It's Time to Stretch! The Use of Visible-Thinking Routines to Increase Cognitive Flexibility in Grade 12 Boys

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Further Information
This poster and further information is available at http://www.theibsc.org/

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Introduction

As the world is ever changing, it is important for my students to be able to adapt as active participants who become change agents. The reason I teach is two-fold: to prepare my students for the future and to give them the skills and understanding necessary to be positive contributing members of the global society. I believe that by helping my students develop their flexibility in thinking and metacognition, my students are better prepared for the future.

The Research Question

How might the use of visible-thinking routines in mathematics encourage flexible thinking in Grade 12 boys?

Research Context and Participants

St. Andrew's College is a Grades 5 through 12 day and boarding school located north of Toronto. The students come from mostly upper socio-economic families and represent approximately 30 nations. The school's mission is to develop "the complete man, the well-rounded citizen"; these qualities are fostered through our academic, athletic, and co-curricular programs where the heart, mind, body, and spirit are encouraged to grow and develop.

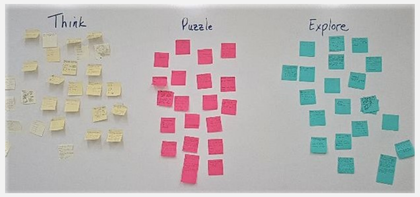
For my project, I chose to work with students enrolled in Grade 12 Calculus and Vectors. As this is their final year before moving on to post-secondary education, I felt it was important to work with these boys specifically during the year. They will particularly benefit from the development of flexible thinking, as this is a necessary skill required throughout university.

"I was able to communicate with my peers in an effective manner."

The Research Action

The change I introduced in my classroom was to use defined visible-thinking routines from *Making Thinking Visible* during two units of study at three different points in time. I used a routine at the beginning of each unit in order to introduce a topic, develop interest, and begin the process of inquiry. I employed a routine during the organizing and synthesizing stage of the units to help the students make sense of the new information and deepen their ability to think flexibly. Finally, I introduced a routine toward the end of the units with the goal of pushing students further in their understanding and to help them consider concepts that were more complex. The specific visible-thinking routines I employed were: Think/Puzzle/Explore, Explanation Game, Colour/Symbol/Image, Generate/Sort/Connect/Elaborate, Headlines, and What Makes You Say That?

"Zoom into the problem, plan out what to do, connect things together."



"I want to get a whiteboard to help plan out things when solving."

"Showing my thinking helps me organize my thoughts better."

Data Collection and Analysis

Data were collected from students using a variety of methods including:

- Concept maps;
- Student work samples of rich problem-solving sets;
- Journal entries;
- Recorded observations of students during visible-thinking routines; and
- Student surveys.

The qualitative data were analysed thematically to look for the main features and key experiences that emerged as a result of the intervention.

Key Findings and Discussion

Several improvements noted by my students due to the introduction of visible-thinking routines in my classes included expansion of their ability to:

- provide evidence with reasoning;
- be more metacognitive;
- effectively communicate with their teacher and peers; and
- think flexibly.

The boys also indicated an improvement in the learning environment.

"There is always a different way to look at a problem."

Conclusions

As a result of the use of visible-thinking routines in my classroom, I believe both my students' learning and my teaching practice improved. Student engagement became stronger, and their ability to think, reason, and justify their thoughts improved. I believe this has helped prepare my students for the future, as they now have more of the skills and understanding necessary for them to react to, handle, and effect change in a global society.

"In adulthood, communication is key."

Key Readings

Metz, S. (2011). 21st-Century skills. *The Science Teacher*, 78(7), 6.

Reitchert, M. & Hawley, R. (2009). *Reaching Boys: An International Study of Effective Teaching Practices: If There Is a Crisis in Boys' Education, Answers Are Not Hard to Find. Thousands of Teachers Around the World Have Found the Secret to Making Lessons Successful for Boys*. Phi Delta Kappan, 91(4), 35+.

Ritchart, R., Church, M., & Morrison, K. (2011). *Making thinking visible: How to promote engagement, understanding, and independence for all learners*. San Francisco, California/USA: Jossey-Bass.

"Routines are a good way to … get my brain working."

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