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Discovery as culture, not template: lessons from Hungary

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Abstract. In this study, I investigate the structural adaptations necessary to implement Hungarian-style guided discovery in mainstream secondary school classrooms. During a six-week residency in Budapest, I observed classrooms, interviewed five Hungarian educators, and collected survey and interview data from students. My findings suggest that guided discovery in Hungary is less a fixed method and more a pedagogical culture, shaped by shared values, historical influences, and professional communities. While Hungarian educators praised its ability to foster deep thinking, student agency, and creativity, they also described challenges around pacing, assessment, and curriculum alignment. Structural supports such as flexible curriculum frameworks, professional networks, and differentiated assessment practices emerged as critical enablers of the method's success. Student responses revealed both the promise of discovery-based instruction and the pressures it can create without sufficient scaffolding. I conclude that Hungarian-style guided discovery is not best understood as a replicable model, but as a set of values that evolve through professional dialogue and trial-and-error. Its meaningful implementation depends not on uniform procedures, but on the presence of cultural, institutional, and community structures that allow teachers to make it their own.

Key words and phrases: guided discovery, Hungarian mathematics education, Pósa Method, pedagogical culture, structural adaptations, student agency.

MSC Subject Classification: 97D40, 97D50, 97C30.

Introduction

As a high school mathematics teacher and aspiring education researcher, I am interested in instructional methods that foster student agency, persistence, and

deeper conceptual understanding. During a six-week residency in Budapest, I observed how Hungarian teachers approach "guided discovery" in secondary contexts. The definition of "guided discovery" that most closely aligns with what I witnessed in Budapest is the following: a method in which students engage with a particular task that leads them to notice patterns, generate insights, and ultimately arrive at formal mathematical ideas. The Hungarian version of this method that I interacted with is the Pósa Method, a problem-thread approach developed by Lajos Pósa. The method's influence appears both in classroom practice and in mathematics textbooks shaped by Tamás Varga, where tasks are structured to help students surface ideas before formalization.

Across my observations, interviews, and student surveys, I saw a rich approach that encourages deep thinking and independence, but also encountered constraints such as pacing pressures, curriculum alignment, assessment demands, and support for struggling students. Although existing research documents outcomes of the Pósa Method, less is known about the structural conditions that sustain guided discovery in everyday classrooms or about how its core features shift when adapted. This study addresses that gap.

This paper explores the motivations behind implementing guided discovery, the adaptations teachers make, and the institutional supports that shape its classroom use. My goal is to help teachers integrate discovery-oriented principles into their existing practice without feeling pressure to replicate a scripted method exactly as designed. I use the term *structural adaptations* to describe institutional conditions, routines, and assessment systems that influence discovery-based teaching. I use *pedagogical culture* to describe the shared norms and informal practices through which teachers learn this work. This study investigates: *What structural adaptations are necessary to implement Hungarian-style guided discovery in mainstream secondary school classrooms?*

Literature review

The Pósa Method and Hungarian guided discovery

Hungarian mathematics education has a long tradition of problem-centered instruction grounded in exploration and teacher-guided inquiry. Lajos Pósa's problem-thread pedagogy, termed the Pósa Method, was originally developed for enrichment camps and later adapted for classrooms. The Pósa Method relies on carefully sequenced tasks that encourage persistence, productive error-making,

and multiple solution paths, with teachers offering strategic prompts instead of direct explanation (Matzal et al., 2020; Urbánski et al., 2022).

This approach is not an isolated innovation, but part of a historical lineage shaped by Tamás Varga, whose mid-20th-century curricular reforms positioned discovery, manipulatives, and student-generated strategies at the center of mathematical learning. Varga's textbooks and teacher-facing volumes, along with subsequent analyses of his work, articulated a philosophy in which intuition, dialogue, and concrete experience precedes formal abstraction (Varga, 1969; Gosztonyi & Varga, 2023). Scholars describe this tradition as forming a distinctive "Hungarian mathematical culture" that integrates structured problem sequences with inquiry-oriented teaching (Gosztonyi, 2016). In this way, the contemporary Pósa Method builds directly on Varga's foundations, contributing to the understanding that "discovery" is more of a guiding pedagogical culture than a singular technique.

Although influential, the Pósa Method (and discovery learning in general) is unevenly adopted across Hungary. Research consistently finds that successful implementation depends heavily on teacher expertise, professional learning, and access to well-designed task sequences (Katona & Szűcs, 2017). Gosztonyi and Varga (2023) describe how visual representations of problem sequences can help novices, but much of the method relies on tacit judgment that is difficult to teach. Replicable structures and sustained communities of practice appear necessary for its effective dissemination.

Related discovery traditions globally

The theoretical foundations of the Pósa Method align with long-standing traditions in discovery learning and inquiry-based instruction. One early and influential figure in this lineage is Jerome Bruner, an American cognitive psychologist whose mid-20th-century work shaped modern theories of learning by arguing that conceptual understanding deepens when learners actively construct ideas rather than receive them passively (Bruner, 1961). A related instructional tradition emerged in mathematics through the work of Robert Lee Moore, an American mathematician who developed what later became known as the Moore Method. Originally designed for university mathematics instruction, this approach asks students to learn through carefully sequenced problems and student-presented proofs, with instructors minimizing lecture and explanation (Coppin et al., 2009). Like the Pósa Method, the Moore Method foregrounds productive struggle, problem sequencing, and teacher restraint, while also encountering similar tensions

around curriculum coverage, student anxiety, and the level of expertise required of instructors.

Building on these earlier ideas, inquiry-based learning (IBL) has emerged as a broad international framework spanning both school and university contexts. The literature suggests that high-quality IBL can improve conceptual understanding and student engagement, particularly when teachers are well supported and tasks are carefully designed (Hmelo-Silver et al., 2007; Lazonder & Harmsen, 2016). Although these approaches are not historically connected to Hungary, they share key structural features with Hungarian guided discovery, including sequenced tasks, student exploration, and strategic teacher facilitation (Artigue & Blomhøj, 2013).

More recent large-scale initiatives illustrate how these ideas have been adapted across diverse educational systems. European projects such as PRIMAS document inquiry-rich classroom practices in which students collaboratively generate solutions and present their reasoning (Engeln et al., 2013). Similar approaches appear in Asian contexts, including lesson-study-based inquiry in the Philippines (Lomibao, 2016), guided-discovery interventions in Indonesian secondary classrooms (Yuliani & Saragih, 2015), and Korean research emphasizing student-generated representations and teacher-facilitated discussion (Pang, 2016). Studies from South Africa likewise document adaptations of guided discovery aligned with local curricular expectations (Mabhoza & Olawale, 2024).

Taken together, these traditions suggest a pattern of convergent development in mathematics education. Across time and geography, educators have independently developed task-based, inquiry-rich practices that resemble the pedagogical spirit of the Pósa Method, even when their historical origins and institutional supports differ. This broader landscape situates Hungarian guided discovery not as an isolated innovation, but as part of an ongoing effort to prioritize sense-making and deep mathematical thinking.

Teacher agency and pedagogical adaptation

In considering how the Pósa Method might travel to other contexts, research on teacher agency is essential. Marshall and Horn (2025) describe teachers as "agentic synthesizers" who reshape practices based on their goals, students, and classroom realities rather than following methods step by step. This perspective frames inevitable variation in teaching to be productive rather than problematic. Given the diversity of phenomena in mathematics education, which often requires different theoretical lenses for explanation and action (Schoenfeld, 2010),

no two implementations will look the same. For Hungarian-style guided discovery, the goal may not be to exactly replicate the method, but rather to support teachers in developing context-sensitive versions that preserve its core spirit.

Methods

Research design

This study employed a qualitative research design, incorporating interviews, classroom observations, and student surveys to investigate the structural supports and adaptations necessary to implement Hungarian-style guided discovery in mainstream secondary classrooms. The primary goal was to understand how this approach functions within Hungarian classrooms, how teachers interpret and adapt it, and how students experience it.

Participants

Participants included five Hungarian mathematics educators and a group of Grade 9 students from Hungary. For confidentiality, all participant names used in this paper are pseudonyms. All communication was done in English, these participants' second language. Readers are advised to keep this in mind, as robust thoughts from the participants could have been limited or meaning could have been lost in their personal translations.

All educators involved in the study interacted with guided discovery through a combination of classroom teaching, teacher education, and enrichment camps. Linda and Flóra currently teach in teacher education programs and have conducted research on assessment and teacher knowledge. Máté and Kata teach secondary mathematics, drawing directly on the Pósa Method in their classrooms. Kata is also pursuing a PhD on guided discovery. Gábor, active in both secondary and university contexts, has long experience with gifted math camps and directs a foundation supporting gifted education. Together, these teachers represent diverse perspectives on how guided discovery is interpreted and adapted. Fourteen student survey participants, aged 14–15, were all members of Kata's standard level mathematics class at a Budapest secondary school. This full class only appears in the paper survey data.

A smaller group of seven students participated in a follow-up interview at the school camp. This group included three students from Kata's guided-discovery classroom and four students who were taught by a different teacher using more traditional instruction. No formal control group was established; rather, the comparison arose naturally from the mixed-group camp interview context.

Data sources

Three primary data sources informed the study:

(1) Semi-structured interviews with the five educators listed above, each approximately 30–60 minutes in length.

(2) Classroom observations, conducted in two contexts: (a) Grade 9 math camp lesson, (b) regular school lessons (Grade 8 and a Special Mathematics track class).

(3) Student surveys and interviews. Fourteen students from Kata's class, gathered at their school's camp, completed a paper survey of 13 Likert-scale items and 3 open-ended questions. A follow-up interview with seven volunteered students (three from Kata's class and four from a traditionally taught class) provided additional qualitative data.

Detailed teacher biographies and full survey administration notes are included in the Appendix.

In addition to field-based data, I analyzed two Hungarian mathematics textbooks rooted in the tradition of guided discovery. The first chapter of Varga's textbook (1969), *Matematika tanítása az alsó tagozaton*, is a teacher-facing text featuring classroom dialogues, structured problem sequences, and pedagogical commentary on discovery-based instruction. The second textbook, *Kombinatorika* by Eszter C. Neményi (2015), is a student-facing combinatorics text that reflects Varga's influence and models open-ended, scaffolded problem-solving. Together, these texts illustrate how Hungarian guided discovery is communicated through curriculum design and provided written reference points for interpreting interview findings and classroom observations.

Analytic approach

In analyzing the data, I looked for recurring ideas, concerns, and insights that showed up across different sources. This process (Linneberg et al., 2019) helped

me organize the data and figure out what ideas were coming up most consistently. Eventually, I sorted the data into six main codes:

(1) Curriculum Fit and Flexibility,
(2) Time and Pacing,
(3) Assessment Practices and Tensions,
(4) Student Experience and Perceptions,
(5) Dissemination Structural Supports,
(6) Inclusion and Equity.

Findings

Curriculum fit and flexibility

Across interviews, all five Hungarian teachers noted that guided discovery does not align neatly with standardized curriculum pacing. This misalignment, however, does not make implementation impossible. Rather, it requires reinterpretation of what curriculum coverage looks like.

> I did finish [the curriculum]... I think the Hungarian curriculum is lenient, so it's kind of easy to finish in the given time frame... but maybe the practice is shorter than in a regular classroom (Máté).

> I wouldn't claim it saves time, but... you can implement it in the same time frame [...] I make sure that the students have a solid understanding of the basics [...] and those basics will stay with them (Flóra).

Gábor echoed this call to rethink curriculum priorities, especially for mainstream learners. He challenged the notion that students must master every topic, especially ones with limited application: "The important thing is to find the tools which can teach our students how to think." The Hungarian educators' willingness to prioritize development of deep-thinking skills echoes principles in foundational texts. Varga warned against teaching abstraction without intuition (Varga, 1969). His lessons often began with tangible experiences before introducing symbols or generalizations, supporting the idea that lasting understanding develops from student exploration.

This reframing, of depth over breadth, showed up again in how teachers talked about the purpose of instruction: not to "cover" content, but to prioritize long-term understanding, even if that means students temporarily appear to know less. Finding success with this process, however, either requires flexibility in curriculum

or other instructional support for maintenance. With the latter, it may be hard to tell whether it is the method or the surrounding teaching practices that lead to any observable positive outcomes.

Time and pacing challenges

Time surfaced as both a logistical and pedagogical constraint. Teachers acknowledged that guided discovery lessons take longer to execute, and that this can create tension with coverage goals. Máté was blunt, "It actually takes longer... Guided discovery takes a long time." However, he explains, "If the students are doing real mathematics, not just repeating steps, that takes time. But it sticks."

Kata offered a similar perspective: guided discovery "is even more time consuming" at the beginning, but she believed that "in the long run" students remember more, so less re-teaching is needed before exams. Gábor echoed this, describing mainstream implementation as "much, much slower than I expected," but noted that "after 2 and a half years, we got a payoff." He emphasized that learning is non-linear and that it was "okay" for some students to take more time and "later [...] catch up."

At the same time, Gábor worried that for "the bottom half of the age," guided discovery may not be feasible if the goal is full curriculum coverage: "If you have this goal to cover the entire curriculum, then I think it doesn't work [for lower-tier students]." While he stressed that these students would still benefit from discovery, his concern highlights a tension between pacing and inclusion.

Student surveys revealed this tension from learners' perspective. While many students reported high engagement, some noted feeling rushed or left behind: "Sometimes when we learn a new module I feel rushed to understand that," and "I think the others are more faster than me." Likert-scale responses on pacing (Figure 1) were mixed: just over 40% felt they had enough time to complete activities, while more than half agreed that they sometimes felt rushed. These results suggest that while many students feel the time given is sufficient, a substantial number experience pressure during moments of conceptual understanding.

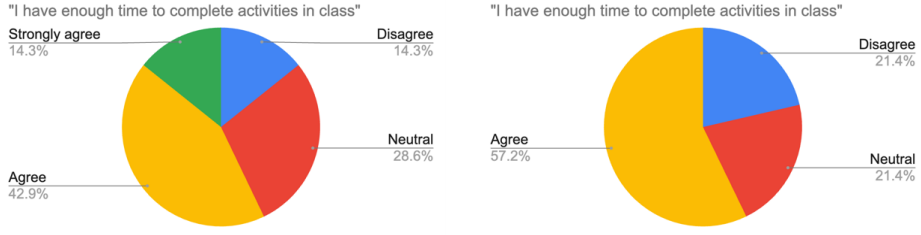

Figure 1. Student perceptions of pacing during guided discovery activities

Assessment practices and tensions

The topic of assessment becomes central when considering the feasibility of guided discovery in everyday classrooms. A common critique of discovery-based instruction is the concern that students may not retain content or perform well on examinations that emphasize formal procedures and conceptual accuracy. The educators in this study approached this tension in two different ways: some modified their assessment and grading practices to align with the values of guided discovery and to reinforce the confidence-building aims of daily lessons (as seen with Flóra and Linda), while others administered traditional tests and expected that guided discovery itself would equip students to succeed on content-based exams (as seen with Máté and Kata). This contrast begs the following wondering, pertinent to mainstream classrooms: does maintaining traditional testing practices limit the extent to which guided discovery can be implemented in regular lessons, or does it have no effect at all?

Flóra, who teaches at a school that omits traditional grades entirely, administers a "Trial of Knowledge" each trimester. The assessment is scored by percentage but framed more as a tool for reflection: "The aim is actually to inform them about where they are [...] If the scores are not high enough, then they will retake it, and they will need to practice more." Her system includes a rubric-based report with weekly homework (mandatory and voluntary), class participation, and a narrative evaluation. Voluntary homework allows for both reinforcement and enrichment, and students can earn bonus points to apply to their test scores.

Linda, whose PhD focused on alternative assessment, developed a robust point-based system where students earn credit for classwork, homework, and a unit test. The monthly point total is converted into a grade, blending formative

and summative elements. She noted that students who accumulated many points through sustained engagement tended to perform well on the final test, effectively learning through the process of point collection itself. She designed the system to ensure that points reflected real learning and regularly gathered student feedback to adjust point values.

In contrast, Máté separates guided discovery from summative testing. "Tests are not for teaching," he explained. "For the test, I use more regular problems [...] I encourage students not to try the guided discovery approach on the test." While he does not use explicit formative assessments, he feels that discovery lessons naturally provide "a good picture of where they are." Similarly, Kata, who works in a school with conventional grading expectations, composes her gradebook mostly from quizzes and tests. She designs these assessments with care, aiming for tasks students can handle methodically while still including a small leap of insight: "I want to make them think [...] not a huge gap, but some little twists and turns." She also uses partial credit and small incentives such as stamps for "quick tasks" or extra problems, creating a low-stakes structure that rewards risk-taking and curiosity.

The student paper survey data of Kata's class presented a range of experiences. Some students expressed appreciation for the freedom and creativity discovery offers, while others felt less confident about its connection to formal evaluations: "Because of the not-so-consistent tasks, I often find myself feeling unprepared for our tests;" "Sometimes I know how to think but not how to write the answer."

In Hungary, students must eventually sit for the Matura exam at the end of Grade 12, a standardized national assessment that plays a significant role in university admissions. At the culmination of the Urbanski study (2022), of which Gábor was one of the teachers for, the research group got to see how the students who learned math through the Pósa Method for four years performed on this exam. Gábor told me in his interview, "these test results [were] absolutely average. So not below, not above, it's totally the same as the previous 15 years."

Student responses on the paper survey regarding Matura readiness revealed mixed perceptions (Figure 2). While over 70% of students agreed or strongly agreed that guided discovery prepares them well for the Matura exam, 50% reported needing additional independent practice. Nearly 86% expressed agreement or neutrality about preferring more direct instruction of formulas and concepts to

feel fully prepared. These results suggest that although students value discovery-based learning, some remain uncertain about its effectiveness for high-stakes cumulative exams.

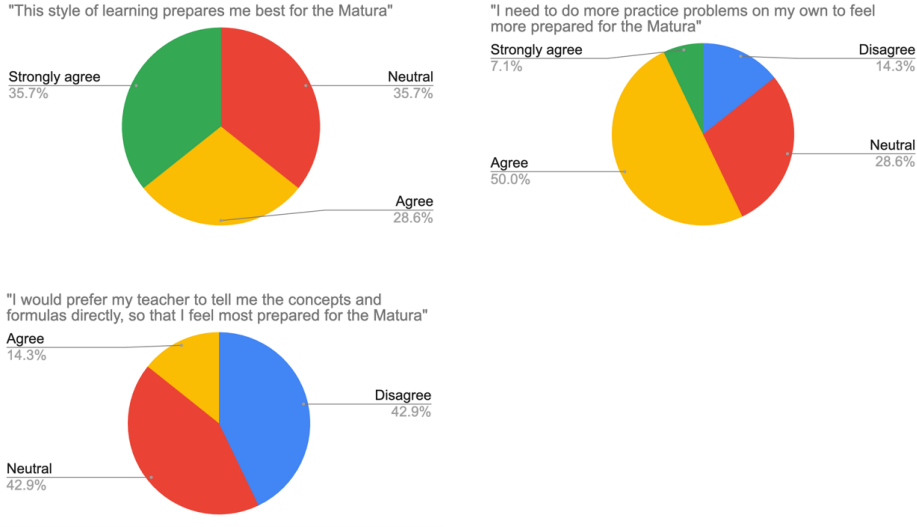

Figure 2. Student perspectives on Matura exam preparation

Student experience and perceptions

Despite some concerns around pacing and assessment, students overwhelmingly described their experience in Kata's guided discovery classroom as creative, engaging, and rewarding:

- "I really like that my teacher never directly tells me the formulas [...] Sometimes we find 2 or 3 other options to solve a problem."
- "When I find out something, I usually feel so happy."
- "Not just numbers and formulas, but logic and games too."
- "I don't like math but I like it here. At my old school I always felt like the ones who already knew math could just go faster [...] here I feel like I can catch up."
- "I like that our teacher lets us struggle for a little. Not too much, but a little."

The style of classroom dialogue described by students mirrors examples found in Varga's textbooks (Varga, 1969), which include real classroom transcripts.

These sequences typically begin with physical or visual tasks, invite students to generate strategies or conjectures, and culminate in shared discoveries. Additionally, Varga encourages teachers to ask students to write story problems for arithmetic expressions, transforming formulas into student-generated meaning.

During the student interview with the seven students (three from Kata's class and four from a traditionally taught class), I asked the participants to hold up a number from 1 to 4, to inform me how many class periods (out of four weekly math lessons) students reported that they (1) felt engaged in class, (2) understood 80% of the material, and (3) were exposed to real-world applications. The results are shown in Table 1:

Question	Kata's Students (n=3)	Other Students (n=4)
Engaged in class	3, 3, 3	2, 3, 2.5, 1.5
Understood ≥ 80% of material	2, 2, 4	4, 4, 4, 3
Exposed to real-world applications	4, 4, 4	1, 1, 1, 1

Table 1. Student perceptions of engagement, understanding, and applications

Kata's students reported higher levels of classroom engagement and significantly greater exposure to real-world applications. In contrast, students in the comparison group rated their understanding of the material more consistently and highly. These responses suggest that while Kata's guided discovery approach fosters engagement and real-world relevance, students in the comparison group may experience more day-to-day clarity in what they are expected to learn.

In reviewing the paper survey on broader questions about classroom experience and instructional clarity, a mostly positive outlook emerged with distinct variation in confidence and enjoyment (Figure 3). Nearly 79% of students agreed or strongly agreed that their teacher explained things clearly, and 86% reported that they understood the purpose of their activities, suggesting that the core instructional intentions of guided discovery were successfully communicated. However, only 57% of students agreed that they consistently enjoyed class, and just 50% felt confident in their math ability. These responses indicate that while guided discovery may promote clarity and purpose, it does not automatically guarantee affective outcomes like enjoyment or self-confidence for all students.

Figure 3. Student reflections on clarity, confidence, and enjoyment

Structural supports for dissemination

Although guided discovery is deeply valued by the Hungarian educators interviewed, it has not gained widespread traction in mainstream education. The absence of centralized dissemination and consistent structural support has led to uneven adoption. Because the approach relies on students engaging with challenging problems and receiving minimal direct instruction, teachers must make independent decisions about scaffolding and structure, resulting in substantial classroom variation. This raises key questions: *How is this method taught? And if its classroom implementation is expected to differ from teacher to teacher, is it even a method at all?*

The experiences of the Hungarian teachers interviewed offer a limited, yet illustrative, response to these questions. Each educator encountered guided discovery through a combination of coursework, immersive experience, collaborative communities, and reflective practice. Flóra and Gábor took a course from Lajos Pósa himself, Linda took a course from Gábor, and Máté took a course specifically on the Tamás Varga method. Máté was additionally a student himself at one the Pósa camps. He explained, "This is how I was taught [mathematics]. This is the method I know and believe in. I did not learn it formally, I just started doing it." His current teaching mirrors the camp structure: emphasizing student autonomy, long problem threads, and strategic hinting.

Gábor was first introduced to guided discovery by Pósa at age 13 through math camps and small group sessions, where students explored problems and ideas collaboratively with minimal direct instruction. This experience shaped his view of mathematics as a subject best learned through problem-solving. As a teacher, he initially doubted the method's fit for mainstream students, but after years of implementation, he found that with patience, flexibility, and confidence-building, it worked well.

Flóra, Kata, and Linda also participated in or were influenced by the Hungarian mathematics camp tradition, though their initial exposure to guided discovery was more observational and self-initiated:

> At the beginning I didn't really understand what it was [...] I thought I was doing discovery when I was just asking questions. But I realized it's about what students are doing. The work has to be theirs (Flóra).

> In the beginning, I gave too many hints or too little structure [...] but then I started seeing how they responded and adjusted (Kata).

> I was never trained formally in it. I started experimenting because I needed something different. And then I made it my research (Linda).

All three credit their exposure to Hungarian mathematics enrichment, either directly through camps or indirectly through colleagues and academic circles, as deeply influential to their current instructional styles. Several teachers, however, emphasized that guided discovery cannot be implemented in isolation. It requires institutional structures, teacher autonomy, and a supportive school culture:

> The biggest challenge is not the method, it's the system around it. If your school or your leadership doesn't give you time or support, it's impossible (Linda).

> If I didn't have the support of the math circle community and my camp work, I probably wouldn't do this kind of teaching at school. The system itself isn't enough (Máté).

> Community is very important. So the community of the teachers. If you're just doing it on your own, there are a lot of difficulties, but if you can communicate with other teachers, then it makes it so much easier. Because maybe you can share techniques and materials, but also because you can share dilemmas. I think that's even more helpful, sharing your dilemmas and seeing that other people have similar challenges, both from an emotional, but also from a practical perspective, it's very helpful (Flóra).

Teachers also described adapting the method in response to their own constraints, whether by shortening problem threads, mixing in direct instruction, or gamifying practice tasks. These adaptations show that Hungarian guided discovery is not a rigid model, but a flexible practice shaped by the individual teacher's contexts.

My final question to Gábor in our interview was "Because the Pósa Method requires so much flexibility, is it not really flexible in its dissemination?" He nodded his head and responded "yeah, yeah [...] one problem is that the teachers themselves are not confident enough [...] they are not so good at math. They can tell their students to ask questions, but what happens if [they] cannot answer? Of course, nothing [...] And another thing is that usually the curriculum and the system is not flexible to implement [this] method."

These educators' thoughts on implementation inform us on the limitations of the method's dissemination to mainstream secondary classrooms. Not only does

the method require a certain amount of flexibility and institutional support, but for it to see its full potential, there may even be unspoken requirements on the mathematical ability of the teacher and students themselves.

Inclusion and equity

While guided discovery is often celebrated for its potential to engage a wide range of learners, some teachers raised concerns about how it interacts with student diversity and curricular equity. Gábor reflected candidly on the tension between inclusion and curriculum coverage. He initially doubted whether guided discovery could succeed with mainstream students, but over time found that with strategic pacing and confidence-building, "we got a payoff." His experience affirmed that student confidence was often the main barrier, and that guided discovery can thrive outside enrichment settings when thoughtfully implemented.

At the same time, Gábor questioned whether full curriculum coverage is always feasible under a discovery model, particularly for students who struggle with foundational skills or lack prior support. He expressed concern about requiring all students to master every topic, such as the Law of Cosines, logarithms, or quadratics, and suggested that some learners "don't need these advanced concepts" as much as they need to "learn how to think." While this stance stems from a desire to empower students, it risks unintentionally reinforcing curricular gatekeeping if not paired with strong equity safeguards. It raises a deeper structural question: *Who gets access to conceptual mathematics, and who is steered toward more procedural work?*

Gábor also acknowledged that much of guided discovery relies on professional intuition: "It was not a very well-defined research. We just felt that it worked." This honest reflection underscores the need for more systematic evaluation and shared indicators of success. Without clearer measures, guided discovery may remain confined to isolated teacher communities, making broader implementation and equity more difficult to achieve. There is a two-fold risk with guided discovery implementation: that some students may not encounter certain mathematical topics, and that intended gains in student reasoning may be difficult to document.

If we treat Hungarian guided discovery not as a fixed instructional model but as a source of pedagogical strategies, it may be possible to design learning environments that both maintain broad topic coverage and support the development of student thinking. Doing so would require explicit attention to how topics are selected, which students experience which forms of inquiry, and how teachers

are supported to make these decisions in ways that expand, rather than narrow, access to rich mathematical understanding.

Discussion

This study set out to explore what structural adaptations are necessary to implement Hungarian-style guided discovery in mainstream secondary school classrooms. Through interviews with Hungarian teachers, survey and interview data from students, and classroom observations, several codes emerged that speak to the opportunities and challenges of translating this approach. My conceptual mapping from Findings codes to Discussion sections is displayed in Figure 4, as follows:

V.1: Guided Discovery as Culture, Not Just Method

V.2: Structural Barriers, Curriculum Priorities, and Access Tensions

V.3: Assessment as a Leverage Point

V.4: Student Perspectives Reveal Both Promise and Pressure

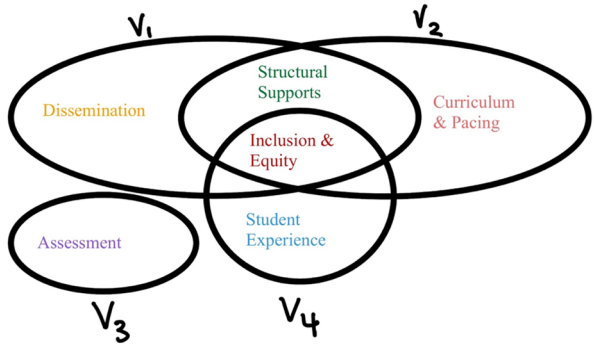

Figure 4. Conceptual mapping from Findings codes to Discussion sections

Guided discovery as culture, not just a method

A central finding of this study is that Hungarian-style guided discovery functions less as a fixed set of procedures and more as a pedagogical culture. Teachers adopt and adapt its core values, such as deep thinking and task-based learning,

in ways that respond to their own teaching contexts. This cultural orientation is evident in how teachers described learning the method: through a mix of formal coursework, math camps, communities of practice (Wenger, 1998), and reflective trial-and-error. Dissemination occurs mainly through immersion rather than scripted training. Gábor, for example, emphasized that guided discovery is not just for elite students, but that it may require slower pacing and carefully scaffolded support in broader settings, reinforcing the idea that guided discovery is developmental and requires trust in nonlinear progress.

This pedagogical culture is not new. Hungarian educators such as Tamás Varga laid its philosophical groundwork decades ago. In his teacher-facing textbooks, Varga advocated for learning "through discovery" (Varga, 1969), structuring lessons to begin with manipulatives or real-life tasks and gradually transition to symbols and general rules. Contemporary textbooks like *Kombinatorika* (C. Neményi, 2015) continue this legacy by offering problem based lessons that encourage pattern-finding, justification, and student-led abstraction. While these texts leave much up to the teacher, they reflect a professional culture that values discovery and is passed down not just through materials, but through how teachers learn to use them.

Structural barriers, curriculum priorities, and access tensions

Despite a strong philosophical commitment, teachers reported significant structural challenges with guided discovery implementation. These include time constraints, curriculum demands, grading systems, and administrative expectations. It appears that discovery-based learning requires additional structures for it to be effective. Several educators pointed to the importance of having a professional community in sustaining the work. Flóra, for instance, described how sharing dilemmas with other teachers was almost more helpful than exchanging materials. Linda explicitly emphasized that the method cannot survive in isolation and requires systemic support.

Even Varga acknowledged these challenges. In his writing (Varga, 1969), he emphasized that not all problems need to be fully proved or formalized in the classroom; what matters is intuitive understanding. Yet he also noted that such an approach requires institutional support and thoughtful pacing, tailored to students' developmental stages. In this way, the tension between philosophy and structure has long been embedded in Hungarian guided discovery.

Gábor emerged as both a champion and a challenger of guided discovery for all students. He spoke powerfully about its long-term benefits, particularly for

building students' mathematical confidence and independence. He also described the early implementation as slow, though eventually rewarding. But he also raised doubts about its feasibility for full curriculum coverage, especially among "lower-tier students." "If you have this goal to cover the entire curriculum," he admitted, "then I think it doesn't work." His remark that some students "don't need these advanced concepts" but instead "need to learn how to think freely and confidently" exposes a central tension: *Is discovery a realistic goal for all classrooms, or a pedagogical privilege?*

Gábor's reflections show thoughtful adjustment to the demands of teaching, but they can still end up limiting which students get access to deeper math if these choices aren't made carefully. Moreover, his comment, "We just felt that it worked," points to a larger issue: *How do teachers really know if this method is achieving the results they hope for?* While some studies have looked methodologically at student reactions and test performance (Urbanski et al., 2022; Matzal et al., 2020), if the goal is, as Gábor puts it, to help students "think better," then how are we measuring that?

Assessment as a leverage point

Across classrooms, assessment surfaced as both a constraint and an opportunity for meaningful alignment with guided discovery. Teachers who retained traditional assessment models, such as Kata and Máté, described the inherent tension between grading accuracy and valuing deep thinking; they relied on conventional tests to satisfy school expectations while trusting that discovery-based lessons would ultimately prepare students for procedural and conceptual demands. In contrast, Linda and Flóra redesigned their assessment systems to reflect the ethos of guided discovery itself. Their gamified and point-based approaches blurred the line between formative and summative assessment, making ongoing engagement, reflection, and perseverance part of what "counted" academically. In Linda's and Flóra's classrooms, assessment was not merely a measure of learning but an extension of the learning process.

These contrasting approaches illustrate that guided discovery does not depend on a single assessment structure, but it does require coherence between instructional goals and evaluative practices. Because assessment informs students, families, colleagues, and administrators on what is valuable in a mathematics classroom, it becomes a powerful lever that can either reinforce or undermine

discovery-based instruction. For teachers seeking to support reasoning, flexibility, and independent problem-solving, rethinking assessment design may therefore be a necessary structural adaptation, not an optional add-on.

Finally, Gábor's observation that students taught through the Pósa Method performed "the same [...] not below or above" on the Matura exam highlights a broader implication: guided discovery may not yield higher standardized test scores, but it also does not appear to disadvantage students. This suggests that while discovery-based instruction can coexist with exam-oriented systems, its full benefits (particularly in developing mathematical habits of mind) may be most visible in learning outcomes that traditional assessments do not capture.

Student perspectives reveal both promise and pressure

Student responses to guided discovery were generally positive, especially around creativity, engagement, and intellectual ownership. Comments such as "I feel happy when I figure it out" and "we find 2 or 3 ways to solve a problem" highlight the potential of the method to build confidence and mathematical identity. Many students described feeling more motivated in math class, appreciating the shift from passive reception to active thinking. Still, students had specific concerns. Several students noted that the pacing occasionally felt too fast. Roughly half of the surveyed students reported feeling rushed during moments of conceptual learning, and several indicated they were not always confident in how to communicate their thinking or prepare for tests.

These reflections suggest that while guided discovery can spark joy and insight, it does not automatically guarantee clarity or confidence for all students. Enjoyment and self-efficacy appeared uneven, with just over half of students reporting consistent enjoyment and confidence in their math abilities. These results point to the importance of constructive classroom conditions in shaping how discovery is received. Students who feel supported and seen are more likely to benefit from open-ended tasks, while those who feel unsure may experience discovery as disorienting rather than empowering.

This tension underscores the need for intentional scaffolding in some classroom contexts. Embedding short, checkpoint-style tasks or offering optional worked examples (Atkinson et al., 2000) might help students bridge the gap between exploration and formalization. Additionally, offering clearer feedback structures can help students understand not just whether their ideas are correct, but how to refine and communicate them. Ultimately, student perspectives reveal

both the promise of discovery-based classrooms and the pressure they can generate. The method appears to work best when paired with structures that help students feel supported even in moments of uncertainty.

Although many of the insights shared by Hungarian teachers may feel familiar within Hungary's mathematics education community, this familiarity is precisely what makes them valuable for international audiences. For teachers outside this tradition, the Pósa Method can appear either overly complex or unrealistic. Rather than introducing new methodological innovations, this study illustrates how experienced educators interpret and adapt guided discovery in practice. The findings suggest that the strength of Hungarian guided discovery lies less in the novelty of its routines and more in teachers' professional judgment, showing that educators need not adopt the Pósa Method as originally designed, but can selectively integrate its core features in ways that enhance instruction while remaining sustainable and responsive to student experience.

Implications and conclusion

While the methodological features described in this study may be well known among Hungarian mathematics teachers, they are far less visible to practitioners in other systems who may benefit from seeing how such practices operate in mainstream classrooms. The findings therefore have practical significance not because they introduce a new method, but because they clarify that teachers can draw on discovery-oriented approaches without feeling pressure to replicate the Pósa Method in full. Instead of learning a method to implement "correctly," teachers may be better served by learning how to embed selected components of the method into instruction that already feels authentic, manageable, and aligned with their students' needs. For educators already familiar with the method, and for programs that aim to share it with teachers, these findings highlight an important pedagogical opportunity. Rather than teaching teachers to reproduce the Pósa Method exactly as intended, they might instead emphasize helping teachers weave its core features into practices they already know, trust, and can sustain. This shift, from replicating a method to leveraging a methodological culture, offers a more realistic, sustainable path for pedagogical growth.

Three implications follow from this study:

(1) *Professional communities are essential.* Guided discovery is sustained when teachers share dilemmas and resources in supportive networks.

(2) *Assessment must align with pedagogy.* Grading structures that reward reasoning, reflection, and persistence better represent learning in discovery settings.

(3) *Equity requires intentional safeguards.* Without systemic attention, discovery risks becoming reserved for high-achieving students rather than accessible to all.

Several limitations temper this study. The findings are based on a small sample of Hungarian educators and are rooted in a particular cultural and institutional context, which may not generalize to other education systems. Additionally, the student survey results reflect experiences with a single teacher in a specific school setting. They offer insight into one implementation of guided discovery, not a broad assessment of the method. Moreover, all interviewees and survey respondents communicated with me in English, their second language, so some meaning may have been lost in translation. Further research could examine how guided discovery functions across a wider range of contexts, how teachers transition into such practices, and what institutional supports best sustain them. Ultimately, guided discovery may not scale easily, but it can seed powerful local adaptations, especially when teachers are given the trust and support to make it meaningful for their students.

My overarching goal in education research is to contribute to a stronger methodological culture of mathematics teaching, one in which teachers feel equipped to design learning experiences that build students' confidence, agency, and engagement. This study showed me that such a culture is not anchored in any single curriculum or routine, but in how teachers learn, collaborate, and refine their practice. The Hungarian educators I interviewed exemplify this: they do not rely on scripts, but on disciplined observation, carefully chosen questions, and iterative experimentation. My findings suggest that while the Pósa Method offers valuable insights into guided discovery, its classroom use also comes with limitations. Rather than encouraging teachers to import the method wholesale, this research points toward a more productive role: using the Pósa tradition to illuminate the pedagogical value of guided discovery while inviting teachers to develop frameworks that match their own students and contexts.

The message I hope educators take away from this study is that there is real value in math teachers diversifying their instructional methods. This study highlights one approach but also demonstrates that no single method, even one as celebrated as Pósa's, should be followed rigidly. Teachers should feel encouraged to experiment without the pressure of overhauling their entire curriculum or abandoning practices that already work for them. Ultimately, meaningful

improvement is more likely when teachers stay active within a professional community that supports thoughtful, adaptive, and inquiry-rich teaching.

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Appendix

Teacher biographies

Full participant biographies are provided here for context:

- Linda used to teach mathematics and English at a secondary level, and is currently teaching in a teacher education program at a Hungarian university. Her research has explored the implementation of the Pósa Method in public school settings. She holds a PhD in Language Pedagogy, where her dissertation focused on alternative forms of assessment such as gamification.
- Máté teaches secondary mathematics in Hungary, and is currently teaching in a teacher education program at a Hungarian university. He has extensive experience using the Pósa Method particularly in enrichment settings.
- Flóra is the director of a teacher education program at a Hungarian university, and teaches mathematics at the secondary level. She has research experience in developing teachers' mathematical knowledge for teaching.
- Kata teaches mathematics at a secondary school in Hungary and is currently pursuing a PhD focused on the implementation of guided discovery in classroom settings.
- Gábor has experience teaching both secondary and university-level mathematics and organizes several Hungarian enrichment math camps. He is currently teaching in a teacher education program at a Hungarian university, and directs a Hungarian foundation that supports gifted math education in Hungary.

Student survey profile, administration, and format

Student Profile: I surveyed fourteen students from Kata's mathematics class. The students were attending a school-organized sleep-away camp. They are entering Grade 9 and range in age from 14 to 15 years old. While this is a standard level math class, the students are described as bright, motivated, and enjoy learning.

Survey Administration: The paper survey was given to the students in the middle of the day, after I had introduced myself, observed their morning class, and toured the camp. I provided verbal instructions in English that echoed the written instructions on the form. While the students each completed their own paper survey, there was discussion among the students for translation purposes. Their teacher, Kata, and I walked around to provide assistance with translation or clarification as needed. The survey took approximately 20-25 minutes for all students to complete.

Survey Format: The survey was broken into two parts: 13 questions on a 5-point Likert Scale, and 3 open-ended questions. The written instructions at the top of the survey read: "Please read each statement carefully and select the option that best matches how you feel, by circling your choice. There are no right or wrong answers. For the last part of the survey, please answer the open-ended questions in your own words."

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