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MAKING LEARNING VISIBLE IN HIGH SCHOOL SCIENCE CLASSES

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This session will present results of a collaborative research project between a high school science teacher and university professor specializing in early childhood education about the potential and challenges in using pedagogical documentation, a process for making students' learning visible to themselves and others that originated in the preschools of Reggio Emilia, Italy, in the content focused context of a high school science class.

BACKGROUND IN PEDAGOGICAL DOCUMENTATION

The Reggio Emilia educational philosophy originates in the infant-toddler and preprimary schools in the municipality of Reggio Emilia, Italy. In April 2011, a conference was held at the University of Calgary on Reggio inspirations in elementary school contexts that attracted international speakers and participants. Following this conference and a connected graduate course, Kenzie Rushton, indicated that he would be interested in exploring possibilities of incorporating pedagogical documentation into his high school science classes that set the stage for our collaboration. While there is increasing experience with the Reggio philosophy in elementary contexts, there is only very limited examples of pedagogical documentation in high school settings (Krechevsky, Mardell, Rivard & Wilson, 2013;

Soble & Hogue, 2010; Krechevsky, Mardell, Rivard & Wilson, 2013). The high school science context provides a unique challenge because of the amount of content that must be covered. This has meant that teachers tend to adopt traditional lecture, laboratory and testing approaches with less emphasis on inquiry, or how students are making sense of the content.

Pedagogical documentation as inquiry into individual and group learning involves the collection of artifacts, digital or video images, notes, audio recordings of educational events, and the process of collaborative reflection to understand how these events influence and respond to teaching and learning practices. Inviting participation and collaboration, the process of documentation makes students' learning visible to the students themselves and to teachers through the creation of documentation panels or posters combining photography and text. According to Soble and Hogue (2010):

Through exploring and even creating documentation (collecting, selecting, organizing, and sharing indicators of learning in order to advance their own and their classmates' learning), students would see themselves in actual learning moments, understand the roles they played in advancing their own and one another's learning, and realize their potentials as learners, group members, and citizens. (p. 48).

The significant difference between pedagogical documentation and collecting data for assessment is that pedagogical documentation is an on-going, collaborative, interpretive process. The process not only makes students' learning visible but also makes visible the documenter's perspectives, assumptions and constructions (Dahlberg, Moss & Pence, 1999/2007). In pedagogical documentation, it is essential for teachers to reflect collaboratively so that they may develop more finely tuned lenses for understanding how students think and learn. We entered our work believing that this process has the potential to transform teachers' practice and shift the perspective from teacher-centered delivery to a process in which the students become co-constructors of learning in the classroom. Teacher as

researcher and as reflective practitioner are concepts central to this work (Giudici, Rinaldi & Krechevsky, 2001).

PEDAGOGICAL DOCUMENTATION IN A HIGH SCHOOL SETTING

We began our collaboration in the fall of 2012, having received approval from The University of Calgary Cojoint Faculties Research Ethics Board and the Calgary Board of Education late the previous spring. I made approximately monthly visits to his science classes with the goal of understanding his context, reflect with him on his strategies for “making student learning visible” and to offer feedback and suggestions. My last visit to his class was in May, 2013. Through engaging in the process of pedagogical documentation and our collaborative reflection, Kenzie’s teaching practice has become more visible to himself. He has expanded my vision of what pedagogical documentation looks like. Three shifts have become apparent in his teaching: 1) incorporating different strategies for making learning visible, 2) using a pedagogy of listening (Rinaldi, 2006), and 3) the use of metacognitive approaches to learning. This has been a non-linear, organic and divergent process. One insight led to another, providing the opportunity to explore a different aspect of how to bring pedagogical documentation to high school science teaching. The following is a narrative where these themes emerge separately and concurrently depending on the situation.

KENZIE’S STORY: EXPLORING HOW TO MAKE LEARNING MORE VISIBLE

At the onset of this research project I had a strong desire to effectively bring pedagogical documentation to the high school science context. In the past, documenting learning involved the completion of worksheets or textbook questions, lab reports, students writing quizzes culminating in a final summative evaluation for the unit. Exploring the possibility of capturing learning in a different way, as inspired by the Reggio philosophy, led me to incorporate drawings, photos, writing and video as alternative approaches to documentation. These artifacts were then shared through one of two

platforms: an online course shell called Desire2Learn (D2L) and teacher led sharing with the whole class.

Of these four ways to document learning, I introduced drawing as a modest first step. The first drawing activity involved the complex topic of photosynthesis. Students were asked to draw the processes out in a number of different ways: 1) on a sheet of paper, 2) on a whiteboard with others, and 3) on a sidewalk with chalk in small groups. There were opportunities for conversation, communicating understandings and misunderstandings, a socio-constructivist approach to learning. As they observed others in the act of generating their drawing, the various ways to represent the same thing became clearly evident. Students were gaining insight into their own learning and the learning of others through the act of illustration. It was not just the act of drawing, but the process of generating the illustration that was important. This process provided the opportunity for me to give formative feedback in a timely and accurate way for the students. It became obvious to me that drawing is a very powerful tool to document learning and I incorporated drawing into other large conceptual topics throughout the semester.

The second form of documentation was photography, both by students and myself taking pictures of classroom activities. Photos are a powerful form of documentation when they become an artifact of learning that can be shared with others and can act as a record of learning. I used photos in an effort to capture learning in the moment and students would use it as a record or a tool by which to display their understanding of a concept. I found that the photos themselves were not enough to fully capture students' learning conversations, and so I requested students to complete written component along with the photographs.

The power of photography today is the ease of which it can be shared with others through digital forms. Further to taking the photos, students would then post their work to a discussion forum online within a password protected D2L course shell. This took the documentation out of the immediate experience of

the photographer to a greater audience. Classmates could respond in a written way to the images that were being shared. Through these comments students received feedback about the accuracy of their representations. The responses were initially superficial in nature so the class brainstormed on specific focusing questions that would guide them in their response to the work. For example: “What did you really like about how your classmate displayed their understanding of the topic?” and “How could that individual change their text or illustrations to improve your understanding of their thinking on the topic?”

The Development of a “Pedagogy of Listening”

Listening to students often can be overlooked as complaining or adolescent banter about being in school. I have been influenced by two key components in the philosophy from Reggio Emilia: an image of a child as described by Fraser and Gestwicki (2002) as “competent, strong, inventive, and full of ideas”; and provocation, “listening closely to children and devising a means for provoking further thought and action” (p. 11). This attentive listening, using all of your senses as part of documentation is referred to by Reggio inspired educators as, “the pedagogy of listening” (Rinaldi, 2006, p. 65). With these in mind, when a particular student vocalized the fact that they were not learning from a lecture, it was time to listen. Biology is a content driven course that often has lessons which are centred on a presentation which may last 50-80 minutes in length. When asked to recall what was discussed during the lecture, a student may shrug their shoulders and vocalize a grunt. With listening, it became clear that students were gaining little from this form of instruction. The pedagogy of listening can be simplified into two primary components: the act of listening resulting in a call to action and the implementation of a response to the call. Intentionally listening and the moral and ethical responsibility to respond to the student voice that is characteristic of sound pedagogy shifted my teaching.

The realization that students were not learning from the note taking process and the act of reflecting upon this led to an activity which involved a blank sheet of paper. I asked students to write what they

remembered about a concept or a lesson onto a blank sheet of paper (without references to aid them). In the act of starting with a blank slate, the student is faced with the question of “What do I know and can I communicate it to others?” The emergent answer was unavoidably: “What you know can only be found in your ability to share it with others.” There are a number of different ways in which you might share your understanding but I summarized it as: “If I can speak it, write it or show it, I know it.”

A Metacognitive Shift

I had few metacognitive conversations with students prior to embarking on this research project. I now include metacognitive questioning as an integral part of the classroom discourse. Not only am I interested in *what* my students learn but *how* they know if they are learning. This is clearly evident in the example that is provided above and the second example of making learning visible on tests.

During parent teacher interviews a number of students appeared to be greatly disheartened at the difference between the high level of effort they were putting into their studies and the poor results their summative evaluations were showing, there was a disconnect. This also appeared to be a recurring theme that could be heard in the statement: “My son/daughter has always done poorly on tests.” Listening led to a call to action. The response was how to make learning visible on tests and quizzes.

I started small: applying an approach of self-evaluating performance on tests for students. The first attempt was during a quiz. Upon completion of the quiz the class corrected it together. Students were given the opportunity to talk with others in the class and share their quizzes. Students milled about talking to friends and classmates, trying to determine why they got certain questions wrong. Emerging from the moment were three simple questions: 1) “Did I have the background knowledge to answer this question? If not, why not?” 2) “If I did have the background knowledge, what was it about the question that I did not understand?” 3) “Did I just make silly mistakes? If so, what can I do next time when I write a quiz or test to ensure that I do not make the same silly mistakes?”

Asking these three questions is an important step but I wondered how this could be further enhanced to ensure that learning moments become more visible for the student. I extended this idea to summative unit exams, asking students to write on their tests after getting the corrected test back. I would ask them to write beside each incorrect response why they got it wrong. Taking the time to write out the reason why they got the questions wrong gave students an opportunity to see that they need help in test taking: they needed help ensuring that they are studying properly or they needed to be more careful when writing tests. After completing this self-evaluation, I asked students to write themselves a letter about the test. In this letter they were to give themselves hints about what they need to do differently for the next test as well as include ideas about what to study at the end of the year for their final exams. In this way the students became researchers and reflective practitioners about their own learning that paralleled my own reflection and research into my teaching.

PAT'S PERSPECTIVE: SUMMARY

The results of a collaborative research project between a high school science teacher and university professor about the potential and challenges in using pedagogical documentation has been insightful. This iterative approach to professional development has led to three shifts in the teaching practice for Kenzie including a shift in 1) the intentional use of documentation to make students' learning visible for themselves, their peers and teachers alike, 2) the development and implementation of the call and response as a result of a pedagogy of listening and 3) the enhanced teaching and learning through the use of metacognitive strategies concurrent with content. While still faced with covering 108 learning outcomes (Alberta Education, 2007), through this process of documentation and making learning visible, Kenzie has provided students with more opportunities to learn from each other, represent their learning in diverse ways, and has begun to take up inquiry as an approach to learning. He has become a teacher researcher of his own teaching and of students' learning.

From my perspective as the researcher and collaborator, he has extended my understanding of documentation beyond panels of photos and text on the walls of the classroom. While students created some photo documentation about a study of a local park with the intent of providing a record of their learning, and Kenzie has created some poster size documentation of investigations, these have not been the major focus of his work, often due to time constraints for creating these documents. He has explored the notion of making learning visible as a process to open up opportunities for dialogue and support student learning through the use on-line forums. He has investigated ways for students to reflect on themselves as learners and has incorporated drawing, group work and other strategies that bring students into dialogue about their learning. In this way their processes of documenting, learning from each other and reflecting on their learning have paralleled his processes of documentation and reflection on his teaching. Both students and teacher have become researchers of their learning through the process of making learning visible.

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