ETHICAL CONCERNS: NEGOTIATING TRUTH AND TRUST

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Working in small groups, the students in this split-Grade 4/5 class (9- to 11-year-olds) are busily sharing their approaches to the magic square puzzle (see fig 1). They have approximately 10 minutes to talk in small groups before the problem is taken up as a whole class.

As part of the research project, this problem was posed by the researcher-teacher during the last 15 minutes of class the previous week, allowing some time for students to work together to get started. During spare time in the ensuing week, either in class or at home, they were expected to work together or independently to complete the problem. The magic square puzzle is the seventh of 23 problems presented over the school year.

As is common, some students have fully completed responses and are eagerly sharing strategies and solutions. Others students, however, left the puzzle tucked away in their math folders and haven't looked at it since last week. At one table an argument erupts:

Jordan: You're copying me!

Riley: No.

Jordan: Yeah, you said you were doing that and then that.

Riley: I almost ...

Jordan: [He calls to the teacher.] He's copying me! I put it [my magic square solution] right there and he's like, he's suddenly like ...

Riley: No I wasn't.

Teacher: Just because he looks at it. Last time I looked he had all the numbers in.

Jordan: No he didn't [the group unanimously agrees with him]. He only had, he only had, he looked at ... I was showing everybody my work and he looked at it and he put a five in there then [in the middle of the magic square].

Teacher: Well, if he knew the answer [the sum of all lines was 15], then all he had to do was figure out where the numbers went.

Ellen: Well, we said it was 15.

Jordan: Yeah, but you could put them in a different order. See, it's exactly the same order as mine!

Teacher: But I think right now that we're just sharing.

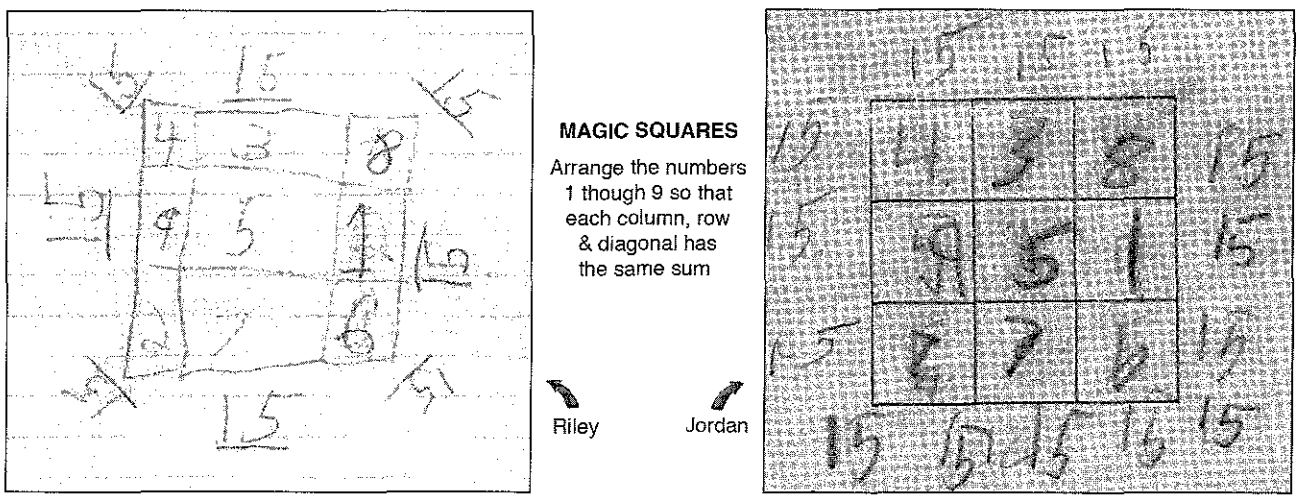

Figure 1. The magic square task

Ellen: You guys. It's okay.

Teacher: Yeah, we're sharing right now anyway. So . .

Riley: So it's kind of hard for me to look at it when I'm like this.

Teacher: [She notices that Riley is quite upset.] Okay. [She walks away from the group.]

In this mathematics classroom Jordan accuses Riley of copying his answer to the magic square. As teachers/researchers in this setting, we 'felt' the unease in the moment, but struggled with how to relieve the tension. In this paper we describe the tension as a moment of *ethical concern* and seek to understand the basis for the concern. Using 'copying' as a site for examining the ethical nature of mathematics teaching and learning we share our understanding of the basis for the concern as it relates to rational arguments in the name of truth, ownership of truth and the connection between truth and power. We offer trust as an alternative pedagogical stance to address moments of ethical concern in the classroom.

A conceptual framework for ethical concerns

We begin with the assumption that all interactions "ride on an underground river of ethics" (von Foerster, 2003, p. 291). The moments that we consider ethically relevant are those moments when we are concerned with the consequences of one person's actions on another (Maturana, 1988). Ethical concerns become apparent in moments of tension, unease, or anger with another – typically in arguments over who is right and who is wrong. These conflicts have implications for our understanding of truth and our relationships of trust. It is this tension between truth and trust that we explore. While research exists on ethical issues in mathematics education related to care (Falkenberg, 2005; Goldstein, 1998; Hackenberg, 2005; Lake, Jones, & Dagli, 2004), social justice (Skovsmose, 2000), and moral dimensions of practice (Ball & Wilson, 1996), few studies in mathematics education explicitly address ethical issues arising from student interactions (Gordon Calvert, 2001). Yet, we believe that such moments occur regularly in the classroom.

In a disagreement between two people holding opposing views, they may choose either to give priority to transcendental truth, in which only one person can be right, or to the relationship of trust in which many truths are acceptable. Choosing truth or trust depends on the issue at hand. The choice a person makes is typically based on the person's emotional response to the concern in the moment, rather than the rational arguments that might exist for or against the action. If we believe in a singular truth in a particular situation, we often insist that our perspective is right and attempt to convince the other through a series of reasoned arguments. Unfortunately, reasoned arguments usually do little to persuade others who hold a different truth. Underneath the rational sparring is an emotional undercurrent of anger or annoyance that the other doesn't share our truth. This emotional response is an indication of an ethical conflict or concern.

Ethical concerns are not only emotionally constituted, but are socially bounded and mediated through culture. That is, what appears ethical within one social domain that holds a particular set of cultural expectations may not appear ethical in another (Maturana, 1988). We can cite dramatic examples such as child labour or bigamy, but ways of attributing knowledge in academic settings, for example, also vary from one culture to another. Ethics, then, is founded not on a universal set of principles, logic, values or beliefs, but on human relationships in context.

von Foerster's (2003) distinction between morality and ethics is helpful in understanding how our choice of truth or trust is revealed in moments of ethical concern and the consequences of that choice. If one chooses morality in an ethical dilemma, he or she tends to seek stability and certainty by turning to a transcendental set of rules to determine what to do or to tell others how to act using "thou shalt not" statements. Reason and truth are privileged and used validate action: "I had no choice." Actions and accusations appear justified regardless of the consequences for the other.

The origin of ethics, von Foerster suggests, is when one chooses interdependence over independence. When I consider myself to be "*part of* the universe", as opposed to "*apart from* the universe . . whenever I *act*, I'm changing myself and the universe as well" (p. 293). From this perspective, truths do not exist. With no truth to provide stability, when ethical concerns arise, one turns to and trusts others to provide direction and support. While truth separates people, trust places people in relationship. When faced with an ethical concern, people are always free to choose what action to take. Freedom increases choices, but with this freedom comes personal responsibility for actions. By privileging trust, rather than truth, relational consequences become the basis on which decisions are made.

The emotional reaction by both Jordan and Riley in the transcript above suggests that this is a moment of ethical concern. The distinctions between truth and trust, morality and ethics helped us examine the basis for the tension that existed between Riley and Jordan and understand what choices were available to us to address the concern.

Using reason to judge ethical action

Jordan obviously feels that something – an answer, an idea – has been stolen from him. His utterances suggest that he is trying to 'prove' Riley's behaviour was unethical based on a series of reasoned arguments. His reasoning is based on his perspective of ethical action and truth. Jordan calls to the teacher to judge the behaviour and starts with the accusation: "*He's copying me! I put it* [my magic square solution] *right there and he's like, he's suddenly like . . .*" The researcher-teacher, in an attempt to ease the tension, 'defends' Riley by saying, "Last time I looked he had all the numbers in". The researcher-teacher upholds (or at least, does not deny) the ethical concern that copying is inappropriate behaviour and judges that Riley is innocent based on the evidence Jordan presented.

Jordan reasons further, saying that Riley put a five in the middle of his magic square – just like his own solution. That reasoning too was quickly challenged by the teacher and by Ellen, another student at the table. In the teacher's response, she suggests that if Riley knew the sums were 15 he could easily figure out that the number five was in the middle. Ellen further disregards Jordan's evidence by stating that

even if Riley didn't know the sums were 15 originally, other students at the table had already pointed out that 15 was the sum of each line; Jordan was not the only one with that answer. Ellen's ruling is that Riley did not copy from Jordan – but she may be suggesting that Riley copied from the group as a whole

Finally, Jordan offers further proof by pointing to the fact that the order of the numbers on magic squares can be different, but Riley's numbers were placed in boxes that were "exactly the same" as his own. Therefore, Riley must have copied. This evidence is much less refutable and it goes unchallenged. Perhaps Riley did copy Jordan's answer.

To this point in the conflict, copying is assumed to be an unethical action and each side attempted to argue truth through a process of reasoning. Did Riley copy Jordan's work or not? Only one side can be right. Jordan believes his answer was 'stolen' while the teacher, Riley and Ellen all deny that Riley has 'taken' the answer from him. Participants on both sides of the conflict attempt to convince the other of what is true, but neither side concedes and the tension is unresolved. Jordan is clearly saying to Riley, 'thou shalt not' copy. Taking a moral stance justifies the accusation even though it is obviously upsetting to Riley. In this example it appears that truth is privileged over trust. When truth is given priority, reasoning and justification of the perceived evidence become the focus of the argument.

Towards the end of the discussion the researcher-teacher shifts the discussion to suggest that copying is a legitimate act; in other words, copying is ethical in this situation. Rather than deny that Riley copied Jordan's work, she argues instead that Riley's actions are appropriate in this particular social situation: *"I think right now that we're just sharing."* Ellen agrees, *"You guys. It's okay."* The researcher-teacher reiterates the shift, *"Yeah, we're sharing right now anyway."* The researcher-teacher insists that copying is a legitimate activity in this social domain. The argument ended, but the tension persisted. The ethical concern was unresolved.

Although the researcher-teacher in this classroom attempted to shift the social expectations to accept copying as an ethical act, there was resistance. Indeed, this resistance might indicate that the present history for student behaviour was in conflict with the weekly expectations of the researcher-teacher. Ethical expectations are historically and culturally mediated. Copying is embedded in a culture of schooling that emphasizes individualism. Individualism and ownership of knowledge in mathematics, perhaps more so than other subjects, is firmly entrenched in the discourse patterns in mathematical conversations (Gordon Calvert, 2001). We turn now to examine the history of ownership of mathematical knowledge to understand its role in the resistance to changing the social expectations for copying as an unethical act.

Ownership of mathematical ideas: an historical perspective

Unlike other thefts of personal property, Jordan still possesses his answer, even though a copy or imitation of it has been made. Perhaps he feels that replication devalues his work. Jordan maintains throughout his argument that he is the rightful and sole owner of his answer. Yet, the magic square problem dates back hundreds of years. The exact arrangement of Jordan's numbers has likely been recreated hundreds if not thousands of times before by mathematicians, mathematical hobbyists, and possibly other grade four students. Thus, unlike plagiarism that occurs in literature in which the probability of writing two identical essays is nearly impossible, identical results in mathematics problems such as these are almost certain to occur.

Jordan isn't likely to consider the fact that others before him have determined an identical solution. Perhaps he feels he owns it because he came up with it himself without help from others. The scribbles of numbers on the square are in his handwriting, but we can question whether his work is an autonomous creation. If we look through the numbers on his page perhaps we can imagine a whole history of interactions bubbling up to this writing surface: interactions with his peers and teachers in this setting and in all previous classroom settings; a history of interactions with family and friends in his lifetime and in a history of lifetimes; a history of mathematics that is brought forth with each symbol scrawled on the page. The answer, perhaps, is brought forth by Jordan in the moment, but with it, a human history of mathematical understanding is also brought to bear through his response.

Mathematics has a long history in which knowledge is assumed to be possessed by individuals. This history has contributed to a culture in which copying is perceived as unethical. Such a perspective has infiltrated the mathematics classroom. On the surface, mathematics is a subject of pristine abstraction in which the symbols themselves transcend human sensitivities. Yet, underlying the seemingly rational structure and symbol system is a long-standing human history promoting mathematics as a culture of secrecy and possession. Perhaps the earliest known story in Western mathematics centers on the Pythagorean School *circa* 520 BCE (Ball, 2001). The Pythagoreans formed a secret communal society where mathematical discoveries were closely guarded. The general popularity of Pythagoras and the secrecy of his mathematical ideas elevated the society to a temporary state of supremacy. The tradition of secrecy persisted as the society followed Pythagoras' declaration that all knowledge was to be held in common, new discoveries were to be attributed to himself as the founder and this knowledge was to be withheld from the outside world. To sustain the secrecy no books were published. In this context, secret knowledge became politically powerful.

The connections between secrecy, supremacy, and political power are evident in the story of Tartaglia and Cardano (Feldmann, 1994). During the 1500s, winners of public debates were rewarded with prestigious academic positions. This climate of competition promoted secrecy of knowledge since a scholar maintained his position by outperforming all challengers (in this era women were not acknowledged as scholars). In mathematics, the quest became the solution to the cubic equation $(x^3 + ax = b)$. Tartaglia suggested that he had a solution by offering a hint for solving this equation in a public debate. Cardano wished to publish this solution but Tartaglia declined. Cardano publicly insulted Tartaglia for withholding his ideas until Tartaglia relented. Tartaglia told Cardano the solution on

the condition that it would remain secret but Cardano broke his oath and published it. The ensuing dispute over the stolen solution culminated in another public debate. Tartaglia withdrew after the first day, lost his academic position, and died without publishing his solution.

Another well-known story of secrecy and controversy involves the invention of calculus, now jointly credited to Isaac Newton and Gottfried Wilhelm von Leibniz (Mankiewicz, 2000). During the seventeenth century, Newton wrote many papers describing his invention of calculus but refused to publish his ideas. During this time, Leibniz published several papers about the standard theorems of calculus. When Newton eventually changed his mind and published his book *Principia*, his ideas were found to be similar to those of Leibniz and a bitter controversy ensued. In 1712, Newton was declared the first inventor of calculus. After Leibniz's death, Newton removed all references to him from subsequent editions of his book. In this context Newton's need for secrecy and supremacy contributed to acrimonious controversy. Ironically we now attribute this invention to both mathematicians.

While these examples may seem anomalous, the importance of the ownership of mathematics remains. A privileging of truth through reason continues to deny relational and ethical responsibilities to the other. In recent history, Gauss put aside his relationship with Bolyai to assert his own priority in the discovery of non-Euclidean geometry. His response after reading Bolyai's publication of his son, János', ideas is well known:

> Regarding your son's work: If I began by saying that I am unable to praise this work, you would certainly be surprised for a moment. To praise it would be to praise myself. Indeed, the whole contents of the work, the path taken by your son, the results to which he is led, coincide almost exactly with my own ideas I have been developing for thirty to thirty-five years. (cited in Prékopa & Molnár, 2006, p. 18)

Yet, Gauss remained silent about his discovery because he feared public ridicule. He denied giving credit to János Bolyai while promoting a culture of secrecy. His silence was interpreted as a lack of endorsement for János Bolyai's ideas: A lack of trust limited truth. János Bolyai, believing himself the victim of theft, suffered ill health and curtailed his publishing because of Gauss' unethical response. A preoccupation with ownership of mathematical ideas persists. Copying is ethically acceptable solely when mathematical ideas are credited to rightful owners.

The question of ownership of ideas surfaces in other knowledge domains, but the curious history and nature of mathematics seems to contribute to and allow for lines to be drawn between one person's ideas and another's. In the transcript provided, Jordan sees himself as the rightful and sole owner of the solution to the magic square. Placing truth, knowledge and ownership as central to his ethical arguments, he essentially denies a relationship with Riley. Moreover, trust may be lacking in this context among students or between the students and the researcher-teacher because of the nature of the research project. The students were engaged in this form of interaction only once per week; their work was assessed, but not scored or used in the student's progress reports. The social norms on the other four days per week and the limited opportunity to establish a relationship with the researcher-teacher might contribute to a privileging of truth over trust. While the researcher-teacher attempted to shift the perspective to suggest that copying is not unethical, the students had difficulty accepting her authority as it stands in contradiction to a long history of ownership of ideas in mathematics.

Ownership and power

The magic squares conflict between Jordan and Riley happened early in the school year although it wasn't the only time that copying as an ethical concern became apparent. The researchers continued to lead and participate in problem solving activities in the classroom throughout the year. Although the act of copying is never defined or discussed in the classroom, the students seem to recognize it immediately. On several occasions other instances of copying were expressed by students within the groups:

- *"You copied me."*
- *"It's the same exact answer [as mine]."*
- *"Don't copy that."*

Each of these statements is a moral accusation. Although we may question whether students who make the accusation are actually in possession of something unique or even whether their knowledge is really their own, the students' angst is real. There is still a sense that something is taken when one's work is copied.

After many more problem solving sessions where the researcher-teacher continued to emphasize sharing strategies and solutions in small groups, a slight shift in the ethical norms occurred. This shift may indicate that the change in social expectations and a more firmly established relationship with the researcher-teacher allows for trust. Copying in the context of trading and checking answers became more acceptable—particularly for those students who were doing the copying:

- *"Can I copy off you? Because you copied."*
- *"I just need to know the answer to something. I'm not going to copy."*

By the end of the year, even Jordan appeared to acknowledge the benefit of copying another person's work. The following interaction between Jordan and Amil, another student in the class, occurred:

Jordan:	I'm going to copy out your example because it's such a nice one.
Amil:	Please don't
Jordan:	But it's so amazing. I can't stand the intellectual science [laughter]. And now that I have your amazing knowledge I can complete my lovely task

Being the one who copies appears more acceptable to Jordan;

however, Amil's response of "Please don't" suggests that he still does not see copying as an ethical act. He is not readily willing to give up sole ownership. The culture of individual ownership of ideas prevails.

Why might ownership of mathematics be important to Jordan, Amil or to other children in a mathematics classroom? Walkerdine (1988) suggests that we use powers of reason to possess an answer and the power of mastery is desirable because it offers authority over others. She questions the power and mastery of reason and challenges the rational dream of perfect control in a perfectly correct and rational universe

> My central point, therefore, is that this so-called natural process of mastery entails considerable and complex suppression. That suppression is both painful and extremely powerful. That power is pleasurable. It is the power of the triumph of reason over emotion, the fictional power over the practices of everyday life ... The 'reasonable person,' in Piaget's terms, is 'in love with ideas' not bodies (p. 186)

The power of mastery is desirable because it apparently offers authority over ourselves, authority over others, and control of events. Truth is privileged over trust. Possessing the answer is often rewarded by the teacher and power is gained by the individual.

Concluding Remarks

In this paper we suggest that no universal set of principles for ethical action exists; instead, ethical concerns are emotionally constituted and historically and culturally mediated. Using copying as a site to examine ethical action, we sought to understand the basis of the concern raised in a split-Grade 4/5 mathematics classroom. By looking back on the event we noticed that reasoned arguments and attempts to shift ethical norms through reasoning were not successful in settling the conflict or in easing the tension. We suggest that in instances of ethical concern, rational arguments tend to privilege truth over relationships of trust. Arguing for truth and taking a moral stance appear to provide justification for making accusations, regardless of the consequences it might have on the other. Privileging truth appears to release a person from his or her ethical responsibility to the other.

Even though there was a concerted effort to alter the ethical norms to accept copying as a legitimate activity, little change appeared to occur. Mathematics presents a long history of individual ownership of knowledge and the power that one garners in society and in the classroom if one maintains individual ownership. Simply allowing copying as an aspect of sharing strategies and solutions did not effectively change the relationships of trust among students.

von Foerster's (2003) ethical imperative to "always try to act so as to increase the number of choices" (p. 295) encourages us to recognize that we always have freedom to choose. However, that freedom also increases our responsibilities to others. As we saw, a focus on truth appeared to separate students and hence, constrain possibilities for learning with and from others; privileging trust places students in relationship and potentially allows students to expand possibilities through their interactions. Viewing the phenomenon of copying through an ethical lens allows teachers and children to see themselves in relationships, nurture those relationships even with disagreements occur, and build on the ideas of others thus breaking down the stereotypes of individualistic learning in mathematics.

We recognize that as soon as we attempt to give advice, we too become moralists and limit choices of others. Instead, we attempt here to share our experiences and understanding. We have become more attuned to the ethical concerns that arise in moments of tension. We recognize that when truth is privileged and rational arguments ensue, they often do little to resolve the unease. Instead, we may be more successful in addressing the concern and the emotional undercurrent by privileging relationships of trust, and considering the choices and the consequences of our actions on these relationships.

While the culture of secrecy and possession is evident in some mathematics classrooms today, the tension between maintaining individual ownership of the mathematics and building on the ideas of others is emerging as educational researchers investigate the ethical dimensions of inquiry classrooms.

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References

Ball, D. L., and Wilson, S. M. (1996) 'Integrity in teaching: recognizing the fusion of the moral and intellectual', *American Educational Research Journal* **33**(1), 155-192.

Ball, W. W. R. (2001) *A short account of the history of mathematics*, New York, Sterling.

Falkenberg, T. (2005) 'Caring in the teaching and learning of mathematics', *For the Learning of Mathematics* **25**(3), 28-29.

Feldmann, R. W. (1994) 'The Cardano-Tartaglia dispute', in Swetz, F. J. (ed.), *From five fingers to infinity. a journey through the history of mathematics*, Chicago, IL, Open Court, pp. 364-367.

Goldstein, L. S. (1998) 'More than gentle smiles and warm hugs: applying the ethic of care to early childhood education', *Journal of Research in Childhood Education* **12**(2), 244-261.

Gordon Calvert, L. M. (2001) *Mathematical conversations within the practice of mathematics*, New York, NY, Peter Lang.

Hackenberg, A. (2005) 'A model of mathematical learning and caring relations', *For the Learning of Mathematics* **25**(1), 45-51.

Lake, V. E., Jones, I. and Dagli, U. (2004) 'Handle with care: integrating care content in mathematics and science methods classes', *Journal of Research in Childhood Education* **19**(1), 5-17.

Mankiewicz, R. (2000) *The story of mathematics*, London, UK, Cassell.

Maturana, H. R. (1988) 'Reality: the search for objectivity or the quest for a compelling argument', *The Irish Journal of Psychology* **9**, 25-82.

Prékopa, A. (2006) 'The revolution of János Bolyai', in Prékopa, A. and Molnár, E. (eds.), *Non-Euclidean geometries. János Bolyai memorial volume*, New York, NY, Springer, pp. 3-59.

Skovsmose, O. (2000) 'Aporism and critical mathematics education', *For the Learning of Mathematics* **20**(1), 2-8.

von Foerster, H. (2003) 'Ethics and second-order cybernetics', in *Understanding understanding: essays on cybernetics and cognition*, New York, NY, Springer, pp. 287-304.

Walkerdine, V. (1988) *The mastery of reason*, London, UK, Routledge.