PERCEPTIONS OF CHANCE EVENTS AMONG R - 7 CHILDREN

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The recently written South Australian Attainment Levels in Mathematics will now bring Chance and Data into the primary curriculum for the first time. However, many teachers are very unsure about teaching the Chance and Data strand and feel themselves to be in need of information and support. This study has been designed to provide support for such teachers.

This study will be done in two parts. Six questions will be asked of all members of a Year 3, a Year 5 and a Year 7 class from one suburban public school. Six children will then be randomly selected from each class and interviewed on a one-to-one basis by the researcher. These children will be asked to expand on their answers in the class situation. They will then be presented with concrete models and be asked to predict the outcome of three further probabilistic situations.

Researchers have questioned children on the predicted outcome of tossing a die. The evidence suggests that children will frequently select six as being the most difficult to throw based on the requirement of many board games for a player to throw a six before the player can begin. A question of this type will be asked as part of this study as a control.

Questions one and two have been influenced by the work of Green (1983). Green's work was done with eleven to sixteen year olds. Green asked subjects to *Put a ring around your favourite number from 1 2 3 4 5 6. If you have no favourite say "None".* Children will be asked this question first to determine whether their preferred number has any influence on the choice of their answer to the question to follow it, i.e. *When an ordinary 6 sided die is thrown which number or numbers is it hardest to throw, or are they all the same?'*

The third question attempts to test the validity of the response to the second question. Children will be shown a pair of dice, and asked *When you roll two dice together which is more likely: that you will obtain the same number with both dice or that you will obtain 2 different numbers?*

The remaining three questions are influenced by the work of Tiegen (1983). Tiegen claims from his research with undergraduates who were asked questions relating to the choice of a number from a series of raffle tickets that the undergraduates chose central, 'representative' values, and avoided extreme ones. Tiegen's assumptions are based on very different reasoning from other researchers in this field. It seems that it is sensible to replicate the work of Teigen and to compare his results with those from primary school children.

Tickets numbered 1 - 12 will be torn from a book and placed into a container. Children will be asked, *'If you chose a ticket (from the container) which number do you think would be on the ticket ?* Children will be shown the box with both blue and red tickets in it and told *This box contains six blue tickets numbered 1 - 6 and six red tickets numbered 7 - 12. If you drew one ticket from this box which number do you think you will draw?* Children will be shown a box containing twelve yellow tickets. They will be asked *'If you took eleven tickets began this box which would be the last ticket that you would remove?'*

This study recently so that it will be impossible to summarise results, and data from only the first part of the study will be available to present at the conference.

To date I have administered the six questions of the initial investigation to three primary classes, Year 3, with 22 students; Year 5 with 30 students; and Year 7 with 25 students, and have interviewed six children from each class.

When analysing the class responses it was found the Year three students were inclined to be less spread than older children and responses were more inclined to cluster.

Question 1: Write the numbers 1, 2, 3, 4, 5, 6 onto a sheet of paper. Put a ring around your favourite number. If you do not have a favourite number write the word 'none'.

There was a wide spread of responses among the choices.

Question 2: 'When an ordinary six-sided die is thrown, which number or numbers is the hardest to throw or are they all the same?'

There was more inclination to choose numbers from 4 to 6 than the lower numbers, but 6 was seen as predominantly more difficult in only 22% of cases.

The perceived wisdom is that children regard 6 as difficult to throw based on their recollection of waiting to begin a board game. Many of the children's comments indicated alternative views. Some believed that the die had a mind of its own, or that it could be mechanically ordered, while many who quoted six as being hardest to throw saw this as relating to the size of the number, or that six was a favourite number.

TC Year 5: Because that's (6) the highest number ... most of the time I never get it.

AD Year 5: 5 is an odd number I suppose. I never get odd numbers only even numbers when I throw a die. I always get a six, two or four.

MM Year 5: ... because it's my favourite number.

CL Year 7: Sometimes you roll it and it's on number six and it doesn't roll to the other side

Some of the younger children felt that colour in the case of dice had some effect on the outcome.

I: If I roll two dice together what is more likely: that you get the same number with both dice or that you will get two different numbers?

MM Year 5: Two different

I: If both dice were different colours would that affect the result?

MM Year 5: Yes, then they'd be different numbers.

Question 3: 'You roll two dice together. Which is more likely: that you will get the same number with both dice or that you will get two different numbers?'

Almost all children answered question three by saying 'different'.

Question 4: Student is shown a container of raffle tickets numbered 1-12 and is asked, "if you chose a ticket from this container which number do you think will be on the ticket?'

The responses to questions 4 - 6 were spread between classes.

Year 3 students chose numbers six, seven, eight, nine and twelve, with eight being chosen most frequently. Year 5 students chose all numbers except one and five with six and seven being their most frequent choice. This pattern was similar with the Year 7 students although in their case six was chosen most frequently.

Raffle tickets and dice were seen by many of the children interviewed as behaving differently. Many children felt that they had some some control over raffle tickets, and that their behaviour could be predicted.

NB Year 5: ... the highest numbers just come up and the lower numbers don't and when the numbers are all shuffled up and all that the higher numbers are mostly on top.

I: If we drew out every ticket in the container except one, what number would be on the last ticket left?

AD Year 7: One of the little ones

I: What do you mean by little ones?

AD: Oh, you know one and two and them.

Question 5: Show student container with six blue tickets numbered 1-6 and red tickets numbered 7-12. 'If you drew one ticket from this container which number do you think you would draw?'

Year 7 students chose numbers from 6 to 9 in a majority of cases, Year 5 students responses spread from five to eleven, with the most popular choice being five, while year 3 students spread their choices fairly evenly omitting numbers one, two, five and nine from their considerations.

In question 5 the colour of the tickets seemed to make no difference to the children. They simply concentrated on the numbers involved in the question, although it was interesting to note that the children's responses to Question 4 and 5 were very different even though there were twelve raffle tickets involved in both cases.

I: In this container there are twelve yellow raffle tickets numbered 1,2,3,4,5,6,7,8,9,10,11,12 if you just draw one ticket out of the container what would that number be?

NM: Year 5 Six

I: In this container there are twelve tickets. The blue tickets are numbers 1,2,3,4,5,6 and the red tickets are numbers 7,8,9,10,11, 12 If you draw just one ticket out of the container what would that number be?

NM Year 5: Eight

I: In this container there are twelve yellow raffle tickets numbered 1,2,3,4,5,6,7,8,9,10,11,12 if you just draw one ticket out of the container what would that number be?

CL Year 7: Six

I: In this container there are twelve tickets. The blue tickets are numbers 1,2,3,4,5,6 and the red tickets are numbers 7,8,9,10,11, 12 If you draw just one ticket out of the container what would that number be?

CL Year 7: Eleven

Question 6: Show student a box containing twelve yellow tickets. If you took eleven tickets from this box which would be the last ticket that you would remove?

This was most interesting in terms of the responses. Year 7 students chose numbers one or twelve in 60% of cases while the other responses were numbers two, three, five,six, seven, eight and nine. (5-9 receiving one vote each). Year 5 students spread their preferences quite differently between eleven and twelve; and four, five, six and seven being chosen by 73% of the students; while all but four Year 3 students concentrated their choices from numbers nine to twelve.

KK Year 7: confidently predicted that in Questions 4 and 5 the result could be any number, however, in question 6 she nominated 12 just as confidently.

I: Why do you say 12?

KK Year 7: Because there are 12 tickets altogether, so I think 12 would be the last number left.

There appeared to be no pattern across the year levels to the answers to Question 6. However at each individual year level there was a distinct pattern that was more obvious than with any of the other question.

In the interviews when children were pressed for an answer to Numbers 4, 5, 6 they frequently commented that the number that they had chosen was 'in the middle'.

Tiegen (1983) presented 73 tertiary students "a box containing 12 tickets, numbered from 1 to 12. The numbers were written on the blackboard, and the students were told that as there was only one ticket of each kind, all numbers had an equal chance to be drawn, Still they had to make a guess, and write down which number they thought would turn up" (Tiegen 1983). The four central values (5,6,7,8) were chosen by 59% of the subjects. When the experiment was repeated with a different 42 students who were promised a small financial reward for correct predictions, then 76% of the students opted for the four central values. The percentage of students who opted for the outer values (1,2,11,12) also decreased.

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