Of Birdhouses and Mosaic Cats: Conquering Fears in the Muddle of Inquiry

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ABSTRACT

This reflection considers the aspects of classroom focus, instructional practice, and evaluation that impact successful inquiry, as viewed through the author's experience in an adult art class. Topics considered include varying organization for the appropriate problem type; and creating a classroom supportive of inquiry through encouraging questioning, teaching independence, and using effective formative and self-evaluation.

Of Birdhouses and Mosaic Cats

While its roots go even deeper, the concept of inductive, or inquiry, teaching has been an important part of the modern educational landscape since Bruner's (1963) *The Process of Education*. It has taken many shapes, from concept attainment, to inquiry-based teaching, to problem-based learning (see, for example, Joyce, Weil, & Calhoun, 2009). But the underlying assumption of inquiry in its many varieties is that because learning is a constructive task, students will learn best when they are provided with experiences that allow them to discover concepts and generalizations through experience. The idea of learning as a constructive task is supported by the growing knowledge base in cognitive psychology (Bransford, Brown, & Cocking, 2000), but the processes of inquiry teaching and learning are less universally accepted.

Both a cadre of researchers and any experienced teacher can tell you that inquiry activities are not always successful (Kirschner, Sweller, & Clark, 2010; Klahr &

Nigam, 2004; Mayer, 2004). Some students may explore materials without drawing the hoped-for conclusions. Other students may jump three steps down the logic path, confusing those they leave behind. Kirschner et al. (2010) argue that while cognitive psychology supports learning as a constructive process, it also explains the failures of inquiry-based teaching because of the increased cognitive demands placed on novice learners. It can be argued that the "pure discovery" (Mayer, 2004, p. 14), used to define inquiry in such critiques, is a straw man, representing an extreme of practice seldom seen in classrooms, but still, demonstrations of limited student learning must be taken seriously.

On the other hand, lack of opportunity to explore and inquire also carries risks, what one author calls the "double-edged sword of pedagogy" (Bonawitz et al., in press). Children who are directly taught about the uses of an object are less likely to explore it and discover alternatives, and are more likely to imitate what they've been shown, even when it is less efficient (Bonawitz et al., in press; Buchsbaum et al., in press). The notion that students explore less after direct instruction is particularly problematic if varied explorations are likely to lead to more substantial understanding.

This leads to the logical question, "Under what circumstances are inquiry activities successful?" and more particularly, "What can teachers do to maximize the possibility of success within their inquiry activities?" Researchers have investigated the question, examining the impact of teaching strategies (Herrenkohl, Tasker, & White, 2011; Viilo, Seitamaa-Hakkarainen, & Hakkarainen, 2011), feedback format (Moreno, 2004), and level of structure (Mäkitalo-Siegl, Kohnle, & Fischer, 2011), among other approaches. This reflection will take a more personal view, examining the circumstances that led the author through a successful inquiry experience in an area that was both unfamiliar and uncomfortable.

In considering this experience, and the relationship it may have to other forms of inquiry, I've used the broadest of definitions. For purposes of this discussion, "inquiry" will entail a variety of types of experience with differing levels of teacher guidance and differing goals. These include the following categories.

1. Inductive teaching activities focused on specific content. These include activities such as concept attainment lessons (Joyce et al., 2009), where the focus of the lesson is to teach specific concepts or generalizations through the purposeful presentation of exemplars.

2. Inductive teaching activities focused on teaching inquiry methodologies. These activities are focused on teaching the inquiry methods of a discipline, including strategies associated with the scientific method, or strategies for gathering and evaluating information from multiple sources. Such activities may be structured to also teach needed content, as in Herrenkohl et al. (2011).

3. Creative activities focused on creating original products or solving original problems. These are the activities that represent "real-world" inquiry, where the problem is genuinely new and the results unknown. This is the type of inquiry in which I engaged in the adventure described below. While it may be viewed as "extreme inquiry," I believe it also provides opportunities to consider implications for inquiry more broadly.

Conquering Fears in the Muddle of Inquiry

Last summer, while in the midst of the brilliant chaos that is the Ann Arbor Art Fairs, I saw a large mosaic mirror that would have been stunning over my fireplace. Unfortunately, a quick glance at the price tag was stunning as well. For reasons I still do not understand, I was struck with the idea, "I'll bet I could make a mosaic mirror." At a number of levels, this idea made no sense. Not only did I have no clue how to make a mosaic, but I have also thought of myself since elementary school as a person with no evident artistic talent. My drawings never look the way I intend them. During my early first-grade teaching days (that, sadly for my students, pre-dated both clip art and Google Images), I frequently had to explain the illustrations on my newly created learning activities with comments such as, "I don't care what it looks like, it is supposed to be a chicken." Clearly, I was no artist.

Still, the idea persisted, so with a burst of courage, I signed up for a community mosaic class. The first day of the class I was nervous but found my way to the studio, built in a detached garage behind the instructor's home. Opening the door felt a bit like walking into an art supply store that had exploded. There were mobiles hanging from the ceiling—some of beads, some of toys—and a skein of plastic flamingos dangling in one corner. There were boxes of beads, crates of glass, broken dishes and bins of unidentifiable objects covering three walls. In the middle of the room was a tall wooden worktable at which about half the students were busily working, and the

other half were sitting, looking about as dazed as I felt. I sat on a tall stool with the other obvious newcomers.

This did not look like my idea of a first day of class. My classes begin with a syllabus, clearly defined outcomes, and grading criteria. I wasn't anticipating that, but I was expecting someone to say something like, "There are three basic steps to making a mosaic," or "Some of the earliest art we still admire is mosaic art," or even, "First, take out a pencil!" We waited for someone to tell us what to do. Instead, the teacher looked at us and said, "Do you know what you want to make?" My first thought was, "Uhhhh, a mosaic??" but I couldn't quite bring myself to say it. When most of us just sat there, the teacher produced an extraordinary collection of books about mosaics and piled them on the table. "Here, see if these give you any ideas."

So we started looking through the books, and looking around the studio. My initial impression of explosion gave way to a vision of organized chaos. There were projects of every description all over the room: on shelves, on the walls, and on the ceiling—even one that was a frame for a large mirror. There were students working on house numbers, picture frames, trays, and boxes. It didn't take many books to realize the scope of mosaic art was much broader than I'd imagined. One by one, the new students looked up and identified projects they wanted to begin. I became intrigued with a round mosaic of water creatures, divided into sections by curved black lines. I knew I didn't want mosaic fish, but the curved lines captured my imagination. Ultimately, I explored the various wooden objects around the room. I wanted to start with something small, but I didn't want to make house numbers or a picture frame, so I settled on a small decorative birdhouse.

I showed the teacher the picture of the fish mosaic and the black lines. She produced paint (to even the background), glue, and several varieties of small black tiles. And so it began. I took the entire semester to complete my birdhouse. It started with curved black lines that circled the wooden frame, dividing it into irregular shapes. I found I loved exploring the bins of colored glass. The birdhouse ultimately was covered with winding bands of color: green to blue to purple, with an iridescent snow-like roof. When it came time to grout the birdhouse, the instructor and I puzzled over the colors that would highlight the glass best, and what emerged was a project that now holds the studio record for the number of different colors of grout in a single project (4)! To my amazement and delight, I like my birdhouse. I'm proud of it. And even more astonishing, there is a glimmer of a thought in my head that perhaps I'm not a person completely without artistic ability. After all these years—do you think this is how Grandma Moses felt?

So now, I really am going to tackle a mirror for my fireplace. It has evolved into a project even more elaborate than the original Art Fair inspiration. This mirror will have a rectangular frame with a wooden cat sprawled across the corner, tail and feet hanging down into the mirror. I've managed to create a cat pattern that is recognizable as a cat, and I'm excited to begin.

As I anticipate the new project, I've been thinking about my mosaic-class experience and how it relates to the things we ask of students beginning inquiry. What about this experience allowed me, a person who, for 50+ years has thought of herself as having no artistic talent, to genuinely enjoy this journey? Many of our students have similar thoughts about themselves as learners. Where I think of myself as someone who "can't do art," others think of themselves as students who "can't do" science, social studies, math, or any number of things. Our students, in general, come to us with the expectation that they'll be told exactly what to do. And my initial reaction of "Uhhhh, I want to make a mosaic," was not really very different from the countless students I have asked, "What would you like to study?" and who looked at me with blank expressions. Clearly there are differences between an adult taking a recreational art class and students in school. But it seems there are lessons to be learned, nonetheless.

Every Project Needs the Right Beginning
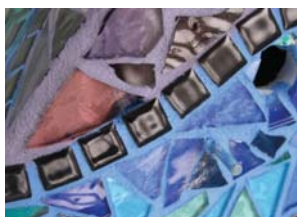
One of the first considerations in planning any kind of inquiry activity is, what is the goal? There are several kinds of activities that are sometimes grouped under the term "inquiry." Each of these needs the right beginning. A mismatch between the type of activity and its beginning can short-circuit an activity before it starts.

Content-Focused Inquiry: Presented Problems

Some inquiry activities are structured inductive activities designed to teach particular concepts or generalizations. For example, young children might explore a variety of materials to determine that are attracted by a magnet, or older students explore a series of poems to discover the strategies used in descriptive imagery. In these projects, the method allows students the flexibility to discover the targeted

principles, but the desired end result is pre-determined. It is the teacher's responsibility to carefully select the materials and target questions to assure that the students have the opportunity to discover the desired principles. For example, if the teacher in the magnet activity failed to provide any items that were copper or aluminum, students could reasonably develop the generalization, "Magnets attract all metals," and have no examples to contradict it. A good beginning for these inductive activities entails careful selection of materials and framing questions. Such problems, where the questions and goals are known and structured by the teacher, can be called *presented problems* (Getzels, 1964, 1987). In this case the problems could be called Type 2 problems, because the problem and correct answer, but not the precise method of solution, are known. (A Type I problem would be like an example in a traditional math book: the problem is known, the steps to solution are directed, and the answer is in the back of the book.)

Other inquiry activities are designed primarily to teach investigative skills, while still based in some aspect of core content. Many typical school research projects are of this type, another variety of presented problems. If the intent is to learn how to organize and communicate information from multiple sources, it doesn't matter whether the content investigated is medieval weaponry or medieval music—and if having different students investigate different content allows the group access to more content, so much the better. In this case, the activity begins with the teacher identifying the skills to be mastered, and then determining how much flexibility in content is desired. Then the activity—and, in particular, the evaluation criteria—can be developed at the beginning, to direct students for maximum success. If particular strategies or skills are to be demonstrated, those can be specified. Similarly, if specific content outcomes are to be addressed, those can be made clear to students. For example, if a general content outcome is to describe cultural transformation from medieval to Renaissance times, that understanding could be demonstrated using changes in either music or weaponry as examples of broader patterns. If those expectations are clear from the beginning, students are much more likely to successfully tie their varied explorations to the desired content and skills. If we are dealing with presented problems, the problems should be clearly presented.

Creative Activities and Problem Finding: Discovered Problems

Some inquiry activities, like my birdhouse adventure, are, at their heart, creative ventures. They may incorporate essential skills (for example, I learned a lot about glass cutting and grouting), but the project itself is designed around a problem the student selects. These are the kinds of problems Getzels (1964, 1987) called *discovered*

(or Type 3) problems, since the problem, method, and results are all unknown. Activities of this type can occur in any domain, but in school they may most often be found in creative writing, science projects, and the arts.

If we want students to experience the full creative process, they must experience the often-muddling beginning stage called problem finding. The problem itself must be discovered. Problem finding, in its broadest sense, underlies all types of creativity. Some of the most basic research in problem finding was done with visual artists (Getzels & Csikszentmihalyi, 1976). In those studies, artists were considered to be problem finding as they manipulated materials to find ideas for their paintings—much as I did with my birdhouse. *The more time and care the artists spent in finding and defining their problem (task), the more creative the outcome.* But problem finding is not limited to artistic endeavors. Every area of creativity requires an initial decision about the task to be addressed. Writers decide what to write; scientists decide what to investigate; historians set out to explore a new area of analysis. In each case they are finding a "problem"—a situation to address or ideas to communicate. Extending these processes into classroom situations can allow creative activities to occur there naturally. It is for this reason that it is so essential that we clarify our instructional goals at the beginning. If our focus is on concepts and generalizations to be understood, our key beginning task is making sure the activity has clarity of purpose and a structure that will allow students to interact with materials in a way that will allow the concepts to develop. On the other hand, if one of our core goals is to engage in the creative process (while, we assume, also teaching the skills associated with that process in a discipline), we cannot assign all students an identical "creative project" to pursue. Finding the task IS the task—or at least part of it. This means that just as I had to have time to look at books, see sample projects, and explore the available materials before beginning to learn the skills of mosaic-making, so students who begin a major creative writing project or individual scientific investigation will need time and support to find their problems. It is possible to structure activities specifically designed to teach students the skills or problem-finding, including exploring with interest, playing and wondering, and capturing questions (see Starko, 2010).

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Skill Development and Just-in-Time Teaching
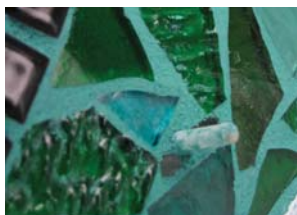
A second key to my growing confidence in mosaic-making has been the just-in-time teaching of needed skills. I initially envisioned class starting with instruction on all needed skills before beginning the project. Instead, we began the projects and learned skills as the need for them arose. While at the beginning this felt disconcerting (How could I be starting a mosaic knowing nothing about grout?), as I learned each new skill I gained confidence, not just in that skill, but in the fact that I would not be left to flounder. When the need for a skill came, the instruction was targeted and clear.

Similarly, in an inquiry activity, it is essential that teachers anticipate the needed skills and how they will be taught. In any inquiry process there are likely to be some parts where students should just "muck about" and learn things through experimentation, analyzing errors and critical thinking. There are other parts where leaving students to flounder on their own is inefficient, unsafe, or just silly. Clearly we would not let students "discover" how to use power tools. But it also may be foolish to have students spend a lot of time figuring out processes that can be taught in a straightforward manner, or concepts necessary for further analysis. For example, we could allow students to experiment with litmus paper or temperature probes, but we also could just teach them how those tools can be used, and then let them apply the skills to research questions. The choice depends on your goals for that lesson.

To me, this represents an important fallacy in some of the articles touting the "failure" of inquiry. For example, Klahr and Nigam (2004) claim to be comparing direct instruction with inquiry learning. However, all students designed experiments and gathered data. The more successful "direct instruction" group was given specific instruction on the characteristics of a good experiment before being asked to design experiments of their own. In my view, this is not a repudiation of inquiry; it is an example of well-structured inquiry, including instruction that facilitated students' investigations. Viilo et al.'s (2011) assessment is a classic understatement, "The delicate balance that enables novice performers not to experience cognitive overload . . . is difficult to achieve" (p. 52).

Creating a Place to Try

The bedrock of successful inquiry is a classroom atmosphere that encourages trial-and-error, a "problem-friendly classroom" (Starko, 2010, p. 120). Even as an adult, I've been struck by how much my interactions with the other students have affected both my willingness to try, and my enjoyment of the journey. For the first several weeks of my mosaic class, I said very little. Several of the other students clearly knew each other well and talked about their outside activities during the class. Those of us who were new kept quiet. Then one week I was unable to come to my usual class, so I attended another section offered on a different day of the week. By chance, I knew one of the other students. We started talking, then I ended up talking with most of the people in that class. I attended that class several times and always felt more comfortable there than in my assigned group.

What is important in this experience is not that one group was more welcoming than the other—those things happen in any teaching situation—but how much difference it made in my process of birdhouse building. In my original group, I might occasionally ask a question ("Where did the glue go?"), but basically I stayed quiet and cut glass. In the second group, collaborative problem solving was frequent and effective. Individuals often sought feedback on their glass choices, the color of their grout, placement of individual pieces, and everything else imaginable. One night, while continuing to work on their own pieces, the whole group worked together to figure out a particularly tricky grout problem. It ended up being solved in a manner the teacher had never used before.

In addition to just being a happier place to be, this classroom transmitted important messages loud and clear, "No one has all the answers here. We're all experimenting. If you are stuck, you have lots of resources. Sometimes things go wrong; we just fix them." The collaborative atmosphere also provided countless opportunities for informal learning. After having participated in solving the grout problem, I was much better prepared to address the multiple color needs of my birdhouse.

In contrast to the stereotype of the lone creator in a studio or bubbling lab, much inquiry in the real world is cooperative (see, for example, Sawyer, 2007). Scientists work in collaborative labs, design teams power the business world, and the

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Internet supports group efforts in multiple disciplines—even music written collaboratively by people who are never in the same room! Traditional school practices of "do your own work" and "eyes on your own paper" may be appropriate for particular evaluation activities but they do not mirror best practices of learning and inquiry in the real world.

Most classrooms have both more complex needs and richer opportunities for community-building than my once-a-week mosaic class. Inquiry activities often require a focused collaboration. For example, the teachers in Herrenkohl et al.'s (2011) study both emphasized the collective roles of their classes as intellectual communities, establishing a classroom where "any question was an opportunity for thinking" (p. 37).

The challenge is that problem-friendly classrooms cannot function just during "inquiry time." If every problem has a right answer and every answer comes from the teacher—except during those magic intervals when students are to be inquiring and figure the answers out on their own—inquiry is doomed to failure. A problem-friendly classroom isn't always solving problems, but it is always open to them. A class that is a safe place to make mistakes is safe all the time, or students will know that safety is a sham.

What makes a classroom safe for inquiry? This list is long, beginning with respect for individual students as mindful human beings rather than potential generators of test scores—a mindset that is not easy to maintain in today's high-stakes testing climate. A problem-friendly classroom incorporates strategies that are supportive of intrinsic motivation (Amabile, 1989), including support for interests and choice, fostering a sense of increasing competence, and care in using rewards. It also encourages questioning and experimentation, teaches both cooperation and independence, provides informational feedback in assessment, and encourages self-assessment (Starko, 2010).

Questioning and Experimentation

One key goal of a problem-friendly classroom is to encourage students to ask questions—each an opportunity for thinking. It is, after all, impossible for students to investigate, challenge, or dream without raising questions. Although it is important that students feel comfortable expressing confusion or lack of understanding about content being taught, it also is essential that they feel free to ask questions that go beyond the immediate issues. The essence of this type of question

is not, "I do not understand what you have explained," but "I wonder beyond what I know." Productive people wonder all the time—about the things they see, the things they hear, the things that trouble them, and the things that bring them joy. Wondering is at the heart of problem finding and inquiry. Unfortunately, students seldom experience this type of questioning in school. School questions generally have one correct answer, and it can be found in the back of the book. The real world is not like that. Teaching students to question, to wonder, is to provide them with a skill for lifelong learning—as well as creative inquiry.

There are at least five strategies you may consider to encourage student questions. First, teach students the difference between checking for understanding and genuine questions. They should know the difference between "questions" you ask to determine their understanding and things you genuinely want to know. Second, model real questioning behaviors. Share your puzzlement and curiosity with your students. Sometimes this may be a casual comment about a current fad, other times your questions may be more serious and related to the content.

Third, *teach* students to ask questions. Don't expect it to happen spontaneously. Some of your students have long experience in environments in which questioning is not welcomed. You may want to do a lesson on what constitutes a question, why people ask questions, and why questions are important.

Fourth, respond to student questions with respect. A friend's young daughter came stomping home from school one day, disgusted with her teacher's use of the K-W-L reading strategy. In the K-W-L technique, students are asked what they *K*now about a topic, what they *W*ant to know, and, later, what they have *L*earned. Her response was, "I don't know why they bother with the W anyway. She asks us what we want to learn, and then we just do what the teacher wants to do anyway." Although we know it is impossible to investigate every question posed by an enthusiastic group of learners, students should have confidence that at least some of their questions will be addressed and all of them will be valued.

Finally, and fifth, consider teaching the problem-finding (question-asking) strategies of your discipline. History teachers can teach about the kinds of questions historians might ask; science teachers can consider lessons that focus on asking good questions regarding particular observations. In all cases, understanding that knowledge comes from somewhere, often as a result of someone's question, makes it clear that questioning and problem solving are valuable skills.

Teaching for Independence

Organizing a classroom to facilitate inquiry implies many things. Certainly it demands a classroom climate that accepts diversity, welcomes new ideas, respects questions, and promotes exploration. There also are logistic elements that can support—or undermine—student inquiry. Among these are strategies that allow students to spend part of each school day working without specific teacher direction. Remember how disconcerted I felt when entering the mosaic class without directions? Similarly, students who are to work in any kind of inquiry activity are stepping out into unfamiliar territory, where the teacher is no longer the step-by-step guide. Even highly structured inquiry activities require students to make choices, ask questions, and work with some level of independence. Just as cooperative learning advocates clearly articulated that skills of cooperative work must be taught, not simply demanded (Johnson & Johnson, 1994), students' skills of independent work do not happen automatically. If most of your teaching has been teacher-directed whole-group instruction, your transition to a less directive mode will require planning.

The first key to making the transition to independent student work is realizing that you need to *teach* students how to work independently. It is not sufficient to tell them to be independent; you must teach them how to do it. You may start this process by planning a series of lessons specifically targeting independent work and inquiry. Topics could include such things as becoming independent, what it means to do inquiry work, what to do if you are stuck, and expectations about noise, use of materials, etcetera.

The need for specific instruction, modeling, and practice is not limited to young children. *Even secondary students who have had limited experience with independent work benefit from careful instruction on the procedures and expectations for this type of work.* In fact, the more ingrained the habit of waiting for teacher direction, the more vital such instruction may become. Students who are prepared for the ambivalence of inquiry are much more likely to stick with the task and be successful.

But You Didn't Have to Deal With Grades

I will admit I am grateful that no one graded my birdhouse. And yet, feedback from my teacher and my fellow students helped me shape the project and, ultimately feel successful. So we must consider, what about assessment?

One of the most powerful forces in determining classroom climate is the means, timing, and format of evaluation. In a traditional classroom the teacher teaches, students (presumably) absorb what they are taught, and when some segment of teaching is completed, there is an evaluation—most often a test or quiz. I should be clear that I am not opposed to tests, as one form of evaluation. When I teach assessment classes, learning to write traditional tests is one of many skills students must learn. But the traditional model of "teacher teaches, students learn, and teacher evaluates the results" is another source of powerful messages. It communicates that the teacher is both the source of knowledge and the judge who determines if the knowledge is accurate. Of course, both of those things are true in some classroom activities. But if students are to grow into independent inquirers, this cannot be the only perspective. A student who views the teacher as the sole focus of both learning and evaluation is wise to be cautious about attempts at inquiry. What if they don't "inquire" the right way? What if the teacher says they are wrong? Will they get a bad grade? It isn't surprising that such students want someone to just tell them what to do—much as I did at the beginning of my birdhouse adventure. Anything else, logically, feels risky.

Formative Evaluation

Surprisingly, one of the ways students can gain confidence in their academic endeavors is through the thoughtful use of assessment, particularly formative and self-assessments. Formative assessment is one of the most important concepts in assessment—and in education—today. There are a lot of definitions, but the one I think is the clearest comes from W. James Popham (2008) in his book *Transformative Assessment*. His definition is succinct but powerful: "Formative assessment is a planned process in which assessment-elicited evidence of students' status is used by teachers to adjust their ongoing instructional procedures or by students to adjust their current learning tactics" (p. 6). Each aspect of this definition is important enough that it merits a bit closer look.

First, formative assessment is a planned process. It is not a test—despite a lot of publishers' best efforts to market their materials that way. A test can be used in either a formative or summative manner. Formative assessment is not the instrument, it is the thoughtful manner in which teachers and students plan and use assessment information.

The information teachers and students use is assessment-elicited evidence. It can include formal and informal assessments. Formative assessments can include short quizzes or traditional class activities, but they also include my teacher watching my glass-cutting technique and pointing out how I could keep the glass from scattering, or her comment that the way my black lines wound around the birdhouse drew her eye around the piece. Each comment helped me identify either something I could improve or something I'd done well. Inquiry teaching is full of moments of informal assessment, as teachers evaluate "on the fly" whether students' investigations are progressing in constructive ways or devolving into wheel-spinning. Either situation can provide the opportunity for *descriptive feedback*, one of the key elements of successful formative assessment. Moreno (2004) found that even software is more effective at facilitating student inquiry when it gave explanatory feedback, rather than simply identifying if the student's response was correct or incorrect.

Perhaps the clearest identifying characteristic of formative assessment is that it is used to make instructional adjustments. Rather than moving ahead with planned instruction like something of a runaway train—with students either on board, clinging to the sides, or left beside the tracks—formative assessment allows teachers to make mid-course corrections and change tactics while instruction is occurring, instead of waiting until the end of body of instruction for the final judgment. Well-used formative assessment enhances the quality of instruction, because the teacher is constantly aware of the level of students' understanding and working to match it.

This is particularly essential when working with inquiry activities. Inquiry activities can be a challenge to our sense of efficacy as teachers because it is very hard to fool ourselves when things aren't going well. During direct teaching, we can move through the lesson, asking questions of a few students, and assume all students understand the information. It is much harder to delude ourselves during a lesson in which students are supposed to question or experiment and they lapse into blank stares. In truth, I think this is a gift of inquiry instruction, but it isn't easy. It takes sensitivity and a deft touch to involve students in inquiry activities, allow them independence to work, and yet recognize when a bit of helpful feedback will keep them

on course. An effective teacher in inquiry activities is constantly aware of what students are doing, what is going well, and where the sticking points may be. Such feedback has a collaborative spirit—the intent is not to judge, but to help students stay on a successful path.

Of course, teachers are not the only ones who use formative assessment. It is also the basis of student decision-making, as students make tactical changes in their learning strategies based on what they do and do not understand. The process of understanding, and taking responsibility for, their own learning processes can be both motivating and empowering for students. One of the differences I am finding in my second semester of mosaic, is that while I have more confidence in my own judgment, I'm also better able to identify when I need more information and less hesitant to ask for it.

Self-Assessment

Clear descriptive feedback (together with, where appropriate, well-defined scoring rubrics) gives students power. Understanding the criteria by which their work is judged can take evaluation from something a teacher "does to" them, to the application of an understandable set of standards. Students, too, can apply those standards in the process of self-assessment.

Self-assessment requires judgment. Allowing students to correct their own spelling tests is not self-assessment. An outside source (the dictionary) is the absolute determiner of the quality of the work. Effective self-assessment requires students to evaluate their efforts against some scale or criterion, and make judgments about how they measure up. Beginning in primary grades, students can be taught to evaluate their own products. They can assess their stories for complete sentences; a clear beginning, middle, and end; or the use of interesting descriptions. They can judge the use of color in their paintings or the precise definitions of variables in science projects. Initially, teachers should provide guide sheets or checklists to help students focus their evaluations. Later, students can add their own variables or develop their own forms of assessment. Understanding the criteria by which one is being judged can take both the mystery and at least some of the anxiety out of the evaluation process—which is essential if students are to fully engage in inquiries that feel puzzling and unpredictable.

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Finding Our Way

And so, in the end, the road to inquiry remains muddy. Such is the nature of the process. While teachers can define goals, in particular, articulating when there is a "right answer" to be identified and when there is not, in the end, the role of the teacher is not to take the mud out of the road, but to help students develop the skills to make the journey. We start to do this by knowing, ourselves, the kind of journey that lies ahead—is today's jaunt a direct route aiming at a particular peak above, or could it be a meandering trail leading to multiple goals? We prepare students with the skills needed for the journey, and the emotional support to continue when things get rough. And finally, we commit to clear and honest feedback that will help them stay on a successful path. I have learned how exciting it can be to manage a journey I thought was beyond me. May your students share my delight!

Fig. 1: My mosaic birdhouse

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