EMPIRICAL ANALYSIS OF COMPLEXITIES IN A HLT ON REASONING WITH LATIN SQUARES

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Completing Latin squares, in addition to being a fun pastime, can provide significant learning opportunities to simultaneously work on logical and spatial reasoning processes with Primary Education students (Křížek & Solcova, 2021). It is known that the problem of deciding whether there is a solution to the task of completing a Latin square or not is NP-complete and, consequently, empirical ways must be explored to analyse its complexity. These analyses turn out to be of interest from the field of psychology, since they use the same ordinal scale to link the ability of individuals and the complexity of the task itself (Birney, 2006). Questions other than complexity are the objective, the sequence and the hypotheses about the process that make up a hypothetical learning trajectory (Clemens & Sarama, 2012). The analysis of the exhibited complexity can be used to redefine and improve. In this research, a sequence of activities has been developed in a virtual environment with the aim of developing logical and spatial reasoning processes, based on a series of hypotheses regarding the potential difficulty that each of the variables involved would entail (dimension of the square, number of constraints, nature of the task required…). Thus, a sample of 50406 students from 76 countries and between 6 and 12 years old, has been studied. Its activity has been monitored from 2019 to 2022, analysing the distributions of efficiency and response times by activity. Likewise, the average time it takes for a student to go from one activity to the next has been statistically estimated. In view of the data, it can be concluded that, for the perceptual description task, no differences related to the dimension of the square are observed. Regarding the completion task, a marked increase in complexity is observed when moving from dimension 2 to 3, which does not happen again in the successive dimensional increases. Finally, it has also been noticed that a lower number of imposed restrictions explains a decrease in the complexity of the task.

References

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