recombining the unit partitions into wholes, he came to understand that grouping the 9 quarters resulted in “9/4”, which was equivalent to 2¼.

Conclusion

Our data show that short and targeted instructional activities can have a positive impact on students’ relational understanding. The activities we designed have implications for classroom practice, but the findings also support the notion that specific aspects of relational thinking can support the development of meaningful strategies for solving fractions problems.

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AN UNUSUAL COMPARISON OF PERIMETERS

Ioannis Papadopoulos and Paola Vighi ☜

Abstract

Primary school pupils 10-11 years old must solve the problem of a shepherd to build a fence for his sheep. The mathematical background is the comparison of the perimeters of three figures obtained one from the other by some modifications.

Keywords: perimeter, area, misconception

Aim of the study

The aim of this study is to investigate the impact of the visual perception, and the reciprocal interaction between the concepts of ‘area’ and ‘perimeter’.

Figure 1 reproduces the three shapes presented to the students.

As it can be seen, Shape-B is obtained from Shape-A by merely moving the white rectangle, while to take Shape-C a small while rectangle must be added to Shape-

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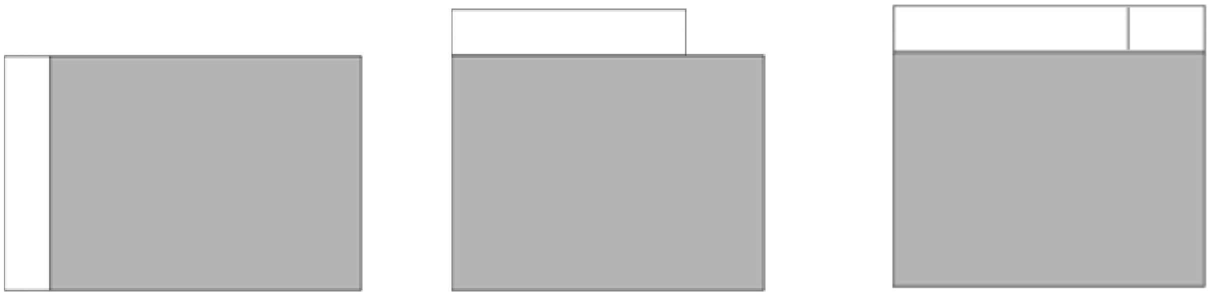
B. Perimeter is the same for all the three shapes, whereas area is the same only for Shapes-A and B, but bigger for Shape-C.



Shape-A **Shape-B** **Shape-C**

Figure 1: The three shapes presented to students

In particular, we want test the presence of two well-known misconceptions: "Same A, same B" (Murphy, 2010) which for shapes A and B is translated to "Same area, same perimeter", and "more A, more B" (Stavy and Tirosh, 1996) which for shapes B and C is translated to "More area, more perimeter". Murphy (2010) examined these misconceptions in the opposite direction (from perimeter to area).

Methodology

A worksheet based on the shepherd's problem was delivered to 10-11 years old students, in Greece (43 students) and in Italy (76 students), asking them to explain if the fence used for Shape-A is enough to fence also Shape-B; a similar question followed for Shape-B and Shape-C. The collected worksheets constitute our data and they were analysed on the basis of correctness and reasoning (Table 1, 2).

CORRECT					WRONG		
	NO EXPLANATION	CORRECT EXPLANATION	WRONG EXPLANATION	NON CODABLE	NO EXPLANATION	WRONG EXPLANATION	NON CODABLE
GR	**4**		**28**	**4**	**1**	**3**	**2**
IT	**7**	**6**	**24**	**4**	**2**	**33**	

Table 1: Arithmetical data for shapes A and B

CORRECT					WRONG		
	NO EXPLANATION	CORRECT EXPLANATION	WRONG EXPLANATION	NON CODABLE	NO EXPLANATION	WRONG EXPLANATION	NON CODABLE
GR	**2**	**8**	**2**	**1**	**2**	**24**	**2**
IT	**3**	**26**	**12**	**2**	**5**	**27**	**1**

Table 2: Arithmetical data for shapes B and C

Results and Conclusions

The analysis of the content of the worksheets confirms that visual perception hindered the fruition of the images, conditioning pupils' answers. Tables 1 and 2 present the distribution of the student's answers.In Table 1, the majority of the answers are correct, but with 44.07% of incorrect explanations. Many of them lie on the idea that since Shape-A and Shape-B have equal area then they necessarily have equal perimeter (same A, same B). Table 2 shows that 43.59% of the students gave wrong answers claiming that shapes B and C have different perimeters. The origin of their mistake was the belief that since shape-C has bigger area, then necessarily it will have bigger perimeter ("more A, more B"). Interestingly, a noticeable number of Italian students (26 out of 76) were able to give correct answers using correct explanation.

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USING THE REAL AND UNREAL ARTEFACTS IN DEVELOPING ALGEBRAIC THINKING

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Abstract

The aim of the classroom experiment was to answer the question of how the use of computer games and special blocks, can foster students' difficulties with algebraic calculation. I run the experiment with the group of twenty 12-year old children, who used three different artefacts during the mathematics lessons. The results show what obstacles children can overcome, using the tools.

Keywords: manipulative and semiotic tools, algebraic symbols, difficulties

Research methodology

The tools used in the research were: Video game (DragonBox Algebra 12+, 2012-2013), computer application (Solving equations with cover-up strategy, WisWeb, 2013), algebraic blocks (Lab Gear, H. Picciotto, 1990). In course of duration of experimental teaching I collected data by observation, recording students' arguing and collecting their written solutions. To describe the research results I analyzed difficulties that students could overcome by using the artefacts.

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