CHILDREN’S ACTIVITIES WITH MATHEMATICAL SUBSTANTIAL LEARNING ENVIRONMENTS

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The aim of our research project is to develop a mathematics curriculum from primary to secondary schools in which students actively engage in rich mathematical activities and acquire sound knowledge and understanding in mathematics. Our theoretical background is influenced by the ‘mathe2000 project’ (Wittmann, 2001). In a collaborative research network between schools and university, we place the designing ‘Substantial Learning Environments (SLEs)’ with both flexibility and rich mathematical content as a core of the network (Wittmann, 1995; 2000). We also regard ‘mathematics’ for students as a ‘science of patterns’ which is not restricted by mere number spotting tasks but includes various patterns in the relationship among numbers, shapes, etc., e.g. patterns in the number pyramids (Fig. 1), ‘321 – 123 = 198, 543 – 345 =198, 765 – 567 = 198’, etc.

In this paper, we shall report selected episodes from our classroom based pilot studies which have been undertaken since 2005 in Japan. Our research design is based on the ‘lesson study’ as we first design SLEs and lesson plans collaboratively, implement lessons and evaluate the lessons. Data is mainly collected by observation and field notes, focusing on how children in primary schools recognise, investigate mathematical patterns and how they reason/justify them. For example, in our pilot lesson Year 4 children (aged from 9 to 10) undertook a problem ‘Investigate differences between 3-digits numbers which consist of three consecutive numbers such as 321 – 123’ During the lesson, children not only found the pattern ‘the answer is always 198’, but also they started reasoning by using ‘the place value table’ with counters(Fig. 2).

Details of the analysis how children interpreted the place value table (321 – 123, 765 – 567 etc. → 200 –2 = 198) will be discussed in our presentation together with other episodes from our pilot studies. We will also discuss how we are going to use these findings to design the mathematics curriculum.

Reference