To investigate the availability of electricity connectivity in primary schools in Kinangop Sub-County.

- iii. To assess the availability of internet connectivity in public primary schools in Kinangop Sub-County.
- iv. To explore the teachers' ICT skills, perceptions and attitude to embrace ICT in the teaching and learning process in schools within Kinangop Sub-County.

2.1 Literature Review

2.1.1 Meaning and Importance of ICT

The term Information and Communication Technology (ICT) refers to any communication device or application which include radio, television, cellular phones, computer (laptops, desktops), network, hardware and software, software systems, as well as the various applications associated with them such as videoconferencing and distance learning. ICT is a combination of computer and communication representing a wide spectrum of devices and techniques (Unwin, 2009). It involves manipulating information outside the human brain, which includes computers and software peripherals with a wide spectrum of devices ranging from optical fibers to communication satellites (Edalia, 2002). The MoE has an ICT policy which affirms that use of ICT in education and training systems prepare learners and policy makers to actively participate in a technologically competitive environment. The purpose of providing learners with tablets is to expose them to e-learning.

In this study, reference was made to ICT, e-teaching and e-learning as these would go hand in hand with the tablet project. The term e-learning, according to Adrich (2004), is a broad combination of processes, content and infrastructure to use computers and networks to scale or improve one or more significant parts of a learning value chain, including management and delivery. Sanjaga (2008), states that electronic learning or e-learning is a general term used to refer to computer enhanced learning. From these definitions, one can rightly say that the tablets are meant to be used to expose the teachers and learners to e-learning so as to help

them fit and compete in the global market. They will be able to access knowledge and information from any part of the world which, courtesy of ICT, has become a global village.

2.1.2 Infrastructure

Infrastructure refers to the different items and factors that are necessary to actualize an idea or concept. The importance of having enabling infrastructure cannot be overstated when discussing the roll out of tablet computers in a third world country such as Kenya.

The availability of items such as storage facilities, availability of electricity to power or charge the devices and the availability of reliable internet connectivity are all central to the successful rollout of the tablets within Kinangop Sub – County.

2.2.2 Storage

The success of ICT based projects, according to Al-Moibadeen (2009), depends on the recognition of the need to understand innovation, identification of the need to recognize and effect cultural change and provision of comprehensive staff development and support structure. Normally, the decision to adopt the innovation tends to start with unrealistic optimism, followed by hasty and widespread adoption (Maddiex and Cummings, 2004). As a result, the innovation fails to meet the initial expectations leading to premature abandonment (Makori, 2012). Ogembo, Ngugi & Pelowski (2012) add to this by stating that although computerization is viewed as an efficient solution to many of the problems facing the developing countries, those people and organizations participating in school computerization programs often have not considered the contextual questions surrounding this endeavor. They identified the following issues; which problems rural schools want to solve with computerization, and whether the schools have the necessary storage infrastructure. They further state that in a survey they carried out among 37 rural primary schools in the former

Nyanza Province, there was inadequate infrastructural preparedness in that there was no classroom computer space, few desks, no secure walls and no protective roofing coupled with the lack of sufficient storage space for the tablet devices.

2.2.3 Availability of Electricity

With an ever increasing need for electrical devices in everyday life, the need for electricity within the schools that are set to roll out tablet computers. The tablet computers require to be recharged every now and then, and this can only be possible with a reliable electricity connection to the schools. The Government of Kenya has made major strides in electrifying rural areas but there still exists major gaps that must be address before the roll out of the tablets by the Government. Mwangi (2017) contends that given the investment required to facilitate electricity to schools, the use of ICT is unlikely to be as cost effective as spending on teachers to reducing class sizes.

2.2.4 Internet Connectivity

Effective introduction of technology into schools is largely dependent upon the availability and accessibility of ICT resources and facilities such as hardware, software and communications infrastructure. The type of ICT available in the country in general and in the educational system at all levels and these include computers in schools, communities and households as well as affordable internet services and internet connectivity. With a number of fiber optic cables having landed in Kenya and the subsequent rollout of a national fiber backbone by the Government owned Telkom Kenya, there is a concerted effort towards

bringing internet connectivity to both urban and rural area in the country, and this will go a long way towards making internet connectivity available and affordable.

2.3.1 Teacher Preparedness

2.3.2 ICT Literacy Skills

The ICT literacy levels among teachers might present a challenge to the tablet project. Some teachers lack ICT skills and it might take a very long time for them to learn computer packages before they can be trained in e-learning and e-teaching. The trainers should not assume that all teachers are computer literate and rush to e-learning. This was the case during the training of teachers in the Computer for Schools Project funded by the Government through KESSP in 2009.

The ICT champions failed badly where teachers had no basic ICT skills and this led to the failure of ICT integration in education by some teachers. The training should be teacher-centered so that individual teachers start at their own level. Tinio and Victoria (2008), state that “teacher professional development should be oriented towards application of skills and curricula changes related to the use of ICT”. This, they add, “should be done in pre-service teacher training and built on and enhanced by in-service programmes”.

The study explored teachers’ skills and experience with using ICT, and their use of ICT, their use of ICT in the classroom and its impact on the learners’ performance and why some teachers do not use it yet the facilities are available in their schools. Owing to inadequate research on the tablet project, even before it has been implemented, there is a lot of criticism directed to it. Findings of a study conducted in Tinderet Sub-County by Tinoi, Kerich & Koross (2016) revealed that teachers lacked computers for ICT integration in education. However, they add that even where computers were available; there was lack enthusiasm or goodwill by teacher to make use them. There are also no procedures for monitoring and evaluating teacher’s use of ICT in curriculum management. These findings are similar to

Farrell's (2007) contention that there was lack of a clear purpose for the use of technology in teaching and learning. This could be the reason behind teacher's failure to use the ICT facilities in schools where they are already in place through the Computers for Schools project.

2.3.3 Teacher Perceptions

There are internal factors in a school that have influence on teachers' use or lack of use of technology in the classroom. Perception and beliefs about ICT and their motivating effects, teacher literacy and confidence levels, pedagogical expertise related to technological use, and the role of the teacher in education (Hennessy, Harrison & Wamakote, 2010). A study by Andoh (2012) revealed that teachers' skills and perceptions were related to their use of ICT in resource planning. The more skilled teachers were in ICT, the more likely they were to use it.

2.3.4 Teacher Attitudes

Kandiri (2012) states that teacher age had an impact on the probability of teachers using ICT in class. Teachers who were trained before the .computer era are not very likely to embrace e-teaching. He adds that probably teachers could integrate and share ICT if professional training was provided to them with ample time to learn, share, practice and collaborate with colleagues. A report by the Ministry of Education Science and Technology on secondary school teachers' adoption and use of ICT indicated that teachers hardly used ICT as a result of low or lack of IT skills among them (GoK, 2010).

The report states that many schools face a challenge of shortage of ICT teachers and other ICT professionals that support adoption and use of ICT. This was attributed to the fact that well trained ICT teachers leave the schools for the private sector which seems to pay higher salaries. According to a report by NEPAD (2015), teachers' attitude towards ICT is brought about by factors like their competency, skills, knowledge and perception. Research suggests

that teachers' perception influence successful implementation of ICT in schools (Keengwe and Onchwari, 2011).

3.1 Research Design

In this study, the researcher was interested in finding out the viability of the tablet project with effect from January, 2014 which involved the exploration of various variables. To attain this, the descriptive survey design was used as it allowed the researcher to administer questionnaires and interview schedules to gather data from the respondents.

3.2 Location of the Study

Kinangop Sub-County is in Central Kenya. It is about 70-100 km from Nairobi along the Nairobi-Naivasha highway. The target schools are between Soko Mjinga market along the Nairobi-Naivasha highway and Njabini along the Fly-over Engineer road. The area is known for high yields of vegetables, potatoes and milk, with the weather being very cold.

3.3 Target population

The study was carried out in public primary schools in Kinangop Sub-County, Nyandarua County. Data was collected from head teachers, teachers, School Management Committee members and parents. Since it was not be possible to collect data from everyone, a 20 percent sample was obtained from each group of the target population. In Kinangop District, there are 43 public primary schools with 43 has head teachers, 344 SMC members as each public primary school has eight and 467 teachers. The total target population was 854 persons excluding the parents who are very many as there are 24,633 pupils. Each public primary school has 8 SMC members; hence 344 SMC members are among the target population. The head teachers are 43 while the teachers are 467. The parents are very many and so simple random sampling was used to identify 100 parents. Thus, the target population was 954 persons.

3.4 Sampling Procedure

In identifying the schools and population from which to collect data, both simple random sampling and the systematic random sampling techniques were used. The systematic random sampling technique was used to identify the schools. From the identified schools, data was collected from the head teachers and SMC members. To identify the teachers and parents to collect data from, simple random sampling technique was used as it gave every member of the population an opportunity to be selected. A sample of 20% of the target population was used. This percentage is higher than the 10% minimum sample size recommended for Social Science Research (Mugenda, 1999).

3.5 Research Instruments

According to Mugenda and Mugenda (1999), in social science research, the most commonly used instruments are questionnaires, interview schedules, observation forms and standardized tests. In the study, the researcher used questionnaires and interview schedules to collect data from the respondents. The head teachers, teachers and SMC members were given questionnaires to fill while the parents were interviewed as some were illiterate or semi-illiterate.

3.6 Data Collection Procedure

After the proposal was approved, the researcher obtained a letter of introduction from the Dean of the Faculty of Education. This helped her to get a research permit from NACOSTI to undertake research from the sampled schools and other respondents during the period of the research. The researcher also visited the schools and requested the head teachers to assist her get in touch with the SMC members and teachers to collect data from. She distributed the questionnaires to them and collected them at the agreed time. She visited the local shopping centers, markets and homes looking for the parents. On getting one, she sat down with him or her administered the interview schedule and recorded the data.

3.7 Ethical Considerations

According to Mugenda and Mugenda (1999), ethics has been defined as that branch of philosophy which deals with one's conduct and serves as a guide to one's behavior. In research, this calls upon the researcher to be a person of integrity who should not undertake research for personal gain or research that could have a negative effect on others. For this study, the researcher started by seeking permission to collect data from the relevant authorities like a letter of introduction from the Kenya Methodist University (KeMU) and the research permit from NACOSTI.

3.8 Data Analysis

Mugenda (1999), states that after raw data is collected from the field, it must be cleaned, coded, entered into a computer and analyzed. It is from the results of such analysis that researchers are able to make sense of the data. In this research, the data was analyzed using both quantitative and qualitative analysis using the SPSS v.16. It was presented using descriptive statistics in form of statistical tables, charts, graphs and percentages. The analysis was mainly on opinions of the respondents pertaining to how viable the Government's tablet project for standard one pupils in public schools was.

4.1 RESEARCH FINDINGS

4.2.1 Status of the Storage Room for the Tablets

Respondents were asked the status of the storage room for the tablets in their school. Findings are summarized and presented in Table 4.1

Table 4.1 Storage Room

Status of Storage Room	Frequency	Percentage (%)
Very adequate	12	4.8

Adequate	22	9.0
Average	76	30.8
Inadequate	41	16.6
Non-existent	96	38.8
TOTAL	247	100.0

Findings in Table 4.1 show that majority of the respondents (38.8%) said that there was no storage room for tablets in their school, (30.8%) said that tablets storage room were average, (16.6%) said that tablets storage room were inadequate, (9%) said that tablets storage room were adequate and (4.8%) of the respondents said that tablets storage room in their school were very adequate. This implies that most of the schools have no storage rooms for the tablets which the government should provide before the tablets.

4.2.2 Electricity

Respondents were asked to state the source of electricity they have in place to power tablets.

Table 4.2 Source of Electricity

Power Source	Frequency	Percentage
Mains Electricity	247	100
Solar Electricity	-	-
TOTAL	247	100

Findings in Table 4.2 show that all primary schools in the sub-county had mains electricity in place to power tablets.

4.2.3 Internet Connectivity

Respondents were asked about the status of the internet connectivity in their school.

Table 4.3 Internet Connectivity

Status of Internet Connectivity	Frequency	Percentage
Good	27	10.9
Average	40	16.2
Poor	125	50.6
Very Poor	55	22.3
TOTAL	247	100.0

Findings in Table 4.3 show that majority of the respondents (50.6%) said that reliability of internet connectivity in their school was poor, (22.3%) said it was very poor, (16.2%) said it was average and (10.9%) of the respondents said that reliability of internet connectivity in their school was good. This implies that internet connectivity was a major challenge in most of the schools. The government should address this challenge before implementing the tablet project.

4.2.4 Fraction of Current Teaching Staff That Have ICT Skills

Table 4.4 ICT Skills

Fraction	Frequency	Percentage
Less Than 20	44	17.8
20-50	83	33.6
More than 50	56	22.6
Do not Know	64	26.0
TOTAL	247	100

Findings in Table 4.8 and figure 4.6 above showed that majority of the respondents (33.6%) said that the fraction of their current teaching staff that had any ICT skills was 20-50, (22.6

%) of the respondents said more than 50, (26%) of the respondents said they did not know and (17.8%) of the respondents said that the fraction of their current teaching staff that had any ICT skills was less than 20. This implies that although most of the teachers had acquired ICT skills, there were still a few who had not, and they to be trained on ICT.

4.2.5 Staff Proficiency

Table 4.5 Proficiency

Respondents who rated teachers over 50% in ICT knowledge were asked to rate their proficiency.

Rate of proficiency	Frequency	Percentage
Very Good	39	15.8
Good	53	21.4
Average	42	17.0
Poor	12	5.0
Very Poor	3	1.2
Do not Know	98	39.6
TOTAL	247	100

Findings in Table 4.5 shows that majority of the respondents (39.6%) did not know how to rate staff proficiency, (21.4%) rated good, (17%) rated average, (15.8%) rated very good, (5%) rated poor and (1.2%) of the respondents rated staff proficiency very poor. This shows that most of the respondents rated staff proficiency as average.

5.1 Conclusions

The study concluded that primary schools in Kinangop Sub-County majority did not have any form of storage facility available 38.8%, while another 30.8% had average storage facilities

available to store the devices, while the rest had adequate storage facilities. The study also established that all schools within the sub county are connected to mains electricity that would be used to charge the tablet devices. Regarding internet connectivity, the study concluded that the internet connectivity was poor in over half the schools (50.6%) with about 26% of the schools having good or average internet connectivity with 22.3% of the schools having poor internet connectivity.

On the question of teachers' ICT skills, findings established that majority of teachers in primary schools in Kinangop Sub-County had ICT skills whereby a fraction of between 20-50 teaching staff had ICT skills as indicated by (56.2%) of the respondents. Teachers' proficiency in ICT was also rated high as indicated by (54.2%). However, teachers were not able to put in practice their ICT skills in teaching and learning due to lack of ICT facilities as indicated by (64.4%) of the respondents. Findings also established that teachers were ready to undergo ICT training as indicated by (66.4%) of the respondents.

5.2 Recommendations

Based on the foregoing discussion of the results and conclusion, the following recommendations are offered:

- (a) The government should supply/ provide funds for the construction of storage facilities in public primary schools.

The study findings show that although all the schools had electricity, some did not have storage rooms for the tablets. (30.8%) of the respondents said that storage was average, (16.6%) said it was inadequate, (9%) said it was adequate and (4%) said it was very adequate.

- (b) With regard to the reliability internet connectivity, (22.3%) of the respondents said it was very poor, (50%) said it was poor, (16.2%) said it was average and (10%) said it

was good. This shows that storage rooms and reliability of internet connectivity are still challenges in many schools. These challenges should be resolved before rolling out the tablet project.

5.3 Suggestion for Further Research

- i. Although the study findings are that schools in Kinangop Sub-County are ready for the tablet project, there is still room for further research. It is advisable that further research be undertaken on the viability of the proposed government tablet project for standard one pupils in other sub-counties in Kenya because the factors identified in this research does not necessarily mirror the situation in other sub-counties.
- ii. Secondly, further research should be carried out to establish the security measure that can be employed in order to ensure proper security of the devices. This includes but not limited to burglar proof windows and doors, installation of alarm systems and employment of watchmen to guard the school compounds.
- iii. Finally, further research should be conducted to find out the effect of ICT integration on performance of the pupils in examinations

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