DRAFT

The Pedagogical System for Teaching – Leadership Tool

Worthwhile Tasks

- Students experience a variety of task types which in their sum help them to develop their ideas about the nature of a topic/idea and to discover that they have the capacity to make sense of the topic
- Tasks are selected based upon knowledge of students' prior learning and their interests
- Task types should include tasks that build conceptual understanding and fluency
- Open-ended and modelling tasks, in particular, should be included as they often require students to interpret a context and then make sense of the embedded mathematics
- Learning experiences and tasks are selected that assist students' understanding of the current mathematical focus
- Tasks are posed that are at an appropriate level of mathematical challenge providing "academic press"
- There are often tasks which allow for multiple points of entry as well as opportunity to extend (low-floor, high-ceiling)
- Students experience tasks that allow them to demonstrate original thinking about important concepts and relationships
- Tasks are selected so that students develop the ability to choose effective strategies and/or adapt or extend their reasoning in a variety of ways
- Students should not expect that tasks will always involve practicing algorithms they have just been taught; rather they should expect that tasks will frequently require them to think with and about important mathematical ideas
- Tasks provide students with experience making and testing conjectures, posing problems, looking for patterns, and exploring alternative solution paths

The way mathematical tasks are realized in the classroom and experienced by students depends on the classroom environment, the tools and representations available for them to use, and the nature and focus of classroom discourse.

Classroom Discourse

Building on students' thinking

- Learning experiences are planned to enable students to build on their existing proficiencies, interests and experiences
- There is a focus on the mathematical thinking that students are engaged in when doing a task, with teacher questions posed to challenge and extend thinking
- Students' misconceptions and errors are treated as a necessary part of learning and opportunities are provided for students to learn from these

Mathematical communication

- Classroom discussions are facilitated with a focus on mathematical argumentation which includes explicit instruction on how to defend their own arguments and how to critique alternative arguments
- Modelling of the process of explaining and justifying, encouraging the use of different forms of representation
- Use of the technique of "revoicing" (repeating, rephrasing or expanding on student talk), to highlight ideas that have come directly from students and to help in the development of their emerging mathematical understandings
- Allowing for different mathematical interpretations and providing within the classroom community ways to discuss them and resolve them by addressing misconceptions as necessary

Mathematical language

- Teachers foster the use, as well as the understanding, of appropriate mathematical terms, expressions and symbols
- Modelling takes into account students' informal understandings of the mathematical language in use
- Explicit teaching to address the fact that mathematical terminology is sometimes particular to the discipline and sometimes uses terms that are similar but not exactly the same in everyday usage

Assessment

- A range of assessment practices are used to make students' thinking visible and to support students' learning
- Assessment includes not only student work products but information gathered by observation of students' working and conversations with students
- Information is gathered about how students learn, what they seem to know and are able to do, and what they are interested in
- Questioning attends to students' mathematical thinking
- Tasks often have a variety of solutions or can be solved in more than one way to gain insight into students' mathematical thinking and reasoning
- Helpful feedback is provided to students often given through prompts, asking students to do further thinking, before returning to check on progress
- Students are given opportunities to evaluate and assess their own work

Tools and Representations

- A range of representations and tools are used to support students' mathematical development
- Tools and representations are used as thinking spaces enabling students to communicate ideas that otherwise would be difficult to do
- Students have access to multiple representations to develop conceptual and computational flexibility
- Care is taken to ensure that all students are able to make sense of the tools and representations (i.e. concrete materials) in the mathematically intended way
- Deliberate decisions are made about when and how to use technology; Technology tools are used to both enhance and reimagine what students are able to do and think about

Making Connections

- Students are assisted to make connections through carefully sequenced examples, including examples of students' own solution strategies, to illustrate key mathematical ideas
- Students develop fuller conceptual understanding by exploring differing representations of mathematical content/topics
- Students make connections within mathematics through cross-strand tasks and tasks that have multiple paths to solution
- Making connections to real experiences through contexts and application to students' everyday lives are used when they assist to students see mathematics as relevant and interesting

Non-Threatening Classroom Environment

An ethic of care

- There is a caring classroom community that is focused on mathematical goals that develop students' mathematical identities and proficiencies
- A high level of trust exists in which the mathematics and cultures students bring to the classroom are valued and nurtured
- Time is provided for students to think for themselves, to ask questions, and to take intellectual risks
- There are high yet realistic expectations
- Tasks may be modified without compromising the mathematical integrity of the task
- Classroom routines are established that provide for all students to have opportunities for productive struggle

Arranging for learning

- Opportunities exist for students to make sense of mathematical ideas through independent working/ thinking time as well as collaboratively (partner and small group)
- Clear expectations of participation norms and roles are set and these are understood and implemented
- In whole class discussions teachers listen to students' ideas, monitor how often students contribute and keep the discussion focused on mathematical learning
- Planning for learning experiences takes into account students' current knowledge, proficiencies, interests and experiences
- Discussions (whole and small group) are organized to address alternative interpretations or misconceptions of mathematics

Anthony, G. and Walshaw, M. (2009). *Characteristics of Effective Teaching of Mathematics: A View from the West.* http://www.educationforatoz.org/images/_9734_12_Glenda_Anthony.pdf

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Worthwhile Tasks

How do the selected tasks and examples support how students view, develop, use and make sense of _____?

Classroom Discourse

What opportunities are provided for students to justify and explain their thinking; examine conjectures, disagreements and counterarguments?

Building on Students Thinking

Subject based Communication

Assessment

How is a range of assessment practices used to make student thinking visible?

Subject-specific Language

Tools and Representations

Describe how students make their thinking visible. What representations and/or tools are used to do so and how do these help students clarify their understandings?

Making Connections

Non-Threatening Classroom Environment

How does the classroom community encourage students to think, reason, communicate, reflect upon and critique the material they experience?

An ethic of care

Arranging for Learning

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