

Video Talk 4: The Irish Experience of Assessing Mathematics Using a Competence-Based Approach

Welcome to this session. In module 1 I introduced you to the Irish initiative Project Maths, which aimed at developing students' problem-solving and higher order reasoning skills. In Module 2, you heard from one of our pilot school teachers, Sandra, who shared the challenges she faced in teaching maths in this new way in the classroom. In this video, I'm going to conclude this course's Irish case study, by sharing with you how we approached assessing mathematics within Project Maths. I'll give you an outline of the changes we made to the assessment so that it would support the development of key competences in the classroom. Then we'll look at some of the challenges and successes which arose along the way.

Changes to assessment

We had two major aims in mind when it came to assessment:

1. That formative assessment would be more of a feature of the day to day practice in the classroom and it would support the development of mathematical proficiencies.
2. That the final examinations would be less predictable than they were in the past and they would include a section on problem-solving and applying knowledge to unfamiliar situations.

We used the model developed by Kilpatrick to define what we meant by mathematical proficiencies. You can see here how proficiency or competence in maths is seen as a blend of different skills.

To give you a feel for the changes we made in the final assessments let's look at an example of a typical question. Previously students may have encountered a question like this: Where they simply insert figures to a formula. Now they are more likely to be asked something like this which tests their mathematical understanding: Can you see the change in the emphasis? What kind of impact do you think the new style of question has on the development of skills in the classroom?

To improve the use of formative assessment in the classroom, much of the teacher Continuous Professional Development (or CPD), focused on analysing student's responses and written work. The emphasis was on looking for evidence of what the student understood, rather than focusing on right answers, judging what students misunderstood and providing supportive feedback to help them develop mathematical proficiency.

The CPD encouraged teachers to use open rich tasks, and to modify tasks so that they would increase the cognitive demand in the classroom.

So a regular textbook question on area and perimeter might look like this

But could be modified to a rich tasks which requires a problem-solving approach like this.

Can you identify the key competences students would use to solve this problem? What impact on teaching and learning would each of the tasks have?

You may find Deborah Ball's features of skilful teaching useful, when thinking about formative assessment and developing key skills in the classroom. She has identified practices in the maths classroom that have a strong positive impact on learning and the classroom environment. You can see here that they incorporate classroom management practices as well as effective teaching strategies. A skilful teacher becomes proficient in

- Explaining representing and modelling core content
- Setting up and managing small group work
- Recognizing common patterns of thinking in a content domain
- Posing questions
- Eliciting and interpreting student thinking
- Establishing norms and routines for a respectful learning environment
- Selecting and using methods to assess students learning on an ongoing basis
- Conducting meetings with parents

Employing some of these strategies posed a challenge for our maths teachers as they moved away from a teacher-centred model to one that was student-centred.

As I mentioned in module 1, currently assessment for certification at lower and upper secondary which includes students aged between 12 and 18, is by way of an externally administered, set and marked written examination by The State Examinations Commission. Assessment arrangements for maths at lower secondary (or what we call in Ireland, Junior cycle) will be revised in 2018 and from then on there will be a second school-based component. We are hopeful that these changes will be extended to senior cycle in the future.

To improve the external assessment we aligned the examinations with the learning outcomes. We removed the choice on the exam papers, to ensure that students were exposed to all learning outcomes and could therefore make important connections across areas of mathematics. The examination paper now also includes a section on context and applications. You can see the style and structure of the exam papers at the link available under Module 3 in the course library.

Challenges

Adopting the changed approach to teaching maths brought with it a number of challenges. These can be summarised as:

- Teaching to develop skills as well as procedural fluency
- A change in the role of the teacher and the student
- Continued impact of the exam
- Heavy reliance on tests in the classroom.

Teaching to develop mathematical competencies as well as procedural fluency and computational accuracy was perceived as a huge challenge. In essence a reconceptualization of what maths teaching and learning involved was needed on a system level and this was not without its challenges. The initiative highlighted the fact that often **teachers viewed their role** as helping students to get through the exam and maximise their grades.

The closer alignment of the assessment with learning outcomes were often viewed negatively by teachers. Many teachers reported a lack of confidence, as they felt exams were no longer predictable for the teacher or the student. Teachers recognised that students needed to become more active learners, getting involved in group-work, discovery learning and questioning and discussing. However they told us that they struggled with the new role which they felt required a new skill set and a new set of classroom practices. As Sandra pointed out in Module 2, finding time for developing skills in the classroom was a huge challenge for all teachers.

Another challenge to assessing key competences was overcoming the heavy reliance on class tests, and exam questions as the main way of assessing learning. Although there is evidence that teachers are making use of other assessment practices such as project work, assignments and open discussion, further support is needed to help teachers develop new and trusted ways of assessing focused on improving learning.

So how did we address these challenges? We prioritised listening to feedback from the pilot schools, conducted research on the teacher experience of the initiative and shared it with all other schools. Summer schools were organised over a three year period, where teachers improved their content knowledge and were given support in the new methodologies. Online forums were set up for teachers to share their practice. The huge investment in CPD is seen as one of the key enablers to the reform. The schools who adopted the syllabuses ahead of the rest of the country in the pilot were given intensive school-based support.

We've discussed the challenges, let's now focus in on four successes of the initiative around assessing key competences.

The first is the **alignment of the syllabus with the assessment**, which was viewed by stakeholders as a huge success and one of the key levers for change. It was seen as essential that the final assessment examined key competencies in maths, that students would be required to problem-solve, to deal with real world applications and to show conceptual understanding in mathematics. This was achieved by all parts of the system working very closely together.

The second success factor was the **investment in CPD**. The supports which were made available for teachers are viewed by all stakeholders as central to the change in methodologies and the development of key skills in the classroom. This support took the form of intensive school support for the initial schools, and 10 days of in-service training for all teachers at post-primary level. Evening courses were available in Education centres around the country. In some ways the initiative exposed weaknesses in maths content knowledge and mathematical knowledge for teaching. Requests for additional support were responded to and a two-year Post-Graduate Diploma in Maths Education was made available free of charge.

Improved teacher competence was another big lever. The most recent research indicates that students are frequently undertaking activities which will help them develop key competencies in maths (for example, making connections between mathematics topics, and applying mathematics to real-life situations). However, more traditional approaches such as using textbooks and copying from the board, also continue to be used. In the initial schools, the indicators are that students are more likely to be engaged in methodologies associated with the revised syllabuses. A link to the evaluation report is available in the course library, under module 3.

In post-evaluation research of the initiative, it was identified that the **change to assessment** was one of the main levers for bringing about the kind of change that the initiative set out to do. Previous reform in mathematics had focused on changing the syllabus for lower secondary without a simultaneous change of the assessment and the aims of the syllabus hadn't played out in the classroom.

Interestingly, while the change in assessment was seen by teachers as an obstacle, the high stakes nature of the assessment at upper secondary meant that altering the style and structure of the final exam had a huge positive impact on changing classroom practices.

*So you are probably wondering what the **next steps** for assessing key competences in Ireland are? Teachers now tell us that they feel the exam doesn't reward the teacher and student for adopting a changed approach and that other forms of assessment would be more closely aligned to the syllabus and ensure that developing key skills is valued in the classroom. Under the new developments at lower secondary, a new assessment model will be designed that will better align the syllabus to the assessment for certification and properly support the development of key skills in the maths classroom. It is our hope that we can build on this in the future and in time introduce a second school based assessment component for mathematics at upper-secondary level.*

Remember that you can access further reading and related resources to this session from our course library, including the report on teachers' experiences of the initiative. We also encourage you to visit the course forum where you can take part in an ongoing discussion linked to this topic with fellow participants and instructors.