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Abstract

This study explores students' experiences of authentic learning in mathematics. Of interest is the relationship among curricular explorations, classroom conversations, and students' ways of being with mathematics. As we problematized the notion of authentic learning, we came to explore Heidegger's notion of authenticity and its relationship with an open, dynamic curriculum. Heuristic inquiry as a methodological approach informed our exploration of students' authentic mathematics learning experiences as their being-with-others-in-the-world mathematically.

"What is the experience of authentic learning in mathematics?" (Matney, 2004)

This question has haunted both of us as we have wrestled with helping our students experience their worlds in mathematical ways. The more we have thought about authentic experiences as related to mathematical explorations, relationships, and understandings, the more we have come to realize there is a gap in the literature as well as our own understandings of what it means to have authentic experiences in mathematics classrooms. Further questions plagued us: How and when do authentic experiences occur? Who has these experiences? And ultimately, why do (or don't) these experiences occur for some students rather than others?

These questions infer a delicate dynamic among individuals, how they experience their world, and disciplinary content such as mathematics. They also create a shadow over the mathematics curriculum, for learning, if connected with authentic experiences, cannot be predicted, controlled, or manipulated. In exploring our questions of authenticity and experience, we engage in critical curriculum pedagogy, challenging the notion that the mathematics curriculum is a set body of knowledge or facts. In our exploration of authentic mathematical experiences we find we are engaging in an aspect of curriculum theorizing as described by Bill Pinar in his book: *What is Curriculum Theory?* (Pinar, 2004).

> Curriculum theory is, then, about discovering and articulating, for oneself and with others, the educational significance of the school subjects for self and society in the ever-changing historical moment. (p. 16)

Authenticity, as essential to what Whitehead referred to as the "romance" of learning, may be an important and overlooked aspect of curriculum theorizing, especially as the notion of authenticity challenges our ideas about the relationship among the curriculum, self, and society. Likewise, within the inquiry process, we provide the spaces for our students to explore for themselves the meanings they have enjoyed of mathematical ways of being.

Problematizing Authenticity

As we explored the meanings of authenticity, we found many current uses of the word in curriculum and pedagogical discourses to be problematic. Most explorations of authenticity found in the educational literature referred to "real-world" experiences, for example as "the quality of having correspondence to the real world," (Petraglia, 1998, p. 165) or referenced activities, rather than

experiences, that were "meaningful." The notion of "authentic learning" as tied to curricular activities was especially problematic for us. Tied to "real world" activities, authentic learning experiences have become central to curricular reform efforts. For example, the role of authentic activities as real-world activities in constructivist approaches to the curriculum, has been a focus in mathematics since the first set of standards were published by National Council of Teachers of Mathematics (NCTM) in 1989 (NCTM, 1989).

We knew from our experiences as high school mathematics teachers that abstract mathematical ideas from number theory could be as "authentic" for our students as figuring out how many gallons of paint were needed to paint your room and, in fact, were often more "authentically" engaging than these "real-world" problems. Likewise, we knew from our experiences with our students that authenticity did not reside in the curriculum but was an experience of students that could not be predicted or controlled. An activity that, for one group of students, was particularly engaging might not be perceived as relevant or interesting to another group of students or for any particular student within various groups of students. And interest, relevance, and understanding were, we came to believe, not at all the same as authenticity, even though we were still trying to formulate what "authenticity" may mean.

Our explorations of the notion of authenticity as an experience our students have, as the "ahaa" moments of awe and romance, where time and space become irrelevant and student's are driven by their own need to know rather than the requirement to complete an activity or lesson, led us to the phenomenological writings of Heidegger.

Theoretical Framework: Complex Self and Authenticity

We found Heidegger's development of the idea of authenticity in relationship to the articulation of self to be helpful in framing and interpreting our research on mathematics students' experiences of authenticity. Heidegger's perspective challenges the view that authenticity is a quality of the world, or, in our case, of the curriculum. In order to understand how he uses authenticity, it is necessary to explore his evolving meanings of *Da-sein.* We focused on Heidegger's development of this idea as he presented it in *Being and Time.* Although he continued to explore and challenge his own ideas of *Da-sein* in later works, it is in *Being and Time* that he deliberately and most extensively considered the relationship between *Da-sein* and authentic experience.

The meaning of *Da-sein* cannot be given as a simple definition and Heidegger's use of the idea changes throughout his discussion of it. The concept of *Da-sein*, of a person's being-in-the-world, is central to ontological arguments about individuation and identity. Starting with a literal understanding of the word, "*Da*" means "here" and "*sein*" means "to be". So a literal translation of the word, *Da-sein*, is "to be here" – an ontological claim.

Heidegger's use of the term, however, places the individual in the world in a way that conflates traditional ontological and epistemological boundaries. This becomes particularly apparent as he challenges traditional neo-Platonic views of self as "ousia" or individual substance, replacing and developing his idea of self as "the dynamic absence which lets a living being manifest its appearances" (Zimmerman, 1981). *Da-sein*, then, is an unfolding of self, of self-in-relation-to-the world and dynamic absence of self negates the simplicity of self-as-being-in-the-world, separate from the relationships that are the becoming of self. Again, the ontological and epistemological merge as our being-in-the-world is on-going relationship and meanings.

Da-sein, then, is the embodiment of being-in-relationship. It is the manifestation of being, or, as Mitchell (2001) explains it:

> *Da-sein* is like a space in which things let themselves be seen. If the phenomenal world is like a wood crowed with trees then *Da-sein* is the clearing in the forest, the space in which phenomena are made manifest. (p.140)

This notion of spacing, of dynamic absence, is very different from the idea of self as a place holder, that is, individuated self as existing in space and time. It is not a matter of occupying space, but of creating spaces, clearings in the woods, being-in-the-world. Thus, rather than being as primary, according to Heidegger, what we typically define as self is really secondary, a relationship we experience as we encounter other, just as we come upon the clearing in the woods and recognize it. The "it" we recognize is only an "it" in relation to the woods.

Heidegger argues that we lose the sense of being-in-the-world when we abstract being from context, defining self as the clearing, for example, without recognizing the relationships that are the clearing. "The being-in-itself of inner worldly beings is ontologically comprehensible only on the basis of the phenomenon of world" (Heidegger, 1996, p. 76). And an important aspect of our being-in-the-world is

our being-with-others in the world. "[The world] is always already the one I share with the others. The world of *Da-sein* is a with world" (Heidegger, 1996, p. 118, emphasis added) .

This notion of "being-withness" becomes important as we elaborate on Heidegger's ideas about authenticity. *Da-sein* as a being-in-the-world, being-with the world, chooses to act. Thus, the manifestation of *Da-sein*, the choices we make as we go about being-in-the-world, is fundamentally *Da-sein*.

Authentic *Da-sein*, then, is an orientation to the world, a being-in-the-world, that embraces our being-with-others. This relationship of self and other, of *Da-sein* and the "they-self" is described by Mitchell (2001):

> Then we encounter the world we have a choice; to stand out in relation of Being-with, to impose our own possibilities on the world, and to give our own meanings to entities we find as equipment, or to accept what we find and to attempt to dissolve distantiality and submerge our own *Da-sein* into that of "the they." (p.132)

Authenticity and inauthenticity, for Heidegger, are therefore ways of being-in-the-world while being-with-others. Authenticity as experience, therefore, confounds common notions of authentic learning as residing in the lessons, materials, or activities, per se. Understanding students' experiences of authenticity requires an exploration into their "being-with" others. Authentic experiences of mathematics, thus, from this Heideggerian perspective, are ways of being-with mathematics, of participating in the world of mathematics, an orientation toward mathematics that creates a way of being-in-the-world mathematically and being-with others in mathematical-ways-of-being. We explored students' experiences of authenticity with mathematics using heuristic inquiry.

Heuristic Inquiry as Mode of Inquiry

Moustaka's (1990) heuristic approach to research seemed most appropriate to explore our students' authentic experiences with mathematics. Focusing on our tacit understandings and previous experiences both with mathematics and as mathematics teachers, this qualitative approach also incorporated our own sense-making efforts of being-with our students in their being-with mathematics. Recognizing the being-with nature of authenticity, the making of the clearings, as it were, we had to resist, however, the temptation to focus on the thing-in-itself, the secondary qualities of the clearing, rather than staying focused

on the laying out of the territory, the being-with mathematics in authentic ways as the unfolding of those experiences.

There are six aspects of the heuristic method that helped us understand the clearings, these negative spaces of authenticity as they were manifested in our mathematics classrooms. These aspects of inquiry are defined by Moustakas (1990) as: engagement, immersion, incubation, illumination, explication, and creative synthesis. Although presented in a linear way, these six inquiry modes are epicyclical, dynamic, and interrelated. Engagement, for example, for each of us, was an unfolding of our separate and joint years of experiences with and wonderings about mathematics and our students' mathematics learning.

As part of the engagement process, we both reflected on our common experiences of teaching in inner city schools, of students differing ways of being engaged with mathematical ideas, of our own curricular struggles to create "complicated conversations" in our mathematics classes that provided spaces for our students to explore mathematical ideas and of our own ways of being-in-the-world with mathematics. We recognized the often disconnected relationship our students had with "school" mathematics and the mathematics of pattern and relationship as an important way of being-in-the world with mathematics.

We became immersed in the context of Gabriel's school experiences, both in regards to his on-going classroom conversations and a curriculum that meandered and responded to student interests and the connectedness of mathematical ideas. During this time period Gabriel's students bounced basketballs, created buildings using 3D architectural software, and went to a water treatment plant. Some of his students were enlivened by these experiences and their being-toward mathematics changed, at least temporarily, to one of inquiry and curiosity. Many of the students however showed indifference for the supposed "authentic" activities.

As part of the incubation process, we considered the relationship between the emergent curriculum of Gabriel's class over the three years of working with these students and the dynamics of the classroom, including students' differing and emerging ways of being with mathematics. Striving for "perspective," just as one might step out of the clearing to better regard the parameters of the space of the clearing as defined by the trees, we considered the context of the curriculum and the classroom dynamics from the perspective of authenticity. It was during our process of struggling with the notion of authenticity that we

came up with and developed Heidegger's notion of authenticity as ways of being with mathematics. Using Moustaka's (1990) framework for our reflections, we further explored the question of authenticity by (1) revisiting our common areas of interest in an experience with authenticity as ways of being with others in mathematical conversation, (2) exploring clusters of ways of being with mathematics into subthemes, (3) discarding subthemes that imply causality, (4) exploring subthemes until further questions related to the interactions among experiences of authenticity, classroom dynamics, and the curriculum became apparent, and (5) formulating our questions about authenticity as a way of understanding our students' experiences of being-in-the-world with mathematics.

Part of the illumination process of our inquiry involved framing our questions about authenticity as a way of understanding our students' being-with mathematics using Davis's (1996) distinction between classroom environment and the ecology of the classroom.

> The term "environmental" is used to direct attention toward our environs – our surroundings – and hence away from ourselves…As Wendell Berry explains, "once we see our place, our part in the world, as surrounding us, we have already made a profound division between it and ourselves." … Ecology is about interrelationships and interconnections. It involves an attunement to codependencies, mutual affects, and codeterminations – in essence, to the fundamental intertwining of all things. When we speak of ecology, then, we speak of everything that shapes our being. (p. 58)

Insights provided by ecological metaphors allowed us to interpret the dynamics we understood in our tacit understandings of authenticity as related to classroom conversations, curriculum, and student experiences. Thus, we struggled to avoid creating lines of separation between curriculum, students, classroom, and culture. These metaphoric understandings allowed for a creative synthesis as we have come to new understandings about authentic learning experiences in mathematics. As an ecological dynamic, the metaphor of clearings, of spaces defined not by what they contain but by their relationship to the forest, became an important way for us to frame our understandings of students' ways of being with mathematics and the ecology of mathematics learning.

Creating Spaces within Classroom Terrains

The students who participated in our study of authenticity attended a charter school in an urban area in the Southwestern region of the United States where Gabriel taught. Beginning in 2001, these students entered as the first class of freshman. Each year, a new freshman class of approximately 120 students was added. During the course of this study, the students we worked with stayed with Gabriel for mathematics instruction all three years of their high school career. As juniors, they had developed close relationships with him.

As an inner city charter school, the population of the school was 78% minority: 60% Hispanic, 10% African American, 8% Native American, and 22% White. Over 91% of the students in this school qualify for free and reduced lunch. The average class size was around 20 students per class.

The fourteen students participating in this inquiry were in the same mathematics class. The majority of these students had experienced two years of a problem centered mathematics classroom (Wheatley, 1991) approach. In this, their third year, many experiences and understandings from previous years were revisited and discussed as common experiences and understandings. There were a few new students to class each year, and their participation was important to also include in order to offer a perspective of engagement-with the mathematics and the evolving classroom ecology.

Data sources included field notes of classroom and out-of-classroom conversations, student interviews, student writings about their experiences of authenticity, student problem solving products, including group problem solving efforts and summaries, as well as our own reflections. Often, after reviewing our notes and impressions, we asked students to reflect on and submit, in writing, their impressions or experiences of a particular classroom interaction or their understandings of the conversations about their experiences. Students also kept portfolios that included reflections on their learning and experiences with mathematics.

The Interconnected Clearings of Authenticity

There were four dimensions of the territory created in our mutual search for understanding students' experiences with mathematics as authentic being-with mathematics. As we explored the terrain of their experiences, these four themes became defining landmarks: mathematics, relationships, occupation, and newness. While these dimensions are addressed separately, their interconnectedness creates a holistic understanding of our students' being-with mathematics.

The Clearing of Mathematics. Students' ways of being-with mathematics varied as the ecology changed. The ecology of the mathematics classroom was a delicate system of interrelationships among the curricular content, classroom conversations, and students' individual and collective experiences and performances with, and beliefs about mathematics.

As students' ways of being-with mathematics varied, we came to recognize that, as mathematics teachers and researchers, we had been asking a question of our students that forced them to define the clearing of mathematics rather than "dance in the spaces" of the clearings-in-their-making. Just as Heidegger came to conceptualize *da-sein* as "the dynamic absence which lets a living being manifest its appearances" (Zimmerman, 1981), we came to realize that our students' ideas about mathematics were over-simplified and one dimensional when we asked them to straight-forwardly answer the question "what is mathematics?" Their ideas about mathematics were manifest in their ways of being with mathematics, which varied according to the mathematical terrain and the ecology of the classroom.

Sometimes a student's being-towards mathematics was as volatile as whether or not they had a pleasant exchange with the previous teacher or whether they had had a good lunch. While the ecology of the classroom is itself a delicate ecosystem, it is embedded within many different ecosystems and the dynamics among ecosystems has an impact on what happens within the parameters of our classroom. Thus, a student's way of being-toward mathematics varied.

Brian is an example of this volatility of the clearing of mathematics. Brian deplores taking notes in class but then gets frustrated when he can't remember what was said or what he thought about doing. He engages in the moment yet finds frustrating the lack of connectedness his own experiences bring him when he has not taken notes. When asked to describe what mathematics is, Brian says that,

> Math is the study of numbers and how they relate, not just to each other but to everything. Math relates to quite possible every single thing that happens in the universe. Disciples of Pythagoras actually worshipped numbers, because they knew they were the basis of all things, and they may have had a valid point. I mean think about it. Just thinking requires chemical responses and nerve responses in your brain. These all move at a certain rate of speed in relation to the actual completion of thought, so booya there's your math.
>
> --Portfolio Entry

Brian's view of mathematics as this standard emblem under girding everything is not the only view he takes of mathematics, however. Through his interaction with other students he sometimes changes his orientation to that of mathematical inventiveness, instead of interacting as if all is ruled by number. Furthermore, different tasks have revealed the shift in mathematical clearings as a way of being-with mathematics. In a task to approximate the area of a circle Brian said,

> I just realized something. We are always trying to find the area of things based on the shape of a square. I mean our units even say it, duh! The area of this triangle is 12 *square units*. Why a square? How would our formulas for area be different if we asked, how many circular units went into a square instead of how many square units are in a circle?
>
> --Taken from researcher notes of a classroom conversation

Here, Brian experiences a different kind of relationship with the mathematics he is studying, an awe or wondering that we were coming to understand as authenticity.

Brian's ways of being-with mathematics likewise affected the classroom ecology. In a different task involving finding the roots of polynomials Brian asked,

> Why are they called "roots" of the polynomial? Are we to believe that these polynomials have something to do with plants?
>
> --Classroom conversation

Through many classroom discussions this question eventually led the class to metaphorically understand polynomial roots as being like tree roots. From the roots of the tree comes the nutrients that create and sustain it, and the polynomial roots, if known, can be used to reconstruct the polynomial. The metaphor emerged from the interaction of the classroom social relationships with Brian's way of being-toward mathematics and sharing his reflective inquiry.

Metaphor became a powerful way for Lucy to make sense of her being-with mathematics as well. Lucy writes,

> When I was younger I memorized formulas, I knew how to get the answer, but I did not know what it meant. So when I actually learn it is like knowing the instruments in a symphony but learning why is like hearing the music. Like all the math I learned was force fed, so therefore I did not like math because I did not understand it. Don't get me wrong, I still don't *love* math, but at

> least I understand why, which makes my brain work and forces it to think, not just to memorize. Which in turn makes me a better learner, because I can see something for more than what it is.
>
> --Response to researcher inquiry

Lucy connects memorizing different parts of mathematics to knowing how to play different instruments, individually. Understanding the "whys" of mathematics, however, is like hearing the music of those instruments. In the hearing we understand what is meant by the instrument. In listening to a symphony we further understand the relation of those instruments to one another in a beautiful cacophony of sound. Lucy's authentic experience of being-with mathematics, described metaphorically as a way to make sense of her learning, likewise alludes to the clearing of relationship among mathematical ideas. For many, the clearing of relationship as being-with-others was an important part of their being-with mathematics.

The Clearing of Relationship. Relationship to others was revealed by the students as one of the stronger connections that contributed to the experience of authentic learning. Some students contributed the love and caring for or from a parent as a large part of their learning. Other students revealed that friendship influences their learning while still others see themselves in competition and in that relation they have made sense of things. Ross is an example of how the clearing of relationship adds to the complexity of authentic learning.

While on a school wide field experience to a national park the class was listening to the ranger as he was explaining the size of the park. He said that the park was 40,000 acres. A student inquired as to how large that actually was. After some conversing with students it was apparent that most didn't have any sense for how large an acre was. In order to allow the students to investigate this size we began studying the National Land Survey system. By studying the Land Survey system we would recursively consider such ideas as length, area, conversion, coordinate systems, large measures such as acres, fractions, and direction.

Ross doesn't typically care about academics. He is very athletic and places all of his energies to his athletic pursuits. This emphasis is reflected in his mediocre performance in his academic classes. However, during this study of the Land Survey system his way of being-with mathematics was very different. This was not the first time we had done something "real world" as an activity in mathematics class. We had built geodesic domes, sent and received coded messages based on matrices, designed houses

using architectural software, programmed and interacted with robots, etc. Yet Ross was no more interested in any of these activities than he had been in our more purely mathematical explorations. Yet on this topic, something was different. After the Land Surveying unit was over, Ross returned to his normal stance toward mathematics. Gabriel asked him why the interest in that particular topic. Ross replied,

> When we were learning about acres and land measures that really got my attention because my grandfather has a family farm and he is always talking to my dad about this acre over here or that acre over there. My dad nods his head. I think we have a section of land out there, or at least part of a section. As we were learning about surveying I wondered what the directions to our land was. When I go and visit my grandfather this summer I am going to ask him if he knows and if he doesn't I am going to show him I can find out for him. When we went outside and measured off an acre I paid extra attention to that task because I really want to know what my grandfather and dad are talking about. Then when you challenged us to see who could best estimate how many acres the school was on and I won, I knew I had ***learned it good***.
>
> --Transcription from taped interview

Ross's familial relationship modified the way he was toward mathematics. He now sought to make sense of this, not because it was a real-world task given by the teacher, but rather because his relation to his father and grandfather were critical relationships for him and he saw that those relationships could be extended by an understanding of the topic at hand. He sought to make sense of the topic as his own.

Students' ways of being toward mathematics was very intertwined with their relationships, both in and out of class. The way students approached a problem would often depend on the partner they were with in paired group activities. As their clearings of mathematics would interact, they might decide to work individually and then corroborate when they felt they were drawing close to completion or completely finished with the task. Other times students might decide to work through different strategies together, constantly bouncing ideas off of one another. The students' relationships constantly interacted with the modalities of the other clearings.

The Clearing of Occupation. By the word occupation we do not mean the strict sense of "that which one does for a living," although the strict meaning need not be seen as absent from the more general meaning. We see occupation as the relational space to which the being of the students concerns itself. For

some of our students occupation means designing cool looking robots that do rudimentary tasks. Others want to learn about building design for a future job, and still others just like investigating patterns and seeing all the patterns they can come up with.

Jose was one of the most talented artists in the class. He would doodle instead of taking notes. All the while he was listening intently to what was said, discussed, and inquired about. He became fascinated with constructing squares from the sides of several different right triangles to compare the areas. He inquired about squaring things other than side lengths. He wanted to know if there was a way to make a square from various shapes, such as a trapezoid, and a kite. He asked: "Can this be done for all shapes? Can you square a circle?" Though he rarely engaged in any of the real-world projects we had done, this question caught his eye, and it was real and meaningful for him like no other topic we had studied. He learned a great deal about the relationships among the shapes, as well as made sense about things like why the area is measured in square units.

For other students the clearing of occupation revealed authentic learning experiences that were directed toward jobs at hand, or projections toward future jobs. One student exclaimed his excitement at being able to help his father's construction crew by using the Pythagorean Theorem, while another student explained that he felt connected to the task of creating a building with computer software using the geometric principals he knew about. Still other students revealed that they simply occupy themselves with the mathematical task at hand since that is what their peers were doing at the same time. The clearing of occupation is as diverse as the number of students studied. These occupations where in relationship to both the clearing of mathematics and the clearing of relationship and as the modality of these clearings changed, so too did the clearing of occupation for each student.

The Clearing of Newness and Wonder: The intrigue of something unknown interacted with the other clearings to modify the clearings in such a way that the task at hand perturbed the student. The newness appeared as the space in which students were perturbed to make sense of the problem. The perturbation further allowed the modifications of the other clearings to present themselves.

Charlie typically is very practical. Normally he strongly clings to the view that the only good mathematics is applied mathematics. When we began looking into matrices and their relationships we

didn't do any real-world activities. It was surprising when Charlie took an immediate interest in the mathematics of matrices. In response to the question, "What was fascinating about matrices?" he said,

> I have never seen anything like it before. It was just a whole new subject for me. It was a more difficult subject than I was used to and it was great to learn it even though it was difficult. At first I didn't see what it was used for. But, then, we started learning how it was put into military code and it could be used for systems of equations and stuff like that. As a member of the United States Army I found it cool that matrices could be used to hide messages. When we made our own codes by hand it took so long but with computers they can code and decode very quickly. Speed and safety are two things they talk a lot about at drill. I wanted to learn matrices better so I could know the mathematics of the codes we send.
>
> --Transcription from taped interview

The clearing of newness played a key role in the experience of authentic learning for Charlie. When asked to reflect on an experience when he really learned something he said,

> One of these experiences would have to be when I learned how to do all of the mathematics involved in solving things dealing with matrices. It was great to see something that I have never seen before and then find myself 10 minutes later teaching people how to do it. To feel that is probably the best feeling that you can get.
>
> --Portfolio entry

Truly amazing are the many modifications of his being taking place in this experience. His being-toward mathematics as only a tool for applied use changed at first to a purely abstract relational way of approaching mathematics. He didn't have any idea at this point that these relationships would have real-world applications. Charlie's modality of being-with others changed as well. Charlie usually worked on his own, not sharing with others or interacting with them on a mathematical level. If he thinks he has figured out a task he is usually more of a distraction to classmates than a help. In the study of matrices however, this way of being was modified toward one of cooperation and engagement with classmates about the topic at hand. Lastly, Charlie did find an occupational vision for his new learning when the class was charged with creating an encoding system using matrices and their operations.

Authenticity as Dynamic Absence

Each of the clearings we explored provided ways of glimpsing what it may mean for students to become authentically engaged in mathematics as a way of being-in-the-world mathematically. The clearings of mathematics, relationship, occupation, and wonder have helped us glimpse the spaces of authenticity. Relationships, explored as being-with mathematics, also included being-with others. So as students' relationships with mathematics and mathematical understandings unfolded, it became evident that their relationships with others were crucial to their being-with mathematics. Likewise, their own relationships with their ideas of their future selves and potential future jobs created a clearing in which to explore their being-towards occupations as related to being-with mathematics. Finally, their sense of awe, their experiences of newness and wonder were pivotal to their authentic experiences of mathematics.

These clearings as spaces of authentic experience with mathematics interactively became the spaces of our understandings of our students' being-with mathematics. The implications of these explorations for a mathematics curriculum that provides spaces for these clearings include supporting the development of self as authentic *Da-sein*, providing experiences for students to be-in the world in mathematical ways that include being-in-the-world-with-others.

The traditional curricular terrain focuses on the clearing, defining and determining the limits of the space of mathematics and mathematics discourse. But creating new clearings that offer students ways of being-with mathematics and coming to experience their world mathematically, in authentic ways, is not a matter of bull-dozing existing forests or reshaping existing clearings, per se, but recognizing those spaces as interconnected relationship. Students' experiences-with mathematics and others are key to their being-in-the-world in mathematical authentic ways.

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