

## Use of Mobile/Smart Phones and Students' Mathematics Learning: A Case of Basic Schools in Nepal

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**ABSTRACT:** This study is mainly focused on the students' mobile using habit and its impact on teaching and learning mathematics. The study method was survey with 119 students of public and institutional schools in the Chandragiri Municipality of Kathmandu. Questionnaire is use for identifying the access and use of mobile for learning and achievement test for measuring the students' achievement as tools for the study. The study found that 89.9% students had access of smartphones at their home including personal as well as their own. The utilization of mobile smart phone is the genuine concern for the proper utilization for learning. The results indicated that, the use of mobile in planned learning for a specified time enhanced the mathematics performance of students. Adversely, those students who engaged on mobile/smart phones higher in hours and not using mobile for learning purpose decreased their achievement in mathematics. Gender difference observed in using mobile that boys used mobile more hours than the girls. Further, entertainment type of application/programme such as music videos, song were the favorite program for girls whereas games related programme was the favorite programme for boys in the use of mobile/smart phones. Two hours/day was found the standard time to use mobile/smart phones for better performance in mathematics.

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### **Introduction**

Mobile is one of the main elements of our daily life in our activities by supporting instrument is the mobile or smart phone. Nowadays young generation use their mobile or smart phones to communicate with their peers, teachers, and parents. Additionally, they use it for entertainment, as supportive tools for their education, and to enhance their knowledge and abilities. There are five main principles for mathematics learning with technology such as attitudes toward the use of CAS to study mathematics, developed the mathematical confidence, development of technological self-confidence, and behavioral with the emotional engagement in learning mathematics (Barkatsas, Gialamas, & Orellana, 2016). The mobile and smart phone technology were spread quickly all around the world including Nepal. Students and adult all

were using this device in different purposes. This tool is also playing a special role for learning. Students used it in for different educational purposes. This can be used any time and any places according to our need. It is a highly useful tool for searching the information, transforming the files and application and different documents. This tool is also useful in communication to each other either personally as well as officially. On the other side, it seems great challenges to avoid from unethical activities including technology abuse. In this context, this study helps to determine how the students of basic level were using their mobile smartphones.

According to Tindell and Bohlander (2012) found in their research on university students, using a cell phone during class activities can divert from obeying the rule and regulations of institution but it is also helps students to learn and perform better. In this context, widely use of mobile phones in classrooms, creates conflicting ideas about their use among students, parents, and teachers. The usage of mobile devices in the classroom was not readily accepted when it came to maintain the discipline and mobile-edict habit. In the contrary of that there was no provision of mobile access to the students of basic level in Nepal. Students have access of mobile /smart phone in their home, either their own or parents. They can get the mobile phone if they need to use it in their learning. They were using it at their home. These smartphones were not belonged to themselves. It was found that students were using their parent's guardian's mobile at their home.

### **Statement of the Problem**

The use of mobile/smart phone as a learning tools is highly remarkable issues in the technological world. As Nepal is also a part of that so this issue is highly discussed in the Nepalese context. In the consideration of proper use of mobile/smart phones by our students in their learning is the great challenge of parents, teachers as well as education expert. In existing context, the use of mobile/smart phone support to connect the classroom teaching /learning with the learning of real-life problems. In this context, there are many complaints of parents and teachers to the use of mobile/smart phone. They are very serious about the proper use of mobile/smart phone by their children. Even though the use of mobile/smart phone developed the collaborative, cooperative learning environment of students with their friends. There was no significance difference in the mathematical performance of students using and without using mobile/smart phones in their learning (Fabian, Topping, & Barron, 2018)

Students from different part of the country were taking online classes in mathematics and other subject as well at the time of COVID. Due to the inaccessibility of laptop and desktop computer with internet facilities, students were using mobile/smart phone. Therefore, mobile/smart phone is becoming a great means for communicating as well as learning and teaching tools. Students were using mobile data for their online classes by different schools and colleges. Further, teachers are enhancing their professional development activities by using mobile/smart phone. In this context, different researches has found that, students has great motivation to search different learning materials with the help of mobile/smart phone. They are motivating to download the different applications which are appropriate in their learning. For this, students were aware of different threat which appears in the downloading the different application and programme (Potgieter, 2015). Similarly, NCTM (2000) as cited in Ferrini-Mundy (2000) has been focused in the use of mobile technology is an open learning system in

learning mathematics. It emphasizes the important of ICT in mathematics education. Use of mobile/smart phone support to understand the abstract concept with the help of simulation and dynamic figures available in its application.

By considering the above relationship give insights to whether usage of mobile/smartphone has contributed to increasing students' learning opportunities or likewise affected their academic performance negatively. In this context, researcher wanted to explore the relationship between the uses of mobile phone and learning performance of the students.

### **Objectives of the Study**

The objectives of this study are as follows:

- To identify the access level and mobile use behavior of students.
- To establish the relation of mobile use and the achievement of students.
- To identify the favourite programme/applications for boys and girls in mobile/smart phones.

### **Theoretical and Conceptual Framework**

In this research the researcher has applied the different theoretical framework such as behaviorism, constructivism, sociological and connectivism to determine the connection between technology and mathematics learning. Most of the schools were still applying the traditional based learning approach (marker and white board) method in teaching mathematics. The behavior of the student is based on the knowledge and skills of students. If the students achieved good knowledge and skills their behaviour is move towards the positive direction. On the contrary of that, insufficient knowledge and skills of students results dispersed behavior in their life. Their knowledge is transformed from one setting to another setting i.e. traditional way of learning to technology-based learning. In this context, mobile/smart technology is one of the very emerging tools for the students to learn different new and innovative and unlimited sources of knowledge that helps to change their behaviour. It is essential to establish the hypothesis that the learners are continuously learning through the advancement of technologies. The different behaviour of the learners is guided by different stimuli in learning to the enhancement in their learning. Students were continuously developing their knowledge and skills through mobile/smart phone by connecting with internet.

### ***Constructivism Aspect of Learning Mathematics***

Similarly, in the constructivism approach of learning, students construct their knowledge and skills in the active participation in activities. They interact with different type of mobile applications/tools and interacted with their friends and created the new knowledge. Constructivist view also recommend that learning mathematics is emphasized on mathematical activities in which they carry out the different skills and knowledge through the use of new application and software in their mobile/smart phones. Students found different application and learning materials that was published globally with the help of mobile/smart phone. Students can construct their knowledge according to the programme/applications they used frequently in their mobile smart phone. If the students watch the learning portal /teaching videos/ scientific discoveries, and related mathematical invention and innovative concept on mathematics

support them for the construction of new and innovative knowledge and skills in their subject areas. In this context, mobile learning became a useful device for the construction of knowledge in mathematics. It helps to develop the cognitive abilities of students in mathematics.

### ***Cognitivism Aspect of Learning Mathematics***

In similar manner, in a perspective of cognitivism learning can occur in the active interaction of learners' mind. Cognitive constructions are either inborn or are by-products of developmental construction. Local knowledge systems and how gaining more skill in them may be responsible for a large portion of the developmental change. Students received more attention in cognitive developmental research (Keil, 1992). It can be classified as both a cognitive and informational perspective. Constructivist techniques have taken the place of directly transmitted, content-based mathematics instruction in educational environments (Pandit, 2007). Mobile technology can assist in the development of these sorts of learning by providing a variety of YouTube videos that can be downloaded and watch on a mobile or smart phone with internet connection.

Additionally, it is suggested that effective learning focused on learner-centered, knowledge-centered, assessment-centered including community-centered approaches. These approaches build on students' skills and knowledge and give them freedom to draw conclusions based on their own observations and interpretations. As mobile technology also supports collaborative and cooperative learning, successful learners establish a community that supports one another by exchanging knowledge and helping less able pupils (Sharples; Taylor & Vavoula 2006).

### ***Sociological Aspect of Technology Use***

In the sociological views, the technology deliver the communication platform. It provides the different tools for collecting the information and for constructing and trying different models. Technology helps to elaborate the different activities and increase the scope of an argument, into the people of other world that are available in the mobile/smart phones. The technology offers a shared conversational learning environment, which can be used not only for single students but also for learning clusters and societies (Sharples, Taylor, & Vavoula, 2006). Students download the different documents related to their study and develop the new and innovative ideas which helps them for their concept maps in their mind. In this context, Vygotsky (1978) considered that the social setting creates its own culture – communicated through physical tools (graphical, verbal, and gestural signs) and psychological tools such as language. Learning can occur with two different way that the physical and psychological tools employed within a social setting. After the review of different theories of learning, different technological tools are useful for the teaching and learning. It also supports the construction of knowledge and skills in different field.

In the process of learning mathematics, most of our everyday knowledge is learnt directly from our own setting and the concept involved are not very abstract. The particular problem in mathematics lies in its great abstractness and generally achieved by successive generations. The present day the learners has to process of new data system of existing

mathematics in different application in the use of mobile technology. Important information are able to take with new technologies.

**Connectivism Theory in Technology-based Learning**

Similarly, the technology-based learning in the time of digital age is most important and valuable. The usage of internet-based technology has opened the door of learning global knowledge that occur significant changes in the study by exchanging the knowledge and experiences in the global world. According to the learning philosophy connectivism Downes (2010) highlighted the usage of internet technology has opened up new chances for people to study and exchange knowledge throughout the globe. It was also emphasized how new learning opportunities were made possible by mobile/smart phones with internet access and a variety of applications such as web browsers, search engines, social media like Facebook, online videos, discussion forums, and blogs. The ability for learning to take place inside peer networks are tied to mobile/smart phone learning.

**The Conceptual Framework of Research**

A conceptual framework, based on a literature research and the author's own experiences, describes the structure and substance of the entire study. In other words, it is the framework of ideas, presumptions, expectations, hypotheses, and beliefs that serves as the researchers' thought. In this context, the conceptual framework of this study is represented by the following figure 1.

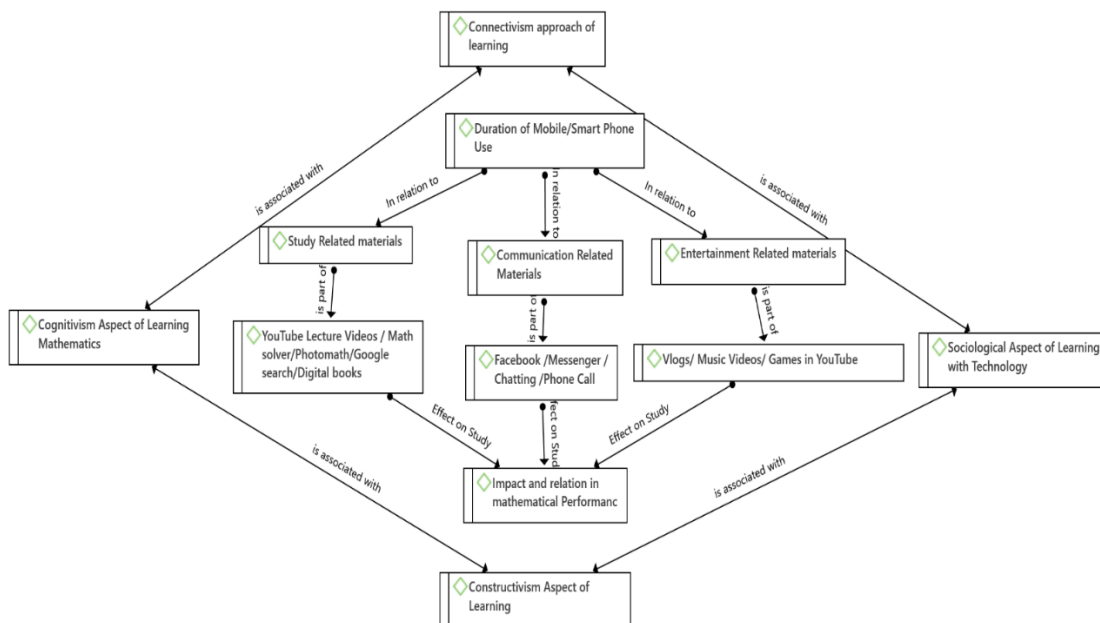


Figure 1 *Conceptual and Theoretical Framework*

**Methods and Procedures**

The methods and procedures focused on the study area, study design sampling procedure, construction of tools and data collection procedure with the validity and reliability of tools.

### Population and Sample of the Study

This study covers the 75 secondary schools of Chandragiri Municipality as a population whereas 15 were public and 60 were institutional schools were the population of this study. Among 15 public secondary schools 3 public schools and 3 institutional schools were selected equally by purposive sampling method for sample of the study. In the process of students' selection in sample, 119 students studying in grade VIII were taken as sample of the study considering the different constraint of researcher in the study. The students without the access of mobile/smart phones were excluded in the study. Besides these, both boys and girls were taken for the test taken by the researcher.

### Tools for Data Collection

Researcher has collected the data from the mathematics achievement test and questionnaire that was prepared and validate with the consultation of expert and subject teacher including item analysis for the test items. All together 52 multiple choice items including 13 questions in each level of cognitive domain were used for the quantitative information.

Beside these, a set of questionnaires related to the access of mobile /smart phones and the information related to the application or programme that they were preferred to watch in their mobile smart phones were used as a tool This questionnaire was divided into two sections one is based on personal information of respondents whereas the second section was based on the status of Mobile/smart phone use by students at their home. This second part consisted of 18 questions, these questions supported to collect the information about the use of mobile/smart phone in different time and different activities. Moreover, these questionnaires consist of favorite programme/application for the students, different types of mobile and purposes to use mobile.

In this study researcher used the split half techniques to calculate the reliability of test item. The score obtained in odd number of questions and even numbers of questions were calculated in following Table-1

Table 1. *Analysis of split half reliability for test items*

Types	Score Obtained in Even Numbers Questions	Score Obtained in Odd Numbers Questions
Pearson Correlation	1	0.715**
Sig. (2-tailed)	--	0.000
N	26	26
Pearson Correlation	0.715**	1
Sig. (2- tailed)	0.000	--
N	26	26

*Analyzed by SPSS 20, \*\*Correlation is significant at the 0.01 level (2-tailed).*

From the above Table -1, it was found that the coefficient of correlations between the score of students obtained in odd number of questions and even number of questions is 0.715

which shows that the odd numbers questions and even number of questions has high degree of positive correlations. Moreover, this shows that there was high level of internal consistency of test items given in odd numbered items and even numbered items.

### Research Philosophy

The basic philosophy of my research was related to the technology-based teaching learning activities particularly into mobile/smart phone-based learning. The new generation learners were in the generation of digital natives, NetGen or google generation even though there are different misconception and misused activities of technologies. Students in this age were growing up and surrounded by technology that cannot be avoided to them for the use of technology. It is needed to motivate them towards the proper utilization of technology in their teaching and learning activities. It is needed to prepare the different learning materials including curriculum and textbook into mobile/smart phone usability.

### Study Design

The study was carried out with a survey design by using quantitative method of data analysis. Further, coefficient of correlation, descriptive statistics, chart and graphs are also used for the analysis of data. It was supported to analyze the effect of mobile technology addiction on boys and girls of public as well as institutional schools and also discover relationships between the use of mobile/ smartphone use among basic level students in mathematics in Chandragiri Municipality

### Findings and Discussion

In this section, the detailed analysis and findings of the research is discussed with the corresponding table and appropriate diagram. The detail procedures of data analysis is discussed based on different objectives and research questions below.

**Objective -1.** The first objective of my research was to find the types of programme those students of basic level watch/see in mobile.

In the process of analysis of second objective based on the collected data, the following Table-2 shows the interest of students in different programme/applications.

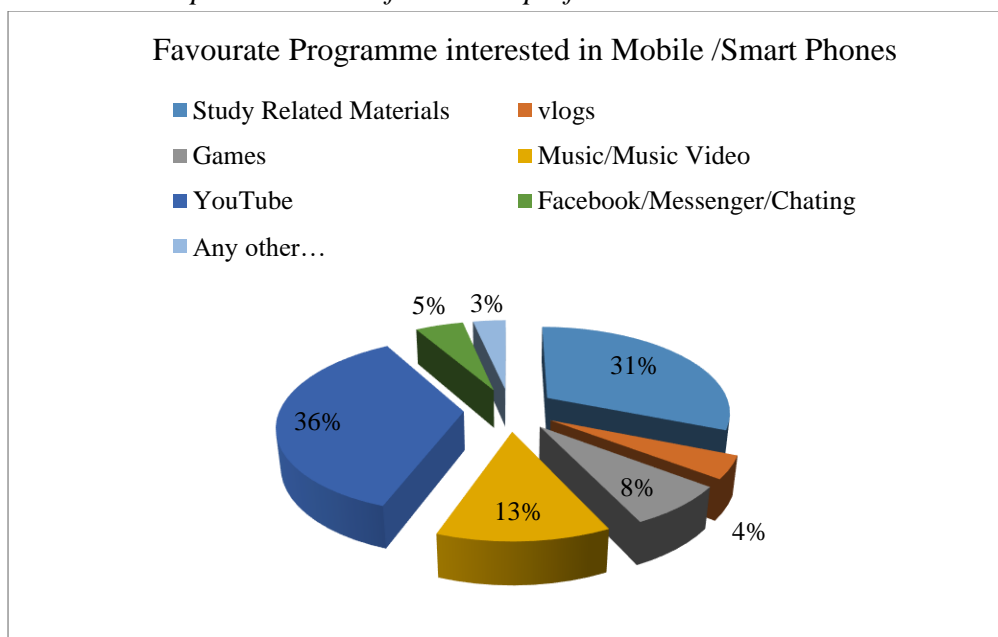
Table 2. Analysis of the most favorable Programme/sites of students

Types of programme	Frequency	Percent	Cumulative Percent
Study Related Matter	37	31.1	31.1
Vlogs	5	4.2	35.3
Games	9	7.6	42.9
Music/Music Video	15	12.6	55.5
YouTube	43	36.1*	91.6
Any other	4	3.4**	95.0
Facebook/Messenger/Chatting	6	5.0	100.0

Analysis with SPSS 20, \*Most favorable programme, \*\* Least favorite programme

From the above Table-2 it is concluded that students of basic level used different programme / applications in mobile/smart phones. The above Table shows that , 31.1% like to watch study related matters related to science experiments, mathematical videos, different term and definition, answers, meaning of some terms by using Google search, Similarly, 4.2% in vlogs, 7.6% games, 12.6% music/music video, 3.4 % other than these, and 5% were interested to see and watch face book /messenger/chatting etc students are engaged to watch. More important finding from the Table -2 found that highest percentage (36.1%) of students were interested in YouTube. This YouTube contains entertainment and the study related materials including lecture videos related to mathematics learning. This shows that our learning materials is needed to prepared and upload in the form of videos, games in YouTube to make them more benefitted. The following Pi- Chart also explored the students' preferences in different application/tools of mobile/smart phone.

Figure 2. Pictorial representations of students' preferences



**Objective- 2** The second objective of my research was to find the relationship between mobile use time and learning performance of students in mathematics

The following Table-3 shows the relationship in the use of mobile/smarts phone and the learning performance of the students in mathematics.

Table 3. Correlation between the use of Mobile/Smart Phone (/day) and scores in mathematics

Average Time to Use Mobile/Smart Phones (hours/Day)	Score in Mathematics	in Number of Students (N)	of Significant tailed)	(2- Result
	$r = - 0.151$	119	0.102	Not Significant

Analysis with SPSS 20



From the above Table-3, the correlations between the use of mobile/smart phones and the students' performance is seems negative ( $r = -0.151$ ) which shows that more use of mobile/smarts phones decreases the achievement and performance of the students in mathematics. So, maximum time in the use of mobile/smarts phone makes negative effect in our mathematics learning. Whereas from the above Table 3, it is also said that small negative correction between the mobile used time and student's achievement score in mathematics was not significant in two tailed tests. From this we can't reject the null hypotheses and concluded that the high use of mobile phone does not reduced the scores in mathematics but has some negative effect on it. This finding is also similar to the finding of following research.

After controlling other threat of external variables, the more uses of cell phone decrease the academic performance of students. Many schools' students were taking the cell phone as a leisure device and use for the purpose of social networking, watching videos and games. But, further research is needed to find the different factors contributing the students' performance. On the other sides mobile phone has a capacity to connect the individual to learning communities (Lepp et al, 2015). For this purpose, it is needed to find out how this device help in proper and genuine contribution of students learning

**Objective- 3:** To find the different programme interested to watch by boys and girls in mobile.

To find the different programme/application which are familiar or see in mobile/smart phone on the basis of gender is described in the table- 4 has summarized the number of students were interested in different application available in mobile.

Table 4 . Gender wise preferences of Programme/Application in mobile smart phone

Girls/Boys	Study Related Matter	vlogs	Games	Music/ Music Video	YouTube	Any othe r	Facebook /Messenger /Chatting	Total
Girls	14	3	1	8	25*	1	5	57
Percentage	24.56	5.26	1.75	14.04	43.9*	1.75	8.77	100
Boys	23	2	8	7	18	3	1	62
Percentage	37.1**	3.22	12.9	11.3	29.03	4.84	1.61	100
Total	37	5	9	15	43	4	6	119

Analyzed by SPSS 20, \* represent most preferable application for girls \*\* Most favorite application for boys

From the above table, on the one hand it is concluded that girls were interested maximum in YouTube video 25 out of 57 (43.9%) and less interested in games (0.02%). Whereas boys were interested more in study related materials by using Google (37.1%) whereas they were less motivated in Facebook/messenger/chatting i.e 0.02%. From these findings, it was also concluded that to make more active for girls in mathematics we should use YouTube channel and Google document as our learning portal. Collaborative work and activities in gaming, searching the learning materials, conversation with teachers and friends, sharing the ideas and learning matters helps to increase the intrinsic motivation in sides and outsides classroom with the help of mobile/smart phones.

Table 5. Gender wise preferences of programme/application in mobile smart phone

Average Time to Use Mobile/Smart Phones (/Day)	Mean Score	Percentage	S.D	Max score.	Min score.	M <sub>d</sub>
1	26.43	50.8	9.517	42	10	27.00
2	31.30	60.2	9.223	48	9	32.00*
3	29.31	56.4	12.419	49	9	31.00
4	25.80	49.6	13.449	49	13	23.00
5	25.89	49.7	12.732	47	0	23.50
6	25.70	49.4	14.095	48	10	22.00
7	27.60	53.1	12.358	48	9	31.00
8	26.50	51.0	13.435	36	17	26.50
9	19.25	37.0	4.500	23	14	20.00
Total	27.51	52.9	11.691	49	0	27.00

\* Represent the standard time to use mobile smart phone to use mobile/smart phone

The above Table-5 represents the students' in watching different applications/tools in mobile/smart phone in their relation in the learning achievement of mathematics. From the above Table, it is shows that the standard time for the better use of mobile/smart phone to get the good performance in mathematics. Two hours/ day is found the appropriate time for the better use of mobile/smart phone.

The similar findings was also found in Rung and Mattheos (2014) that the dual environment of the use of smartphones is benefited but it could also be a distraction. It shows that a little more than fifty percent of the students used their smartphones in unnecessary time. It is a common issue whether use of mobile/smart phone technologies during classroom activities is a productive activity, as often, such use might be inappropriate use of it consider that smartphones improved access to learning materials (Reed, Drijvers, & Kirschner, 2010) However, they were not highly positive regarding independence of learning and teaching. From the analysis of different literature, it was also found that the attitude of boys and girls towards the use of technology was different. In the comparison of male and female, male students has more conscious in finding the value of technology than female students.

### Conclusion and Implications

In the rapidly moving world with technologies, mobile/smart phones and its usage is also having significant role to connect each individual with the global community. Mobile/smart phone is also becoming a part of our life. It has many benefits to the use of this device. Nowadays the great concern is raising in the appropriate use of mobile /smart phone by schools' students. In the rapid development of new technologies mobile/smart phones has also updated with the new and updated features according to the need of the user. In the context of the world in the fingers and hand of people, this study was conducted to find the proper use of mobile technology. By considering the existing context of the use of mobile/smart phones by students, this research was focused on the scope, different popular application for students and its effect in the learning mathematics. From this research, it is concluded that the different usage of mobile/smart phones and approaches in the supplementary tools for learning mathematics.

The usage was found vary from one student to another so it's clearly being identified by using this type of studies. This helps the researcher, policy maker, curriculum designer to implement the appropriate policies related to technology-based learning and techniques of the use of this mobile/smart phone in the learning purposes. This is also helping to develop the learning materials according to the interest of the students accessible in mobile phones. From this research it was also concluded that students were used their mobile/smart phone in multiple purposes apart from communication only. They were used it as a learning tools as well as entertainment tools. It is considered as a means for teaching learning activities. This research helps to explore the different purposes of mobile to the students learning. It is found that the proper use of mobile/smartphone in relation to time and application develops the positive aspect in the student's life mainly focused on mathematics learning.

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