

*Pardimin et al., 2020*

*Volume 6 Issue 1, pp. 411-421*

*Date of Publication: 21<sup>st</sup> April 2020*

*DOI-<https://doi.org/10.20319/pijss.2020.61.411421>*

*This paper can be cited as: Pardimin, Rochmiyati, S., & Wijayanto, Z., (2020). Mathematics Learning Profile of Junior High School. PEOPLE: International Journal of Social Sciences, 6(1), 411-421.*

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## **MATHEMATICS LEARNING PROFILE OF JUNIOR HIGH SCHOOL**

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### **Abstract**

*The driving factors of the success of mathematics learning activities include models, media and learning resources. However they need to be modified or adjusted in order to facilitate the students to have the ability of reasoning, problem solving, mathematical communication, mathematical connections, mathematical literacy, and mathematical representation. A number of obstacles experienced by teachers and students in mathematics learning activities indicate that it has not been quite successful, as notably occurred in mathematics learning activities in junior high schools in Special Region of Yogyakarta (DIY). Departed from the problems, this study aims to analyze the mathematics learning profile of the junior high schools in DIY, as well as finding solutions to the obstacles faced in learning mathematics which were then developed into good mathematics learning model in accordance with the latest development of science and technology.*

## **Keywords**

Mathematics Learning, Instructional Objectives, Science and Technology

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## **1. Introduction**

One way to improve education in Indonesia especially in the realm of mathematics learning activities is by making improvements in the instruction along with the development of the era which requires students to be open-minded (Paulus, 2017). Mathematics learning activity is the process of providing learning experiences to students through a series of planned activities so that students gain knowledge about mathematics being learnt, become intelligent, become skillful, and able to understand the material being taught properly (Amir, 2014). The most important factors that can drive the success of mathematics learning activities are the use of appropriate learning models (Nopiyani, Turmudi, & Prabawanto, 2016), interesting learning resources (Sumarmo, 2004) pleasant learning atmosphere (Herman, 2010), and the use of learning media in accordance with the latest era development (Widodo, 2018).

Good mathematics learning instruction certainly has to pay attention to the determined instructional objectives of mathematics itself (Fennema, & Sherman, 1976). The purposes of learning mathematics in accordance with the 2013 curriculum are to facilitate students to have the ability of reasoning, problem-solving, mathematical communication, mathematical connections, mathematical literacy, and mathematical representation (Richardo, 2017). However, the facts demonstrate that there are still many obstacles experienced by teachers and students in the learning process (Alfian, 2016). These obstacles include the lack of learning time allocation (Retnawati, 2015), teachers' low ability in applying learning technology (Murtiyasa, 2015), and the use of less appropriate learning methods (Susanti, 2013).

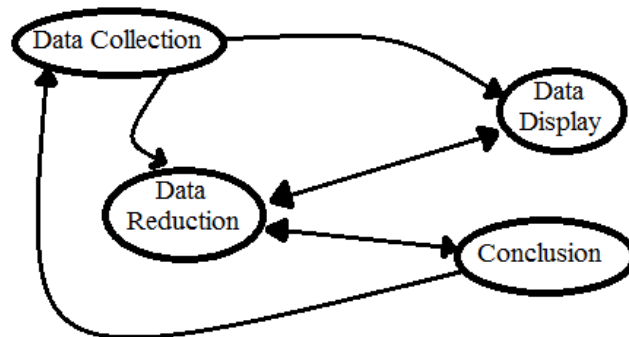
Based on the problems, it is necessary to develop a process of learning mathematics which takes into account the factors driving the success of mathematics instructional goals. In general, this study aims to analyze the mathematics learning profile of junior high schools in DIY. The results of the analysis will then be developed into a new mathematics learning instruction model in accordance with the latest development of science and technology.

## **2. Method**

The research approach of this study is descriptive qualitative. Therefore this study aimed to understand the phenomena experienced by research subjects and provide an overview of a

phenomenon which is associated with the process of mathematics learning activities in junior high schools in DIY. The selection of the research subjects in this study applied purposive sampling, namely the determination of subjects based on research objectives. As a result, six junior high schools (SMP) were picked, namely: SMP Al-Azhar 26 Yogyakarta, SMPN 5 Banguntapan, SMP Taman DewasaIbuPawiyatan, SMP PGRI Semanu, SMP N 4 Depokand SMP N 4 Wates.

In terms of the data collection techniques, this research applied observation, interviews and documentation. The obtained data were then analyzed by using descriptive qualitative in the forms of: (1) data on learning strategies undertaken by respondents, (2) driving and inhibiting factors in the process of learning Mathematics, (3) data on student responses to the process of learning Mathematics in school. The analytical model used in the study was an interactive model as illustrated in the figure below.



**Figure 1:** *Interactive Model*

The data obtained during the research process were reduced by employing triangulation techniques. Hereinafter the results of the data reduction were selected and presented descriptively according to the research objectives in the form of analyzing the profile of mathematics learning activities in junior high schools in DIY. Finally a conclusion which stated whether the mathematics learningprofile in junior high schools in DIY is appropriate or not in accordance with the ideal learning objectives of mathematics was drawn.

### **3. Result and Discussion**

The respondents containing six teachers and twelve students in this study were selected from 6 junior high schools in Yogyakarta Special Province (DIY). The results of the interviews revealed how the condition of the students in their class and how the teachers carried out mathematics learning activities, and how the learning facilities provided by schools.

### **3.1 Learning Approaches and Methods**

Learning approach is the starting point of the learning process which is still very general in nature. The implementation of the 2013 curriculum greatly emphasizes a scientific approach with learner-centered learning as well. This is in line with the results of the interviews with 26 teachers of SMP Al Azhar who also applied five stages in the scientific approach to learning, namely: observing, asking questions, collecting data, associating and communicating. At the observation stage, supposedly, students are asked to observe a floor plan or a form given by the teacher. Then, in the questioning stage, students are invited to formulate questions related to existing plans or problems. In the third stage, students are asked to collect data or information to find answers for these problems. After the data are collected, students are asked to discuss and connect the information obtained to get the right answer and arrange it in a neat report/summary form. Next, the communicating stage is where students present the results of their discussion in front of the class.

Besides the learning approach, the learning method also needs to be applied by the teacher so that the students can understand the material presented easily. Learning methods that are often used by teachers in teaching mathematics include discussions, presentations, lectures, demonstrations, exercises accompanied by discussion, giving school assignments and homework. The methods usually applied by teachers were presentations and practices. As stated by a teacher of SMPPGRI Semanu, the presentation method is indeed important to always be used to explain the concepts and principles of abstract mathematical objects. Likewise, with the practices, the teacher of SMP 4Wates revealed that the practices can train students' memory about mathematical patterns on mathematical concepts. This is to make students accustomed to working on complex math problems and having a deep understanding because they gain direct experience in solving problems.

Based on the approach and method used, the model used by the resource persons in learning mathematics varies, ranging from lesson study, problem-solving, expository, to think pair share (TPS). Variations in the choice of approaches and methods of learning mathematics must be adjusted to the mathematics material. This is because there are many branches of mathematics, so not all learning methods can be applied well to certain mathematical material. Teachers of SMP Negeri 5 Banguntapan applied the teaching instruction method on straight line equation material. As a result through applying the method, some students still had difficulty in understanding the material because the time allocation was insufficient and there were quite a lot of materials to be given, so learning could not be run properly in accordance with the prepared design and must have provided homework (assignment) for students.

The application of mathematics learning methods can affect student responses. There are some students who are only interested on certain mathematics learning methods. This was revealed by students of SMP Al Azhar 26 Yogyakarta, SMP 4 Wates, and SMP PGRI Semanu who preferred the Think Pair Share (TPS) learning method. These students were interested in learning in pairs because they can solve problems together and it was more effective than dividing groups in large numbers. In contrast, the students of SMP Negeri 5 Banguntapan preferred the assignment method in learning mathematics, because with the assignment method students were able to learn independently and could find the answers from various sources. On the other hand, the students of SMP Negeri 4 Depok and SMP PGRI Semanu students preferred the lecturing method, this is because through this method, students would clearly gain the knowledge conveyed by the teacher, as well as by learning independently students would experience many difficulties.

### **3.2 Learning Resources**

The learning process cannot run properly without proper learning resources. Learning resources are all materials designed and used by teachers and students to obtain information, skills and opinions in developing their cognitive processes (Akpan, 2017). Learning resources are identified as messages, people, materials, tools, techniques, and settings (Butcher, Davies, &Highton, 2006). Therefore, anything that is used by teachers and students and contains information needed in learning can be hailed as learning resources.

Based on the results of interviews with the resource persons, the learning resources that were often used by teachers were in the form of textbooks and worksheets. The textbooks used in mathematics learning sources consisted of teacher books and student books. The package book has been provided by the government in soft file and printed format in accordance with the revised 2013 curriculum. The student worksheet contained a summary of the material which was also equipped with practice questions so students could practice and understand the formulas for solving mathematics problems more easily.

Textbooks and worksheets are must-have learning resources for students in any junior high school. In addition to the completeness of the material, some schools also provided other learning resources. The teachers of SMP Negeri 5 Banguntapan preferred to use other textbooks as learning resources, because the teacher books and student books provided were considered incomplete and still confusing. It was different from teachers of Al Azhar 26 Yogyakarta Junior High School opinion who preferred to arrange their own learning resources. The learning resources they

arranged were more communicative and contextual in accordance with the students' surrounding environment.

The more sources of student learning are, the more complete students will receive mathematics information on knowledge. This was carried out by the teacher of SMP Negeri 4 Depok who always demanded students to use various learning resources in learning activities. When learning activities took place, the students were allowed to find learning resources by accessing the internet. Likewise the teacher of Taman Dewasa junior high school, Ibu Pawiyatan, allowed her students to operate the computer in lab to access learning materials from any online sources.

The use of the internet as a learning source has an important role in the process of learning mathematics. This was according to students of SMP Al Azhar 26 who said that in understanding geometry material which required high imagination there was a need for real objects or objects which could move. The students then looked for interesting learning videos on the internet. The same thing was also said by the students of SMP Negeri 4 Wates and the students of SMP Negeri 5 Banguntapan. Almost all of the students had internet access through their smartphones so they could share learning resources with their friends. It was different from SMP PGRI Semanu students. Whenever they faced difficulties in learning mathematics, they preferred to ask their parents, siblings or friends. This showed that the teacher and books provided at school were not the only source of learning, but also everything which could provide additional information about mathematical knowledge.

### **3.3 Class Atmosphere**

Considering the role of the teacher as an educator, guide, trainer, and leader who can create an attractive, safe, comfortable and conducive classroom atmosphere, his presence in the midst of students can dilute the atmosphere of freezing, stiffness, and boredom of learning that feels hard to be accepted by students (Irawan, 2015). The class atmosphere which is not conducive will have a negative impact on the learning process and the difficulty of achieving learning objectives, students will feel restless, and bored. Conversely, a conducive and attractive classroom atmosphere can easily achieve learning objectives, and the learning process is also fun for students. Class atmosphere is the situation and condition of the class related to learning activities. The class atmosphere is a situation marked by the existence of patterns of interaction or communication between teacher and students, student and teachers and students and students. The main task of the teacher is to create a pleasant situation the teaching and learning environment in order to support the occurrence of behavior change in students.

The role of the teacher in building a pleasant classroom atmosphere is demonstrated through the results of observations of mathematics learning activities. Boring mathematics learning activities can trigger a negative impact on students, where students will feel bored and lazy to pay attention to the mathematics lesson delivered by the teacher during the learning process. The results of the interviews with eighth grade students in several schools in the Special Region of Yogyakarta revealed that almost all of mathematics learning processes applied lecturing method. This was revealed by one of the eighth grade students of SMP N 4 Depok who regarded that the mathematics learning process tended to use lecturing method so that at certain times students felt bored for studying. The same thing was also experienced by eighth grade students of SMP N 5 Banguntapan, SMP N 4 Wates, PGRI Semanu SMP and Taman Dewasa junior high school. However not all schools only apply the lecturing method in the mathematics learning process. According to the eighth grade students at SMP Al Azhar 26 Yogyakarta the process of learning mathematics was not always monotonous by only applying lecturing methods, in certain materials, students were involved to be active in the learning process; one of them is through discussion activities. This indicates that there is a need for new learning models to be applied by which this learning model can increase student enthusiasm in learning mathematics and can involve students actively in learning in class.

### **3.4 Learning Media**

In addition to create good learning atmosphere, the learning process will be more effective when using proper learning media. The existence of this learning media is a form of equipment and objects that can be used for learning needs in achieving the effectiveness and efficiency in the learning process. The selection of the right media is very necessary considering that the media used must be interesting in order to catch student's attention during learning activities.

Based on interviews conducted with several resource persons in this study, it is identified that in the process of learning mathematics, not all teachers used learning media. The teacher was more dominant to use the blackboard rather than using other media such slides show and learning videos. This has several advantages for the teacher as well. The teacher is more flexible in presenting materials, giving exercises, giving answers appropriately. However many teachers still use outdated media such as paper-based media. It is exactly true that the use of papers is easier than other learning media. However the learning process will always be the same and monotonous, as a result it has a bad impact on student learning. This can make students easily bored, and reduce the students' interest to learn.

This was stated by eighth grade students of SMP PGRI Semanu and Taman Dewasa Yogyakarta, in which during the learning process the teacher never used any learning media instead of paper media to facilitate students in understanding the material presented. But it was different from the statement expressed by eighth grade students of SMP N 4 Wates and SMP N 4 Depok where the students admitted that their teachers were not monotonous by merely using blackboards as learning media but on certain materials, their teachers used power points to explain the material. Meanwhile, based on the explanation of the eighth grade students of SMP Al Azhar 26 Yogyakarta and SMP N 5 Banguntapan, in the mathematics learning process, the teacher not only used power point but also used other simple learning media in the form of objects around the students.

Based on the problems elaborated above, it is necessary to develop new learning media that are interesting, informative, communicative, and easily obtained and accessed by the students and the teachers. This is highly required to support the needs of students and teachers in learning or teaching both in the classroom and outside the classroom.

### **3.5 Learning Obstacles**

Exactly every learning activity in the classroom and outside the classroom will face various obstacles or problems. In this case the problem lies in the difference between the teacher's book and the student's book which is considered confusing to be used by both them in the learning process. Another problem is the time allocation, the class hours of learning, especially on mathematics has been decreased from 6 hours a week to only 5 hours a week. Meanwhile, the material that must be delivered is still too much compared to the learning hours. Therefore, to overcome this problem, the teachers often give assignments to the students to learn further material at home or provide homework.

In addition to the above problems, during the learning process, most students were always reluctant to express their difficulties in learning, they said it was better to be quiet because they felt shy and felt inferior to other classmates. This was revealed by eighth grade students of Taman Dewasa and SMP N 4 Depok, apart from that, some students felt uncomfortable when they asked their teacher directly. This was triggered due to the teacher's way of teaching where the teachers often only explained the material contained in the book alone without any renewal or expansion of teaching material. Moreover some eighth grade students of SMP Al Azhar 26 Yogyakarta, SMP N 4 Wates and SMP N 5 Banguntapan explained that the teacher merely used textbooks and worksheets.

Meanwhile, in terms of facilities, there were still many schools that do not provide adequate learning facilities such as internet access. This was revealed by several eighth grade students of SMP



N 4 Depok, SMP N 5 Banguntapan and SMP 4 Wates stating that the school had provided services for internet access, but the students could not access it independently. In fact, in some schools these services are intended for teachers and staff only.

Another obstacle explained by the students was dealing with the LCD projector that could not work properly. This was revealed by eighth grade students of SMP N 5 Banguntapan. They said that mostly of the LCD projectors provided in each class did not work properly. Even some of them were damaged and could not be operated at all. Beside that, the next problem related to the policies of each school. Some schools (SMP N 4 Wates, SMP N 4 Depok, and SMP Al Azhar 26 Yogyakarta) allowed their students to bring communication devices such as smartphone and laptop. However the other schools such as SMP N 5 Banguntapan, SMP PGRI Semanu, and SMP Taman Dewasa Yogyakarta did not allow it.

Based on the results of the discussion above, it can be drawn a conclusion that there are still a number of obstacles that restrict the students from accessing information through the internet as much as possible, the inadequate condition of learning media and school policies regarding permission to operate communication devices at school.

### **3.6 Overcoming the Obstacles**

Based on the results of the interview, it is discovered that there are still many obstacles faced by students during the learning activities. In this case the teacher also has an active role to be able to provide optimal learning services. Changing innovative learning models can be one alternative to solve the problem above. The selection of the proper learning method can make students feel that learning is not monotonous, so students will naturally have an interest in learning. Discussion activities in class can make students active to learn, besides the existence of supporting media such as LCD, internet service and smartphone in the learning process can be supportive tools in learning activities. Furthermore there is an additional time in the learning hours within one week.

Therefore changes in the mindset of students and teachers are highly needed. Even more in this information era, through the internet the students can learn anytime and anywhere they want. In addition the selection of proper learning models will be more efficient if the implementation is not only done in the classroom but also can be applied outside the classroom and even at the student's dwelling.

#### 4. Conclusion

Based on the results of the research, it can be drawn conclusions that the majority of mathematics teachers use lecturing method in delivering materials. Certainly these conditions make students become less active during the learning process. In addition, the insufficiency of the learning facilities also raises various problems such as preventing the students to utilize the internet service, and not providing LCD projectors which work properly in each class. In case of learning resources, it is revealed that most schools only use textbooks and worksheets so that the students are restricted to learn from given books and worksheets only. In case of the place of learning, mostly it is conducted in the classroom. Even some schools never carry out learning outside the classroom. The lack of innovative learning models and teaching materials can restrict the student's knowledge considering that teaching materials are the most important media in the learning process. Teaching materials themselves can easily be obtained by the students through any communication devices such as laptops, smartphones, and tablets.

The results of the mathematics learning analysis in junior high schools in DIY further can be developed into a new learning model. The learning model consists of learning strategies, learning methods, various learning resources, a pleasant learning atmosphere, interesting learning media, and the role of technology that supports mathematics learning activities.

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