Invited Book Review

P. Liljedahl: Building thinking classrooms in mathematics. Corwin Press, Thousand Oaks, CA, 2021

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Peter Liljedahl's *Building Thinking Classroom in Mathematics: 14 Teaching Practices for Enhancing Learning* is a groundbreaking work that redefines the landscape of mathematics education. With a focus on fostering a classroom culture that prioritizes critical thinking, problem-solving, and collaboration, Liljedahl presents a comprehensive framework comprising 14 teaching practices designed to transform traditional math classrooms into dynamic hubs of active learning.

This book is an examination of what the author Peter Liljedahl describes as studenting behavior and how, as observed by him, the traditional mathematics classroom environment shows “students not thinking and teachers planning their teaching on the assumption that students either couldn’t or wouldn’t think” (Liljedahl 2021, p. 6). The author wanted to see student behaviors after being told to complete a now-you-try-one task after the teacher had demonstrated to students how to complete the task. According to studies and research by Liljedahl and Allen (2013), only about 20% of students observed behaved exactly as expected, or in other words, tried it on their own. More often, student behaviors fell into one of these other categories: slacking, stalling, faking, or mimicking (Liljedahl, 2021). This behavior was observed across many different classrooms in the author’s findings, to the point where it is noted that non-learning behavior transcends classroom norms (Cobb, Wood, & Yackel, 1991; Yackel & Cobb, 1996) and has reached into the territory of institutional norms (Liu & Liljedahl, 2012), which extend beyond the classroom and are entrenched in the fabric of what is considered to be school.

The author goes on to talk about his research in finding universal teaching practices that will enhance studenting behavior to allow more student thinking to take place in the mathematics classroom. According to Liljedahl (2021), he went into the classrooms of over 400 K-12 teachers in the span of 15 years to enhance and refine the eventual 14 teaching practices that he recommends any K-12 mathematics teacher should implement in any classroom setting to create an environment in which student thinking is not only tolerated; it is encouraged. At the end of the text, the 14 teaching practices are separated into four different tool kits. The order of the teaching practices within each tool kit does play an important role in its effectiveness in transforming the math classroom.

In Toolkit #1, there is a focus on establishing routines and defining student behavior; simultaneously, a teacher will give thinking tasks, frequently form visibly random groups of three students, and use vertical non-permanent surfaces for tasks. These are considered the biggest shock to the system when it comes to traditional classroom norms, so it is important to implement these practices at the same time from the beginning of the school year (Liljedahl, 2021). By starting the school year with non-curricular thinking tasks that build to curricular activities after one or two weeks, students learn the desired norms and behaviors within a thinking classroom early. Students feel more comfortable with making mistakes and have an opportunity to use their own voice more often when they work on vertical non-permanent surfaces and when they work with small random groups that are changed on a daily basis.

In Toolkit #2, there is more of a focus on the teaching practice. Within this toolkit, these teaching practices can be implemented in any order: defronting the classroom; answering only “keep thinking” questions; giving thinking tasks early, standing, and verbally; giving check-your-understanding questions, and mobilizing knowledge (Liljedahl, 2021). *Defronting the classroom* requires moving furniture and the teacher being positioned in such a way that students do not always know where initial learning may be taking place. When the teacher answers fewer questions and only gives hints and extensions as answers to the questions that allow students to keep thinking, students tend to learn more from one another within their own group and from other groups around the room. When a teacher gives the thinking task early, standing, and verbally, students are likely to engage deeply with the task and can easily transition to starting thinking tasks in a shorter amount of time. Rather than giving students traditional homework, the author posits that teachers give students non-graded check your understanding questions with a simplified answer key as a way for students to reflect on why they practice. When mobilizing knowledge during a thinking task, student groups can look around the room to see what other groups have completed and what hints or extensions the teacher may have written on their boards. This collaborative learning environment gives students multiple perspectives that may assist them in their own thinking.

The teaching practices in Toolkit #3 allow the teacher to help create flow within their lessons; creating flow helps students to be willing and ready to learn about anything (Liljedahl, 2021). The teaching practices within this toolkit should be implemented in order without moving on to the next practice until the previous one has been established. These teaching practices include asynchronously using hints and extensions to maintain flow, consolidating information from the bottom, and having students write meaningful notes. The teacher uses their own colored marker to provide hints and extensions on some vertical non-permanent surfaces which allows the group, and other groups that are also mobilizing knowledge, to persevere through thinking tasks. When the teacher brings the class together to sequentially walk through certain groups’ work throughout the classroom, students are reassured of their learning by starting at the “bottom” level of understanding and then seeing ideas emerge in more complicated examples. By incorporating time for meaningful notes as a way for students to record their learning and reinforce their own understanding, students can work more to be collaborative with other students in determining what is important to remember and will retain more from their learning in the thinking tasks.

In the final toolkit presented by Liljedahl (2021), he establishes what assessing students will look like in a thinking classroom. Toolkit #4 should be implemented last of the four toolkits; however, the practices within the toolkit are to be done in sequential order. The practices for assessing students in a thinking classroom include evaluating what the teacher values, helping students see where they are and where they are going, grading based on data (not points) (Liljedahl, 2021). In the thinking classroom, a teacher may value certain day-to-day activities such as perseverance, risk-taking, and collaboration. In this sense, a teacher can co-create a common language with students (possibly using a rubric), to help students visualize what the teacher expects of them in that classroom. Using a navigation instrument to help students see their progress within math content or standards will give students an up-to-date look on their understanding of the concept and will further help them to focus and to give them more responsibility in their own learning. These navigational tools will eventually give the teacher a way to grade students based on observational and conversational sources both at a collaborative level and at an individual level. These three pieces within the

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toolkit will give a more equitable picture of each student's depth of knowledge and shift their perspective to see grades as an indication of their progress rather than a product.

In conclusion, Peter Liljedahl's book, *Building Thinking Classrooms in Mathematics,* underscores the importance of creating a safe and supportive learning environment where students feel comfortable taking risks and making mistakes—a crucial aspect of developing mathematical resilience and perseverance. The content of the book is applicable to all grade levels of any subject in K-12 mathematics. The amount of information presented by the author can seem overwhelming when taken in all at once; however, by following the sequence of practices presented in the toolkits and taking time with implementation at the start of the school year, teachers will find that they are creating a classroom culture that encourages and nurtures students into becoming lifelong learners and thinkers. With its evidence-based strategies and emphasis on student-centered learning, this book offers a roadmap for creating vibrant mathematical communities where every student has the opportunity to thrive.

References

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Scott Boettinger is a dedicated middle school math teacher in Howard County who enjoys working with teachers, students, and families to create a positive learning environment. In 2023, he was named MCTM's Outstanding Beginning Mathematics Teacher for his commitment "to creating nurturing and inclusive classroom environments, where every student feels a sense of belonging and confidence in their mathematical abilities" (interview with Jon Wray, HCPSS Coordinator of Secondary Mathematics). In addition, he strives to give himself the time and energy every day to fill his own cup.