DYNAMIC IMAGINATION FOR SOLVING GEOMETRIC PROBLEMS

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In this study we were interested in investigating the ability of preadolescents (12-14 years old) to find effective solution strategies in geometric problems in which the figures were already provided with the text. The topic of the problems was surface equivalence. An initial test revealed that not even half of the students answered the items correctly and that the proposed solution strategies were, in most cases, rather convoluted. We considered this to be due to the fact that the students remained too stuck studying the initial figure of the problem, which otherwise, by imagining simple movements, could be transformed into an equivalent one for which it was easier to find the area.

We believe that by working on geometric perception we can develop this dynamic imagination. Since there are no specific studies on the encoding of geometric figures, we have referred to models for word encoding [2] that have also been experimentally verified [6]and to encoding processes during the observation of an object [5]. We know that the power of such neuronal activations depends on the habit we have of seeing an image.

We also wanted to consider the neuronal activations following interaction with mathematical manipulatives. It is known from studies on primates [4], and from studies on humans [1], that we grasp an object in the way that is most effective for our purposes. The neuronal circuits involved are not only activated when the individual's hand interacts with the object but also when he/she simply remembers the interaction with it [3].

The students involved in the study then performed specific treatments. In order to compare the effectiveness of these treatments, the students were divided into two groups although the objectives of the assigned tasks were the same. The difference between the two treatments was that, in order to formulate and test their hypotheses, the students in one group could use traditional tools while those in the other group could use manipulatives representing geometric figures and designed taking into account the neurophysiological aspects mentioned above.

After the treatments, all students were tested again. We found that most of the students in both groups were clearly able to identify the known figure against which to transform the initial figure using appropriate movements. However, about 6 months later, with another test, we found that the students who had worked with traditional methods showed no further improvement in contrast to the students in the other group. We concluded that interactions with manipulatives help to recover related mathematical facts even after a long time.

References

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