

## FOR ALL STUDENTS, OCCASIONALLY

There are 2 doubts that educators express about deeper mathematics:

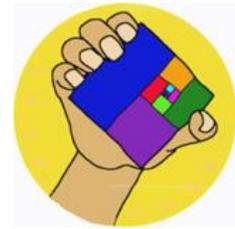
1. Can students handle it?
2. Do I have the time?

### 1. For all students

Our schools are democratic institutions.

They provide access to mathematics education for all students.

Students thirst for making connections, seeing relationships, getting a bird's-eye-view of mathematics, and experiencing the pleasure of mathematical surprise and insight. Such as, learning to hold infinity in the palm of their hand!



Quenching this thirst becomes possible when we bring deeper mathematics to the classroom.

However, as educators, we sometimes worry that deeper mathematics may confuse students. We also worry that students who typically struggle mathematically may not be ready.



Such low expectations are perpetuated in education by some popular but incorrect views of children's abilities.

Jean Piaget, for example, proposed stages for children's cognitive development, suggesting that they are concrete thinkers who develop their capacity to abstract later, maybe around age 12.

Kieran Egan (2002) noted that young children naturally abstract to develop language and to understand words, such as "dog". Although dogs have different characteristics and dispositions, young children abstract the essential characteristics of "dog" and distinguish dogs from other animals that may look like them.

Seymour Papert (1980) said the stages Piaget identified are symptoms of our education system and not in children's minds.

Fernandez-Armesto (1997) added that "Generations of school children, deprived of challenging tasks because Piaget said they were incapable of them, bear the evidence of his impact" (p. 18).

Children naturally are much more capable and more attracted to deep ideas of mathematics than we sometimes assume.

One teacher noted (Gadanidis, Clements, & Yiu, 2018, p.47): *I found that sometimes the tasks we might feel initially [to be] difficult, the kids got just like that. It has made me less fearful to go beyond the curriculum.*



Another teacher said: *I wish you were here to see the kids that never do well on assessments.*