Characterizations and issues of teaching which support the professional development of higher education instruction

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A spectrum of pedagogical development

• The following series of slides covers some basic characterizations of teaching discovered by the University Mathematics Teaching Project conducted by myself, and colleagues, Barabra Jaworski and Elena Nardi at Oxford University, 1998-2000.

• We discuss a 4-stage spectrum of pedagogical development that we have found germane to a wider variety of teaching settings (see paper)
4 Stage Spectrum

- Naive and Dismissive
- Intuitive and Questioning
- Reflective and Analytic
- Confident and Articulate
Naive and Dismissive

- Acknowledging ignorance of pedagogy; recognition of student difficulties with little reasoned attention to their origin or to teaching approaches that might enable students to overcome difficulty.
Intuitive and Questioning

• Implicit and hard to articulate but identifiable pedagogic thinking; recognition of student's difficulties with intuition into their resolution, and questioning of what approaches might help students.
Reflective and Analytic

• Evidence of awareness; starting to articulate pedagogic approaches; reflection enables making strategies explicit; clearer recognition of teaching issues related to students' difficulties and analysis of possibilities in addressing them.
Confident and Articulate

- Considered and developed pedagogic approaches designed to address recognised issues; recognition and articulation of students' difficulties with certain well-worked-out teaching strategies for addressing them; recognition of issues and critiquing of practice.
Stage 1: Naïve and Dismissive

“I still just don't know how to teach it because a lot of this Group Theory course is going to be manipulation of symbols and silly little tricks. And I know I understand this. I mean the fact that you can conjugate things and stick a sigma on one side and a sigma inverse on the other makes a lot of sense to me but they still haven't even changed bases on a matrix in, you know, in any course and, and that's so absolutely fundamental and it's going to underlie so much of what they do.”
Stage 2: Intuitive and Questioning

“Um, what I think I wanted to do there, was actually to, to interpret what, for example, the first part was, \( n^2a^n \) tends to zero. So I wanted them to have the idea that what this is telling us is that \( a^n \) tends to zero is faster than whatever \( n^2 \) does. Which is a sort of, you grow a sort of feel to what, there's some sort of feel to it and then actually prove it using the \( \varepsilon-\delta \) so that I wasn't just jumping straight in with what I know I wanted to but actually, there's a reason for it.”
Stage 3: Reflective and Analytic

“...as a tutor you're in a position where [pause] you know what the relevant examples are which spell out every pitfall and [...] you want to present them with an example which contains all the [pause] relevant, um, features and, and phenomena. So you don't want to give an example and say this is your typical open set or something, 'cause it might give them loads of prep- misconceptions about things and so, but [in this case] it was a good opportunity to do that. The fact they asked me about metric spaces gave, gave me a chance to explain, you know, the difference between an open and not, um, sorry, not-open and closed and, and er [pause] to see why it's not a crazy thing to think of, you know, the closed interval zero one as being open in itself [...] And, but it's actually very important [...] to show that the zero, one closed is open [pause].”
“I think that's the standard problem that all undergraduates have is, they always, they always have, they carry this baggage with them like in every other subject, you're trying to remove the baggage and make them [pause] think in the way you want them to think. And the baggage they carry into metric spaces, the intuition, the trick's there, it's the ambient space, they all work in the bloody ambient space!”
Stage 4: Confident and Articulate

“... the analogy of integration is interesting because I always try to convince them that summation and integration are really the same thing. Because they are, it's just Measure Theory. Um, but it makes life much easier if they can think of sums as integrals and so I do tend to try to do the two together. [explains the details of doing so in the particular Probability question] And we'll come back to it when they have to do it again. And they will see this again. This is something that comes up all the time but they've now got the idea and they can worry about it a bit. [...] I am constantly trying to do these links.”
Group Work

• Discuss in groups the Spectrum
• Highlight an area of the spectrum that you situate yourself on
• Discuss how there might be overlaps of stages in your teaching approach
• Discuss the merits and pitfalls of progressing in your teaching practice from one stage to the next
• How does it relate to the nature of your particular subject?
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