DESIGNING DISCOURSE WITH ICT ENVIRONMENT THAT AFFECTS REIFICATION OF FUNCTION

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Understanding functions is difficult for junior secondary students. This research aims at designing classroom discourse with dynamic ICT environment that affects reification of a mathematical object. Reification is a transition from operational procedure into a mental object. Based on research about reification of mathematical objects (Font et.al, 2010; Nachlieli & Tabach, 2011; Sfard, 2011), there is substantial inconsistency in discourse about functions. Classroom discourse often includes both statements that distinguishes a function from an algebraic expression and that identifies a function with an algebraic expression. Such inconsistency in discourse may cause unintentional difficulties for students in understanding function as a reified mathematical object. We designed teaching unit that includes a milieu of coherent discourse and a dynamic ICT environment. We adopt two design heuristics (Gravemeijer & Cobb, 2006): making a distinction between function and its tabular, algebraic, and graphical representation; observing and telling properties of changing quantity in dynamic ICT environment. We adopt a definition of function not as an abstract one-to-one correspondence, but as a concrete quantity which was formulated by Euler (1775/2000) in his textbook on differential calculus. In order to emphasize function as a concrete quantity that depends on or is determined by a given quantity, the design research made use of the dynamic mathematical software ‘GeoGebra’. We expect students to observe the changing quantity while manipulating applets.

REFERENCES