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Basic Research on the Formation of Students' Concept of Functions

In Japan, issues pertaining to schoolchildren's learning of mathematical functions have long been highlighted. The students' understanding of mathematical functions is based on the formation of the following two concepts: (i) Quantifying changes in a phenomenon, that is, deriving variables from the phenomenon; and (ii) establishing the relationship between the two variables derived. However, a number of children are not satisfactory in forming the two concepts. In this study, we have ad-dressed these issues from the perspective of previous research on children's cognition.

Dixon, Moore et al. (1991, 1996) have shown that performing intuitive problem-solving first, without the use of numerical values, and intuitive understanding, is necessary to generate mathematical solution strategies. Therefore, transitioning from 'learning without the use of numerical values' to 'learning with the use of numerical values' is deemed to be one of the approaches that promote the understanding of mathematical functions. This is because children usually skip the 'learning without the use of numerical values' part and learn with the use of numerical values.

'Learning without the use of numerical values' involves linking changes in a phenomenon to changes in quantity, then striving for the formation of concept (ii), which is based on the relationship between the two variables on logical structure, such as 'one variable increases when the other variable increases', 'one variable decreases when the other variable increases', or a combination of these.

Learning Content is the change of the shadow cast by objects due to sunlight, which is a variable dependent on the passage time. Currently, we are proceeding with the preparation of educational practice, while discussing with the teacher.

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