

A Qualitative Study of Coping Strategies in Secondary Level Mathematics Learning: A Psycho-Analytic Perspective

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Abstract

Through a qualitative research approach, this study aims to understand how thirteen secondary mathematics students who do not do well in mathematics learning cope with it in a classroom. The participants included a total of thirteen students in a Singaporean mathematics classroom at secondary school level. Observational and interview data were collected over a period of 6 weeks to understand the strategies formulated by these students to cope with mathematics learning. Grounded theory analytical methods were used in the analysis of the data. From this study, three main categories of defence mechanisms utilised by these thirteen students evolved – Avoidance, Denial and Apathy. "Avoidance", the stage where the students attempt to avoid mathematics learning, is supported by the defence mechanisms of "Aim Inhibition", "Compensation" and "Displacement". They usually begin such avoidance on an individual basis and may graduate to group actions in the form of "Collaborative Avoidance", which is supported by the defence mechanisms of "Displacement" and "Identification". Students may also use the coping mechanism of "Denial" where they imagine and maintain the picture of them doing well in future mathematics assessments. This defence mechanism is complemented by "Suppression", "Repression", "Fantasy" and "Deceit". "Apathy" the stage where they start to resist against mathematics learning openly, consists of "Minimisation", "Rationalisation", "Provocation" and "Dramatization". The findings have implications for the development of theory, practice and future research.

Keywords: *Qualitative research; coping behaviours; mathematics learning; psycho-analytic defence mechanisms.*

Introduction

Mathematics learning can be a stressful event due to the social demands and expectations on Singaporean students in terms of mathematics education. This source of stress worsens for many students who find mathematics difficult (Jackson & Leffingwell, 1999; Burns, 1998; Misra & McKean, 2000). In coping literature, Lazarus and Folkman (1986) first categorised coping strategies in stressful situations into either problem focused (taking behavioural action to alleviate problematic event) or emotion focused (alleviating the expected emotional or physiological distress of the problematic event through controlling or discharging emotions). Later, Carver, Scheier and Weintraub (1989) divided coping into active and avoidant strategies while Higgins and Endler (1995) grouped it into three

categories: task-oriented, emotion-oriented, and avoidance-oriented. Cartwright and Cooper (1996) instead perceived coping strategies as being categorised into adaptive and maladaptive ones.

Examining studies that have investigated coping strategies in learning, they draw similar conclusions to the above coping literature. There are strategies that are positive, self regulatory and consciously displayed by students to improve their learning (Zimmerman, 2001; Boekaerts, 1993). They are termed as approach strategies (Covington, 1992; Newman & Goldin, 1990). Scrutinising these approach strategies, they are synonymous with the problem focused coping suggested by Lazarus and Folkman (1986), active coping proposed by Carver et al. (1989) and the task-oriented coping in Higgins and Endler (1995). They are also adaptive as suggested by Cartwright and Cooper (1996). On the other hand, if students do not have successful approach strategies, they turn to exhibiting negative coping strategies such as refusing to seek help, avoiding the tasks (avoidant behaviours) or disrupting the class (disruptive behaviours) as they do not know how to, or do not want to, perform the learning tasks allocated to them (Covington, 1992; Newman & Goldin, 1990; Woods, 1980, 1984). These negative coping strategies are termed as avoidant or disruptive strategies (Covington, 1992; Newman & Goldin, 1990). Avoidant or disruptive strategies are in the same category as the avoidant coping strategies in Carver et al. (1989) and Higgins and Endler (1995). And they are usually maladaptive as suggested in Cartwright and Cooper (1996). As for the emotion-oriented strategies as proposed by Lazarus and Folkman (1986) and Higgins and Endler (1995), they are present in both approach and avoidant strategies. Skinner, Edge, Altman and Sherwood (2003) proposed that there are two categories of coping with stress. The first category consists of strategies (problem solving, support seeking, information searching etc.) that are formulated to cope with stress perceived as challenge, while the other category of strategies (helplessness, opposition, escape etc.) deals with stress appraised as threat.

However, academic emotions are seldom researched on in educational psychology, especially in subjects like mathematics and science (Pekrun et al., 2002). This is due to the common perception that mathematics is a pure cognitive endeavour that is out of bounds to emotional responses. The manner that students cope with mathematics learning can also be strongly related to their mathematical identity and mathematical socialisation (Martin, 2003). Their mathematical identity refers to their belief and perceived importance about mathematics learning and their motivation in, constraints faced when they are learning mathematics (ibid). On the other hand, mathematical socialisation is defined as the experiences students undergo when learning mathematics as a group (ibid). Ewing (2004) proposed that teacher interaction with students in mathematics learning can have an impact on how the students cope eventually in their learning. This study will attempt to explore understand the coping strategies as exhibited by students who do not do well in mathematics learning in the classroom, as individuals or in groups, from a psycho-analytic perspective.

Mathematics students have to face the prospect of learning mathematics that is physiologically and psychologically uncomfortable for them in their mathematics classes if they are not coping well in it. Therefore, such students may consciously or unconsciously attempt to reduce such discomforts in their mathematics learning through their thought processes and actions. Such thought processes and actions are "defence mechanisms" that are defined by Freud (1936) as a set of mental processes with self-protective instincts or dispositions that can culminate into protective behaviours. Cooper (1998, p 951) sees defence mechanism as "a force struggling to against a counterforce, usually involving undesirable (anxiety-producing) content" and generally associates with the phenomenon of anxiety and pain. However, through the use of defence mechanisms, individuals can sustain their growth and homeostasis as part of their normal development (Cooper, 1998; Kernberg, 1994). Defence mechanisms are usually perceive to distort and falsify reality in one way or another and are considered unhealthy ways of coping with any anxiety. These behaviours only serve as a false and temporary relief from the anxiety and are

perceived to be maladaptive. However, defence mechanism can also be conscious and self directing. These defence mechanisms, if directed effectively, can be useful in handling anxiety (Freud, 1936).

There are a number of defence mechanisms proposed by psychoanalysts now and then (See Blackman, 2004; Cramer, 2000, 2001, 2006; Freud, 1936; Kernberg, 1994; Straker, 2004; Vaillant, 1992, 1998). Most of current defence mechanisms are derived significantly from "*The ego and the mechanisms of defense*", written by Anna Freud in 1936. They include the defence mechanisms of repression, dissociation, denial, regression, rationalisation, projection, displacement, isolation, reaction formation, identification, sublimation, fantasy, compensation, introjection, turning against the self, turning into opposite, undoing, identification with the aggressor, altruistic surrender and intellectualization. Freud (1936) also emphasised that individuals usually select and use a few of such defence mechanisms although there may be a wide repertoire of defence mechanisms.

Research Question

This study aims to answer the main research question: "What do students who do not do well in mathematics learning say about how they cope with it in a mathematics classroom in Singapore?" This research question would be answered in the context of the conditions below, as experienced by the participants:

- a) They are studying in a Singaporean mathematics classroom at secondary school level;
- b) They do not do well in mathematics learning. The definition of "not doing well in mathematics learning" refers to their poor performance in mathematics assessments.

The main research question is fragmented into two sub-questions as below:

- a) What are the coping strategies used by mathematics students who do not do well in mathematics learning when they are learning mathematics in the classroom?
- b) Why do they use these coping strategies?

To intervene successfully in the area of mathematics learning, there is a need to recognise and understand the various manifestations of coping behaviours in the mathematics learning setting. The reasons behind the manifestations that are often trivialised have to be investigated too. These behaviours and thoughts have to be understood from the voices of the affected students. The interpretation of the behaviours of such mathematics students can also be approached from the psycho-analytic perspective that can be useful in the intervention stage. This can help the teachers greatly in identifying such mathematics students. At the same time, being aware of the students' psychological approaches towards mathematics learning, teachers can better intervene in assisting them in coping with mathematics learning. However, there is hardly any literature in these areas. Thus, this study should contribute significantly to the current local and international body of relevant literature.

Methodology

This study adopted the interpretive research paradigm to understand how students who did not do well in mathematics learning coped with it in the classroom. The data collection and analysis methods of theoretical sampling, theoretical saturation, open coding and axial coding as in grounded theory research were used (Glaser, 1978; Strauss & Corbin, 1990). This allowed the analysis of the data to be descriptive and explanatory in depth.

The researcher was mentoring a trainee teacher who was teaching a class that had a substantial number of mathematics students who did not do well in mathematics learning. Thirteen students who failed their mathematics assessments regularly since their secondary school years and exhibited some levels of mathematics anxiety were selected as participants in this study. All students in this class took a simple mathematics anxiety test. This was designed by the researcher and was pilot tested on students from another class. The target group for the study comprised 18 male and 21 female students aged 14 years old and were in their second year of attendance in a public secondary school in the eastern part of Singapore. The test consisted of a series of Likert-type responses for specific statements and students were asked to indicate their level of agreement for each statement. The test was modified from the ones designed by Richardson and Suinn (1972). The test was administered by the researcher and the trainee teacher in the classroom during one of their mathematics lessons. Nineteen of the students scored an average mathematics anxiety score of 3.17 that is above the designated 2-point benchmark¹ in this survey. They suffered from higher levels of mathematics anxiety than others. However, only thirteen of them, who were the selected participants, failed their mathematics examinations badly, with grades ranging from 10% to 32%, in the previous academic year.

Data Collection Methods

Study of defence mechanisms may be problematic in data collection. One main issue relates to the reliability of data collected in such studies of defence mechanisms. As Vaillant (1998) rightly pointed out, whether any form of defence mechanism is observed, it depends greatly on the subjective interpretation of the researcher. Thus, Vaillant suggested that the use of self reported data in data collection can help to provide a certain acceptable level of reliability. This study employed a form of observation-based interview data collection method which involved:

1. Non participant observation of the thirteen mathematics students' behaviours during their mathematics lessons. This allowed an unobtrusive form of observation of the behaviours of these students. These observational data served as the basis of the description of the types of coping strategies used by them. At the same time, they helped in the formulation of the interview questions that were asked of the interviewees to elicit their reasons behind these observed coping strategies.
2. Individual interviews of all thirteen students. The interview questions were formulated based on the observations done. They were semi-structured and intended to elicit the reasons behind their observed behaviours and to triangulate the observational data. Theoretical saturation is where no additional data are found whereby the researcher can form new categories or develop new properties and dimensions of any present category (Strauss & Corbin, 1990). Sample size in theoretical sampling is not an important issue as long as theoretical saturation is reached (Strauss & Corbin, 1990).

The whole observation process took six weeks to complete where the researcher observed the participants for four periods of thirty minutes each per week. This culminated into a total of 600 minutes of observation. The topics of algebra and trigonometry were taught in these lessons. After each observation, selected participants were interviewed. The interviews of the participants lasted ten to twenty minutes each. Five participants were interviewed one time, three participants were interviewed

¹ As the average score of the mathematics anxiety ranges from 1 to 4 point, this study adopted the benchmark that any student with a score above 2 is considered to be suffering from some levels of mathematics anxiety.

two times and the remaining five participants were interviewed three times. A total of 456 minutes of interview data was collected. The observational data were recorded as hand written notes while interview data were audio-taped. Each of the thirteen participants was identified through a nickname in this study. The observational data were presented as summaries and the interview data were also quoted through the participants' verbatim (thus, some comments were grammatically incorrect) in the latter section on the findings of this study.

Data Analysis Methods

Open and axial coding stages of grounded theory analysis procedure are used (Glaser, 1978; Strauss & Corbin, 1990). They were utilised with the aim of achieving the three concurrent data analysis stages as proposed by Miles and Huberman (1984): data reduction, data display and conclusion drawing. Open coding involves the labelling and categorization of phenomena as indicated by the data (Strauss & Corbin, 1990). The end products are concepts which are the building blocks that will help build up the theory or theories. The comparative method that employs the procedures of asking questions and making comparisons is being utilized in this process (Glaser, 1978). By asking simple questions such as what, how, when and where, the data are broken down into different compartments. In axial coding, it then progresses to the platform where the data are compared and similar compartmentalized data expressing the same incidents are grouped together under the same conceptual label. These conceptual labels are then contrasted again and further clustered into a higher and more abstract level known as categories (Strauss & Corbin, 1990).

From the non-participant observations of the selected s participants, they were seen behaving in a number of ways in the context of the mathematics learning classroom environment. These observations were based on instances in the mathematics class when the participants were involved in mathematics related activities. These observed data were compared and similar compartmentalized data expressing the same incidents were grouped together under the same conceptual label. However, the researcher acknowledged that these manifestations of behaviours could be due to other reasons not related or unique to mathematics learning such as boredom and mood swings. Therefore, the researcher further substantiated the association of these behaviours to the mathematics learning in the subsequent interviews done as the interview questions aimed specifically at eliciting the explanations of the observed behaviours. The earlier conceptual labels, with the support of the interviewed data, were then contrasted again and further clustered into a higher and more abstract level in this study. The preliminary explanations for the behaviours through the subsequent interviews of the researched participants with regards to the behaviours exhibited by them or their peers as observed by the researcher were then linked up with the literature of coping behaviours originating from Blackman (2004), Cramer (2006), Freud (1936), Straker (2004) and Tucker (1970).

Ethical Issues

The process of informed and process consent, as suggested by Behi (1995), was followed in this research. All the participants in this study were briefed on its aims and gave their consent. During the research proper, they were periodically reminded that that they were being observed and could opt out. None of the thirteen students asked to opt out during any stage of the research. Other ethical questions such as the confidentiality of information and the possible potential harm to the participants were taken care of in the data collection and analysis phases.

Rigour

According to Lincoln and Guba (1985: 290), the basic question addressed by the notion of rigour in interpretive research is "How can an inquirer persuade his/her audiences that the research findings of an inquiry are worth paying attention to?" The rigour of an interpretive study is examined by the notion of trustworthiness. Trustworthiness is defined as the conceptual soundness of the research results and is influenced by the notions of credibility, transferability, dependability and confirmability (Lincoln & Guba, 1985).

In this study, credibility was achieved through the triangulation and maximum variation of data sources. Its transferability was achieved through thick descriptions of how the participants coped with mathematics learning in the context of a mathematics class. An audit trail of this study that consisted of a detailed documentation of the methods and the collection and analysis of data was maintained. Two colleagues of the researcher were also asked to corroborate the findings. These measures ensured dependability and confirmability of this study.

Limitations

As the students know that they were being observed, they might not exhibit their actual coping behaviours found in normal circumstances. However, as the data collect stretched over a substantial period of time and the researcher attempted to be as non-intruding as he could in the classroom observation, it could be ascertained that the participants were oblivious of the fact that they were participants in a research most of the time.

This study is based in the context of mathematics learning. It does not aim to compare or contrast students' coping behaviours in other learning contexts of other subjects against the context of mathematics learning. Therefore, the findings are only restricted to students' coping behaviours in a secondary mathematics learning context in Singapore.

The researcher's epistemological preferences, beliefs, values, theoretical orientations, bias, experiences may also affect the data collection and analysis. However, such constraints were reduced as far as possible through the researcher being reflexive in the data collection and analysis processes (Finlay, 2002).

Findings

Three main categories of psycho-analytic coping mechanisms employed by the participants have evolved from the data analysed. They are the main categories of "Avoidance", "Denial" and "Apathy". They are able to answer the two research questions formulated for this study:

- a) What are the coping strategies used by mathematics students who do not do well in mathematics learning when they are learning mathematics in the classroom?
- b) Why do they use these coping strategies?

The sections below will provide an in-depth discussion of the various defence mechanisms as described above. The observational data were presented as summaries and the interview data were also quoted through the participants' exact words.

Avoidance

Such avoidant behaviours that are always carried out in solitary, allow the individual participants to stay away from the task of mathematics learning as long as possible. Mathematics learning is a psychologically and physiologically painful experience for them. To the participants, tasks related to mathematics learning should be avoided. Therefore, they engaged in avoidant behaviours as below:

Covert individual non-mathematics activities

During mathematics lessons, it was observed that the participants might carry out other non-mathematics related activities when they were not within the sight of the teacher. These activities included reading comics or storybooks, doing the work of other academic subjects, scribbling or drawing on paper, looking out of the window, daydreaming, playing with mobile phones or personal grooming.

Delayed action in mathematics activities

The observational data also showed that the participants were slower in carrying out mathematics related activities as compared to other students. These activities included taking out their mathematics textbooks, notebooks, calculators, stationery for computation, doing mathematics questions, handing in mathematics homework, and contributing to group work. Such forms of avoidance were consciously carried out by the participants. This conclusion is confirmed by Jane and Ravi who stated below.

"I really do not like maths. It is so stressful; I will try my best to do the minimum in the class." (Jane)

"Do the work slowly, don't rush. Once lesson is over, don't need to do anymore." (Ravi)

Such task avoidance by the participants led to three other forms of individual coping behaviours – "Aim Inhibition", "Displacement" and "Compensation". These participants might set low targets in mathematics learning. By doing this, it allowed them to achieve their own premeditated targets easily within a short period of mathematics related activities. Their set standard was usually way below their expected learning potential as perceived by the teacher. The lower level of target set meant the lower the level of psychological and physiological anxiety felt due to mathematics learning. This form of coping behaviour is known as "Aim Inhibition" as Lin En showed below.

"I tell myself to at least write some correct part on the exercise, I don't care whether I get the whole question correct, like this, I can finish the work faster."

A closer examination of their non-mathematical activities showed that some of the participants were carrying out activities they liked and excelled in. A few of them were observed doing exercises on subjects such as history, mother tongue, literature and art in which they liked. This form of behaviour is collaborated by Calvin as below.

"Yeah, I like to do read my history textbook when in maths lesson. History is so interesting, much better than numbers, haha."

In this aspect, the participants were dealing with mathematics learning through the defence process of "Displacement". "Displacement" allows the participants to direct their actions from the original punishing anxiety-producing mathematics learning on to another more favourable or less threatening activity.

Some participants were also trying to convince themselves that they might not be good in mathematics but they could still excel in other areas. They hoped to dilute their incapacity in mathematics by engaging in the activities in which they excelled. Such coping behaviour is known as "Compensation" that happens when the participants hoped to cope with their weakness in mathematics learning by gaining strength in another area. An example of compensation is shown by Ahmad below.

"I always score better in English. Knowing English is also enough when I work next time. Maths is not always that important I like to read story books during maths lesson."

In summary, a participant's main coping strategy of "Avoidance" may activate the complementary coping processes of "Aim Inhibition", "Compensation" and "Displacement" that help to further facilitate the task avoidant process. These coping mechanisms work hand in hand in reducing the participants' negative emotions in mathematics learning. However, data showed that not all participants engaged in the coping mechanisms of "Aim Inhibition", "Compensation" and "Displacement" although all of them would engage in "Avoidance".

Such individual avoidant behaviours can graduate into group avoidance of mathematics learning. Such group behaviours are shown below:

Covert group non-mathematics activities

As observed, the participants could be seen carrying out social but non-mathematical activities such as talking discreetly among themselves, passing little notes, playing some games on paper, and making fun of one another, outside the view of the teacher. If the teacher was within sight, they reverted back to the legitimate work as assigned by the teacher. These non-mathematical activities were usually carried out in groups of participants comprising two to four members.

Deliberate and timed requests to teacher

On a number of occasions, especially during group or individual class work, pairs of participants requested permission to go to the washroom. On some instances, if they saw the teacher notice that their peers were carrying out group non-mathematics related activities, they asked the teacher some questions to shift the teacher's attention away.

These group avoidant behaviours set out to achieve the aim of reducing the psychological and physiological anxiety of mathematics learning. However, these group activities are different from individual ones as they harness the dynamics of groups in the avoidant process. It is a tacit understanding that the members in the group do not like mathematics learning. Therefore, they set out to support one another in avoiding mathematics learning. Their form of support is actually detrimental to their mathematics learning as everyone in the group encourages the others to engage in paired or group non-mathematics activities. To prevent the teacher from discovering their acts, they even watch out for one another or divert the teacher's attention from such non-mathematics activities. Their support for one another is damaging to their mathematics learning but is yet so powerful. This paper will term this form of group avoidance as "Collaborative Avoidance" as it is anchored in the dynamics of groups. Such "Collaborative Avoidance" is supported by Ahmad and Lin En who said as below.

"X and Y are also playing games during lesson, so I join them since I really cannot do the questions. If I do, later I will get scolded by teacher too...they (X and Y) also cannot do the questions and they are ok with it." (Ahmad)

"Yes, of course, we make sure you are not looking then we pass notes...(we) take turns to ask permission to go toilet, teachers sure let us if we say we have female problems. Feel good if the teachers believe us..." (Lin En)

Such "Collaborative Avoidance" is based on the two coping strategies - "Displacement" and "Identification". This form of "Displacement" is different from the earlier one mentioned as the students now direct their actions from the original punishing anxiety-producing mathematics learning onto the more favourable or less threatening event of outwitting their teachers in concealing their non-mathematics learning acts. On the other hand, "Identification" is a form of coping behaviour where the participants unconsciously mimicked another classmate (who also did not do well in mathematics learning) coping better in mathematics learning. This allowed the participants to escape from their anguish as they imagine they can cope with the anxiety as well as that classmate he or she mimicked unconsciously. In short, "Collaborative Avoidance" results in the participants setting up a joint identity (Identification) as a group entity to form a collective displacement of their original anxiety on to the less threatening and more achievable task of outwitting the teacher in concealing non-mathematics related activities. The main category of "Avoidance" in this study can be summarised pictorially below.

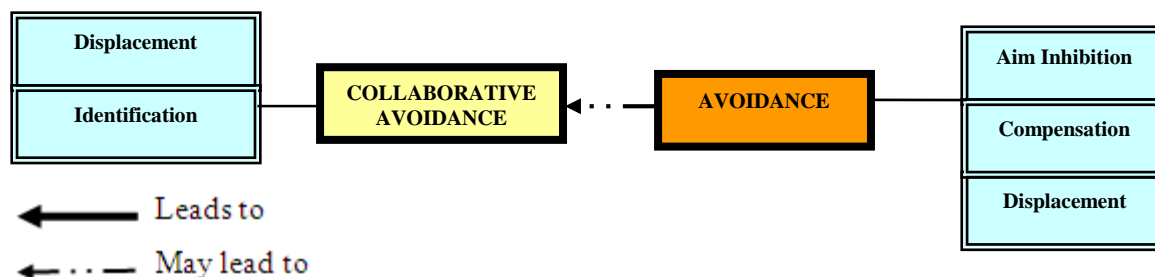


Figure 1. Pictorial Representation of Avoidance

Denial

Accepting the fact that they could not do the mathematics questions actually intensified the participants' negative emotions in mathematics learning. Thus, "Denial" is another coping behaviour that the students use to deny the fact that they could not do mathematics. The observational data showed that "Denial" is achieved through the following behaviours by the participants:

Refusal to admit mathematical errors

There were instances where the classmates of the participants pointed out that some of the mathematical steps that they had worked out were incorrect. However, the subjects usually refused to acknowledge it by refuting or ignoring them. They carried on with their work. The researcher confirmed the mathematical steps were actually incorrect as claimed by their peers when he checked on the participants' work.

Refusal to check answers

There were instances where some participants left their final solutions as they were without checking if they were correct. In most cases, they presented their solutions in an appropriate number of

mathematical steps. When the teacher asked them to check their solutions with the correct answers provided at the back of their textbooks, they did not do it. They were also not interested in comparing their answers with their classmates. Instead, they would go straight to the next question. If the teacher came by and asked them if their answers were correct, they would usually give responses like, "check later", "think so", and "should be correct". A quick check by the researcher on their answers usually yielded incorrect ones.

Deliberate question copying

The observational data showed that when some participants were tasked to do certain mathematics questions, they set out to copy or rephrase the questions on the space allocated to the solutions. Most of the time, there were no solutions to the mathematics questions after the rewriting or rephrasing of the questions. Thus, in reality, the spaces allocated for the students to write down their solutions were occupied by the rewriting or rephrasing of the questions themselves. Nevertheless, the participants repeated this process.

Faking solutions to mathematical questions

Some participants would refer to the answers listed behind the mathematics textbook if they were asked to do certain mathematics questions from it. From there, they started doing the mathematics questions and their solutions were usually presented in a number of mathematical steps. The last mathematical step always saw them obtaining the answer similar to the one they checked from the mathematics textbook. However, a scrutiny of their mathematical steps usually showed that there were a substantial number of mistakes. Besides, the final mathematical step that allowed them to obtain the correct answer was not linked to the earlier mathematical steps most of the times. This showed that their solutions were actually faked.

The process of "Denial" can be conscious or unconscious on the part of the participants. Some of them have done it consciously while the others are not aware of it. Such conscious refusal to admit own mathematical errors or to check the final answer can also be seen as a form of "Suppression" where the participants try to push down thoughts of getting the incorrect answers, which contribute significantly to their anxiety. Below are instances of suppression by the students.

"She (his friend, one of the top mathematics students in the class) always tells me that my answer is wrong, how does she know? I think mine is correct." (Calvin)

"It is very frustrating to see my answer wrong after doing some many steps, so I might as well don't check the answer, and then feel better..." (Lin En)

What Xiao Ming had stated in his interview as below is a form of unconscious act of refusal to check answers to the mathematics problems tasked to be done.

"Sometimes only after the lessons, then I find that I have not checked the answers to maths problems at all." (Xiao Ming)

This is known as the coping mechanism of "Repression" that involves the participants' unconscious act of pushing down thoughts that had contributed to the anxiety. In summary, the participants practised the coping process of "Denial" through "Suppression" and/or "Repression".

"Fantasy" is a coping mechanism that arises from the behaviours of deliberate question copying and faking solutions to mathematical questions. The participants fantasized that they could actually cope

very well in mathematics learning. This reduced their anxiety. The act of rewriting the question in the answer space given was an obvious case of direct fantasizing that they could do the questions. This might be conscious or unconscious. However, this process became a false and temporary fantasy instead as they would not score well in mathematics tests and examinations eventually. Such consequences are shown below.

"I always copy the question again. I think maybe by copying many times; I can understand how to do." (Xiao Ming)

"I thought I know how to do (mathematics problems), but whenever I have exams, I don't know why my steps are marked wrong." (Calvin)

Not scoring well in mathematics tests and examinations is a very strong indication of failure to cope well with mathematics learning. Nevertheless, the temporary fantasy that they can cope well with mathematics learning is very important to the participants as it relieves them from the psychological and physiological pains of mathematics learning. Even so, this temporary fantasy can always be reaffirmed after the failure of any mathematics test or examination if the participants self-create another fantasy that they can cope well with mathematics learning in class but just cannot perform in mathematics tests and examinations. To explain why he felt that he could understand the mathematics learnt but could not do well in examinations, Royston commented:

"Maybe examination is just not my cup of tea but I still understand how to do maths..."

From there, the earlier fantasy prevails with the continuation of those coping behaviours with the support of another self-created fantasy. As a whole, together with the coping strategies of "Denial" "Suppression" and "Repression", the coping behaviour of "Fantasy" is used to create the impression for themselves that they are coping well in mathematics learning. These are very powerful to those participants who have not given up on mathematics learning. Sometimes, such denying strategies can also lead to the coping mechanism of "Deceit" through the following observed behaviours:

Deliberate and timed contribution during group work

A common observation during group work was some participants would always put themselves in a passive mode. They would not voluntarily contribute anything unless prompted by their group mates. In some instances, some participants might not even care to respond to their group mates at all. However, whenever the participants noticed that the teacher was watching them, the researcher could see them pretending to be engaged in the group work. However, once they discovered that the teacher was no longer looking at them, they dropped back to the passive mode. Therefore, their contributions were always deliberate and timed for the purpose of fooling the teacher.

Pretend to understand the teacher's mathematical explanations

When the teacher was explaining certain mathematical concepts, some of the mathematical anxious students would display signs of acknowledgement and understanding. These signs included nodding in agreement with the teacher, maintaining eye contact and raising their hands to ask questions about the concepts. However, when they were asked some mathematical questions about the concepts they supposedly had understood as shown by their earlier signs of acknowledgement, they usually could not answer.

Seeking of assistance from others

When the teacher posed questions to some of the participants, an automatic and immediate reaction was to look to their peers next to them for answers. Their peers outside the sight of the teacher always provided the responses secretly.

Copying of solutions from others

A number of instances showed the participants not attempting to read any of the mathematics questions they were asked to do at all. They unthinkingly shifted their attention to their peers' answers and copied immediately from them. This action was almost automatic in the participants observed. Some of them chose to copy as their peers were still in the process of solving the mathematical questions while the others preferred to copy only when their peers had finished solving the mathematical questions. All these actions were performed discreetly outside the view of the teacher.

These activities are carried out by the participants with the aim of misleading the teacher that they are coping well in mathematics learning. This can support their fantasising process. This coping mechanism will be termed as "Deceit" in this paper. Some of these behaviours are confirmed by the participants below.

"...copy from X, he is smart, sure can get correct answers. Like this you are happy, teacher is also happy" (Ravi)

"haha, ya, I actually don't understand ... just pretend you look at Mr M (the teacher), he will not ask you to answer." (Ahmad)

"The important thing is to write things on the answer space. It is enough already...then Mr M (the teacher) won't disturb me as he will not check what I write" (Lung Yu)

The main category of "Denial" in this study can be summarised pictorially below.

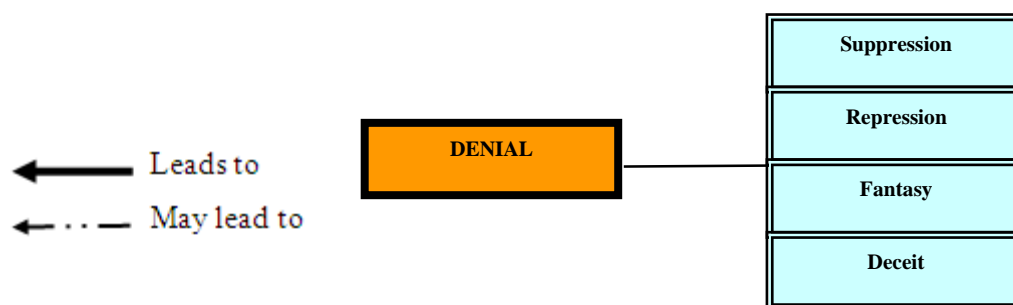


Figure 2. Pictorial Representation of Denial

Apathy

"Apathy" is the last main coping mechanism that is used by the participants in mathematics learning. "Apathy" is a type of coping where the participants exhibit no interest to participate in these mathematics-related activities at all and it manifests in the form of "Minimisation", "Rationalisation", "Provocation" and "Dramatization".

Such participants have usually given up on learning mathematics. To them, learning mathematics was a futile and psychologically painful event. First of all, they attempted to put the blame on their teachers

for not teaching them well. They also try to trivialise the importance of mathematics learning internally although they know that mathematics is very important for their academic advancement. This coping process is termed as "Minimisation". It is then strengthened by the process of "Rationalisation". They rationalise that they do not underperform in mathematics learning as long as they do not attempt at all in mathematics learning. This is because by not attempting at all means that they have no chance of failure, though there is also no chance of doing well. By the action of not attempting at all is also acceptable to them as mathematics learning has already been trivialised by them. Thus, to them, mathematics learning to them is at the lowest end of their list of priorities in learning. Another coping mechanism in place here is "Provocation". These students like to draw out negative reactions from their teachers so that they can further justify their hatred for mathematics learning. Such provocation can be reinforced by the process of "Dramatization" where powerful negative emotions (such as hatred and anger) towards mathematics learning are openly exhibited in front of the teachers. Such destructive emotions can also effectively negate their fear and anxiety (in mathematics learning) that supposedly put them in a passive and volatile mode. This acting out process has to be openly dramatic as it aims to 'impress' the other students. They want their classmates to see that they are not interested in mathematics learning but in other more interesting activities. Therefore, if they do not do well in mathematics tests or examination eventually, the cause will not be due to their disability in mathematics learning. To some of them, the prospect of creating a self-assurance that they have not underperformed in mathematics by non-participation looks more promising than poor performance through participation. Even when it comes to important mathematics tests and examinations, they will not attempt the questions at all. This is to preserve this self-assurance that they have not done badly in mathematics learning. These defence mechanisms are shown below.

"I forget to bring the book, not I purposely don't bring. He (teacher) scolds me also no book what. What is so important about maths" (Saffe)

"Haha, you notice that too? I am used to punishment, I think punishment is nothing compared to doing something (mathematics learning) which is totally useless." (Mei Mei)

"What is wrong to let others know I hate maths? We have our rights." (Elliot)

"I just do not like to do maths. It is not that I cannot do maths. I just don't like to do the maths homework and the exams. I want to show my teacher I just hated maths" (Farhan)

These are achieved through the activities below:

Failure to bring mathematics related items and materials

Such participants claimed that they had forgotten to bring their mathematics textbooks, notebooks or calculators. They were usually unapologetic about it. They were unrepentant even if admonishments or punishments are meted to them.

Refusal to take part in mathematics related activities

When they tasked to do individual work or group work, some participants did not perform or participate at all. They were also ready to take any admonishments or punishments meted out by the teacher.

Overtly carrying out other non lesson related activities

These participants did not do any mathematics question as tasked, participated in group or peer learning and showed no interest in listening to the teacher's explanations of mathematical concepts. Instead, they carried out a range of activities that included sleeping in class, reading comics or storybooks, doing other subjects' work, scribbling or drawing on paper, looking out of the window, daydreaming and personal grooming during mathematics class. All these activities were personal, as they did not involve other classmates. However, these activities were done in the direct view of the teacher. Both Farhan and Elliot admitted that it was boring in mathematics lessons so they might as well do something else interesting. They also divulged that they did not care if the teacher reprimanded them for doing those non mathematics related activities.

At times, such participants may attempt to influence other students in resisting mathematics learning through the activities below.

Distractions creation

Some participants set out to create distractions in the class. They made noise, talked to other classmates, disturbed other classmates, walked around the class as they liked, argued with the teacher or classmates. These activities usually disrupted the process of mathematics learning, as the teacher had to spend a substantial amount of time restoring order in the class.

Promoting overt non-mathematics activities

Such participants tried to influence their peers to adopt their resistant stance against mathematics learning. They tried to influence other students not to participate in mathematics learning too. They encouraged other students to participate in other non-mathematical activities. These moments were usually opportunistic where such participants made calculated moves in certain situations to achieve their aim. For example, when some students were reprimanded by the teacher for not doing some mathematics related activities correctly, such participants would make some open instigating remarks to encourage them to adopt confrontational stances.

Those participants who engage in "Apathy" do not want their resistance to be a minority activity in the class. Therefore, they also disrupt the process of learning mathematics by the other students, aiming to recruit more students in their resistant activities if the situation permits. Mei Mei and Elliot confessed that they tried to recruit more peers to promote their resistant behaviour so as to agitate the teacher. Through this process, there is a possibility that other students may also resist mathematics learning and not do as well in mathematics tests and examinations. These failures in mathematics learning will presumably demoralise these students and make them join their resistant activities permanently. This is confirmed by Saffe:

"I see Y (another student) starting to do badly in maths so I think I can make him join our gang (the maths haters)."

This increase of resisting students will make their failure in mathematics learning look less threatening to their self worth. This is because there are more students around them who do not cope well in mathematics learning. This, in turn, helps to "trivialise" mathematics learning among the students. This is termed as "Expanded Trivialisation" here as it aims to trivialise mathematics among the class population. Saffe further elaborated:

"The more friends we have in our gang (the maths haters), the better for us. Then others cannot look down on us."

In summary, the coping process "Expanded Trivialisation" is not only detrimental to the mathematics anxious students but also harmful to the main student mathematics learning population in the class.

The main category of "Apathy" in this study can be summarised pictorially below.

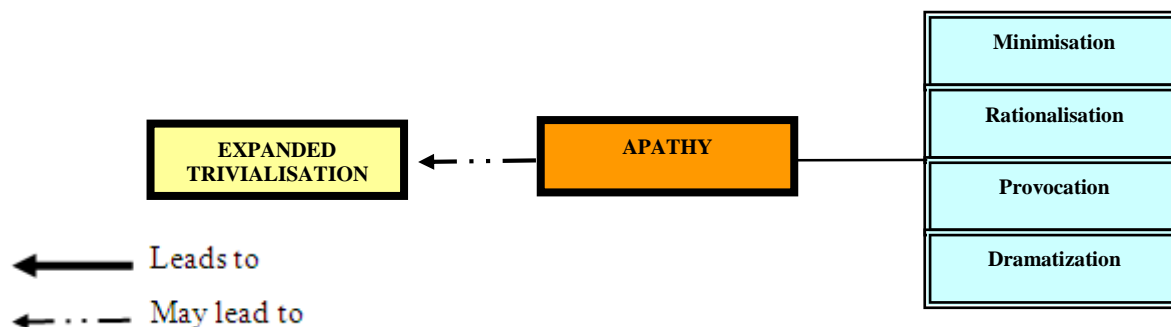


Figure 3. Pictorial Representation of Apathy

Discussion

From the comparison of the analysed data and literature, it was shown that most of the coping mechanisms uncovered in this study were closely related to the ones in Blackman (2004), Cramer (2006), Freud (1936), Nimier (1993), Straker (2004), Tucker (1970) and Vaillant (1992) although they may be termed differently. The defence mechanism of "Avoidance" can be found in Nimier (1993), Straker (2004), Blackman (2004) and Cramer (2006). "Avoidance" is supported by the defence mechanisms of "Aim Inhibition" (found in Straker, 2004), "Compensation" (found in Tucker, 1970, Cramer, 2006 & Blackman, 2004) and "Displacement" (found in Freud, 1936 & Cramer, 2006). They usually begin such avoidance on an individual basis and may graduate to group actions in the form of "Collaborative Avoidance", which is supported by the defence mechanisms of "Displacement" and "Identification" that are highlighted in Tucker (1970), Straker (2004) and Blackman (2004). "Collaborative Avoidance" is a strategy that is unique in this study.

The next main category of "Denial" is similar to the ones mentioned in Freud (1936), Cramer (2006) and Vaillant (1992). This defence mechanism is complemented by others: "Suppression", "Repression", "Fantasy", and "Deceit". "Suppression", "Fantasy" and "Repression" are mentioned in Freud (1936), Nimier (1993), Straker (2004), Blackman (2004), Vaillant (1992). However, "Deceit" is not found in the coping literature.

The last main coping mechanism, "Apathy", consists of "Minimisation", "Rationalisation", "Provocation" and "Dramatization". "Minimisation" and "Rationalisation" are found in Blackman (2004) and Vaillant (1992) while "Dramatization" and "Provocation" appear to be unique in this study. "Expanded Trivialisation", another offshoot of "Apathy", is unique in this study.

The ones that do not appear in the above literature of coping mechanisms include "Collaborative Avoidance", "Deceit", "Provocation", "Dramatization" and "Expanded Trivialisation". These five types of coping mechanism might only be found specifically in a secondary school learning context of this research. They are either group-based coping or teacher-directed coping.

One prominent similarity between "Collaborative Avoidance" and "Expanded Trivialisation" is that it is anchored on group processes. Participants exhibiting these two types of coping strategies are utilising a form of group coping instead of individual coping. They use these two coping strategies, as a group, to manage the anxiety caused by mathematics learning. From another perspective, it is can be perceived that these students form support group in coping with mathematics learning.

"Dramatization" and "Provocation", on the other hand, are unique in the sense that they set out to challenge the authority in the class as a form of coping. "Deceit" is a form of coping strategy that aims to mislead the teachers' in believing that the students are doing well in their studies. While such behaviours are perceived as common in classrooms, the teachers might not see it as a form of maladaptive coping used by the students challenging or deceiving them. And this has great implication on how the teachers deal or follow up with their behaviours if they do not see it as a sign of distress by the students.

Lastly, for the benefit of further research, it is hypothesised, but not proven in this study, that the relationships between the three main categories of coping are as below. The coping journey of participants usually starts from the defence mechanism of "Avoidance". During this stage of the journey, they still aim to do well in mathematics learning. However, they are affected psychologically whenever they are engaged in mathematics learning. Thus, to balance between their aim of passing mathematics examination and alleviation of mathematics-related psychological pain, they can only choose to avoid mathematics learning periodically but not totally. They hope to pass their mathematics assessment with the minimum contact with mathematics learning scenarios. However, as reality hits them in the form of poor results in mathematics assessments, the students realise that they have to adjust their coping mechanisms to better complement their current strategy of "Avoidance". This adjustment comes in the form of the coping mechanism of "Denial" where they imagine and maintain the picture of them doing well in future mathematics assessments. Instead of making attempts to improve their mathematics learning, the students engage in the processes of "Avoidance" and "Denial" to alleviate their psychological pains of mathematics anxiety. At both stages, the participants still harbour hopes of doing well in their mathematics learning. Eventually, it will come to a trigger point where they give up the hope of doing well in mathematics learning. It is not known when this trigger point is achieved. This will lead them to the utilisation of the coping mechanism of "Apathy" where they start to resist against mathematics learning openly. Although this hypothesis may seem tenable, the descriptions, causes and their relationships may be more complex than the above findings have depicted.

Conclusion

This study answered the main research question: "What do students who do not do well in mathematics learning say about how they cope with it in a mathematics classroom in Singapore?" This main research question is fragmented into two research questions:

- a) What are the coping strategies used by mathematics students who do not do well in mathematics learning when they are learning mathematics in the classroom?
- b) Why do they use these coping strategies?

From this study, three main categories of coping behaviours of such students who do not do well in mathematics learning evolve from the literature of defence mechanisms. They are the categories of Avoidance, Denial and Apathy, which achieve the aims of reducing the psychological and physiological pains of mathematics learning in class. In order to provide the most effective solution to a problem, there is a need to understand the problem thoroughly. This applies for the case of students who do badly in mathematics learning in Singapore and these findings present some important implications for

the stakeholders in education (policy makers, teachers, counsellors, researchers and students) as below.

- a) With a clear presence of a comprehensive inventory of behaviours of students who do not do well in mathematics in a mathematics class, it will create an awareness of the problem of maladaptive learning behaviours among the stakeholders in education.
- b) A conscious awareness of such coping mechanisms of mathematics anxious students is a great step towards the understanding of students who used maladaptive coping in mathematics learning. Knowing the exercise of such behaviours, policy makers and teachers dealing with such students will also be obliged to focus on them.
- c) Such maladaptive coping strategies in mathematics learning can be made know to all students. Being aware of such unconstructive coping strategies, students can consciously refrain from engaging in them during mathematics learning.
- d) Lastly, researchers can use it as a platform to study other aspects of coping in mathematics learning.

References

- Behi, R. (1995). The individual rights to informed consent. *Nurse Researcher*, 3, 14-23.
- Blackman, J.S. (2004). *101 Defenses*. New York: Brunner-Routledge.
- Boekaerts, M. (1993) Being concerned with well being and learning. *Educational Psychologist*, 28, 148-167.
- Burns, M. (1998) *Math: Facing an American phobia*. Sausalito, CA: Math Solutions.
- Cartwright, S. & Cooper, C.L. (1996) Coping in occupational settings. In M. Zeidner & N.S. Endler (Eds.), *Handbook of coping*, pp. 202 -220. Canada: John Wiley & Sons.
- Carver, C. S., Scheier, M. F. & Weintraub, J. K. (1989) Assessing coping strategies: A theoretically based approach. *Journal of Personality and Social Psychology*, 56, 267-283.
- Cramer, P. (2000). Defense Mechanisms In Psychology Today: Further Processes for Adaptation. *American Psychologist*, 55, 637-646.
- Cramer, P. (2001). The Unconscious Status of Defense Mechanisms. *American Psychologist*, 56,762-763.
- Cramer, P. (2006). *Protecting the Self: Defense Mechanisms in Action*. New York: Guilford Press.
- Cooper, S. H. (1998). Changing Notions of Defense Within Psychoanalytic Theory. *Journal of Personality*, 66, 947-964.
- Covington, M.V. (1992) *Making the grade: A self worth perspective on motivation and school reform*. England: Cambridge University Press.
- Ewing, B. (2004). Teacher communication, student identity and classroom participation. In E. McWilliam, S. Danby, & J. Knight (Eds.), *Performing educational research: Theories, methods and practices*, pp. 137–150. Flaxton, Australia: Post Press.
- Finlay, L. (2002). Pearls, pith and provocation. 'Outing' the researcher: the provenance, process and practice of reflexivity. *Qualitative Health Research*, 12(4), 531-545.
- Freud, A. (1936). *The Ego and the Mechanisms of Defence*. London: Hogarth Press.

- Glaser, B. G. (1978). *Theoretical Sensitivity: Advances in the methodology of grounded theory*. Mill Valley, California: Sociology Press.
- Higgins, J. E. & Endler, N. (1995) Coping, life stress, and psychological and somatic distress. *European Journal of Personality, 9*, 253-270.
- Jackson, C.D. & Leffingwell, R. J. (1999) The role of instructor in creating math anxiety in students from kindergarten through college. *Mathematics Teacher, 92*(7), 583-586.
- Kernberg, P. F. (1994). Mechanisms of Defense: Development and Research Perspectives. *Bulletin of the Menninger Clinic, 58*, 55-87.
- Lazarus, R.S. & Folkman, S. (1986) *Stress, appraisal and coping*. New York: Springer.
- Lincoln, Y.S. & Guba, E.G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage Publications, Inc.
- Martin, D. B. (2003). Hidden assumptions and unaddressed questions in mathematics for all rhetoric. *The Mathematics Educator, 13*(2), 7-21.
- Miles, M. & Huberman, A. (1984). *Qualitative data analysis: A sourcebook of new methods*. Newbury Park: Sage.
- Misra, R. & McKean, M. (2000) College students' academic stress and its relation to their anxiety, time management, and leisure satisfaction. *American Journal of Health Studies, 16*(1), 41-51.
- Newman, R.S. & Goldin, L. (1990) Children to seek help with school work. *Journal of Educational Psychology, 82*, 92-100.
- Pekrun, R., Goetz, T., Titz, W. & Perry, R.P. (2002) Academic emotions in students' self-regulated learning and achievement: A program of qualitative and quantitative research. *Educational Psychologist, 37*(2), 91-105.
- Richardson, F.C. and Suinn, R.M. (1972). The mathematics anxiety rating scale: Psychometric data. *Journal of Counselling Psychology, 19*, 551-554.
- Skinner, E., Edge, K., Altman, J., & Sherwood, H. (2003). Searching for the structure of coping: A review and critique of category systems for classifying ways of coping. *Psychological Bulletin, 129*, 216-269.
- Straker, D. (2004). 'Changingminds.org'. Retrieved from <http://changingminds.org/about.htm>.
- Strauss, A. & Corbin, J.(1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Newbury Park: Sage.
- Tucker, I. (1970). *Adjustment: Models and Mechanisms*. Academic Press.
- Vaillant, G. E. (1992). *Ego Mechanisms of Defense: A Guide for Clinicians and Researchers*. Washington, DC: American Psychiatric Association.
- Vaillant, G. E. (1998). Where Do We Go From Here? *Journal of Personality, 66*, 1147-1157.
- Woods, P. (1980) *Pupil strategies: Explorations in the sociology of school*. London: Croom Helm.
- Woods, P. (1984) Negotiating the demands of schoolwork. In M. Hammersley & P. Wood (Eds.), *Life in school: The sociology of pupil culture*, pp. 225-237. Scotland: Open University Press.
- Zimmerman, B. J. (2001) Theories of self regulated learning and academic achievement: An overview and analysis. In B.J. Zimmerman & D.H. Schunk (Eds.), *Self regulated learning and academic achievement*, pp. 1-38. Mahwah, NJ: Erlbaum.