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Title of the paper:

Strengths and Limitations of Informal Conceptions in Introductory Probability Courses for Future Lower Secondary Teachers

References/literature

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Working title:

How and why I changed my approach in teaching probability for future teachers

How:

From deductive to an inductive approach

Why:

I became aware that the students “knew” a lot about probability, even if they had no formal background in the topic from school

Why is it like that?

People have an intuitive interpretation about probability because words like

- Probable
- Chance
- Likely
- Likelihood (and so on)

are common words in our language.

Linguists define such words as

hedges in the language (also Rowland (2000)).

Hedges: A help to modify the certainty in statements

Example: The mystery at Boston airport is probably solved

In the paper I have divided the hedges into four different categories.

Example category 4:

The Smith family had their tenth child, the tenth girl. The chance of something like this happening is estimated to be one in a million.

(from a week magazine)

These categories represents a description of the steps in the cognitive development that is needed to make an individual able to interpret examples shown here.

Knowledge about hedges may avoid reasoning according to the outcome approach.

My research question:

How and why can we take advantage of

people's informal understanding of

probabilities in introductory courses?

Method:

Introduction to the topic through

problem solving exercises.

Both simple and compound events.

Exercises about

- simple events establish definitions of probability through discussions

- Compound events reveal several interesting strategies

My conclusion:

The intuitive and informal concepts are sufficient to explore basic probabilities in simple events but are insufficient for calculating probabilities of compound events.

I have found several interesting (and erroneous) strategies and explanations students use to find an answer to problems of compound events.

Among these findings I here will focus on a common heuristic not yet documented in the literature:

One-step orientated heuristic.

This means to find an answer by simply treating a two-step problem as a one-step problem or simple trial.

Exercise 6:

Two girls and three boys have a dinner party. They agree that two of them are going to do the dishes. They decide who by drawing lots. What is the probability that two boys will do the dishes?

- 1/5 + 1/5 = 2/5

  15 % of the students give this answer.

- The probability of getting 2 boys is 3/5 or 60 %.

  Almost 15 % of the students give this answer

Another 15 % of the students show that they are aware that this is a two-step problem:

P(boy in the first draw) = 3/5
P(boy in the second draw) = 2/4
But what are we going to do next?

About 20 % of the students find the right answer.

Exercise 7:

Anna has three red, two green and one blue pencil in her pen case. She asks Maria to pick out two pencils without looking. Anna thinks that the probability that both of the pencils are red is 1/5 but Maria thinks that the probability is 1/3. Does either of them have the correct answer?

- Maria is right. 2 red pencils out of 6 possible makes 1/3 (2/6).
- I agree with Maria. Argument: There are a total of 6 pencils and Maria picks out 2 pencils; this leads to the probability 2/6=1/3 for red pencils.

More than 20 % of the students give the answer 1/3 to this exercise.

No, one has to divide the red pencils, 3 pieces, on the number of the total number of pencils, 6 pieces, = 3/6= 50 % chance for a red pencil

If the answer is 1/5, it ought to be 5 pencils. If the answer is 1/3, it ought to be just 2 red pencils. It is 3 red of a total of 6. Therefore the answer is 50 %.

About 15 % of the students give the answer 50 %.

About 20 % of the students find the right answer.