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## Case Study on Improving Learning Abilities of Students Who Have Difficulties in Mathematics

This case study is focused on investigating factors of leading learning difficulties in mathematics, and developing strategies for improving mathematics for students with learning difficulties. Two types of learning difficulties have been discussed in this case study: **Learned Helplessness** and **Defensive Attribution**. Sample cases show how the students enhanced their learning in mathematics with the use of appropriate strategies.

### Conceptual Framework

In daily teaching practice, various factors contribute to good performance towards helping students in learning mathematics. It includes encouraging students to work hard, apply effective learning skills, and being good at mathematical thinking. However, many reasons cause students to develop learning difficulties in mathematics. For example, students with poor performance may fail in mathematical learning from not making sense of mathematical learning. There are different types of learning difficulties in mathematics in high schools in India. Therefore, it is necessary to apply proper strategies to improve their Learning.

### Learned Helplessness

Learned helplessness is the expectation, based on experience that one's actions will ultimately lead to failure. It is an internal factor and relates to student's confidence. Sometimes, learned helplessness is also related to external factors. For example, some students lack help for learning mathematics. They failed in mathematics because of rarely getting help in their learning process. If they achieved academic success on certain mathematics exams, they would think that it was because of luck. Otherwise, failures are based on some uncontrollable factors, such as knowledge of mathematics foundations and loss of interest in the subject, or low ability in mathematics learning and lack of ability. Their self-confidence can be enhanced through proper guidance in improving the learning skills and correcting the negative attribution.

### Defensive Attribution

Some students have "defensive attribution," with mathematical learning difficulties; they usually do not study hard, do not take initiative, loose interest, and always complain. For example, they complain that mathematics is boring, mathematics curriculum materials are not good enough, and teachers do not teach well. Never do they try to find problems within themselves. Usually students with repeated failures may develop a defensive attribution to protect themselves from negative feedback.

### Methods of Helping Students with Learning Difficulties

Following are the four helpful general principles for supporting students with a tendency to accept failure:

- (1) Accentuate the positive. Understand the student's strengths and use these to develop their confidence
- (2) Eliminate the negative. Deal with the student's weaknesses tactfully. Talk to the student and develop a plan to improve learning;
- (3) Go from the familiar to the new, using advanced organizers or guided discovery; and
- (4) Create challenges in which students actively create problems and solve them using their own knowledge and skills

The National Research Council points out following principles for helping students with learning difficulties:

- (1) Learning with understanding involves connecting and organizing knowledge;
- (2) Learning builds on what children already know; and

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(3) Formal school instruction should take advantage of children's informal everyday knowledge of mathematics.

## **CASE-1: Learned Helplessness**

This case study is about Priyanka, female, a high school student in a city of South India.

### **Student demographic background:**

The student's mother is an employee in a foreign company and her father does private business. Her parents had divorced and Priyanka stayed with her mother and grandparents. In Priyanka's learning processes, she seldom passes mathematics exams in high school. Therefore, Priyanka was identified as a struggling student in mathematics.

### **Learning Characteristics:**

Priyanka is an introvert character; she seems depressed all the time. When EON Education Tutor met her, she smiled however looked sad. When Priyanka's mother talked about Priyanka in front of her, she would escape to her room. Priyanka's mother believed that Priyanka was a nice girl, listened to her parents, and studied hard. She studied until midnight from the time she went to high school. She did well in other subjects except mathematics. She had failed in Mathematics exams many times. Due to her learning character, parents did not give her pressure and only hoped EON Education Tutor would be able to help Priyanka and teach her effective learning skills in order to make her more relaxed in learning. Actually Priyanka did well in middle school. However, Priyanka did not catch up with her classmates in high school. Priyanka's mother felt responsible for her family to improve Priyanka's scores. Therefore, she was looking forward to EON Education Tutor to be able to understand this particular situation and continued to be patient with Priyanka.

### **Diagnostic Assessment**

EON Education Tutor chatted to Priyanka and asked: "Do you like mathematics?"

Priyanka said: "I don't know, I only learn mathematics because of teacher's requirements."

EON Education Tutor: "What has happened so far in learning mathematics? Why do you have to study Mathematics?"

Priyanka was surprised and reluctant to answer this question and kept silence for a while, then said: "Because I have to take mathematics exams."

EON Education Tutor: "Anything else?"

Priyanka told EON Education Tutor that she learns mathematics in order to comfort her mother; she knew that it was not an easy life for her mother, and also she felt guilty for her poor performance in mathematics.

After EON Education Tutor contacted Priyanka a few times, EON Education Tutor discovered that Priyanka is indeed a sensible girl but a bit stressed. For example, Priyanka was asked the reasons why she could not do well in mathematics. She kept saying that she has low ability in mathematics and could not remember the methods for solving problems with flexibility, and her brain cannot match this challenge.

In addition, she felt she was not as clever as her classmates. EON Education Tutor attempted to guide her, and asked: "What do you think about your teacher's teaching? Did the teacher care about you?"

Priyanka said: "My mathematics teacher is excellent, although I am not good at mathematics; the majority of students in the class do well. It can be proved that I was not good at mathematics. I suppose my teacher doesn't know my name. It is understandable because he/she is usually busy and I am not good at mathematics."

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EON Education Tutor: “Teachers care about every student. Your teacher believes that you can behave yourself and don’t need to be controlled by her.”

Priyanka: “Maybe.”

When talking about her parents, Priyanka believed that there is no direct relationship between her mathematics results and her parents’ divorce. Priyanka emphasized that her exam results were ok except for mathematics. Therefore, her parents always argued because of her poor performance. She felt really guilty about this. EON Education Tutor told her it was wrong that she always blamed herself; she needn’t burden herself, because adults should have their own life. Priyanka felt very stressful in daily learning; she told EON Education Tutor that she felt nervous when she saw a new topic in mathematics; she thought she could not do it, and stupid, and lost confidence completely.

Based on this particular learner’s character and lack of help, EON Education Tutor attempted to develop some strategies to change her learning.

### **Praise at proper time and enhance the student’s confidence.**

When analyzing topics of mathematics, EON Education Tutor often asked Priyanka whether she could find a good idea, and if her thoughts were based on reason. When Priyanka put effort and came up with answers, EON Education Tutor would agree with her responses and praised Priyanka. This helped in building confidence in Priyanka. In addition, EON Education Tutor often showed the process of thinking and told her how to “think” when EON Education Tutor and Priyanka studied the topic. Sometimes, EON Education Tutor failed to identify her thinking. Sometime, it took several trials. Later on, Priyanka was not afraid to solve mathematical problems. She recognized that even mathematics teachers did not know the best way to solve problem sometimes. So, Priyanka did not give up any more like she used to.

### **Encourage developing problem-solving skills.**

EON Education Tutor not only developed Priyanka’s diligence but also pointed out her weaknesses in learning skills and required her to exchange ideas with classmates via communications. Priyanka found many of her classmates always resolved mathematics problems that they could not solve the first time, and recorded the strategies of problem solving in their notebooks so that they would be able to review before exams. EON Education Tutor also told her to write down the reasons why she could not solve problems, and the key factors in solving these problems. He asked her to master the processes that Priyanka used in solving problems. Later on, Priyanka realized that there are differences between high school and middle school mathematics. In high school, there is more focus on thinking and not only simply imitate examples. More focus should be on trial-and-explore solving methods. She started to explore methods in solving problems and learned how to think mathematically, not only remember results while doing mathematics.

### **Provide guidance to identify reasons beyond personal factors.**

EON Education Tutor trained Priyanka to objectively organize positive aspects and to realize that successful learning depends on various factors. It does not only include personal work, ability, learning strategies, but also relates to the level of tasks, teachers, teaching methods, and family background, etc. Finally, EON Education Tutor helped her to develop some methods to deal with these factors.

### **Results**

Priyanka made great progress during the term. She got 80 % on her final mathematics exam. EON Education Tutor asked her to talk about her experience of improvement. She was able to relate clearly, why and how she thought. She likes mathematics now and has learned how to enhance her mathematics

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learning. EON Education Tutor continued to encourage her to apply effective learning skills. For example, her effective learning skills include outlining the structure of the topic, re-doing problems with mistakes in her homework, exchanging ideas with classmates, regularly reviewing the content, and focusing on the connection between mathematical concepts.

## **CASE-2: Defensive Attribution**

This case study is about Ramesh, male, a high school student in Bangalore.

### **Student demographic background:**

Ramesh's parents are managers of a bank. Both of them are very busy and do not have time to help with Ramesh's learning. The family's financial situation is good. Ramesh is an only child in the family. The parents have high expectations from him. Ramesh used to study in a key middle school in Jayanagar. Due to Ramesh not doing well on the final exams, he had to attend a common high school. After that, his achievements were not good enough. Five out of eight times he failed on the final exams. He got 38 out of 100 points on the mathematics exam. He was classified as a difficult learner in this study.

### **Diagnostic Assessment**

When the second term started, EON Education Tutor interviewed Ramesh.

EON Education Tutor: How do you feel about mathematics Ramesh?.

**Ramesh:** "Very bad, I cannot understand all of it."

EON Education Tutor: "Would you like to carry on learning?"

**Ramesh:** "Ok, but I am not getting good result in high schools. I used to get better results in middle school."

EON Education Tutor: "But why are you not good at mathematics now?"

**Ramesh:** "Well, the mathematics teacher bored me, her lessons were not attractive, and she often lost her temper. She only focuses on exam results. I don't like to see her."

EON Education Tutor was surprised that he had such prejudice toward his mathematics teacher, and asked him: "Anything else?"

Ramesh thought a while, and said: "Yes, for example, there are many students who cheated on the exam. However the teacher didn't find out. After exam, the teacher criticized students who failed, including me most of the time. Furthermore, there was no connection between the early and later contents in the current mathematics curriculum. The teacher re-arranged the order of the lessons and I was not able to catch up with these."

EON Education Tutor: "What and how do you think you could learn mathematics?"

**Ramesh:** "If I put more effort and practice more, I will be outstanding. But I don't want to."

Ramesh seems to be confident, but has a negative attitude.

EON Education Tutor: "You are clever; Try to study hard. Can you achieve a good score in the next exam?"

"No problem," Ramesh said.

### **Analysis of Reasons for Ramesh's Poor Performance:**

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After a trigonometry unit test, EON Education Tutor chatted with Ramesh during lunchtime in the office. EON Education Tutor showed him the exam paper and asked: "This exam result is not ideal. What problem do you think there is?"

**Ramesh:** "I haven't finished it yet; also I misunderstood a question. Next time, I will not."

He tried to be relaxed.

EON Education Tutor: "Why can't you finish your exam on time?"

**Ramesh:** "There was a classmate who felt sick; the teacher asked for a student to accompany the classmate to the hospital. I cared about him and wasted time on thinking about it."

EON Education Tutor: "There were a few questions which you did before. Why did you still make mistakes?"

**Ramesh:** "I can do these problems. But in the exam, I was nervous."

EON Education Tutor: "Why were you absent in mathematics lessons a couple of days before the exam?"

**Ramesh:** "I fought with some classmates and I was not allowed to go to the classroom. I had to be educated by the school for fighting."

EON Education Tutor: "Promise me, you will try to avoid this issue happening again."

**Ramesh:** "I will try my best."

After term final exams, EON Education Tutor talked to Ramesh.

EON Education Tutor: "How were your exam results?"

Ramesh was upset: "I paid attention to the mathematics lessons, but the exam results disappointed me."

EON Education Tutor encouraged him and said: "You did few questions correctly, which means you have grasped the concept".

**Ramesh:** "Yes, I did. Arithmetic sequences were all right. But geometric sequences, I was not sure."

EON Education Tutor: "When you practiced geometric sequences, did you find them problematic?"

**Ramesh:** "Honestly, I often copied geometric sequences homework from other students. No revision after lessons. I will do it in my home."

EON Education Tutor added: "Hopefully you can continue to study hard."

Based on a series of test results and Ramesh's performance, it could be seen that Ramesh did not study hard, did not take initiative, lost interest, and also complained that mathematics was boring, the mathematics teacher was no good. However he never sought reasons from himself. Therefore, Ramesh was identified as difficult learner because of external factors. EON Education Tutor combined his choleric character and strong performance desire. So the following strategies were designed for improving Ramesh's poor mathematics performance.

## **Intervention**

### ***Objective analysis of the reasons for poor performance in mathematics***

EON Education Tutor suggested to Ramesh's mother after a mathematics exam that she should attempt to praise Ramesh's concrete behavior. She should not simply say he is clever. Otherwise, Ramesh would not understand why he always failed in mathematics. Ramesh has disadvantages in his character. He should not blame himself; however, he needs more patience in treating him and guiding him to know his merits and shortcomings. Ramesh's mother promised to do so and encouraged Ramesh to find the reasons for lacking effort in the subject.

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Ramesh was interested in the Cricket; also he read the Cricket News every day. EON Education Tutor commended Ramesh's attitude of persistence and asked him questions related to Cricket knowledge. EON Education Tutor hinted to Ramesh that if he wants to gain good results in mathematics exams, he would have to put his effort into it, like the effort he put into watching the Cricket every day.

EON Education Tutor told Ramesh why he was not able to learn mathematics better. The possible reasons included the mathematics teacher not being good enough, and curriculum problems. However, it is necessary to think about why other students could do well with the same teacher and curriculum. Therefore, Ramesh should find the reasons for himself.

## **Offering opportunities for students to present their ability in the classroom; supervising and fostering learning habits**

Based on Ramesh's character, EON Education Tutor intended to encourage Ramesh's answering questions and presenting his thinking in front of his classmates. Also EON Education Tutor led Ramesh to feel that his mathematics teacher cared about his improvement. In addition, the teacher specifically treated Ramesh face to face when marking his homework. When the teacher found an error in Ramesh's homework, the teacher let him analyze the reason why he made a mistake. After that the teacher taught him the correct way. Finally, Ramesh corrected it by himself. Moreover, the teacher often contacted Ramesh's parents in order to address his progress. EON Education Tutor also discussed with Ramesh once a month, helping Ramesh evaluate his learning and finding personal shortcomings in learning, during the study. EON Education Tutor suggested that Ramesh should cooperate with classmates in order to be more effective in achieving success in their learning.

## **Results**

Three months later, Ramesh has changed in a few aspects; for example, he was able to pass his mathematics exams, is full of passion in learning mathematics, and he has clearer objective in learning mathematics. His character has changed.

## **Conclusion**

This study focused on two cases, both high school students with learning difficulties in mathematics. The EON Education Tutor employed different strategies to improve their performance in mathematics learning. The EON Education found some strategies to address the students' poor performance in mathematics.

Strategy applied in **case one (Priyanka)** was that of enhancing the personal confidence. In addition, Student was guided towards finding effective learning skills and correcting her negative attitude. After letting the student focus on understanding and practicing various methods, learning habits were improved.

Strategy applied in **case two (Ramesh)** was that of communicating with the teacher and helping the student analyze mathematical topic face to face with the mathematics teacher. The EON Education Tutor also supervised Ramesh's learning process, pushed him to learn hard, compared early and later exam results, and help him find more personal reasons in his learning. Tutor helped Ramesh understand that poor learning was not related only to the external factor such as the mathematics teacher but also it was related to Ramesh's character and negative attitude as well.