

Assessing Children's Probabilistic and Creative Thinking in a Non-formal Learning Context

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Abstract : Daily, we face unpredictable events, often attributed to chance, as there is no justification for such an occurrence. Chance, understood as a source of uncertainty, is present in several aspects of human life, such as weather forecasts, dice rolling, and lottery. Surprisingly, humans and some animals can quickly adjust their behavior to handle efficiently doubly stochastic processes (random events with two layers of randomness, like unpredictable weather affecting dice rolling). This adjustment ability suggests that the human brain has built-in mechanisms for perceiving, understanding, and responding to simple probabilities. It also explains why current trends in mathematics education include probability concepts in official curriculum programs, starting from the third year of primary education onwards. In the first years of schooling, children learn to use a certain type of (specific) vocabulary such as: never, always, rarely, perhaps, likely, and unlikely, to help them to perceive and understand the probability of some events. These are keywords of crucial importance for their perception and understanding of probabilities. The development of the probabilistic concepts comes from facts and cause-effect sequences resulting from the subject's actions, as well as the notion of chance and intuitive estimates based on everyday experiences. As part of a junior summer school program, which took place at a Portuguese university, a non-formal learning experiment was carried out with 18 children in the 5th and 6th grades. This experience was designed to be implemented in a dynamic of a serious ice-breaking game, to assess their levels of probabilistic, critical, and creative thinking in understanding impossible, certain, equally probable, likely, and unlikely events, and, also, to gain insight into how the non-formal learning context influenced their achievements. The data analysis employs a mixed-methods approach, based on students' written productions, audio recordings, and researchers' field notes. This methodology allowed us to conclude that such an approach is an appropriate and helpful formative assessment tool.

Keywords : critical and creative thinking, non-formal mathematics learning, probabilistic thinking, serious game

Conference Title : ICELS 2025 : International Conference on Education and Learning Sciences

Conference Location : Dubai, United Arab Emirates

Conference Dates : February 15-16, 2025