**Rich Learning Tasks: Changing the Culture of the Mathematics Classroom**

Gary Flewelling

## The Sense-Making Game

The sense-making game is about, using one's knowledge / experience in integrated, creative, and purposeful ways to conduct investigations, inquiries, and experiments and to solve problems and, in the process, coming to better understanding of things. An important role of schools is to graduate life-long sense-makers.

People who play the sense-making game well find themselves involved such things as:

| | | | |
|---|---|---|---|
| challenge | finding out | modeling | justifying |
| uncertainty | conjecturing | creating | proving |
| complexity | testing | connecting | disproving |
| ambiguity | revising | integrating | arguing |
| exploring | gathering evidence | monitoring | demonstrating |
| investigating | organizing | autonomy | generalizing |
| experimenting | applying | confirming | understanding |
| thinking | transforming | questioning | communicating |
| imagining | reflecting | making decisions | interacting |
| planning | patterns | clarifying | empowering |

## The Problem

Unfortunately, many students, teachers, parents, administrators, resource developers, curriculum and test developers, politicians, and business people see the sense making game and the math-classroom game as two different games. They have experienced both and they know that these two games are played according to different rules and that they are played for different purposes. There are a number of studies that support this assertion. In DeCorte, Verschaffel, and Greer (2000), for example, we read, *'studies suggest that it is not so much a cognitive deficit that causes pupil's abstention from sense-making when doing arithmetic word problems in a typical school setting. To the contrary they are acting in accordance with the "rules of the game" which they believe to regulate the interactive ritual in which they are involved.'*

## The Typical Math-Classroom Game

Unfortunately, people who play the math-classroom game frequently find themselves involved with such things as:

| | | | |
|---|---|---|---|
| memorization | simplicity | routine procedures | unconnected things |
| quick recall | knowing | other's questions | being correct |
| certainty | automatic response | listening | rote learning |

## The Challenge

The challenge here is to turn the typical math classroom culture into a sense-making culture, to make the game played in the math classroom a sense-making game. Until we can do this, the best ideas, texts, tasks, tests, software, resources, technology and curriculum will continue to be under-utilized or un-utilized, under-implemented or un-implemented, under-valued or un-valued. Until we can do this,

mathematics will not be learned with deep understanding or used appropriately, powerfully, or creatively.

**Comparison of a Sense-Making Culture with a Traditional Math-Classroom Culture**

| Sense-Making Culture | Traditional Classroom Culture |
|---|---|
| 1. convincing | 1. unconvincing |
| 2. the discipline as a way of thinking | 2. the discipline as a collection of procedures |
| 3. working with things that make sense | 3. working with the inexplicable |
| 4. master | 4. slave |
| 5. addresses student needs | 5. ignores needs of student |
| 6. significant to learner | 6. significance lost on learner |
| 7. known to be true | 7. accepted as true |
| 8. student active | 8. student passive |
| 9. validated by student | 9. validated by teacher |
| 10. truth as constructed | 10. truth as presented |
| 11. student-owned | 11. teacher-owned |
| 12. wielded powerfully | 12. wielded mechanically |
| 13. student as rule maker | 13. student as rule taker |
| 14. described / explained in student language | 14. described / explained in teacher language |
| 15. teacher as educator | 15. teacher as inculcator |
| 16. remembered / re-constructible | 16. often forgotten / not re-constructible |
| 17. grows into being | 17. pops into existence |
| 18. considers student readiness | 18. ignores student readiness |
| 19. experiential | 19. non-experiential |
| 20. independence / interdependence | 20. dependence |
| 21. developed by end of lesson | 21. presented at beginning of lesson |
| 22. minimal reliance on memory aids | 22. reliance on memory aids |
| 23. painting without numbers | 23. painting by numbers |
| 24. learning via a problem solving process | 24. impediment to problem solving |
| 25. connected | 25. isolated |
| 26. thorough | 26. superficial |
| 27. reading between the lines | 27. reading their lines |
| 28. develop procedures | 28. follow procedures |
| 29. a partnership | 29. master-slave relationship |
| 30. enlivens the mind | 30. deadens the mind |
| 31. enlivens the spirit | 31. deadens the spirit |
| 32. sense of personal efficacy / confidence | 32. subject anxious |
| 33. constructivist | 33. destructivist |
| 34. bringing forth a world of significance with others | 34. bringing forth a world of insignificance at the insistence of others |

**A Solution**

Changing the typical math-classroom culture to a sense-making culture can be achieved by having students and their teacher work together and focus on, engage in, and experience *rich learning tasks*. They need to see what learning looks and feels like when they are so engaged. They need to experience the kind of interaction that is involved when they are so engaged. They need to experience, identify, develop, refine, value, and exercise the actions, habits, and attitudes that are important in sense-making.

**What Makes a Learning Task Rich?**

I define a learning task as 'rich' if the task gives the learner the opportunity to:

- use (and learn to use) their knowledge in an integrated, creative and purposeful fashion to conduct investigations, inquiries, and experiments and to solve problems and in so doing,
- acquire knowledge with understanding, and in the process,
- develop the attitudes and the habits of a life-long sense-maker

**A Comparison of Rich Tasks with More Traditional Tasks**

| **Rich Tasks** | **More Traditional Tasks** |
|---|---|
| 1. prepare for success outside of school | 1. prepare for success in school |
| 2. address relatively many learning outcomes | 2. address relatively few learning outcomes |
| 3. address discipline and cross-curricular learning outcomes | 3. address primarily learning outcomes of the discipline |
| 4. provide an opportunity to use broad range of skills in an integrated, often creative fashion, to a purpose | 4. isolate on the use of relatively few skills |
| 5. are authentic | 5. are more artificial |
| 6. are in context | 6. are usually out of context |
| 7. encourage a balanced use of actions | 7. encourage an unbalanced use of actions |
| 8. are more like writing a story | 8. are more like writing a sentence |
| 9. emphasize problem solving | 9. emphasize procedures |
| 10. encourage more thinking, reflecting, and use of imagination | 10. encourage more recollection and practice |
| 11. allow for demonstration of a wide range of performance | 11. allow for demonstration of a narrow range of performance |
| 12. need performance assessment strategies | 12. need traditional assessment strategies |
| 13. provide enrichment within the task | 13. usually require enrichment to be added after the task |
| 14. encourage the use of wide variety of teaching and learning strategies | 14. permit the use of fewer teaching and learning strategies |
| 15. encourage greater engagement of students and teachers in task | 15. keep students and teachers distanced from the task |
| 16. not a new/untried idea | 16. a much-applied idea |

## Conclusion

A math classroom needs to be a centre for sense-making. This can be achieved through the use of rich learning tasks. Students raised on a diet of rich learning tasks are likely to become life-long sense-makers. We should have no lesser goal for our students.

As John Dewey said (in his 1938), *What avail is it to win prescribed amounts of information about geography and history, to win ability to read and write, if in the process the individual loses his (or her) own soul: loses his (or her) appreciation of things worthwhile, of values to which these things are relative; if he (or she) loses the desire to apply what he (or she) has learned and above all, loses the ability to extract meaning from his (or her) future experiences as they occur.*

## References

**De Corte, Eric, Lieven Verschaffel** and **Brian Greer** "Connecting Mathematics Problem Solving To The Real World" Mathematics For Living: Proceedings of the International Conference, Amman Jordan: The Mathematics Into The 21st Century Project, 2000, p 68

**Flewelling, Gary** and **William Higginson** A Handbook on Rich Learning Tasks Centre for Mathematics, Science, and Technology Education, Queen's University, Kingston, 2001.