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Math study habits on deaf learners

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Abstract. The purpose of this study was to obtain a picture of mathematics learning habits for deaf students. The subjects in this study were 99 deaf students taken purposively in across 4 schools, including, SLB B Karya Murni Ruteng, SMPLBN Semarang, SLB B Don Bosco Wonosobo, and SLB B Denaupakara Wonosobo. The research involved a quantitative and qualitative research design where the quantitative data was taken from a set of questionnaires that included a commitment attitude questionnaire, a disciplinary attitude questionnaire and a commitment attitude questionnaire in learning mathematics; meanwhile, a qualitative data was gained through the observation of learning activities at their schools and at their boarding house. The results of the analysis showed that students' consistent attitude, disciplined attitude, and attitude of commitment in learning mathematics were in a good category; therefore, we assumed that deaf students maintained good habits in learning mathematics. By having these good study habits, they were expected to acquire basic skills related to basic arithmetic operations that will be applied in life skills such as sewing, making patterns, carpentry, and automotive. Also, good study habits might improve their cognitive skills that impacted their study result and learning achievements that in turn enable them to reach their goals.

1. Introduction

Deaf students are those who experience a hearing impairment either partially or completely that cause a complex impact on their on-going lives [1–4]. They physically look like normal students, yet the problem occurs when they are involved in a conversation as they find difficulties in following the conversation due to the hearing loss [5–7]. Although some deaf students are not losing their ability to hear, many deaf students tend to receive a secondary disability that is a deaf speech which results in a different range of intelligence from low to genius [8,9]. This is caused by the acquisition of information and understanding of the language that is less received compared to that in normal students [10]. Nevertheless, their hearing impairment does not necessarily mean they are not able to follow the learning process activities as deaf students attain information from senses that are still functioning, such as the sense of sight, touch, taste, and smell since. Therefore, their hearing issues can also be tackled with visual abilities, such as visual skills and lip reading to be able to follow the learning process well.

Visual and lip-reading play important roles for hearing-impaired students in understanding a problem [11]. The use of visual-spatial schematic representation is a stronger positive predictor of the performance of mathematical problem solving for deaf students [12]. Deaf students use their strong visual activity as their strength in the learning process to improve language development and communication [13]. Yet, they are generally slower in processing information than normal students [14]. As a result, deaf students need more time to learn to connect the relationships between mathematical concepts and use in problem-solving [15–18]. To overcome the problems, schools need to provide



special assistance both spiritually and materially. Besides, guidance from people around them and maintaining good habits in learning mathematics is crucial in their intellectual development and skills.

Learning habits are any existing ways owned by a person when receiving lessons, reading books, and setting the time to complete an activity [19]. Learning habits are good predictors of student academic achievement [20] as study habits can meet students' practical needs to assess, understand, and optimize their learning processes [21]. As for deaf students, learning habits affect the acquisition of information since they often get less information than normal students [22]. A study reported that there was a significant difference between students who experience vision and orthopaedic disorders in self-concept and study habits [23]. Math study habits in this research were measured through their attitudes towards consistency in learning mathematics, disciplines in learning mathematics, and a commitment to learning mathematics [24].

Self-consistent attitude is a personal attitude that is firm, suitable, good, uneasily distracted, directed, or focused to learn mathematics which affects the behaviour that a person does. All achievement and success can be achieved through self-consistent learning. Meanwhile, a disciplined attitude in learning mathematics means being obedient to study time, to work on assignments, to use learning facilities, and to make use of time before and after school hours. Besides, the attitude of self-willingness is seen as a commitment to uphold the vision, mission, and willingness to exert all efforts in carrying out the duties and responsibilities of those tasks. The attitude of students' commitment to learning mathematics is confidence, shows a high learning intentions, is able to evaluate learning outcomes, and takes extra efforts in learning from mistakes during studying math.

2. Method

The methodology used in this study focused on the pragmatic paradigm through a mixed-methods approach [25–27]. The quantitative data were gained through a questionnaire consisting of a commitment attitude questionnaire, a disciplinary attitude questionnaire, and a commitment attitude questionnaire in learning mathematics. Qualitative data focused on exploring the participants' learning activities both at school and in the hostel. The combination of quantitative and qualitative data allowed us to identify their attitudes and beliefs about mathematics, teaching mathematics, and habits in learning mathematics.

This study involved 99 deaf students taken purposely in 4 schools, including SLB B Karya Murni Ruteng, Semarang State Junior High School, SLB B Don Bosco Wonosobo, and SLB B Denaupakara Wonosobo.

To find out the attitude of students in learning mathematics, a rating scale was designed based on indicators of self-consistency, self-discipline, and self-commitment. 12 statements were drawn to measure the indicators of the deaf students' self-consistent attitudes in learning mathematics; 11 statements were to examine the indicators of the deaf discipline of students in learning mathematics; 10 statements were to find out the attitudes of deaf students' commitment attitudes in learning mathematics. Each statement had four choices, namely always, often, sometimes, and never. Scores were given for each scale item using a Likert scale. The score of the attitude towards mathematics learning habits was stated in positive statements where the answer “always” was given a score of 4; option “often” was scored 3; option “sometimes” was scored 2, and the option “never” was given a score of 1. While for negative statements, the option “always” got a score of 1, the option “often” was scored 2, the option “sometimes” was 3, and the option “never” was given a score of 4. Thus, the ideal maximum score for indicators of self-consistent attitude, indicators of self-discipline attitude, and indicators of self-commitment attitude were 48, 44, and 40 respectively. The scale of the likes of learning mathematics in deaf students was also arranged for each indicator. Indicators of self-consistent attitude in learning mathematics including consistency, being assertive, feeling secure with own choice, being steady and being uneasily distracted, and being focused to learn and being directed. As for indicators of self-discipline attitude in learning mathematics, they included: a discipline with schedules, discipline with assignments, a discipline of using learning facilities and facilities, a discipline with students, and discipline of going back home after schools. Lastly, the indicators of self-commitment in learning mathematics consisted of confidence, serious intentions, learning while calculating formulas, assessing learning outcomes, and efforts to improve weaknesses. Other than the questionnaires, in-depth

observations were also conducted by living together with subjects for approximately 1 month at each study site to observe student activities about indicators of mathematics learning habits outside school hours.

3. Result and Discussion

The analysis of the deaf attitudes of students in learning mathematics was based on the results of the questionnaire and observation. The questionnaire consisted of 3 indicators of deaf student habits in learning mathematics, including; consistency, discipline, and commitment to their commitment to learning mathematics. Analysis of the results of observations was done descriptively towards their habits in learning mathematics both at school and at their boarding house. The results of the analysis of each indicator were presented as follows.

3.1. The consistent attitude of students in learning mathematics

To find out their consistent attitude in learning mathematics, researchers gave a questionnaire that consisted of 12 statements. The results on table 1 showed that, of the 12 statement items, 24.8% of students responded “*always*”; 36.1% of students gave “*frequent*” responses; 31.1% gave responses “*sometimes*” and 7.9% gave responses “*never*”. In the answer category column, 3 statement items were categorized in a “*very good*” category which meant that they were very consistent to learn mathematics because of the importance of math; therefore, they were consistent to improve themselves individually in learning mathematics and to consistently focus on learning mathematics related to understanding the concepts and procedures. Their consistent attitude affected the behaviour as consistency can be understood as a match between words and actions [28]. In general, the average of their attitudes related to consistency in learning mathematics is 2.76 (good category).

As a result of our observations, we found that they were very consistent with what was said and what was done. They possessed a fixed attitude and always tried to harmonize their words, attitudes, and behaviour. Consistency means maintaining the same expectations for appropriate behaviour in a particular activity over time for all students [29]. Although in general, the average of their consistent attitude in learning mathematics was in a good category, there were several statement items in which the percentage of students who responded “*sometimes*” and “*never*” was greater than those who gave answers “*always*” and “*often*”. When we conducted interviews to clarify these results, we found that some deaf students did not favour calculating and did not try to find out when facing difficulties in learning mathematics as they felt ashamed of their other friends which in turn has caused them to not focus on learning mathematics. They preferred to focus on improving life skills, such as sewing, salon, carpentry, or machine automotives. They did not realize that they needed to learn mathematical skills, such as basic arithmetic operations to make patterns and to be accurate in doing calculations[30].

Table 1. Analysis of students' consistent attitudes in learning mathematics

	Statements	Percentage				Average	Category
		Always	Frequent	Sometimes	Never		
1	I like studying mathematics based on my personal attitude because mathematics is important for calculation.	34.3%	37.4%	28.3%	0 %	3.06	Very good
2	I am aware that to succeed in mathematics it cannot be forced by anyone, but it must come from yourself.	19.2%	42.4%	34.3%	4.0%	2.77	Good
3	I am committed to my attitude on studying mathematics because I knew the benefits	15.2	29.3	50.5	5.1	2.55	Good

	Statements	Percentage				Average	Category
		Always	Frequent	Sometimes	Never		
4	I still try to improve myself even though some teachers are not good at teaching mathematics which makes me difficult to understand.	48.5	17.2	33.3	1.0	3.13	Very Good
5	Ever since I was a child, I felt that it was appropriate to study mathematics because I like counting things in my house and my dorm	18.2	42.4	32.3	7.1	2.72	Good
6	I find it appropriate to study mathematics because it helps us to solve problems related to everyday life.	13.1	49.5	27.3	10.1	2.66	Good
7	Many friends said that studying mathematics puts yourself in a difficult time, but that does not easily change my attitude	24.2	23.2	34.3	18.2	2.54	Good
8	I feel confident with my attitude to study mathematics because mathematics is needed in the community.	11.1	65.7	10.1	13.1	2.75	Good
9	Even though my parents could not afford to buy math textbooks, I was not easily influenced because I would try to study with friends or read at the library	18.2	28.3	41.4	12.1	2.53	Good
10	Many friends are easily discouraged when facing difficulties in understanding mathematics, but I still try to overcome them.	32.3	24.2	38.4	5.1	2.84	Good
11	I remain focused on learning mathematics to sharpen my intelligence.	29.3	29.3	23.2	18.2	2.70	Good
12	Studying math must focus on learning formulas and steps to find answers.	34.3	44.4	20.2	1.0	3.12	Very Good

3.2. The disciplined attitude in learning mathematics

To find out their consistent attitude in learning mathematics, we provided a questionnaire consisting of 11 statements. The results presented in Table 2 show that, of the 11 statements, 34.3% of respondents gave “very good” answers; 19.9% responded “good” answers; 43.8% agreed to say “fair”, and 23% of students chose “poor” responses. In the category column, several statements were in the “good” category, which meant that there were students who had a good discipline attitude towards the points of the statement. In general, their discipline in learning mathematics is good. To see the compatibility of the questionnaire data with daily life, we conducted in-depth observations of their daily activities, especially those who lived in the dormitory. The observation was carried out for ± 30 days from 06.00 until 12.00, continued at 17:30 to 20:30.

The results of observations showed that in general schools that carried out a boarding-school based education had separated schedules both at school and at boarding activities. Activities at the boarding began at 04.30 where all students started the morning activities according to the division of tasks for each person in small groups. The discussion with the leader of the boarding house showed that all

students obeyed and followed the rules for daily house-work routine unless they had a specific reason, for example, illness. When we observed at school, we found that all students should come to school no later than 6:30 AM to carry out their morning assignments at school before starting the lesson. Teaching and learning activities began at 07.20 AM until 12.00 AM. Interestingly, we found that teachers always avoided using sign language, and students always tried to talk when answering questions from the teacher. The results of interviews with several teachers found that the school prohibited students and teachers to use sign language in the classroom. Schools suggested teachers and students minimize the use of sign language in any possible interaction. Students were "forced" and were trained to be able to speak using broken language and be able to read expressions (lip movements) when other people spoke. Training students to speak greatly helped students to communicate with others in the community [24].

Furthermore, the researchers conducted observations during the evening schedule that started from 7:00 PM to 8:30 PM. The researcher found that there were two learning groups for deaf students; namely a preparation class for children who are still illiterate and a literate group whose students were able to read and write. In the preparation group, the children were mentored by peers to practice speaking a word for word even though it was slow and broken. Researchers found that students were highly enthusiastic to learn how to speak with the guidance of their peers. The peer teaching is very effective in this group because students would feel more relaxed without any pressure or fear and were very enthusiastic to learn how to say words from their peers, not to mention their teacher's assistance.

In the other study groups, each student learned to do homework given by the teachers, some learned to read the material for tomorrow's lesson and also discussed with each other group work. We see that all students were very disciplined in learning and maintaining mutual calm with one another even though there were no assistants to look after them in learning activities. The evening study ended at 8.30 PM and followed by the prayer activity and then rest time. These activities were always carried out every day except Sundays or holidays, and deaf students were very disciplined about the scheduled time. Discipline is a condition that is created and shaped through the process of a series of behaviors that show the values of obedience, loyalty, orderliness, and attachment [29]. Discipline is an effort to control oneself and attitude, mental individual or community in developing obedience and being obedient to the rules and based on encouragement and awareness that arises from his heart. The results of Hao and Chunsha Wu's research report that moral cognition might be enough for deaf children to avoid breaking the rules but not enough for them to show prosocial behavior [31]

Table 2. Results of students' disciplinary attitudes in learning mathematics

	Statements	Percentage Answer				Average	Criteria
		Very good	Good	Poor	Very Poor		
1	I make a study schedule where its time allotment for Maths is more than other subjects.	34.3	12.1	27.3	26.3	2.55	Good
2	I use every time well if there is a curiosity about the formula and the complete steps given by the teacher.	1.0	10.1	59.6	29.3		Poor
3	I immediately work on every assignment on that same day.	26.3	4.0	57.6	12.1	2.44	Good
4	I do all easy and difficult assignments until they are finished.	16.2	33.3	40.4	10.1	2.56	Good
5	I try to have a calculator so that it would help me work on complicated and difficult problems.	1.0	11.1	57.6	30.3	1.83	Poor
6	I try to regularly visit the library at schools or in other places to enhance my mathematical knowledge	6.1	3.0	32.3	58.6	1.57	Poor

	Statements	Percentage Answer				Average	Criteria
		Very good	Good	Poor	Very Poor		
7	During math class, I have to prepare stationery such as pencils, ballpoint pens, extra papers, eraser rubber, and so on because I need to calculate it.	3.0	13.1	56.6	27.3	1.92	Poor
8	To prevent being late to school, I usually arrive at school or class 15 minutes before the lesson starts.	25.3	32.3	29.3	13.1	2.70	Good
9	Although teachers are absent, I still come to class and work on difficult math tasks or study with friends.	2.0	16.2	50.5	31.3	1.89	Poor
10	If the Math teachers come late, I do not roam around the class or outside the class.	15.2	44.4	33.3	7.1	2.68	Good
11	I am still obedient to follow the schedules until school hours end unless there is an instruction from the school principal for going back home earlier.	16.2	39.4	37.4	7.1	2.65	Good

3.3. The attitude of students committed to learning mathematics

To find out their commitment to learning mathematics, we provided a questionnaire consisting of 10 statements. The results presented in Table 3 showed that, of the 10 statement items, 15.9% of respondents gave “very good” answers; 20.2% of respondents responded “good”; 42.8% said “poor”, and 21.4% agreed “poor”. In the category column, it presented that not all statements were in “good” categories. However, in general, the average attitude of their commitment to learning mathematics was in the “good” category. Commitment is the bond of an individual with an act of behavior, an intellectual characteristic, a personal trait such as honesty, which cannot be forced from the outside [32,33]. Those who are considered to have high creativity are generally supported by a strong commitment to what is done.

Table 3. Attitudes of students' commitment to learning mathematics

	Statements	Percentage Answer				Average	Criteria
		Very good	good	Poor	Very poor		
1	I am confident that I can understand mathematics through hard work and effort.	25.5	33.7	19.4	21.4	2.63	Good
2	The success of learning Math on others encourage me to willingly learn Math more.	49.0	21.4	4.1	25.5	2.94	Good
3	I have a serious intention to understand Math because Math is my choice, and I would like to prove it to my parents.	6.1	13.3	54.1	26.5	1.99	Poor
4	My intention to study Math is motivated by my curiosity to solve problems related to numbers.	24.5	30.6	31.6	13.3	2.66	Good
5	Every time I get an assignment from my teacher, I try to study it at home	8.2	14.3	36.7	40.8	1.90	Poor
6	Although Math teachers often assign Math assignments, I always try to work on it every day to avoid from pressures of piles of assignments.	32.2	23.3	43.3	1.1	2.87	Good
7	Math must be studied through regularly counting and calculating so that we can find the answers.	1.0	17.3	58.2	23.5	1.96	Poor

	Statements	Percentage Answer				Average	Criteria
		Very good	good	Poor	Very poor		
8	Learning Math is not only about memorizing the formulas since it does not help us to understand the concept well.	3.1	10.2	53.1	33.7	1.83	Poor
9	I try to follow the schedule of Math tests regularly so that I can track down my learning progress.	6.1	26.5	51.0	16.3	2.22	Good
10	If I find difficulties, I try to discuss the issues with intelligent students or with my subject teachers.	3.1	11.2	73.5	12.2	2.05	Good

4. Conclusion

Based on the description above, it can be concluded that the consistent attitude, disciplined attitude, and the attitude of their commitment in learning mathematics were in a good category, therefore, we assumed that deaf students had good habits in learning mathematics. Regardless, the inconsistent responses such as “sometimes” or “never” on the survey, these learning habits need to be maintained and improved so that they are more accustomed to being consistent, disciplined, and committed to learning mathematics. By having these good habits, they are expected to have basic skills related to basic arithmetic operations that will be applied in learning life skills, such as sewing, making patterns, carpentry, and automotive. Besides, good habits might be able to improve their cognitive skills so that they can achieve their targeted goals.

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