STRENGTHENING OF ELEMENTARY TEACHERS IN THE USE OF PROBABILITY IN EVERYDAY LIFE EVENTS

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We believe that the inclusion of the concept of probability in our daily life is intrinsically related to the degree of knowledge that we have about its use. That is, if we have clear what is the value of occurrence of a certain event for; we have an interest in calculating it. The proposal that we have inclined is related precisely to familiarize teachers with the use of this concept and how this is necessary in certain situations of daily life. Our concern then is not only focused to recognize randomness, but to know what to do in its presence in a situation of interest.

PURPOSE

Nowadays, many people think that the possibility and probability terms are synonymous and represent exactly the same, this shows us a lack of familiarity that people have with these terms possibly for not having worked in basic training. In my country, some years ago, it has made the inclusion of the teaching of probability in the curriculum of elementary education, but in practice this has not been fully implemented. Based on this situation, we believe it is essential that active elementary teachers prepare to work these issues with their students. Because of that, in the work we have been doing during 2015 with the development of workshops of strengthening for elementary teacher, our research work has been directed to find strategies to improve the knowledge of teachers in this area.

BACKGROUND

The presentation of the concepts of randomness and probability has evolved historically, there are different positions and several of them coexist today. We present the concepts that exist and should be related to get an idea of the use of probability in everyday life.

An evolution of the concepts of randomness can be found in Batanero and Serrano (1995), which indicates that in the early days it has thought that randomness could not be controlled humanely and that was the "random" the cause of the existence of aleatory phenomena. In addition, it conceived that random feature was the phenomenon itself and that everyone would see it that way, we're talking about the objective concept of randomness. A subsequent conception states that phenomenon had a cause and simply the phenomenon was taken as random because the person, who analyzed it, doesn't know the cause that produced the result in the phenomenon. This conception was rejected by some authors, because certain phenomena whose laws we don't know are, however, considered as deterministic.

On the other hand, in Batanero (2001) it is mentioned that nowadays positions has been added about the conception of what makes a random phenomenon, this is considered random if its behavior is based on the calculation of probabilities. It is also indicated that Kyburg (1974) criticizes the position that the probability and randomness are 'objective' and rather proposes the subjective nature of them. It is indicated that the meaning of the term is associated to the situation where it is

studied and the knowledge that the person has about it, then the determination of the randomness will depend of the person.

Also in Batanero (2001) it is presented the relationship between the notion of randomness and the conceptions of probability, and it is presented the two known concepts.

- The classical conception, the probability of an event is the "ratio between the number of favorable cases to the event and the number of possible cases, provided that all cases are equiprobable. This conception could only be used if the whole set of possible cases is finite; if it was infinite, the probability of each case would be zero.
- The frequency conception, we can use it when we want to apply the idea of probability to situations where we can't apply the principle of equiprobability. The method provides to each case a certain relative frequency in the long run. This definition is useful when we have statistical data of a large number of cases, but we have the theoretical problem of deciding how many experiments are required to considerate that the value found is close to real.

Besides conceptions, there are positions that allow us to organize the ideas required for the use of probability. Batanero (2001) talks about the idea of probability as normalization of our beliefs. The first fundamental idea is to assign numbers to random events, in order that these numbers reflect our degree of belief in its verification. In this way, we put in correspondence the multidimensionality of the complex world around us with the interval [0,1]. It also presents the Kolmogorov's idea to assign a sample space of observable events to each random experiment and to represent the observable events as subsets of the sample space, giving a probabilistic interpretation to the operations with events.

In Azcárate., Cardeñoso and Porlán (1998), it is indicated that the concept of random event has been a key element in understanding and historical development of probabilistic knowledge. It is reported that for Konold and colleagues (1991, p. 2), the notion of randomness is ambiguous and complex, but that variants of the concept are, however, the heart of probabilistic and statistical thinking. They argue that it is preferable to see the random term as a «label» that can be applied in many situations and that are associated with many other concepts, such as event, sample space, probability, etc.

PROPOSAL DESIGN

Active elementary teachers are in many cases adults who haven't had the opportunity to work the ideas of randomness and probability during their school life and the approach that they have about the probability during their professional training has been linked in many cases only to the calculation of probabilities under the classical conception. We have seen that during our work with elementary teachers, where a few of them could give a definition even intuitively about what is the probability.

Our concern has focused on finding a simple way to familiarize them with the concept of probability. Therefore we have proposed a way to integrate all conceptions discussed in the previous section, in a logical order and understandable. We have used this approach when we wanted to present these ideas to our students of a first course of Statistics at the university level, and we were perfecting the course along eight years of work. Finally, we present it as part of our research work on Osorio (2012).

The idea consists in the understanding of the existence of random situations in the daily life and to introduce the idea of uncertainty as the simplest explanation for identifying such situations. So we seek that it is conceived that everyday situations which involve an action are divided in situations of uncertainty and in certain situations.

Then, to submit that any situations of uncertainty produces a series of concepts that relate to it: the possibility or possible result of the analyzed situation of uncertainty, the sample space as a set of all possible results, the events that are the elements of the power set of sample space. So now we are ready to discuss possible event, impossible event and sure event. Finally, we can formulate the concept of random experiment as a reproducible situation of uncertainty.

So the situations of daily life would be divided into: certain situations, reproducible situations of uncertainty and non-reproducible situations of uncertainty. In reproducible situations of uncertainty or random experiments, it is possible to define the axiomatic concept of probability. So we can define the probability as a numerical value between [0,1] that is assigned to each event related to the random experiment, in order to assess its occurrence in experimentation. This conception makes us to realize that the sum of the probability of all possible results in a sample space must be 1 and a possible result could be conceived as probable or improbable.

The two conceptions of probability, the classical approach and the relative frequency approach, don't have to oppose each other. They may simply be different ways of treating different random experiments. The idea is to work with the nature of the existing possibilities in a sample space. If these possibilities are equiprobable and the sample space is finite, so we use the classical approach to calculate the probabilities that interest us for the analyzed situation of uncertainty. However, if the possibilities aren't equiprobable or the sample space is infinite, we can use the relative frequency approach.

To conclude our approach, we will explain how to work in a situation of non- reproducible situations of uncertainty. In this case, the probability has the same intuitive idea but its valuation is done through a subjective approach, i.e. there is an expert or a specialist who can give the value of probability of a certain event.
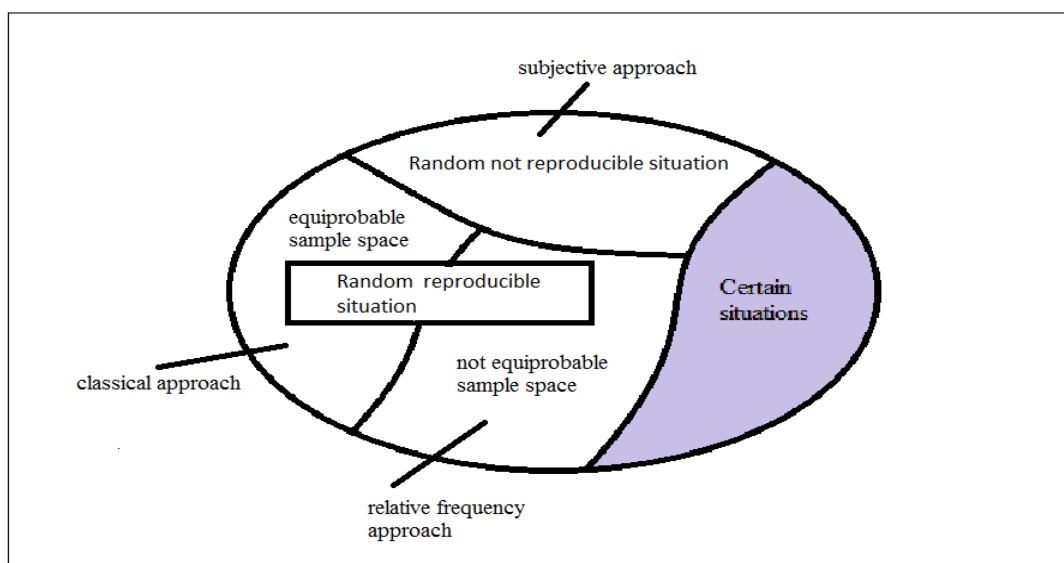

Figure 1. Relationship between approaches and types of random situations

PROPOSAL IMPLEMENTATION

We have implemented this proposal through the work of everyday situations, such as the time that a person takes to go to work or to see what the best-selling items in a restaurant are. The idea has been to promote the use of empirical approach of probability, which has been neglected in the teaching of our country.

The work that we have proposed to perform within the workshops has three stages. First, teachers will participate in activities that allow them to work with random situations of everyday life and learn to recognize the different elements that are contain and facilitate the understanding concept of probability. Then, teachers will review the indicators proposed by National Standards for teaching of the probability content, and they will analyze problem proposed for students in order to verify their suitability for work in the classroom. Finally, teachers will practice the preparation of proposals for their students, and they will analyze them.

Teachers will work the determination of possible results in a situation of uncertainty. They will determine the sample space associated with the situation of uncertainty, and they will build some events from it. Then, teachers will be submitted to new situations, and they will be asked to justify why these situations would be uncertain, in order to identify the components associated with it and eventually to indicate under what approach they might find the probabilities requested.

Ideally, the teacher not only can analyze a situation of uncertainty raised, but he is able to define new situations of uncertainty related to any problem, and to identify all elements that allow him to find the probability that interest him.

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