

---

## Meaningless means

*Cecilio Mar Molinero*

When I was seven, as part of the first communion preparations, in common with other children in my class, I had to renounce the acts and deeds of Satan and promise to forever follow the teachings of Jesus Christ. Now the department in which I work, in keeping with the spirit of the times, is about to do something similar. It is discussing the adoption of a mission statement. This mission statement does not include renouncing Satan, but mentions other semi-religious objectives such as, for example, that we shall strive to obtain average ratings of four in student questionnaires.

In the above paragraph I have made reference to two numbers: seven as an age, and four as a rating in a questionnaire. It is worth pausing for a moment to think about them, their meaning, their properties, and the consequences of those properties. In developing my thoughts, I will make use of the theory of measurement.

Seven, as in age, is a measurement on a ratio scale. Zero has a clear meaning: the individual has just been born. Age can be counted in years, months or centuries, all that is required is multiplication by a well defined number. Intermediate values exist and their meaning is clear. For example, four and a half means that the person was born four years and six months ago. The value of the difference between four and five is one year, the difference between six and seven is also one year, and these two one year differences are identical. One year is a well defined quantity: it means the same thing for all individuals in all countries at any moment in time. Schools could have calculated the average age of their pupils and this would have been a perfectly valid operation. The average age thus obtained could have been compared with the average age of the children who attended another school, and valid consequences would have been derived from the comparison.

Four, as in the rating given to the enjoyment of a lecture, is a totally different kind of number. It is a measurement in an ordinal scale. It means that out of the total possible outcomes of lecture enjoyment (terrible, poor, normal, good, excellent), the one in the fourth place best

*Radical Statistics 66*

describes the feelings of the student. The student had a "good" time. As far as this student is concerned, things could have been better, the adjective in the fifth position could have been chosen in which case enjoyment would have been 5, meaning that the lecture was "excellent". Zero does not exist: it has not been defined. The difference between a rating of 4 and a rating of 5 is 1, which is not to mean that the difference between the two possibilities was "terrible" (the equivalent of number one in the ordinal scale). Orderings are only to be used as orderings. No arithmetic operations should be performed with orderings. There is no such thing as the square root of "good". Any temptation to add or subtract or multiply or divide measurements on an ordinal scale is meaningless and should be resisted. There are techniques that are appropriate for the analysis of measurements on an ordinal scale, but averages is not one of them.

Students in my department are asked to assign a 1 to the adjective "terrible", a 2 to the adjective "bad", and so on until 5 for "excellent". They could also have been asked to proceed in the opposite direction: assign 5 to "terrible" and so on until reaching 1 for "excellent". A number in an ordinal scale is only a metaphor. The metaphor can be extended: it is possible to point out that an improvement from mediocre to good is better than an improvement from bad to good, and that an improvement from good to excellent is even better; this idea could be conveyed by means of a sequence such as 1, 2, 3, 5, 8. It would have been to emphasise excellence by using a number such as 42, a long way away from the others. So, a student, when asked the question "how much did you enjoy the lecture?" could reply "42" meaning that this is the best lecture this week. Since no emotional value is normally attached to numbers, all that is required is that the numbers used should be in the correct order. It is, of course, possible to exploit the magical meaning of some numbers and a mystical sequence such as 3, 7, 13, 39, 69 would also have been perfectly acceptable. The actual numbers used to describe the adjectives are totally arbitrary but, of course, the value of the average will depend on the actual numbers used.

But arbitrariness does not end with the choice of numbers. There is no objective scale of measurement. When two students say that the enjoyment of the lecture has been "good", they may be saying totally different things. One of them might have slept all through the lecture and might have thought that this was a "good" thing. The other one

might have enjoyed seeing the lecturer making a fool of himself/herself and considered it to be a "good" thing. Of course, once the questionnaires have been completed and returned there is no way of finding out what was meant by the adjective. But even if we were to go back to the individuals who completed the questionnaires the absence of an objective scale of measurement would mean that there would be no way of finding out if they were telling us the truth. Perhaps they are too ashamed to disclose their motives for the ranking given. Perhaps they did not know themselves why they allocated a particular number to the lecture.

Careful examination of questionnaires leads to earth shattering discoveries such as "a student had a good time", or "a rating of 4 was obtained from a student". After this, the best destination of the questionnaires would be Friends of the Earth. The only processing necessary being to tie questionnaires in a bundle with a piece of string and take them to a suitable collection place. Any calculation of averages would be logically meaningless, theoretically unjustified and scientifically absurd.

I have always distributed questionnaires to my students as a way of assessing the impact of innovatory elements in my teaching. The results have helped me to produce a better syllabus for the next academic year. I never reported the results to anyone, as nobody else needed to know. I am not a vain person and I do not mind if my successes are not known beyond my classroom. Nevertheless, when the current obsession for questionnaires spread, I performed an experiment. I first gave students my own questionnaire designed with course improvement in mind. When this was completed, I told students that I had been asked to distribute an official questionnaire, that my promotion prospects might depend on what they said in it, and that I expected them to reply that I was the best teacher they ever had. They complied with my request. Some used my own words and replied: "This is the best teacher I have ever had". I returned the questionnaires for analysis with a health warning: I gave full details of how the data had been obtained. The results were coded into a computer file, averages were computed, and they were given to such bodies as the head of department (to whom I also made clear how the data had been obtained), the committee for assessment of departmental performance, and outside bodies. The following year I

continued the experiment with a new twist: I did not distribute the official questionnaire and, sure enough, the average from the previous year was used to fill the gap.

I will always be left with the doubt that my attempt to influence students was redundant: perhaps I am the best teacher that some of them ever had, perhaps I would have got the same ratings anyway. Would have I got the same ratings with a different set of students in a different institution if I had delivered the same lectures in exactly the same way? There is no way of finding out and, what would it all mean anyway? An average calculated from measurements on an ordinal scale is meaningless. The sad thing is that once such averages have been calculated they become the basis of further calculations and comparisons with other institutions, league tables are created and the absurd reaches monumental proportions. In the case of my department, there is a proposal that the absurd be institutionalised in the form of a mission statement.

I will end with a call to insurrection to students and teachers. Next time you are asked to complete one of these questionnaires refuse to do it. Rebel in the name of common sense and measurement theory.

Author: *Cecilio Mar Molinero*, Accounting, *University of Southampton*, SO17 1BJ. Email: *C.Mar-Molinero@soton.ac.uk*. A previous version of this article appeared in *Viewpoint*, a paper for comment of the University of Southampton.