According the primary years (empson and levi, 2011;

Accordingto Dr. Catherine Bruce, Diana Chang and Tara Flynn, Trent University Shelley Yearly, Trillium Lakelands DSB, on assignment with Ontario Ministry of Education. Submitted to Curriculum and Assessment Branch Ontario Ministry of EducationJune 21, 2013. The mathematics education literature isresponding in its finding that understanding fractions is a challenging area ofmathematics for North America students grasp (National Assessment ofEducational Progress, 2005). Students seem to have difficulty retainingfractions concept (Groff, 1996).

Adults continue to struggle with fractions concepts(Lipkus, Samsa, & Rimer, 2001; Reyna & Brainerd, 2007) even whenfractions are important to daily work related tasks (Bruce & Ross, 2009). Fractions involve difficult-to-learn anddifficult-to-teach concepts that present ongoing pedagogical challenges to themathematics education community. These difficulties begin early in the primaryyears (Empson & Levi, 2011; Moss 7 Case, 1999) and persist through middleschool (Armstrong and Larson, 1995; Kamii and Clark, 1995), then into secondaryand even tertiary education (see Orpwood, Schollen, Leek, Marinelli-Henriques,& Assiri, 2011). The challenges and misunderstandings students face inunderstanding fractions (Gould, Outhred, & Mitchelmore, 2006; Hiebert 1988; NAEP, 2005) persist into adult life and pose problems in such wide-rangingfields as medicine and health care, construction and computer programming. Thefield of science, technology, engineering and mathematics (STEM) demandconsiderable fractions knowledge; a shaky grounding in fractions are preventindividuals from pursuing advanced mathematics and shut students off from asignificant number of career opportunities in later life. In medicine, theimplications of

inadequate fractions understanding can be severe (Grillo, Latif, & Stolte, 2001, p.

168). The mathematics education and researchcommunities have much more work ahead to begin to resolve the challengespresented by the learning and teaching of fractions. The implications are broad(touching on, for example, a wide range of career fields), but they are alsodeep, affecting foundational understandings that help or hinder the learning ofother areas of mathematics. Behr, Harel, Post & Lesh (1993), for example, to have insisted that " learning fractions is probably one of the most seriousobstacles to the mathematical maturation of the children" (in Charalambous& Pitta-Pantazi, 2007, 293). Fractions understandings are underpinned bylarger mathematics cognitive processes.

Empson and Levi (2011) view " the studyof fractions as foundational to the study of algebra in particular because itoffers students the opportunity to grapple with the fundamental mathematicalrelationships that constitute the core of algebra that govern addition, subtraction, multiplication and division work in algebra as well asarithmetic". In addition, limited understanding of particular aspects of thedifferent meanings of fractions, affects the ability of students to generalizeand to work with unknowns, both of which are fundamental to algebra (Hackenberg& Lee, 2012). It is clear that a weak foundation infractions can eventually cut the students off from higher mathematics and wemust strides through mathematics educational research and classroom practice toameliorate this situation. However, the problem is complex and requires along-term commitment to gaining a greater understanding of how to supportstudents in building that solid foundation.