Generalising from visual spatial patterns

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In the research project presented, I categorise the strategies employed by four Fourth class girls and four Sixth class girls when asked to construct a general term for a visual spatial pattern. The approach adopted by each girl is categorised as either explicit or recursive, and the mode of generalisation is categorised as either linear or numeric.

Keywords: Visual spatial pattern, generalisation strategies, reasoning.

THEORETICAL BACKGROUND

Generalisation is considered by many to be a highly significant component of algebraic reasoning (Kaput, 2008). Patterning plays a key role in supporting children's developing skills in generalisation, and internationally visual spatial patterning tasks have been utilised in many research projects to investigate children's success in generalising (e.g., Rivera & Becker, 2011).

Lannin (2004) presents two approaches to the construction of generalisations from patterns. An 'explicit' approach involves identifying a rule for the relationship between a term and its position in the pattern, whereas a 'recursive' approach focuses on a relationship between successive terms. Rivera and Becker (2011) discuss the tendency of some children in their research to adopt a 'numerical' rather than 'figural' mode of generalising, which in some cases caused difficulty in the children's own reasoning about the generalisations they had constructed.

Within the algebra strand of the Irish Primary School Mathematics Curriculum (PSMC) it is proposed that children be facilitated in establishing rules for number sequences, but explicit approaches are not mentioned, and examples given all indicate constant differences between terms (Government of Ireland, 1999). Generalisation is not mentioned and visual spatial patterning is not suggested for consideration, beyond repeating patterns of shapes aimed at the youngest children in primary school. In light of this, the research discussed in this paper aims to explore the responses of primary school children in Ireland when asked to construct generalisations from a visual spatial pattern.

METHOD

Individual clinical interviews were used to gather data on children's constructions of generalisations.

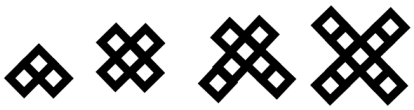

Figure 1: Diamonds pattern

Four girls were randomly selected from each of Fourth class and Sixth class in an Irish primary school. The cohorts from the two classes had mean ages of 10.08 years and 12.19 years respectively. Pseudonyms are used. The girls were asked to describe, extend and construct near and far generalisations from the pattern terms shown in Figure 1. Suggestive questions were asked to support children in making progress in the solution of tasks.

FINDINGS AND DISCUSSION

During the clinical interview, each girl was asked to identify the 100th term in the pattern, as a far generalisation. Each girl's generalisation, or work towards a generalisation, was deemed to be figural or numeric. A response was deemed to be figural if the child referred to the position of the diamonds, by referring to the 'top' or 'bottom' or through gesture and use of the deictic 'there'. Table 1 summarises the mode of generalisation adopted by each girl and whether the approach adopted in working with the pattern was recursive or explicit. An incomplete generalisation

Name	Class Level	Numeric/figural mode of generalisation	Recursive or explicit approach	Validity of generalisation
Natasha	4th	Figural	Explicit	Complete, but flawed numerically
Bella	4th	Figural	Explicit	Complete and valid
Tara	4th	Did not respond	Did not respond	No response
Nikki	4th	Numeric	Recursive and later explicit	Complete and valid
Lisa	6th	Numeric	Recursive and later explicit	Complete and valid
Sarah	6th	Figural	Did not explain her thinking	Complete and valid
Aoife	6th	Numeric	Recursive	Incomplete
Rachel	6th	Numeric	Recursive	Incomplete

Table 1: Classifications of girls' constructions of a far generalisation

refers to an instance when a participant did not construct the 100th term.

Within the PSMC the 6th Class girls may have encountered many number sequences which favour recursive thinking. Lannin (2004) suggests that such immersion may cause difficulty in considering an explicit approach. Additionally, the numeric approach of Aoife and Rachel seemed to inhibit their thinking about the general term, in a manner consistent with the findings of Rivera and Becker (2011).

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