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Effect of chronotype and student learning time on mathematical ability based on self-regulated learning

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Abstract. One of ways to improve students' learning ability is conduct a research, with purpose to obtain a method to improve students' ability. Research often carried out on the modification of teaching methods, uses of teaching media, motivation, interests and talents of students. Research related to the internal condition of students becomes very interesting to studied, including research on circadian rhythms. Every person in circadian rhythms has its own Chronotype, which divided into two types namely early type and night late type. Chronotype affects the comfort in activity, for example a person with Chronotype category of early type tends to be more comfort in daytime activities. The purpose of this study is to examine the conditions of students, related Chronotype suitable or appropriate for student learning time. This suitability then studied in relation to the ability of learning mathematics with self-regulated learning approach. This study consists of three stages; (i) student Chronotype measurement, (ii) data retrieval, and (iii) analysis of research results. The results show the relationship between the students' learning ability in mathematics to learning time corresponding to Chronotype.

1. Introduction

Mathematics much liked by students in junior high school, because they are under challenge in solving problems or cases in some math problems. Based on the results of preliminary observation, some students find it difficult to learn mathematics because the material is complex because it requires understanding and mastery of materials that require high focus and a lot of practice doing in the matter. Self-regulated learning is the process of how a learner regulates his own learning by activating cognitive, affective and behavior to achieve learning objectives [1]. The use of instructional media on self-regulated learning approach used with the aim to simplify and assist the learning process [2]. The focus of this study of science that became the topic of this study is the ability to learn mathematics based on self-regulated learning specific to junior high school students. In several study chorotype closely associated with shift work, and is a reflection of human, whether prefers to indulge and prefer to be active early or late in the day [3]. As previously investigated, Chronotypes were studied in shift workers associated with workload and performance [4]. Chronotype has shown to affect many aspects of everyday life such as sleeping behavior and other habits [5]. Kuhnle, T.K (2006) suggests in his dissertation that a person's chronotype can performed and analyzed quantitatively [6]. Other research on Chronotype studied to see and compare the Chronotype of shift workers and students in Indonesia

[7]. This study is the focus of the study are students who study mathematics with time to learn night or day. Workload or material burden that is submitted for all respondents same, which is math lesson. Performance that used as a reference for this research is the level of ability to learn mathematics.

The purpose of this study is to measure chronoype of students with The Munich Chronotype Questionnaire (MTCQ) in Indonesia Language, this questionnaire obtained from several research journals [3]. The second objective is to collect the necessary data. The third goal is to process and analyze the data to see the correlation between the learning times corresponding to the Chronotype with the level of mathematical learning ability. Based on the previous description, this research entitled is "Effect of Chronotype and Student Learning Time on Mathematical Ability Based on Self-Regulated Learning".

2. Methods

Coordinate with junior high school especially with mathematics teacher. The method used in learning is self-regulated learning. At this, stage the determination of students who be selected as research respondents.

Designing questionnaires that have been available based on literature search results, for further research sampling. The questionnaire used to be readjusted to the conditions of the respondent, the adjustments do not affect the form and essence of the intent and purpose of the questionnaire Chronotype. The number of respondents and the technical implementation for sampling discussed in the next section of this research journal.

To collect research data covering the average value of student progress reports for mathematics subjects, as well as brief interviews briefly explore patterns, learning time habits, student interest in subjects and other information. All data is obtained after the treatment on the respondents, in the form of learning by using the teaching media provided during one semester.

Codification of research data is a stage between the done before the data processing using statistical tools. This stage defines the data acquisition of the respondents. Suppose that students with night Chronotype and study at night are categorized accordingly, whereas on the other hand if the students Chronotype the night but the learning time of day, the student can be categorized as non-conformity. At this stage determined the data analysis in accordance with the research, and the hypothesis used.

Perform data analysis previously done first by conducting a series of data codification of research results. After this step is completed then performed the steps of statistical testing for respondents' responses, the results of questionnaires and data on the level of student ability in mathematics lessons, for further analysis of the effect of the suitability of Chronotype and learning time with the level of learning ability of mathematics. In this study the data obtained is presented in the form of data description. The next stage of data obtained by analysis using statistical tools SPSS tools, to determine the correlation between the learning times corresponding to the cronotype in comparison with the achievement of learning mathematics.

The recipient of this research is a junior high school student in one of the junior high schools in Tasikmalaya city. The number of respondents studied in this study amounted to 87 respondents, of the total respondents who planned as many as 120 people. Prior to the research, initial coordination since the end of 2016 to condition the students using self-regulated learning approach used in mathematics learning.

3. Results and Discussions

The student conditioning was conducted for a full semester involving mathematics teachers at the junior high school level. Based on the results of the research of 120 students who made the respondents, only 87 students who complete the data collected, or about 72.5% of research data successfully taken. In Table 1 Demographic characteristics and conditions of study population, presented demographic data and other information required in this study. Table 1 shows that the numbers of men and women in this study were nearly equal, to eliminate gender influence.

Table 1. Demographic characteristics and conditions of study population

Variable	Men (n = 42)			Women (n =45)		
	Mean	SD	Range	Mean	SD	Range
Age (year)	13.71	0.71	12.5 – 15.0	13.56	0.49	13 – 14.5
value Lesson	82.14	7.25	70.0 – 95.0	80.56	7.01	70.0 – 95.0
Duration of Learning	85.71	25.08	45 - 120	79.33	21.36	60 - 120

Questionnaires that have been designed and available based on literature search results, this step was done to make a student Chronotype measurement questionnaire. The questionnaire is modified to make it easier for parents to fill their children's habits in daily activities such as bedtime, waking, sleepiness and other questions. After completing the series of questionnaires, the parents can conclude the Chronotype of the student. Some questions about interests, hobbies and talents of students taken and used as supporting data on this research. Sampling was randomly on 120 students with data collected as many as 87 people. The data declared complete if all the existing data such as Chronotype measurement questionnaire, students' mathematical assessment and others, collected completely. If one of the completeness is not complete then it not processed further. The number of respondents and the technical implementation for the sampling was determined as early as 120 people by dividing 60 men and 60 women. The results obtained only there are 42 male respondents while women 45 people.

To collect research data covering the average value of student progress reports for mathematics subjects, as well as brief interviews briefly explore patterns, learning time habits, student interest in subjects and other information. Based on the results of the research results obtained data processing as follows, which presented in table 2. The table shows the distribution of Chronotype types for both men and women. As well as the distribution of student learning time data.

Table 2. Result of the Research

Measurement results	Men (n = 42)	Women (n =45)
Early Type	26 (61.90%)	28 (62.22%)
Late Type	16 (38.10%)	17 (37.78%)
Learning Daylight	32 (76.19%)	27 (60.00%)
Learning Night	10 (23.81%)	18

The result of codification is obtained by the data of the students who are as conforming as well as those that do not correspond to the learning time. After the codification is done stages of correlation testing to see the relationship between Chronotype conformity and learning time with the achievement of student learning on mathematics subjects. The analysis used to test the correlation in this study using Spearman Correlation. The hypothesis used in this research is Ho: There is no correlation between Chronotype conformity and learning time to the achievement of student learning on mathematics subject. H1: There is a correlation between Chronotype conformity and learning time to student achievement in mathematics.

The result of data processing with the application of statistical data processing SPSS, showed by using spearman correlation value r = 0.867 and p = 0.000 <0.01, thus can be concluded Ho: Rejected and H1: Accepted. The result of data analysis is that there is a very significant correlation between the matching of student's learning time with Chronotypes, attributed to achievement of student achievement. It is possible to recommend and change the appropriate learning pattern, for example if students have Chronotype with early type, it suggested to study at night, whereas if students have Chronotype with late type, it is advisable to study at noon.

4. Conclusions

After done the steps of research then it concluded that Chronotype affect student achievement in mathematics lesson. The compatibility between the type of Chronotype and the student's learning time should be the same, meaning that if the learning time and the Chronotype are appropriate, the students are more likely to obtain optimal learning outcomes, although other variables such as learning duration need to take into account and more in-depth discussion.

Further research needed by focusing on the study of the level of material difficulties presented, with different respondents at the school level. Another interesting study that not been done in this study is to examine the relationship between IQ with Chronotype and in junior high school students.

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