

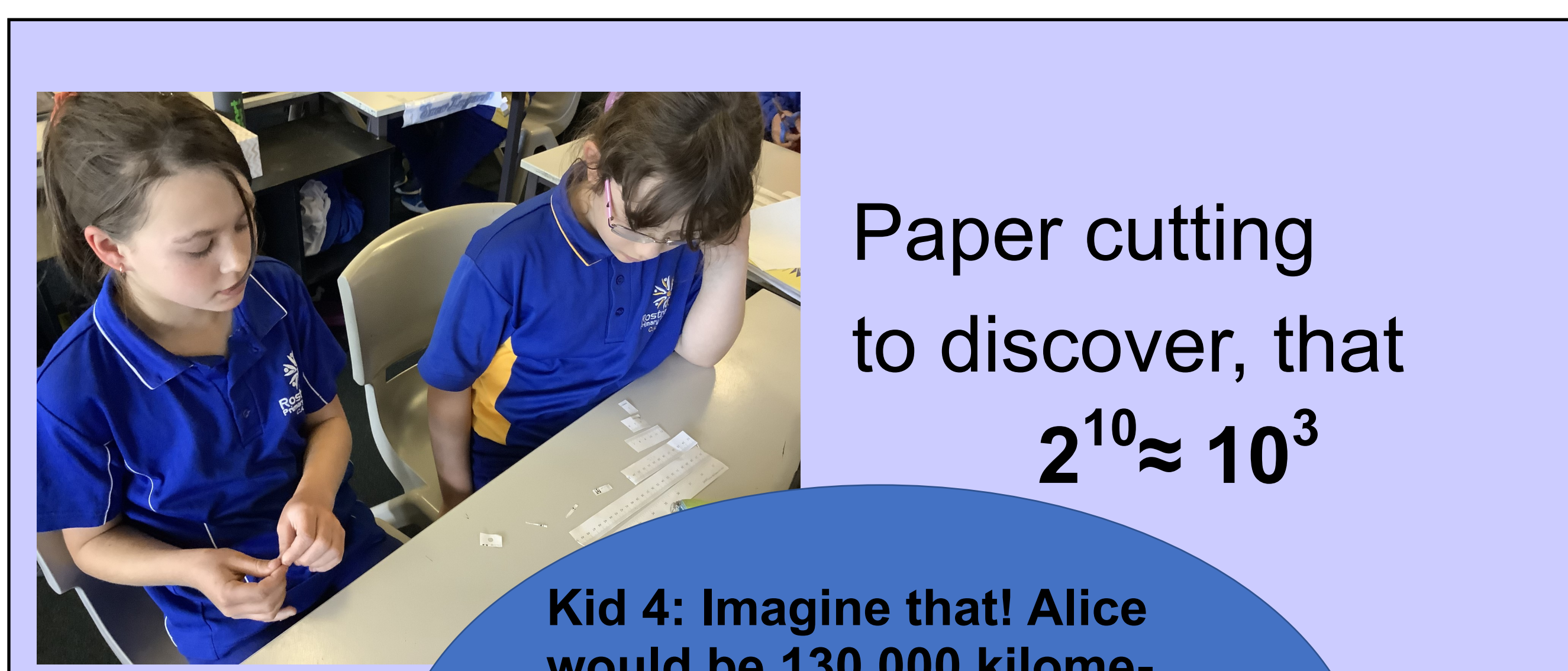
Maths for Einstein's Universe

How big is an atom? How small is a light year?
 (A program for primary school)
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Introduction

- both very large and very small things are crucially important for understanding the modern world and physics
- hand-on mathematics learning reduces maths anxiety
- simple arithmetic using powers of ten notation helps to understand advanced science problems, which are relevant to modern life
- results demonstrate strong student enthusiasm and positive learning outcomes in areas normally considered beyond the ability of students in this age group**

70 children from years 3 to 5 took part in the 4-lesson program, totalling 8 hours

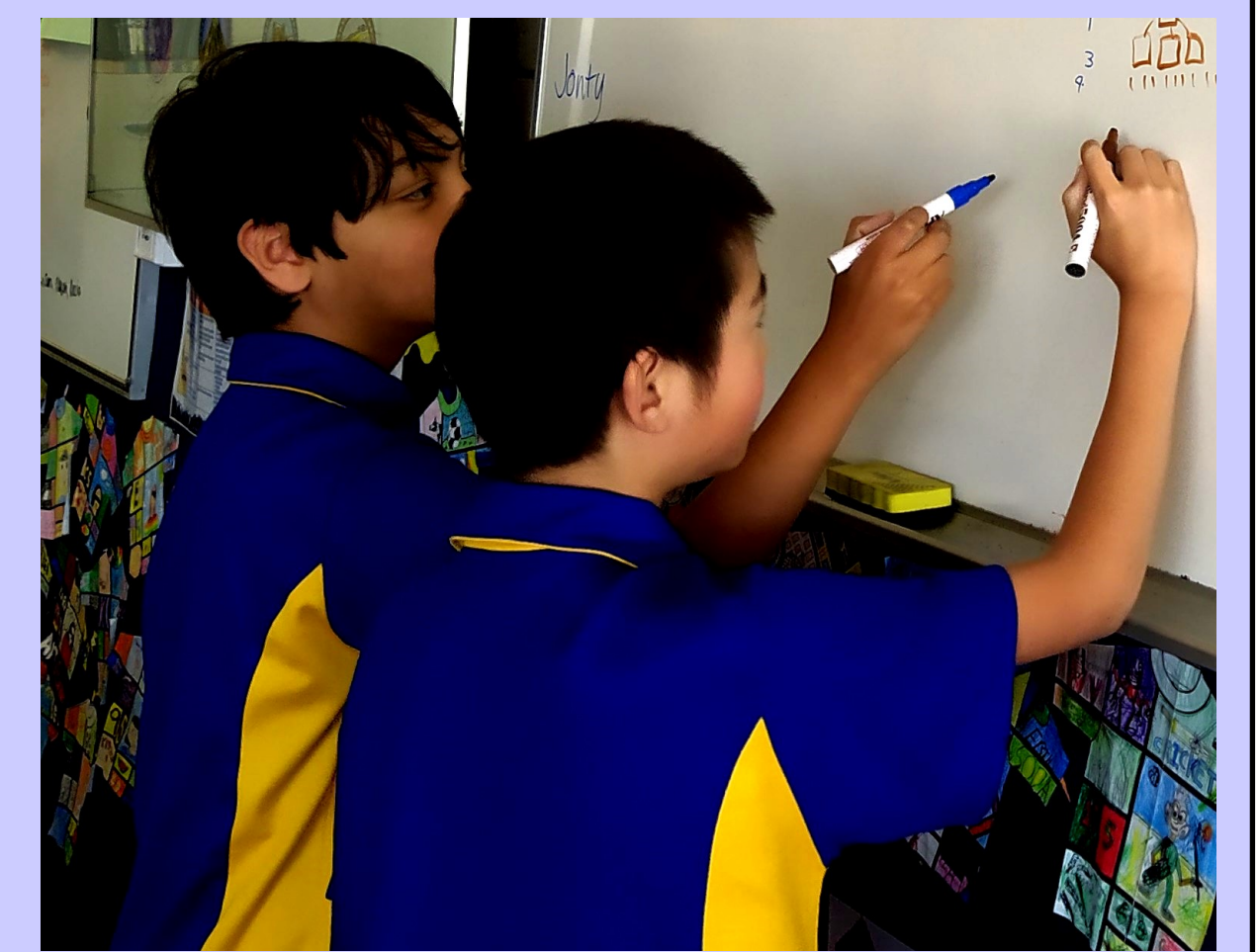


Paper cutting to discover, that $2^{10} \approx 10^3$

Kid 4: Imagine that! Alice would be 130,000 kilometres high, her head would be close to the moon. These tim tams are better than Elon Musk's rocket ships.

Key activities

Lazy numbering for using power of ten notation

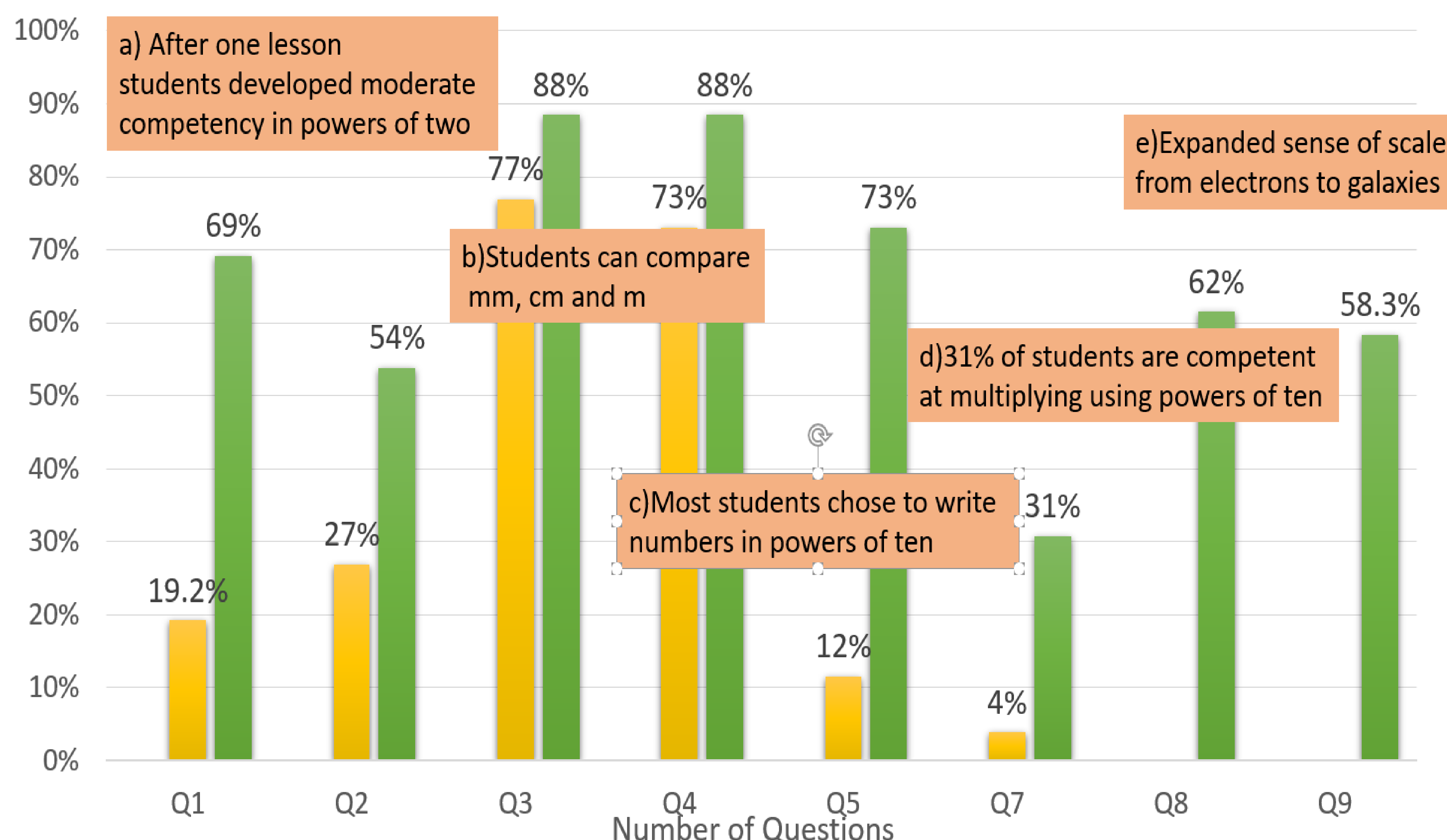


Drama play "Ten Times Alice" to learn multiplication and division by ten and to create a logarithmic thinking

Powers of the Universe book; scale of the Universe from neutrino to the observable Universe itself on 130 pages



■ Pre-test ■ Post-test



Conclusion

We introduce the concept of powers of ten for understanding big and small numbers and the way to make maths more intuitive, more relevant, and less dependent on rote learning. The outcomes of the program show the ability of children to learn how to use the tool of powers of ten for understanding modern physics and the world around them.

Post-test and Pre-test scores for a) understanding powers of two b) comparison units of measurement c) and d) writing and multiplication numbers in powers of ten e) expanding the sense of scale with Powers of the Universe book

Teacher's feedback:

"I like being able to offer a genuine extension to students who need to be challenged and stimulated. I like the variety of activities which used cutting, physically moving around the room, creating a booklet, participating in a play and explicit teaching. I look forward to teaching it again." Maths teacher (Year 5-6)

"Excellent; exposed the students to new concepts in an active, hands-on way. The physically active, experiential approach was especially valuable for learning."
 Science coordinator