

## Balancing Classroom Management with Mathematical Learning: Using Practice-Based Task Design in Mathematics Teacher Education

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### What is it about?

Are you able to undertake any form of mathematical learning activity in your class without concern? Can a misbehaved student affect the mathematical activities in your classroom? Have you ever thought whether the management of your students' behaviour may interfere with the quality of your mathematics teaching? In our study we put forward the argument that the learning atmosphere in the mathematics classroom can interfere with the quality of mathematics teaching and we propose “an innovative direction that combines, and concurrently considers, classroom management and mathematical learning issues in teacher education and research” (p.196). To this aim, we designed two situations-specific tasks in which the teachers are invited to reflect on and address issues related to behaviour management in the mathematics classroom:

- The *Polygon* task takes place in a Year 10 high-attaining class, with students used to “instrumental and competitive working style” (p.187). The teacher challenges this style by suggesting an investigative task, using Dynamic Geometry Software. To this aim, the teacher asks the students to sketch polygons with 3, 4, and 5... sides, work out the formula for the sum of angles and justify why it works for all polygons. However, the teacher is faced with the established culture of drill and practice: the students voice the claim that it would have been better if they were simply given the formula and then practised with problems using this formula.
- The *Simplification* task takes place in a Year 10 middle-attaining class, where students are asked to answer the question: When  $p = 2.8$  and  $c = 1.2$ , calculate the expression:  $3c^2 + 5p - 3c(c-2) - 4p$ . One student (Student A) substitutes all the values of  $p$  and  $c$  in the given expression and finds the answer (10). Another student (Student B) simplifies the expression first, does the substitution and finds the same answer (10). Student B's work requires skills in algebraic simplification and is a quicker way to solve the problem. When sharing their answers with the class, there is a confrontation between students A and B, during which Student B accuses Student A with “You cannot work with letters because you are thick...” (p.188) and ends with some students giggling and the class possibly off-task.

Both tasks were given to 21 pre-service teachers attending an Initial Teacher Education programme in the UK. Those teachers were asked to: identify key issues in these two incidents; outline how they are going to respond in class; and, what they may change in their practice in order to deal with similar incidents in the future.

We analysed teachers' responses in terms of the social and socio-mathematical norms (Cobb & Yackel, 1996<sup>1</sup>) they would like to establish in their class. Social norms identify the rules of classroom interaction including those about students' participation, group work, and criticism of other class members. Socio-mathematical norms are the rules of classroom interaction that are specific to mathematics, e.g., which mathematical solution is adequate or efficient. Also, we examined the balance that the teachers aspire to establish in their classroom according to the three elements of the Teaching Triad (Jaworski, 1994<sup>2</sup>): *Management of Learning* (ML), *Sensitivity to Students* (SS), and *Mathematical Challenge* (MC).

### Key Results:

- Most participants referred to social norms they aim to establish in their classrooms including promoting respect, dialogue and investigative learning.
- Most participants stated their intention to establish socio-mathematical norms in their classroom including acceptance of different solutions (Simplification task) and investigative learning style (Polygon task).
- “[I]t was not always possible to distinguish social from socio-mathematical norms” (p.189) in teachers' responses. For example, in their responses to the Polygon task, teachers think that students' reluctance to do investigative tasks is due to “their perception of mathematics as a repetitive use of ready-made rules” (p.190), and their desire to get answers quickly rather than investigate why. Some teachers suggest a “gradual transition” (p.191) from instrumental to relational approach, but there is some uncertainty about the value of the transition, as the instrumental approach seems effective for achieving good exam results. The socio-mathematical norm in this case is influenced by a social norm related to exam requirements. This result indicates to us how hard it is to disentangle classroom management from learning issues in the classroom.
- Only two teachers commented on the disrespectful students' reaction in the Polygon task. While, all teachers identify the issue with Student B's reaction, and suggest a disciplinary measure (e.g.: send out) in the Simplification task.
- Looking at the teacher responses through the lenses of the Teaching Triad, we notice that the tendency to prioritize classroom management (management of learning, ML) over mathematical learning issues (mathematical challenge, MC) varies according to task context.
- “We envisage that this strand of our research program will give further insight into the complexity of balancing effective classroom management with high

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<sup>1</sup> Cobb, P., & Yackel, E. (1996). Constructivist, emergent, and sociocultural perspectives in the context of developmental research. *Educational Psychologist*, 31(3/4), 175-190.

<sup>2</sup> Jaworski, B. (1994). *Investigating Mathematics Teaching: A Constructivist Enquiry*. London: Routledge.

quality mathematical learning, and into how this balance can be achieved in the preparation of new mathematics teachers” (p.196).

#### How to put these ideas into practice?

- Why not share the task in this paper with your colleagues and discuss it with them? What different responses did you and your colleagues come up with?
- Can you or your colleagues think of examples in which you have chosen to change your plan in order to address students' behaviour? What choices have you made? What are your warrants for these choices?
- Can you think of similar examples?
- Tell us your thoughts at @mathtask, <https://www.uea.ac.uk/groups-and-centres/a-z/mathtask>.