

Thinking “Outside the Lines”
By Dr. Debbie Silver
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Like Captured Fireflies

In her classroom our speculations ranged the world.
She aroused us to book waving discussions.
Every morning we came to her carrying new truths, new facts, new ideas cupped and sheltered in
our hands like captured fireflies.
When she went away a sadness came over us,
But the light did not go out.
She left her signature upon us,
The literature of the teacher who writes on children’s minds.
I’ve had many teachers who taught us soon forgotten things,
But only a few like her who created in me a new thing, a new attitude, a new hunger.
I suppose that to a large extent I am the unsigned manuscript of that teacher.
What deathless power lies in the hands of such a person.

--John Steinbeck

I did not have John Steinbeck’s teacher in the first grade. On the very first day of school Mrs. Castleberry, my teacher, asked us six-year-olds to color a worksheet picture of an apple. I dutifully pulled out my favorite two crayons, green and blue, and laboriously tried to get large chunks of colored wax to stay within the confines of the fruit outline centered on the paper. Not being blessed with fine motor skills, my strokes made their way beyond the boundaries of the paper itself. However, I was still quite pleased with my final product until a dismayed Mrs. C. held up my paper for everyone to see and pronounced, “Boys and girls, look at this. First of all, apples are NOT blue and green. But more importantly, I said to color *in* the apple, and look what Debbie did . . . she went *outside the lines!*” With a grand show of dismay she wadded up my paper and tossed it in the trash. I can still remember the collective “uh-oh’s” as other students quickly tried to conform their masterpieces to her expectations. We soon learned that there was to be no “outside the line going” that year! We were led through a tedious nine-month term of being quiet, sitting still, and repeating exactly what we were told to do. We brought Mrs. Castleberry no fireflies, no ideas, and certainly no new truths. As one who never made it out of the Buzzard group (or whatever insipid name she used for the low readers) I found myself constantly feeling like something was wrong with me. While some of the students were able to satisfy Mrs. Castleberry’s every abstract expectation, I was just thankful that I remembered to change my pajama bottoms for real underwear before I showed up at school. I knew the drum I heard was indeed distant and far away, but rather than learning to cherish my “outside the lines” thinking, I felt ashamed and frustrated. It was not a good year; when she went away, I was glad.

The good news is that there have always been teachers like Mr. Steinbeck writes about and that educators today are being encouraged and trained to be like the teacher he describes -- to help students purposefully “think outside the lines” (or outside the *box* as some say). Research has shown that simple knowledge acquisition is no longer enough to ensure students a place in the job market or guarantee a productive life. Students are now being asked to evaluate

evidence, make connections, consider alternatives, assess importance, and apply concepts in new and novel ways.

Teaching is now viewed as an interactive verb that requires the engagement of the learner. A teacher may say it, write it, demonstrate it, or in any other manner make a sincere effort to convey knowledge to students, but if the students do not *learn* it, it cannot be said that the teacher *taught* it. Thus the focus today has shifted from teachers being the gatekeepers of all knowledge and rules to one in which the teacher interacts with the curriculum and the students by designing active learning tasks, designing more authentic types of assessment, and redirecting time and energy (Vatterott, 1995). “The student focused classroom shifts emphasis away from the delivery of inert content to the interaction of individual students with the content” (Vatterott, 1995, p. 31).

In this new advocacy role teachers must now consider the distinctive ways that individual students truly know about their world. Multiple intelligences, learning styles, and even learning preferences are to be given due consideration. Curriculum is to be flexible enough to meet the unique needs of learners and is to be student driven more than teacher driven. Much is being researched and written about how best to advance the various student strength areas while compensating for areas of weakness. In practice, the results of applying brain research to thoughtful outcomes has been overwhelmingly successful. Thinking “outside the lines” refers to the practice of incorporating how students best learn with lesson designs that actively teach them how to enhance their own metacognitive skills. This paper will focus on an additional instructional strategy that can be used by all educators to help engage every learner.

The reality is that teachers live in a standards-based world in which accountability often means that students are required to demonstrate a common literacy and skills acquisition. Inasmuch as students who enter school have different knowledge levels resulting from diverse experiences, backgrounds, and cultural values teachers must take into account these factors and present new information that is related in a meaningful way to each learner’s existing knowledge. The task can seem daunting, but there is a relatively simple lesson design that has been used successfully by teachers across disciplines and for all grade levels to accomplish this end.

The Learning Cycle

“Although it is generally enhanced by the use of cooperative learning, the learning cycle can be incorporated into most teaching situations with little modification of classroom arrangement or materials. It primarily involves an ideological shift in lesson presentation and teaching responsibility. The basic idea is to begin lessons by engaging students in hands-on explorations rather than giving them vocabulary lists, lectures, or lists of rules” (Silver, 1998, p. 63).

Picture this classroom: The teacher holds up a standard piece of typing paper and tries to “fly” it across the room. Students giggle as s/he unsuccessfully makes several attempts to get the paper to move in the direction s/he wants. S/he then distributes paper, scissors, and paperclips. Students are asked to do whatever they like to their papers in order to get them to travel the farthest distance across the room. The children smile, design, fold, cut, compare, fly, modify, retry, discuss, and finally emerge with finished products ready for testing. During the exploration student comments range as follows:

“Hey, his is going further than mine. I’m going to fold my wings like that!”
“Look, if you get rid of some of the extra paper, it will stay in the air longer.”
“I’m making my pointed because I’ve never seen an airplane that wasn’t pointed!”

The teacher is using the first stage of the learning cycle to engage students in solving a problem that requires them to use process skills to gather and organize data. S/he closely monitors the group and guides them through her/his open-ended questions addressed to individuals and groups:

“Do you think there’s a reason that airplanes have pointed noses? What could it be?”
“Why do you think folding the wings makes the plane go further than leaving them flat?”
“Is there anything else that flies that is modeled like this?”

In this lesson, the teacher is using an exploratory activity that allows all students to encounter the same experience at the same time, giving them an equal starting point from which to construct their learning. By encouraging students to become active participants in their own learning, the teacher's role changes from "teller of facts" to "facilitator of discovery." In first asking students to use their prior knowledge to construct a product, s/he has engaged them in learning through an activity that arouses their interest and allows for exploration, discovery, questioning, and discussion (Silver, 1998).

As the students continue to explore, they discover that certain laws of aerodynamics seem to apply to all of their creations. They begin to articulate what they have observed in their own words. The teacher helps them translate such terms as “falls down” to “the pull of gravity” and “the harder you throw it” to “thrust.” Next, s/he may show a computer model of flight along with appropriate dialogue to help develop the concepts and clarify the explanations. Because of their prior shared concrete experience students are ready to participate in scientific discussions about lift, thrust, drag, and gravity. They are able to compare their observations from the data they collected in their previous explorations.

Once the students demonstrate an understanding of how actual flight occurs, the teacher asks them to apply what they have learned to computerized versions of cartoons involving flight. Learners are asked to state whether or not they believe the cartoon characters and contraptions could really fly and give rational explanations for their hypotheses. With a paint and draw program students can actually circle the areas of discrepancy and indicate how they believe this might be remedied. The children are actively involved in learning as they use their newly acquired skills and understandings to construct deeper meanings and broader applications of their discoveries.

With this lesson, the teacher has guided the students through the three phases of the learning cycle (also called discovery learning): exploration, concept development, and concept application (Silver, 1998). It should be noted that the learning cycle has been described in similar forms with steps of varying names whose numbers range from 3 to 6. For the purpose of this paper, I have used a model first presented to me in 1987 at an NSF-sponsored Operations Physics Training Program in San Diego, CA. The model has its roots in the Science Curriculum Improvement Study (SCIS), an NSF-sponsored elementary science program developed in the 1960s. Regardless of the number and names of the steps in a particular model, the learning cycle is not a one-way progression. At any point in a lesson, learners may shift back and forth among

the phases. It is the teacher's responsibility to monitor and informally assess where the students are, and where they need to go next.

The Learning Cycle's Three Phases

The **exploration phase** tries to initiate students' interaction with information, materials, and each other in order to investigate an open-ended question. All class members are given common, concrete experiences that challenge them to gather and organize data and compare their answers. Lessons involving paradoxical or conflicting information capitalize on their natural curiosity.

The **concept development phase** builds on student curiosity, discoveries, and inquiries as the teacher assimilates data that students have organized, and clarifies terms and concepts they have developed. In this phase, students are far more receptive to vocabulary lists, direct instruction, and investigating other resources because their earlier explorations have shown them the relevance of the lesson. They also are far more likely to retain ideas and concepts because they begin to see patterns and connections to their knowledge of the world.

During the **concept application phase** the teacher challenges students to apply their knowledge to real-world situations and to explore broader applications of their discoveries. At this point, the teacher can pose new situations and questions to ensure deeper understanding.

(Silver, 1998, p. 64)

Why the Learning Cycle Works

Instructional specialists advocate this kind of student-centered, active learning because it gives learners tasks that relate to their concerns, allows them to pursue their own interests, offers links to the outside world, and stimulates curiosity by introducing unexpected or unique information. (Silver, 1998). Learning is dependent on these factors:

1. The student's motivation.
2. The student's active involvement in the experience of learning.
3. Linking the new concepts with information that is familiar.
4. Being able to take new information and apply it to the real world.

Exploration

Often the exploration phase of the learning cycle is launched with a situation or question designed to capture the interest of students. An problem is posed in which new information that is introduced is inconsistent with knowledge previously thought to be true (i.e. the teacher cannot just fly a flat piece of typing paper across the room). Piaget (1974) referred to this type of knowledge when he described how students can be motivated to learn if they experience a sense of "disequilibrium." As long as the learner's environment is stable, mental activity is not necessary. But when an unfamiliar problem arises, the learner must use prior experience, new insights, and/or peer interaction to solve the problem and reestablish equilibration. During this motivational phase students are encouraged to manipulate materials and explore ideas without the specific outcomes designated by the teacher. Students use their skills to gather and organize data. Technology such as digital cameras, probeware, and software programs are now available to give students more tools to assist with their data collection.

Concept Development

The concept development phase is, as it has always been, a time for the teacher to provide direct instruction if needed. It is an excellent time for teachers to use multi-sensory and multi-task choices for students to learn "outside the lines." Students are involved as they are guided to create explanations, classifications, or hypotheses through discussions, mini-lectures, research,

models, and so forth. With the advent of the internet learners literally have at their fingertips links to all of the best research, models, and examples they would like to explore. The key idea in the learning cycle is that although this phase has traditionally been used to introduce lessons, research tells us that it is better placed *after* the exploration phase.

Concept Application

One of the concerns of traditional educators is that teaching “outside the lines” will take away time and other resources better spent on getting students to pass standardized tests. Without going into an argument on the legitimacy of teaching to a test, let it just be said that assessing for true understanding has little to do with merely acquiring isolated facts of content knowledge.

According to researchers (Newmann, Marks, & Gamoran, 1995, p. 3) assessment strategies are moving beyond superficial levels of comprehension and towards deeper understandings such as:

- Construction of knowledge: Students should construct or produce knowledge, instead of merely reproducing or identifying understandings that others have created.
- Disciplined inquiry: Students should engage in cognitive work that requires them to rely on a field of knowledge, search for understanding, and communicate in “elaborate forms,” their ideas and findings.
- Value beyond school: Students’ accomplishments should have value – either aesthetic, utilitarian, or personal—beyond just documenting their competence.

“Elaborate forms” have taken on new meaning with the introduction of Power Point presentations, Hyperstudio, graphing programs, and electronic portfolios. Students are now able to use their creativity and imagination to demonstrate knowledge that was never before able to be assessed. If we truly want students to become autonomous, life-long learners, then should we not be assessing that which we say we truly value even though it is indeed harder to measure? It is certainly more difficult to create divergent tasks that compel students to apply concepts to a broader perspective. It takes teachers who are firmly grounded in their subject areas and who are not afraid themselves to think “outside the lines” to foster a spirit of wonder and delight in learning.

In his book, *Awakening Genius in the Classroom*, Thomas Armstrong (1998) strongly advocates models that promote a natural rhythm to learning. He is concerned about tapping the source of what drives the learning process in every child. The learning cycle seems to be a good fit with his twelve aspects of students’ intrinsic motivation to learn – curiosity, playfulness, imagination, creativity, wonder, wisdom, inventiveness, vitality, sensitivity, flexibility, humor, and joy.

In summary, it can be said that teaching for understanding requires different strategies from those that were traditionally found in the classroom. In an “outside the lines” classroom, students’ misconceptions are addressed through exploration and discussion. Students explore their own questions as a way of acquiring new knowledge. In the educational community, there is agreement that traditional direct teaching is not the most effective way to promote conceptual change or real understanding of new concepts. It is generally agreed that the learning cycle is more suited to individualizing instruction and thus more successfully meets the needs of all learners in terms of student motivation, understanding, and development of higher level thinking skills.

Conclusion

The concept of teaching students to “think outside the lines” emerges from a cohesive set of ideas about knowledge and learning that have roots in philosophy and psychology. It is a model that teachers can add to their repertoire in order to engage learners and extend thinking. In examining the perspective of a learning cycle curriculum, it is evident that attention needs to be shifted away from the static, absolute curriculum which plows ahead regardless of the learners and towards a place where teacher control is not as valued as student creativity and knowledge construction. The challenge is to foster students' abilities so that they can continue to learn and to build their understandings based on the changing world around them. All students should have the teacher John Steinbeck wrote about. Every student deserves an “outside the lines” teacher who infuses learners with confidence, with enthusiasm, with hope, and with promise.

References

- Armstrong, T. (1998). *Awakening genius in the classroom*. Alexandria, VA: ASCD.
- Newmann, F. M., Marks, H., & Gamoran, A. (1995). Authentic pedagogy: Standards that boost Student performance. *Issues in Restructuring Schools*, 8, 1-11.
- Piaget, J. (1974). *To understand is to invent*. New York: Grossman.
- Silver, D. (1998). Engaging students in the learning cycle. *Principal*, 77 (4), 62-64.
- Vatterrot, C. (1995). Student-focused instruction: Balancing limits with freedom in the middle grades. *Middle School Journal*, 28 (2), 28-38.