Pedagogical Content Knowledge (PCK)

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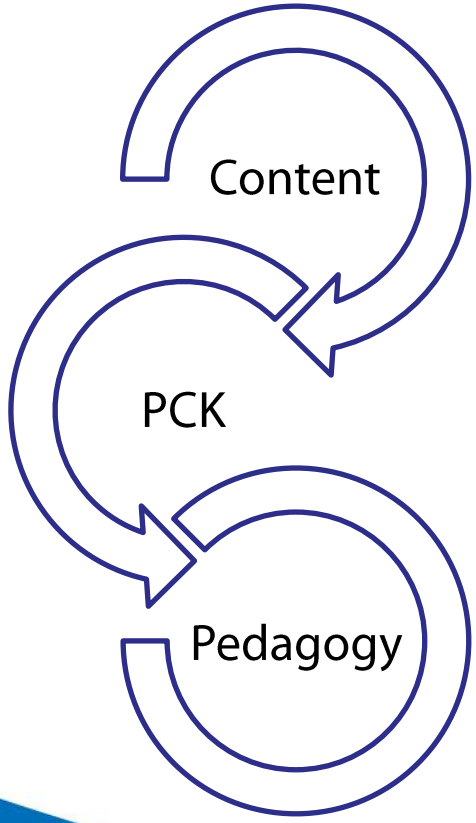
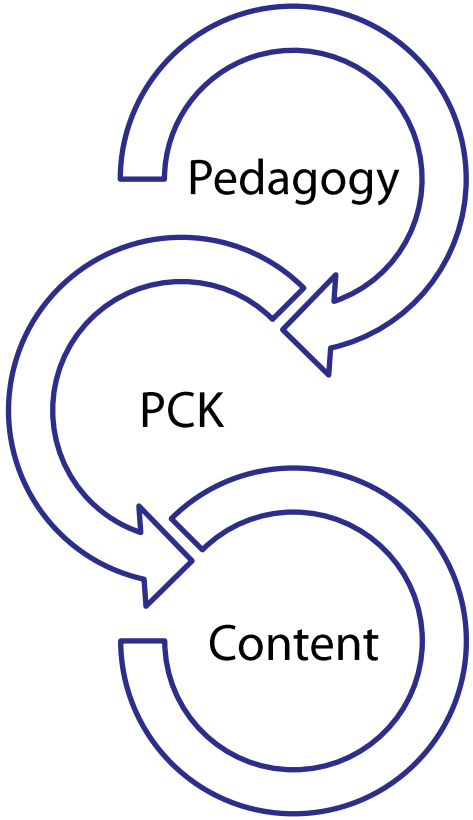
What is PCK?

- PCK is the intersection between knowledge about teaching and knowledge about content
- PCK seeks to understand what pedagogical strategies are appropriate for learning of specific content (Schulman, 1986)

What is PCK? What comes first?





What is PCK?

- PCK is in the mind (and actions) of the teacher
- PCK has been investigated at primary/secondary mathematics level (Ball, 2000;Goos, 2013) and has shown that higher PCK in teachers leads to better student outcomes

- Where does this leave us at tertiary?

Content vs pedagogy

- At tertiary, no training is required to teach
- Professional development has been shown to improve outcomes – at least improve student and staff experience (Uni Auckland group)
- Aust MS has a PD subject but it is general and does not have much specific PCK as we have not done enough in-depth investigation of the area

Tertiary mathematics PCK

- Different domains of mathematical knowledge: Pure, applied, statistics, computational?
- Is there a tie in with threshold concepts? ie can we use TC to tease out the key areas where PCK is critical? To get across the main ideas in the curriculum?
- Is there a different PCK for each of these mathematical domains? There are definitely different TCs

Students and PCK

- PCK is theorised as being in the mind of the teacher. At tertiary, where the syllabus is more fluid, and where we are preparing students to become learners in their own right, is there a call for developing PCK in students ie making explicit what is in the minds of the lecturers? ie teaching PCK?
- This requires an extension of PCK to students and could suggest incorporation of other factors (such as employability)

Conclusion

- PCK at tertiary needs to explicitly include students
- There are different types of mathematical knowledge which require different PCK
- TCs are a good way to investigate the different mathematical domains
- Empirical ways to test all this is to take a few TC and investigate ways of learning them with groups of students and lecturers

Eigenvalues and eigenvectors

- Find the eigenvalues and eigenvectors of the matrix

$$\begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix}$$

- If **A** is an *n* X *n* matrix, explain what it means for a scalar λ to be an *eigenvalue* of **A**.

Eigenvalues and eigenvectors

- A 3 X 3 symmetric matrix has 3 positive eigenvalues. Give a geometrical interpretation of this result and describe a geometrical application
- Give an example of a set of 3 simultaneous equations that has no solution