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# Visualisation of shapes and use of technology in kindergarten

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In 2006, the Norwegian government added mathematics and technology as a subject in the national guidelines for kindergartens in Norway. The activity in this case is a visualisation task about the connection between 2D and 3D shapes. The activity starts with a short introduction from one of the researchers, where she together with children explored different 3D shapes with collapsible folding shapes. After a while, iPads were taken into the activity, using an application where they could see 3D shapes fold and unfold. The activity lasted for around 50 minutes where the children freely combined the work on the concrete folding shapes and the ones at the iPads. Preliminary findings indicate that the children were focused on the appearance more than the characteristics of the shapes. Further, technology gave some new opportunities, but also some limitations due to tactile feelings.

Keywords: Kindergarten, technology, geometrical shapes.

#### **RESEARCH QUESTION**

How do children utilise technology when exploring the transition between 2D and 3D shapes? Does technology add something to this activity? The aim of the study is to develop knowledge about children's use of and explorations with interactive devices, like touch screens seen in relation to traditional play material for construction.

#### THEORY

The case study will be discussed in light of explorative and a playful approaches to mathematics (van Oers, 2010), where children experience different geometrical shapes. Van Hiele's model will work as a framework for the analyses of children's understanding (van Hiele, 1986). Clements and Sarama (2007) argue that use of different concrete models will help children develop spatial skills. The study reported here will support this by using an iPad application.

#### METHODS

The method is an explorative case study (Cohen, Morrison, & Manion, 2007) where the researchers together with kindergarten teachers designed and carried out the activity. The case study is explorative due to lack of research on kindergarten activities that combine virtual and concrete objects.



Figure 1

Two boys and two girls aged five were studied and the activity was recorded with two video cameras and transcribed. It was analyzed by the researchers and discussed with kindergarten teachers for validations.

#### EARLY FINDINGS

The children used the names of 2D shapes like circles, squares, rectangles and quadrilaterals, but not always in a very accurate way. For instance, a boy referred to a square as a long quadrilateral, although still pointing at a rectangle.

Figure 1 illustrates the activity. To the left, they compare the shapes included in the cylinder. Initially, they interpreted the group of shapes as a smiling face and pointed out the eyes and mouth. To the right, they compare concrete shapes with virtual shapes on an iPad. They used the color function to make the virtual shape look equal to the concrete shape. The children were focused on the appearance (e.g., color, proportions) more than the characteristics (e.g., angles, parallel sides) of shapes. Our findings indicate that the combination of technology and traditional collapsible folding shapes can give children richer experiences when they use the iPads to understand how to fold and unfold 3D shapes. We observed that this iPad application can help children investigate several shapes more effectively than with traditional solid shapes. Despite this, the tactile aspect must not be underestimated. Holding and touching the physical shapes is important for children's investigation of shapes.

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