Using technology to promote formative assessment in secondary mathematics: Advantages for teachers and learners

EPPC 2015

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Session 3: 1.30-3.00pm
Friday 22nd May 2015

Background

- **1975-2007**
  - Secondary mathematics teacher - VIC, SA, MN(USA)
- **2008-present**:
  - University of Melbourne (MGSE)
  - Research (Technology in Maths Education; Teachers' Statistical Literacy), tutoring in TFA, SEB, M.Ed, Clinical Specialist in MTeach
  - Texas Instruments – Nspire CAS PD
  - ACER – Mathematics PD (primary/secondary)

Problems encountered in the technology-enabled mathematics classroom…

- Tracking student progress:

    "I don't want to look stupid"

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- Tracking student progress:

    "I don't want to look stupid"

- Small-scale technology:

    "I don't know what I did"

- Pace of lesson exceeds capabilities:

    "I can't keep up"

Formative assessment

How can technology assist teachers to collect formative data to allow modifications to their content delivery?

Research

One of the many researchers who is looking at this is Amanda Roble from Ohio State University, USA:

Summative assessment is akin to an autopsy – the body is already dead

Formative assessment, by contrast, is like a checkup – assists diagnosis

Research

Her research involves the use of Texas Instruments' Navigator™ technology – linking the teacher's computer to the students' handheld calculators.

Roble, A. (2014). Formative assessments in connected classrooms. In Oesterle, S., Nicol, C., Liljedahl, P., & Allan, D. (Eds.) *Proceedings of the Joint Meeting 6 - 207 of PME 38 and PME-NA 36*,Vol. 6, p. 207. Vancouver, Canada: PME.

Features of Navigator ™

- Class capture
- Presenter
- QuickPoll

Today we'll look at some junior secondary maths content and see how Navigator™ technology can assist teachers to collect formative data.

Mathematical Significance (standard)

A date is considered to be mathematically significant if a TRUE statement can be formed by…

Arranging its eight digits in order left to right, with some or all of them interspersed with or enclosed by mathematical symbols, one and only one of which must be an equals sign (=)

[*Note: I made up this definition…*]

Is today mathematically significant?

Mathematical Significance

Today is 22nd May 2015

So can we write a <u>true</u> mathematical statement using 2,2,0,5,2,0,1,5 in order, placing one equals sign and some other mathematical symbols in some or all of the spaces?

Mathematical Significance

Here's one idea:

$$2 \times 2 \times 0 = 5 \times 2 \times 0 \times 1 \times 5$$

Some might say that's cheating, using the zeros like this…
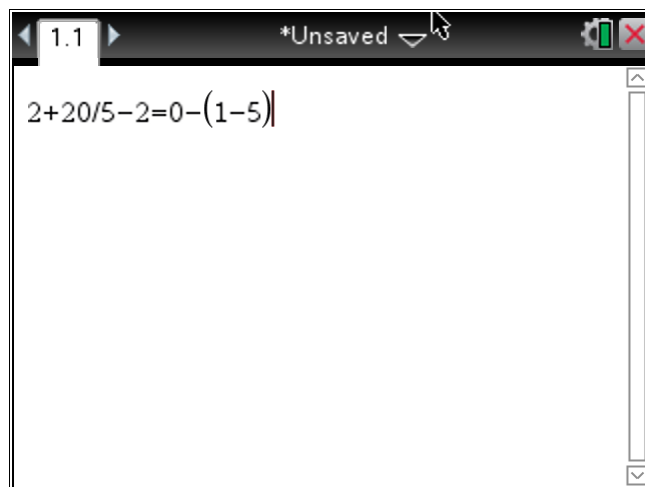
6

Mathematical Significance

Here's another idea:

$$2 + 20 \div 5 - 2 = 0 - (1 - 5)$$

Now more symbols are being used, and the *order of operations* is being followed…

Mathematical Significance

Now try this last one on Nspire:

```
1.1   *Unsaved

2+20/5−2=0−(1−5)
```

Another look at Mathematical Significance – changing the definition

- Isaac turned 17 on Christmas Eve last year. Could his date of birth form an expression which was equal to his age on that warm December day a few months ago?

- Isaac's d.o.b. is 24th December 1997. So how can we express 2,4,1,2,1,9,9,7 to be equal to 17?

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$$24 - 12 + 1^9 + \sqrt{9} + 7$$

So under this new definition…

- Is your birthday this year mathematically significant?

Imagine an entire wall of calculations showing how everyone in the your school (parents, students, staff) has a mathematically significant birthday this year … just for geeks? Or are we giving families an opportunity for participation in the growth of numeracy in the school?
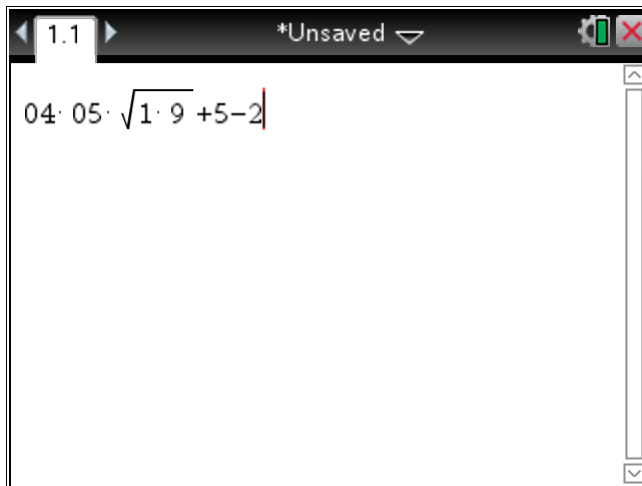
Mathematical Significance

Is your birthday this year mathematically significant?

Mathematical Significance

Here's mine on Nspire:

$$04 \cdot 05 \cdot \sqrt{1 \cdot 9} + 5 - 2$$

Try yours…

Substitution

Tom and Jesse play a game. Tom tells Jesse a number; Jesse, in his head, performs a simple 2-step calculation (*ie*, add 3 then divide the result by 2) and tells Tom the result.

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What calculations did Jesse do?

Statistics

Khalid and Margaret conducted a survey of nine homeowners in their neighbourhood, asking "How many fruit trees do you have?" for the purpose of finding the mean, median and mode number of fruit trees.

They collected the following data, and performed the required calculations:

9, 2, 5, 6, 4, 9, 9, 2, 8

However, they ignored the rental property at the end of the street, and their teacher Ms Precision asked them to return to that property; they did so, and found there were x fruit trees there. They then recalculated the 3 required values.

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Find the value of x if the mean and median have increased by 0.5 and 1, respectively, over the old values, but the mode has remained the same.

Statistics

What QuickPoll questions could you ask students to gain some formative assessment data concerning this problem – not just in terms of the solution, but related to the methodology embedded in this problem?

Conclusion

- Modify today's materials to suit your students
- Look for PLP/PD opportunities through TI, local Maths Associations
- Read and contribute to the research

Thanks for your participation…
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