Realising Values Through a Probability Activity

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Abstract

Values define outlook and attitudes of an individual. Hence, inculcating moral values is of utmost importance to develop the desired behaviour in an individual. Values are a vital part of the affective domain of education including mathematics education. This paper reports a study that aimed to determine the effectiveness of a probability activity in providing experience to students to help them realise the role of the values of 'humility', 'determination' and 'perseverance' in achieving their goals. The comparison of these intended values of the researcher and the students realised values which were based on their written reflections, illustrates the extent to which the activity served its purpose. The results of the study showed that the activity did serve its purpose for the majority of students and hence is suitable to provide experience to students to help them realise the significance of these values.

Keywords: Values; humility; determination; perseverance; probability

Abstrak

Nilai menentukan pandangan dan sikap individu. Oleh itu, menyemai nilai-nilai moral adalah amat penting untuk membangunkan tingkah laku yang dikehendaki dalam seseorang individu. Nilai adalah sebahagian penting daripada domain afektif pendidikan termasuk pendidikan matematik. Kertas ini melaporkan satu kajian yang bertujuan untuk menentukan keberkesanan aktiviti kebarangkalian dalam menyediakan pengalaman kepada pelajar untuk membantu mereka menyedari peranan nilai 'merendah diri', 'keazaman' dan 'ketabahan' dalam mencapai matlamat mereka. Perbandingan nilai-nilai yang dicadangkan bagi penyelidik dan pelajar menyedari nilai-nilai yang berdasarkan pantulan bertulis mereka, menggambarkan sejauh mana aktiviti yang berkhidmat tujuannya. Keputusan kajian menunjukkan bahawa aktiviti yang tidak menjadi tujuan bagi majoriti pelajar dan oleh itu adalah sesuai untuk memberi pengalaman kepada pelajar dalam membantu mereka menyedari kepentingan nilai-nilai ini.

Kata kunci: Nilai; merendah diri; penentuan; ketabahan; kebarangkalian

1.0 INTRODUCTION

Moral values of any society present a true perspective of the development of any society or nation (Reddy, 2006). Reddy (2006) claims that they tell us the extent a society or nation has developed itself. Every individual's actions and beliefs are based on their values. Values define outlook, attitudes and behavior of an individual (Rokeach, 1973). Hence, inculcating moral values is of utmost importance to develop the desired behaviour and attitude in an individual. Among the various fields of human endeavor to inculcate moral values, education stands out most as a means for the realization of values in the individual as well as in society. Values are a vital part of the affective domain of education including mathematics education. Hence all teachers play a vital role to inculcate moral values.

Bishop, FitzSimons, Seah & Clarkson (n.d) in their research investigated the extent to which mathematics teachers were able to implement their intended values in the classroom and also if there were any implemented values inculcated or demonstrated which were not explicitly intended. They found that not all intended values were implemented and vice versa.

This paper reports a study on intended and realised values that I did with a group of trainee teachers on the Malaysian pre-degree teacher training program who attended my mathematics course. The mathematics course in the second semester is on 'Problem Solving'. The students were for a large part of the course required to solve problems either individually or in groups. This gave me opportunity to observe the behaviour of my students.

I noticed that they had very big egos. They would try for some time and if they solved the problem then they would make sure the rest got to see how quick they were by shouting out to me that they had solved it. This I concluded was because they lacked humility. If they were struggling they went on to do something else, trying to show that they were unable to solve it because they were not on task and not because they were facing difficulties. Explaining that participating and trying was important because they would experience the process of solving non-routine problems made no

impact on their behaviour. This revealed a lack of determination and very low perseverance.

Although they did group discussions to solve the problems, most of the students who solved the problems were determined to make it known that they had solved it on their own. Although from my observation the discussion in the group helped them realise the solution, the students were determined to ignore that their friends played a role in their success. This again revealed their lack of humility.

Disappointed with their behaviour I decided to carry out an activity which I designed by modifying the rules of two probability activities. It was conducted at the end of the course with the hope that the students would realise that their success was not only attributed to their own ability but may also be because of those around them. I also wanted them to realise that it was important for them not to give up trying when things became difficult.

Hence I had values that I intended the students to realise which were basically 'humility', 'determination' and 'perseverance'. The students reflections after the activity illustrated the values that the students realised through the activity. The comparison of my intended values and their realised values illustrate the extent to which the activity served its purpose which was to help students realise the role of the values of 'humility', 'determination' and 'perseverance' in achieving their goals.

■2.0 THE ACTIVITY

The activity involves two games used in the topic 'Probability'. The first is called 'Car Racing Game: 1' used to illustrate a non-bias event having equally likely outcomes. The second game is called 'Car Racing Game: 2' which is a game used to illustrate a bias event having unequally likely outcomes.

The game proceeds as follows. Each participant has to choose a number from 1 to 6. Each group is given a die and a sheet representing the 'racing track' as shown in Figure 1.

Figure 1 Car racing: game 1 racing track

They are then given the following instructions. This game is for 6 players

1. Each player selects their car number from numbers 1 to 6.
2. Roll the die.
3. If the player's car number is 2 and the rolled die shows 4, then the car number 4 will move one step forward. To indicate the move, mark a cross 'X', in the space on the board. If the die shows 2, move the player's car one step forward by marking an 'O' in the space on the board. This means that if you move forward because of your own score, you mark 'O' and if you move forward because of another person's score you mark a cross, 'X'.

    (I made this modification in the game so that the participants can keep track of the number of steps of progress to the finishing line due to their own scores and progress due to the help from others' scores).

4. The winning car is the car that reaches the finish line first. Second place for the second car that reaches the finish line second and so on and so forth.
5. The game is to be played until all players reach the finish line. Every player remains in the game until all reach the finish line.

After the first game the second game is introduced. For the second game they choose numbers from 2 to 12. They are then given 2 dice and a sheet of the 'racing track' as shown in Figure 2.

They are then given the following instructions:

1. Each player selects their car number from numbers 2 to 12.
2. Roll two dice and find the sum of the numbers obtained. This sum indicates the car number that is to be moved.
3. If the player's car number is 2 and the sum of the numbers on the dice is 4, then the car number 4 will move one step forward. To record the moves please refer to Car Racing Game 1, step 3.
4. The winning car is the car that reaches the finish line first. Second place for the second car that reaches the finish line second and so on and so forth.
5. The game is played until all players reach the finish line. Every player remains in the game until all reach the finish line.

Figure 2 Car racing: game 2 racing track

After the participants complete the game, they are asked to reflect on the game and write what the game had taught them about life on a sheet of paper. They are also informed that the first game represents a fair non-bias equal opportunity situation of the real world. This is because when rolling one dice there is an equal chance for the die to be face up with any one of the numbers 1 to 6 showing. The second game on the other hand represents an unfair bias unequal opportunity situation of the real world. This is because in the second game the numbers that are face up on the two dice are added together and since some numbers have more combinations like 7 (1+6, 2+5, 3+4), then they are more likely to be an outcome rather than other numbers with few or only one combination such as 2 (1+1).

■3.0 THE STUDY

3.1 Purpose of Study

The purpose of this study was to determine the effectiveness of the probability activity in providing an experience to students to help them realise the significance of everyone around them in contributing to their personal achievements and the importance of determination and perseverance (intended values to be realised).

3.2 Participants

The study involved 18 first year second semester Malaysian pre-degree teacher training program students (2 boys and 16 girls) not majoring in mathematics. The mathematics course that I taught is a compulsory paper for all programmes.

3.3 Procedure

The students were first divided into 3 groups of six for game 1. For game 2 they were all in one group. There are only 11 numbers between 2 and 12 and so there were 7 pairs of players and 4 single players in the game. They then participated in the probability activity. At the end of the activity a discussion was held. Through the discussion the students were informed that the first game represents a fair non-bias equal opportunity situation of the real world while the second game represents an unfair bias unequal opportunity situation of the real world. The probability theories were used to explain 'fair' and 'bias'. The students were then told to assume that the finish line on the sheet with the racing track was their goal and the process and progress to reach the finish line was the experience and events that led to achieving their goal. They were then asked to reflect on the game and write what the game had taught them about achieving their goal on a sheet of paper. They were also informed that they may omit writing their names on the paper. This was to remove the fear of been judged on what they were writing and I hoped that it would then encourage them to write what they actually realised rather than write what I would expect them to write.

■4.0 DATA ANALYSIS AND DISCUSSION

Sources of data were from the reflections written by the students and my observation of the students' reactions and facial expressions during the activity.

All groups completed the first and second game and wrote their reflections. Their reflections were analysed for several features. The first feature was the realisation of the importance or the role of others in their success or achievements. This was called category A. This realisation illustrates humility because it reduces self-importance since achievement is not solely attributed to ones' own effort. The second category was realisation of the importance of not giving up, when striving to achieve the goal. This was called category B. This realisation illustrates determination and perseverance in achieving ones goal. Any other realisation from the activity was categorised as others. This was called category C. This category includes reflections which cannot be in categories A and B and reflections which may not be related to success or achievements of their goal.

Reflections such as the following were categorised as the students illustrating realisation that people around them played an important role in their achievements, this is category A.

All in all, I counted it was only a few times that I threw the dice which was my number. Even though I got second and fourth place, all I can say I won because of my friends efforts. So, what does it imply in reality? What I have achieved until now is not only what I have done with my own effort. Even though it seems that I almost got everything, until now, but actually without the mercy from God, without pray from my beloved parents, without support from my siblings, for sure I can't stand where I'm standing now. Now, I'm so thankful for what I have achieved and to all who have supported me up till now. Now I realise the real purpose of this game. It is extremely awesome...

This student has revealed humility. He admits that others were involved in his achievements. Another extract in this category was as follows.

.. success is helped by others – friends, family, colleagues ... be thankful to those around you who helped you directly or indirectly....

Although the student has realised the role of others in a person's success he did not explicitly state that his own success was also attributed to the help from those around him. However, based on the fact that if we give a certain advice to others then we ourselves are aware of its importance this and similar reflections were categorised under category A. Another student stated the following.

.....we need each other in order to achieve our goal.....friends and family ....pushes us to work hard to achieve our goal. Either the chance is small or big for someone to achieve the goal, they still have the probability.

This student has applied the mathematical concept of unequally likely outcomes to explain what he learnt through the game. His number was 3 and hence had only one combination which is 1+2 to obtain his number in the second game and so the chances to obtain his number was less. This student finally went on to realise the importance of perseverance. He wrote...

So we must remind ourselves that we cannot give up on whatever we are doing because when there is a will, there is a way.

Hence his reflection will be placed in both categories A and B. Some students did not realise the importance of others. They only wrote about their own determination and perseverance in their success in reaching their goal. Below is an extract of the reflection from such a student.

After I played the game I realised that to reach our goal we must not give up.... I also realised that sometimes in life to achieve something that we want, we must face failure..... Never stop... sometimes it is about luck but even luck is not on your side but then you believe in yourself, keep on putting a good effort to achieve your goal, you can succeed ...

Every statement made was about the significance of his own effort. The student did not reflect on his progress in the game from his number been obtained by his friends when they rolled the dice and hence he made progress from others efforts. The activity had no impact on the humility of the student. It however served to strengthen determination and perseverance.

There were several other cases of students who only reflected on perseverance to reach their goal. Among these students who only reflected on perseverance, one student went further to reflect on his help for others but did not reflect on the help given by others in his progress in the game. The extract of his reflection illustrating this was as follows.

....In conclusion, we have to work hard in order to succeed. Helping others in life should be part and parcel of life as it will help when we are in trouble one day.

His final statement illustrates that he would help others because of the benefit he may gain in the future. The student did not express any intrinsic feeling of happiness in helping others and seeing others happy. He also did not reflect about his progress because of others help to reach the finish line. The sheets with the racing tracks clearly illustrate that no one made progress to the finish line solely because of their own effort. In fact it showed that

more than 50% of their progress was due to others effort and yet this student and several others could totally ignore or over-look this important fact.

Another interesting reflection is the following.

> *... In this game most of the winners won by the efforts of other players. This somehow tells me that in order to reach our goal, we cannot do it alone....... However, the most important thing that this game had made me realise is that we must always believe in ourselves...Never ever give up...*

I called it interesting because the student has clearly realised that winning is also attributed to efforts from other players but she then goes on to state that the most important thing that the game had taught her was to believe in ourselves. How she came to such a conclusion was difficult to fathom at the beginning. However her next statement – 'never give up' leads to perseverance. Many students like this student realised that they had to remain in the game to reach the finish line even if they were the last. It may be this requirement to remain in the game to reach the finish line that shadowed the students' attention from the other purpose of the game which was to realise the importance of others in reaching your goal. This obviously is true because should they have given up half-way then no one can put in any effort to help them. This may also be the reason for some students over-looking the help given by others.

The most unexpected reflections were in the category 'others' that is category C. Here are some of the extracts of reflections in this category.

The following extract is from a student who realised the impact of others effort in his achievement and success. He wrote the following in his reflection.

> *... success that we get in our life is not dependent on our own effort but there are others who support us in many ways... without the help from her teaches and family members and also friends.....*

After one paragraph of explaining the impact of others in his success (which is category A), he wrote the following.

> *... On the other hand I also realised that some people could take advantage of our hard work to achieve their goal. We are actually the person who have put in all our effort on something but other people get the reward for it. So we just move on and continue our good work. Finally we also can achieve our goal and it is with our effort and hard work.*

He did not realise that when he obtained the number of one of his friends and his friend moved forward towards the finishing line in the game, it showed that sometimes even if our effort does not help us it may lend to help others just like others' effort help us in achieving our goal. It surprised me that this student interpreted this as people taking advantage of his effort.

Another unexpected negative effect from this activity is illustrated in the following extract of the student's reflection. This reflection is from category C.

> *.....Even though I tried many times I couldn't make myself to win but I helped others to move forward and win. As others moved forward and I still remained the same without moving forward made me feel hurt. This situation is suitable to connect with my personal life. I always help other people whenever they need but I never think about myself and my needs. It has happened many times in my life. I help others when they need and at last I suffer. Nobody helps me. Many people advise me to be selfish. It means that I should fulfill my needs and keep for myself. This is a very good lesson for me. I realised that I should think about myself before I help others.*

This was a student who was so obsessed with winning that she did not look at the board and see that she had reached her goal and it was solely because of others. She was last to reach the finish line in both game 1 and game 2. In game 1 although the outcomes are theoretically equally like but in reality some numbers show up more often than others. In game 2 however, this student was number 2 and she was alone. She had no partner. This may have affected her perception of the game and her personal bad experiences in life may have led her to reach such a realisation. This was certainly something I did not expect.

Of those in category C, only two students illustrated negative reflection from the game. The others had positive reflections. An example of an extract of this reflection is the following.

> *...I realised that when we are given a chance or opportunity, we should appreciate it because not all people can get the chance....*

This may have come from the fact that they are given a chance to roll the dice or participate in the games. Another example from category C is the following.

> *...jealousy has to be out of the way. Cause jealousy will lead to a bigger problem. Always think positive about others but don't give away our trust easily. Plus we have to understand each other's needs....*

This reflection is not based solely on the game but on their feelings during the game. It was obvious from their expressions that some of them were feeling bad because they were among the last to reach the finishing line. Hence the feeling of jealousy may have arisen but controlled by telling oneself not to let it take over and lead to more problems. The understanding of each other's needs may be because of the fact that the players who were leading were screaming with joy while their struggling friends were miserable. Hence these unexpected feeling were been festered and I too never thought that the students would actually regard a mere game in which all will complete would have such a serious effect on their affective domain.

Table 1 shows the number and percentage of students' extracts of their reflection in each category.

Table 1 Data of reflection in each category

Category	Number of students	Percentage of students
A	13	72
B	13	72
C	6	33
A or B	17	94

The results show that 72% of the students actually realised the important role that everyone around them played in their achievements (category A). This means that the intended value of humility was realised in relation to ones achievements. It also shows that 72% of the students realised the importance of them striving and not giving up until they achieve their goal (category B). This reveals that the intended value of 'determination' and 'perseverance' were realised in relation to ones achievements. The data also shows that 33% had extracts of reflections which were not in either category A or category B. The final data in the table which is the category A or B refers to the reflection having features of category A alone, B alone or A and B together. In the Figure 3, the Venn diagram below shows the categories in relationship to each other.
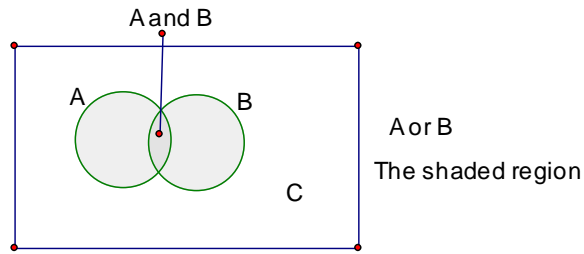
Figure 3 Venn diagram showing the relationship between the categories

This shows that the game was effective to help 94% of the students to reveal 'humility' or 'determination' and 'perseverance' or both.

■**5.0 CONCLUSION AND SUGGESTIONS**

The probability activity has helped students realise the values of 'humility' and 'determination' and 'perseverance' and is a suitable activity for this purpose. However several alterations in the procedure may enable a larger percentage to realise the values. For example instructing students or participants to first state the number of moves that were from their own scores and the number of moves contributed by others may have prevented students from overlooking the importance of others around them in reaching their goal – the value of humility. Asking what might have happened if they were not required to finish the game may have drawn their attention to the significance of 'determination' and 'perseverance'.

Another aspect that much be given attention are the very low probability sums in the second game. For example 2, 3, 11 and 12 should be given may be two or three steps to move forward for each score then it may not demotivate and lead to very negative and undesirable effects on the students.

The game however illustrates that mathematics can be used to realise the importance of values. It however, like any other activity requires the teacher to organise it to serve its purpose.

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