ABSTRACT. This article presents a research project on the development of pre-service mathematics teachers’ skills and understanding of themselves as pedagogical problem solvers. The problems were similar to those they are likely to encounter in their future mathematics classrooms. The project took place within a Bachelor of Education program. The article describes changes in the students’ attitudes towards problem-based learning and examines the critical incidents that were catalysts for these changes to occur. The project addressed an important issue in the current Hong Kong context, with the emphasis on quality learning and instruction. With curriculum reforms in primary education, teachers are required to respond to changes and implement recommendations within the constraints of day-to-day classroom management. They need to be critical and informed professionals. Therefore, we argue that by adopting a problem-solving approach to teaching, teachers would be better able to view themselves as competent problem solvers who are able to develop various strategies to deal with change.

Ongoing reforms in mathematics education require teachers to engage in continuous professional growth and adjustment to change throughout their careers in ways that were unprecedented in the past. Teachers who do not adapt successfully to change will more likely produce students who can only “follow the rules and procedures and conventions specified in the textbook” (Gregg, 1995). Several reasons have been put forward for teachers’ reluctance to embrace reform. One is that the teachers may lack the pedagogical skills and/or confidence to overcome obstacles to changes (Gregg, 1995). Also, according to Gregg, in many cases teachers believe that these obstacles are insurmountable. Many feel unable to be innovative because they are effectively isolated in a sink-or-swim atmosphere in which they are subject to accountability pressures (Gratch, 2000). Gratch also suggested that teachers simply lack understanding of what they are supposed to do. Whatever the reason, there is certainly evidence of a dearth of teachers who are implementing current reform ideas in mathematics (Simon, 1995).

Of particular concern are beginning teachers who, despite having had recent instruction about up-to-date methods of teaching mathematics, often revert to teaching styles similar to those of their own teachers (Brown, Cooney & Jones, 1990); they show little or no change in their conceptions of mathematics teaching despite their methods courses (Thompson,

When teachers become caught up in the “reality shock” at the complexity of professional work” (Myint, 1999, p. 18), they find it difficult or impossible to implement in the classroom even those practices that they have come to believe in during their methods courses (Brown & Borko, 1992).

Consequently, it is especially important for pre-service programs to play a role in preparing prospective teachers to adapt to continuing professional change, rather than just to be “technicians” (Gratch, 2000) or to “paint by numbers” (Thiessen, 2000). Often teacher education programmes fall short in this mission because they are too abstract and academic and provide insufficient opportunities for students to confront their beliefs about teaching (McDiarmid, 1990). For mathematics teachers such a confrontation is particularly important because there is a tendency among them to believe that learning mathematics is equated with remembering rules, procedures, and facts primarily through practice (Ball, 1989; McDiarmid, 1990).

If pre-service programs are to do more in preparing teachers to be problem-solving practitioners who can adapt to change, it is important to establish just what it is that teachers need to be able to do this. There are several kinds of knowledge with which teachers need to be competent. One is procedural knowledge, which refers to knowledge of the rules, procedures and symbols needed to complete a task (Eisenhart, Borko, Underhill, Brown, Jones & Agard, 1993; Simon, 1993). A second kind of knowledge is conceptual or content knowledge, which refers to the ability to understand the concept and connect or apply the different parts of knowledge (Leinhardt, 1988; Sullivan, Clarke, Spandel & Wallbridge, 1992; Eisenhart et al., 1993; Simon, 1993). For mathematics teachers, conceptual knowledge includes the ability to make generalisations, describe relationships, and demonstrate higher order reasoning skills (Sullivan et al., 1992). In addition, teachers need to be competent with general pedagogical knowledge of how to teach and specific content pedagogical knowledge, that is, knowledge of how to teach specific content in their subject area. It is not enough, however, to simply impart this knowledge – it is also important to challenge the students to examine their fundamental beliefs about this knowledge and to help them discard or revise some of these beliefs (Ball, 1988). In other words, it is important for teacher education programs to address the issue of how to cope with the complexities of professional change.

Peterson, Williams, Dock & Dunham (1998) suggested that a problem-solving approach to teaching can be better realized by beginning teachers through collegial problem solving rather than through advice on crisis