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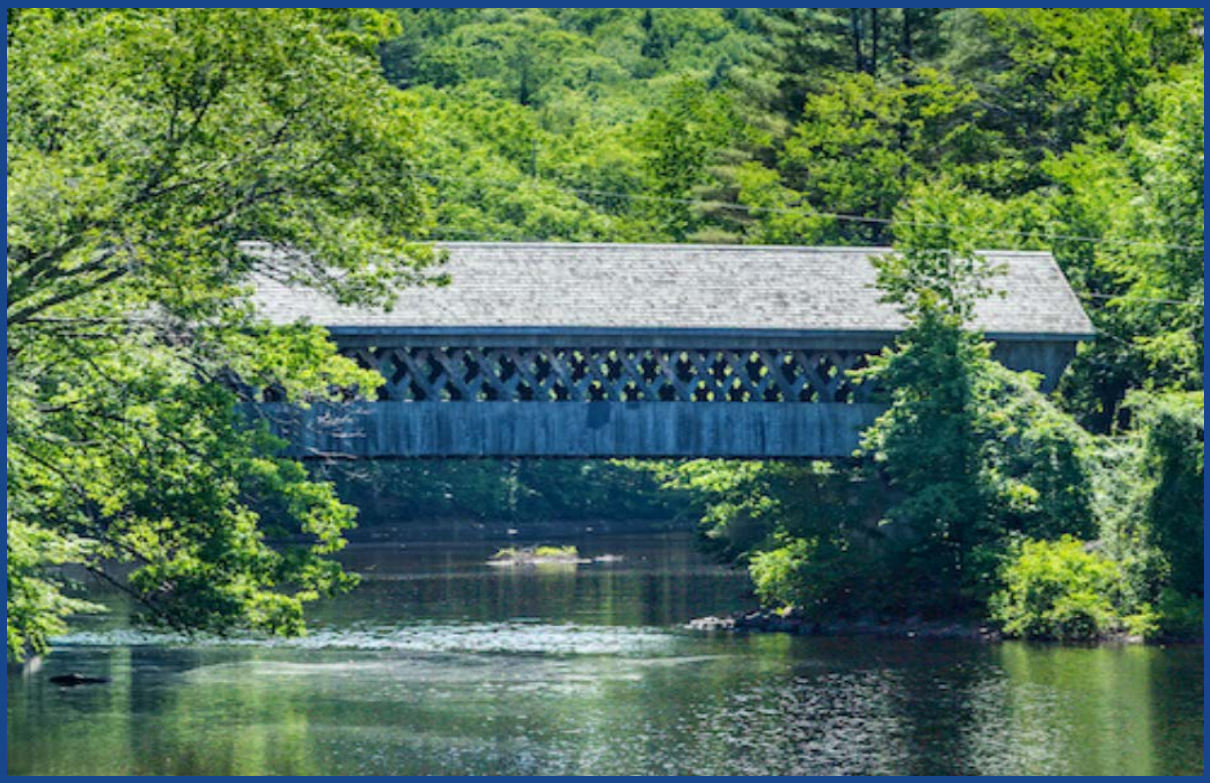

An Open Source Journal from the Doctor of Education Program at New England College

New England College

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***New England College Journal of Applied Educational Research* (*NECJAER*)**

98 Bridge Street Henniker, New Hampshire 03242

Aims and Scope of the *New England College Journal of Applied Educational Research*

The *New England College Journal of Applied Educational Research* (*NECJAER*) is an open access journal that aims to give authors a platform to publish their ideas, work, and research for the benefit of educators and their students, PreK–institutions of higher education. The purpose of this journal is to help educators advance the cause of making education equitable for all students. All aspects of education will be covered through the projects and research of our authors. Novel techniques for research, teaching and learning processes, and student life are encouraged so that educators have a platform for creating and assessing ways to make our educational systems more equitable.

Contributions regarding student and teacher satisfaction, preferences, quality of life, and their role in optimizing the educational process will be welcomed. The journal is characterized by the reporting of research and applied theories to the lived experiences of educators and their students.

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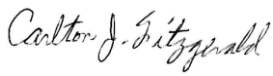
Message From the Editors

The past few years have been very interesting as educators have been working to help our students gather their selves so that learning can become more meaningful in their everyday lives. Many educators and students are still recovering from the traumas of the pandemic and the fall out of the politicization of education, causing some to feel education is now less important. For some families, schools get in the way of their beliefs (i.e., political, religious, social, world views), and many either put pressure on teachers and schools, or they simply remove their students from the process. These issues are present from K–16 and beyond. Some university presidents and instructors have been pressured to stay in line with the powerful or face the consequences. Many educators have decided to leave the profession, rather than give in to the pressure. On the other hand, we are seeing educators who are moving forward in positive and inspiring ways. Educators are taking care of their wellness needs, and they are helping their colleagues and students do the same. The idea of helping each other be strong is expanding, and more instructors and students are reaching out to each other, so we all can believe we are not alone in our journeys. One great way to share our ideas and offer assistance is through sharing your educational articles. We are now receiving articles from around the world in addition to more articles from our NEC students. Thank you for your courage to step out and share your ideas. Our editors and peer readers will continue to help you spread the word.



Carlton J. Fitzgerald, EdD

Gavin W. Henning, PhD

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Part A

Instructional Coaching's Most Impactful Practices as Told by Teachers and Instructional Coaches in Vermont Schools

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Abstract

The National Assessment of Educational Progress (NAEP) indicates a significant decline in student achievement since 2019, with average scores dropping by nine points between 2020 and 2023. Given the link between instructional quality and student outcomes, this grounded theory qualitative study investigated the practices of instructional coaching in Vermont schools as a lever for teacher growth and student success. Though teacher evaluation systems often remain compliance-based and ineffective for professional development, instructional coaching offers a non-evaluative, job-embedded alternative that can mitigate teacher burnout—which accounts for 27% of attrition variance—and enhance self-efficacy. Through interviews and document analysis with 10 instructional coaches and nine teachers across five Vermont school districts, this study explored how participants describe effective coaching and its implementation. Findings reveal Vermont schools do not strictly adhere to a single coaching model (e.g., Knight, Aguilar, or Sweeney and Harris); instead, they use an eclectic, flexible approach tailored to individual teacher needs. Key themes emerged regarding the necessity of nonevaluative relationships to build trust and the importance of a "human-first" approach, grounding professional support in the fulfillment of basic psychological needs. The study concludes with the presentation of a flexible

coaching model designed to enhance teacher effectiveness and reduce learning gaps, particularly for students in rural and disadvantaged settings.

Keywords: instructional coaches, impactful practices, instructional practices, student achievement, teacher well-being, Vermont education

According to the Nation's Report Card (National Center for Education Statistics, 2024), a key challenge facing U.S. schools is underperforming students. Data from the National Assessment of Educational Progress (NAEP) test, administered in schools around the country annually by The National Center for Education Statistics, has shown that student achievement in reading and mathematics has been steadily declining since 2019 with an average score change decline of nine points between 2020 and 2023, one of the most dramatic drops represented in the data since 1971 (National Center for Education Statistics, 2023). According to Nilsen and Gustafsson (2016), changes in teacher practice can positively address student underperformance. Nilson and Gustafsson went on to state, "teacher quality was significantly related to instructional quality and student achievement" (p. 21). Hattie (2009, 2023), through the meta-analysis of strategies that increase learning, concluded that what teachers do instructionally matters and correlates to student learning gains or losses.

Given that instruction and student achievement are fundamentally linked, improving the quality of teaching is a significant lever that can be pulled to improve student learning outcomes. Student underperformance suggests that more instructional coaching for educators could be beneficial (Rhue, 2022). According to Hattie (2009, 2023) and Knight (2018), instructional coaching has shown promise as one way to improve teaching quality and, in turn, student achievement. Given the positive impact instructional coaching can have, I believe that all schools would benefit from having some version of instructional coaching for their teachers.

However, Clenchy (2017) suggested instructional coaching is not always part of systems designed for teacher improvement. According to Hattie (2023), teacher evaluation systems, which are commonly used to rate teacher performance, are usually compliance-based instead of being dedicated to the coaching and growth of educators. In fact, insufficient time is allotted to instructional coaching (Hunter, 2020). According to Clenchy (2017), research on teacher evaluation models have shown they are ineffective at generating teacher growth. According to Hunter (2020), typically there is a local and/or state mandate enforcing teacher evaluation, and, to meet legal requirements, many schools and districts have evaluation systems that rate teachers often based on classroom observations and student test scores. These evaluation systems tend to leave teachers with nothing more than a rating about their practice. In some cases, a teacher can receive a rating below proficient with no suggestions regarding how to improve or any support given to assist them in their professional growth. Said rating can be based on a single observation of instruction over the course of a school year. The result is a system that leaves teachers unsupported, which perpetuates inequities for both teachers and students in the form of lack of support, lack of changed classroom practices, and unchanged systems (Hayes, 2023; Kimball et al., 2021). These researchers highlighted the importance of instructional coaching which is more than a single observation followed by a rating but instead focuses on teacher growth and support over time.

If evaluation alone is not enough to elicit teacher growth (Clenchy, 2017) and sufficient time has not been dedicated to teacher growth (Hunter, 2020), the outcome can be classroom instruction that does not positively impact student learning. Quality of classroom instruction and student learning outcomes are linked; therefore, teachers not performing at an effective level are unlikely to yield high levels of growth in students (Olsen, 2016). Without systems to improve

teaching, achievement gaps will grow because ineffective teaching negatively impacts student learning outcomes and students' potential to access higher education, jobs, and career opportunities (Opper, 2019). Though achievement gaps are largely affected by factors outside of the educational setting, such as student race and socioeconomic status (Gothart, 2023), effective classroom instruction can improve equitable access to learning for all students and reduce learning gaps (Shell et al., 2023). For this reason, students, especially those who have been historically disadvantaged, must have access to high-quality teaching (Gothart, 2023; Hattie, 2009; Olsen, 2019; Opper, 2019; Shiheiber-Gilmer et al., 2025).

Further, if students continue to receive instruction from teachers who are not supported in their own growth and improvement, especially those working with students who are historically disadvantaged, the learning problems will persist (Gothart, 2023; Opper, 2019). According to a June 2024 report by the National Center for Educational Statistics (2024), 32% of students in public schools are below grade level as of the end of the 2023–2024 school year. An article about the aforementioned study identified that just 59% of public schools have an instructional coach (Ng, 2024, para 5). These statistics demonstrate that just over half of schools nationally are using coaching as a strategy to improve instruction and student learning, leaving a significant portion of schools nationwide not engaging in the practice.

Teacher burnout and attrition is connected to teacher support; instructional coaching influences this through improved teacher efficacy. Madigan and Kim (2021) conducted a meta-analysis of studies aimed at better understanding the effects of teacher attrition. The findings showed that burnout explained 27% of the variance leading to teachers quitting the profession and burnout increasing over time (Madigan & Kim, 2021, abstract). Li (2023) showed that when teachers develop more self-efficacy, they are less likely to experience burnout, and that teacher

self-efficacy was statistically significant in reducing burnout with the effects being amplified if the teacher also was able to emotionally regulate and show resilience.

With a lack of instructional coaches and overall teacher support, it seems apparent that more educators may experience burnout and leave the profession, exacerbating the already growing teacher shortage problem nationwide. Patrick and Franco (2023) reported that as of the 2022 school year, one in 10 teaching positions nationally remained unfilled or were filled by teachers who were not fully certified. They estimated, based on state-reported data, that a minimum of 27,844 vacant teaching positions remained as of 2022 and that number grew to nearly 42,000, or one in eight, as of July 2024 (Tan et al., 2024, Table 1). Given the data presented by Li (2023), Madigan and Kim (2021), Patrick and Franco (2023), and Tan et al. (2024), it is clear that properly supporting teachers through instructional coaching can help alleviate common issues impacting schools nationally, like teacher burnout and lack of retention, and having schools fully staffed with educators who feel positively about their jobs, thus benefitting students and staff alike, and positively impacting student outcomes.

Statement of the Problem

A primary problem is that many schools in the United States are underperforming and students, especially those who are most disadvantaged, have limited access to high-quality teachers (Hunter, 2020; Milanowski, 2017). This means that learning gaps exist between affluent students and economically disadvantaged students. Research has shown that students who need quality instruction the most, those who are most disadvantaged, receive instruction from the most inexperienced teachers (Hunter, 2020; Milanowski, 2017). Additionally, though schools are required by state and local mandates to have evaluation frameworks in place, those frameworks are commonly accountability systems that rate teaching practice but do little to support teacher

growth (Kraft & Christian, 2022; Milanowski, 2017). Studies such as those conducted by Hunter (2020) and Milanowski (2017) have demonstrated that accountability-based evaluation systems perpetuate biases within the school system, including racial and assimilation bias.

According to Hunter (2020) and Milanowski (2017), instructional coaching has emerged as a promising practice that can support teacher growth and improvement, reduce inequities, and positively improve student outcomes. The study builds on the existing research by seeking the perspectives of coaches and teachers currently being coached to understand how instructional coaching is implemented and identify strategies and practices coaches and teachers believe are most impactful. This research benefits schools looking to incorporate instructional coaching because it provides perspectives on what approaches teachers being coached and instructional coaches believe are effective while allowing other schools to use these best practices.

Purpose of the Study

The purpose of this study was to understand, from individuals being coached and those coaching them, what effective instructional coaching looks like and how effective instructional coaching is done. My understanding of what effective instructional coaching is and how it is done led me to create of a model which could result in enhanced instruction, improved student performance, and enhanced teacher effectiveness.

Methodology

The purpose of this grounded theory qualitative study was to answer the research questions: 1. In what ways do coaches and teachers being coached describe effective instructional coaching? 2. In what ways do coaches and teachers being coached describe how such instructional coaching practices are effectively implemented? The central phenomenon of instructional coaching is generally defined as "job-embedded professional learning that focuses

both on content and practice" (Institute of Educational Sciences, 2020, para. 1). Coaches meet with teachers about their needs and goals, observe them in action, and use a variety of strategies or tools to help the teacher reflect, adjust, and improve instruction in an ongoing cycle. Implementation refers to the strategies and/or tools used by instructional coaches. The study used an interpretivist paradigm, defined as a paradigm where reality is constructed based on the experiences of individuals and how they interpret those experiences (Nickerson, 2024). The interpretivist paradigm is also well aligned with the research methods for this study, which included interviews and document analysis.

Research Design and Rationale

I conducted a grounded theory qualitative study which is a methodology that "attempts to unravel the meanings of people's interactions, social actions, and experiences" (Lumivero, 2023, para. 1). I used interviews with coaches and teachers who were being coached, gathered and reviewed artifacts as examples of tools or strategies, and implemented a follow-up questionnaire. Grounded theory is an approach that suggests data analysis can occur in an ongoing way while data are being collected. Thus, as I conducted interviews and reviewed artifacts, I engaged in ongoing analysis and coding to make meaning of the experiences shared with me. In this way, my study was iterative, which is another feature of grounded theory research. I also sent out a follow-up questionnaire that was optional for participants, but allowed them space to elaborate on responses, share tools, and share contact information for others who may like to participate in the study.

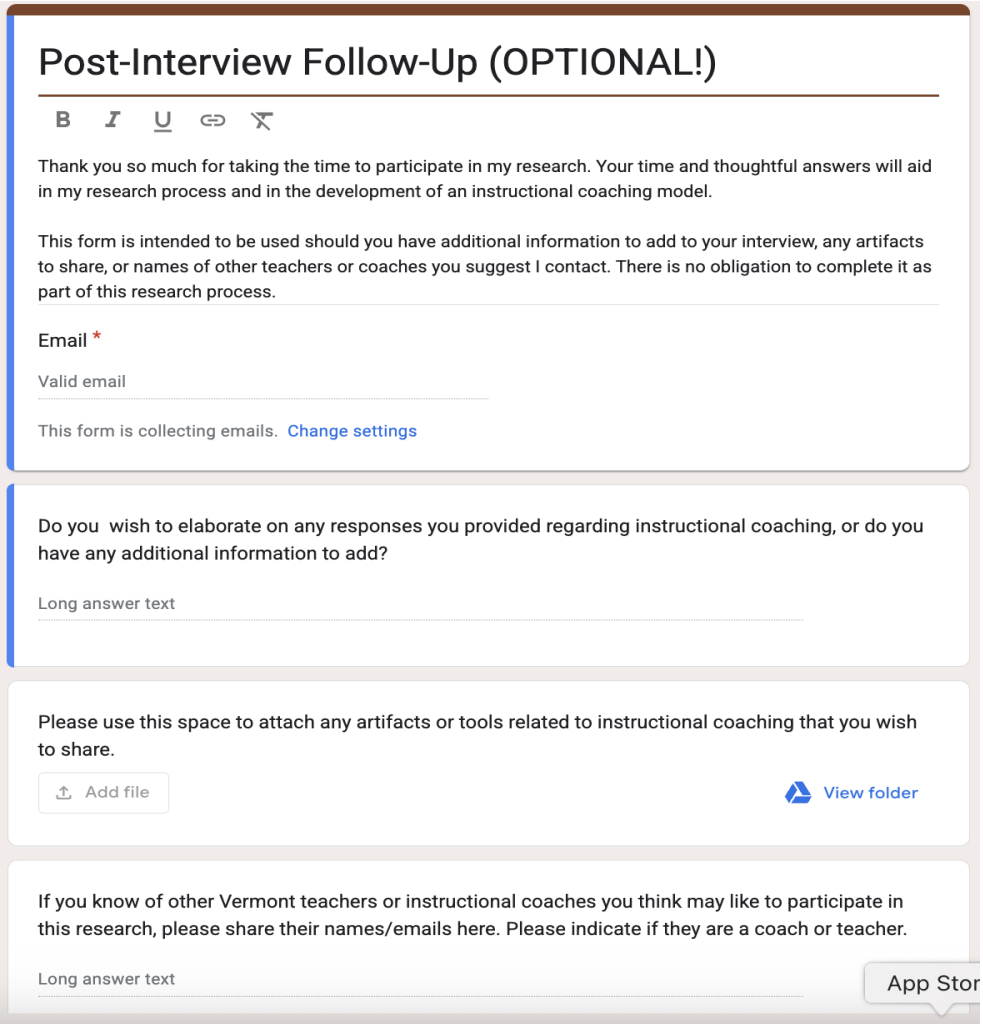
Sampling

I used a purposeful selection model to identify participants with background experience in instructional coaching and teachers who were being coached. In addition, I used convenience

sampling, which allowed me to seek coaches and teachers being coached in schools in my state of residence, Vermont, for better ease of access. Once I had an initial pool of coaches and teachers with whom to meet, again identified through convenience sampling (starting with schools with which I had connections), I used snowball sampling, where I asked participants if they would be willing to pass along names of other coaches or teachers, they knew who may be interested in participating. I included this in my interview follow-up questionnaire, where I included a space for people to provide that contact information (see Figure 1).

Figure 1

Follow-Up Questionnaire



I wanted teachers and instructional coaches in this study to meet some specific criteria. I began by selecting instructional coaches with 2 or more years of experience in their role. Two or more years' experience was my preference because I wanted to ensure I spoke with coaches who had engaged in their practice for long enough to have ample time to work with multiple educators resulting in them having more insights into patterns they saw over time in terms of effectiveness. However, it was harder to find participants than I anticipated, and to ensure my sample size had enough individuals to obtain different perspectives, I ended up also including data from instructional coaches who were new to their roles. Two of the 10 coaches I interviewed were in their first year. Since I started gathering data in February 2025, the school year was over halfway complete, which ensured that those coaches in their first year of coaching had been in the role over half the year before I spoke with them.

For the purposes of this study, I only included instructional coaches who were in non-evaluative roles. In other words, coaches who were not school principals or administrators. According to Russell and Booker (2022), who conducted a meta-analysis of instructional coaching studies, having the same person as a coach and evaluator erodes trust and results "in superficial and infrequent feedback" (p. 3). Taking evaluation out of the coaching process allows the teacher to feel that the coach is there for support and growth and helps them build trust resulting in implementation of changes with higher fidelity. For this reason, the instructional coaches I included in the study were non-evaluative in their roles.

I wanted to have a sample size of 15 instructional coaches and 15 teachers being coached. Having 15 participants in each group provided a mix of coaches in terms of their experience, grade level or content in which they specialized, and potentially a variety of tools or strategies

used across different schools. Having a diverse pool of coaches, who worked with a variety of teachers, provided a range of perspectives and strengthens findings.

To contact these coaches and teachers, I engaged in a variety of outreach approaches with equally varied results. I started by conducting outreach to school leaders with whom I had a connection and schools that I knew had instructional coaches on staff. These leaders were able to connect me to instructional coaches and coached teachers. In some cases, they did initial outreach such as sending an email and including me. In other cases, they facilitated a meeting with coaches so I could connect and describe the study and its purpose. These were the most effective approaches resulting in multiple interviews with coaches and teachers.

In cases where a person I knew simply provided a contact list, which led to more anonymous outreach, I had less success in receiving responses. I also asked the Vermont Principal's Association Director if they would include an invitation to participate in their weekly outreach to all Vermont school leaders. This provided some validity to my request and resulted in several school leaders contacting me for participation. I also engaged in some "cold calling" style outreach of emailing or contacting coaches or school leaders via email directly, but those almost never resulted in follow-up.

Perhaps my most effective method of obtaining study participants was using social media to my advantage, which was surprising to me. I made a post on my personal Facebook page, asking that anyone in an educational role in Vermont spread the word that I was looking for instructional coaches and coached teachers to interview for a study. The post was shared frequently and yielded 15 responses. I suspect this was both because educators shared my post and the word was passed around broadly, and because it was summer vacation, teachers had more time and flexibility than they did during the school year. I was able to interview seven of

the people who contacted me based on the social media post. Ultimately, I interviewed 10 instructional coaches and nine teachers who had been coached for a total of 19 participants.

Following this initial outreach and consent process, I employed snowball sampling to increase my participant pool. Nikolopoulou (2023) described snowball sampling, also called chain or network sampling, as a process of identifying additional study participants through referrals of current participants. In my study, coaches and teachers I interviewed sometimes identified other coaches or teachers who would also provide valuable insights.

Though my study did not officially require IRB approval, I opted to follow the IRB consent process when connecting with my participants. Whenever I went through a superintendent or principal for access to coaches and teachers, I asked them to sign a consent form. Participants were provided either a written or verbal description of the study and procedures used to protect anonymity and returned signed consent forms before interviews.

Ho and Limpaecher (2021) explained that saturation is reached when the data either repeatedly confirms what you already know and/or when the data continues to show the same patterns repeatedly. In this study, saturation was achieved when the data yielded common patterns about coaching strategies and/or tools and additional interviews further reinforced those and/or were not revealing novel ideas to explore. At that point, I was able to arrive at a theory that answered my research questions. Through my interviews, I was able to achieve "rich rigor," which "obliges the researcher to collect data until there is more than sufficient coverage, at which a point of saturation is reached, and in which no additional data collection is useful" (Jones et al., 2022, p. 269). Though I engaged in frequent outreach in a variety of ways, I was not able to reach 15 each of teachers and coaches in the end, but I did reach saturation with the pool I

obtained, which was 19 total participants, and an almost equal balance between teachers (nine participants) and coaches (10 participants).

Participant School Demographics

Five school districts in Vermont participated in this study. Vermont schools are organized into larger districts and supervisory unions, which may contain several towns with a union high school that serves students from various towns. Most districts in the study were rural districts consisting of smaller schools. There was a tendency for instructional coaches in these settings to be assigned to multiple schools in the district to support teachers versus one individual to provide instructional coaching in one school building (see Table 1).

Table 1

School District Demographics

District	Number of district towns	Number of district schools	Number of coaches	Number of schools coaches work in	Full Or Part time coaches	Mandatory or opt-in	Coaching assigned
District A Suburban	1	5	2 (MS/HS)	2	full	Opt-In	Content
District B Rural	6	9	3	4 or more	full	Both	Content & grade level
District C Rural	3	4	5 (MS/HS) 3 (Elem)	1	Both; HS are part-time	Both	Content
District D Rural	8	7	1	7	full	Both	Content & Grade Level
District E Rural	6	5	2 in the school	1	full	Both	Content

I was aware of how data could be affected by only one district being suburban. In the rural districts the instructional coaches tended to work across schools in the district, coaching across grade levels, though usually in grade levels and content areas where they had experience and background. This sharing of coaches is largely due to Vermont's rural schools being small and, for a district to justify a full-time coaching position, the cost of the role must be shared among schools. This usually meant an instructional coach would need to travel between school sites, sometimes across broad geographic areas, to provide instructional coaching support. Comparatively, District A also did some shared coaching across their middle and high school buildings, but since the schools were in one town and on one campus, it was relatively easy for coaches to work between buildings that were adjacent to one another.

Universally, full-time instructional coaches who participated in the study worked in multiple school sites. Part-time instructional coaches, those who also continued to teach while coaching, worked in one building. Instructional coaching additionally tended to be targeted to specific grade levels or areas of content expertise. Instructional coaches tended to provide coaching in their area of expertise, for instance, a coach who had a literacy instruction background would be assigned to coach literacy and humanities educators and a coach with a math background would coach math and science educators. Coaches also tended to coach within their grade-level licensure areas, meaning those with elementary backgrounds tended to support elementary educators and those with secondary backgrounds tended to support secondary educators.

This was not a uniform rule, however. In District D, there is one full-time instructional coach for seven schools. Coach Hannah (pseudonym) reported supporting any and all content and grade level needs in District D. This makes sense as she is the only coach district-wide.

Coach Sarah, from District D, typically supported elementary and middle school educators in math instruction, but also took on coaching a high school science teacher who was a late hire to the district because Coach Sarah had the most availability in her schedule. Though content and grade-level experience were typical approaches to targeting instructional coaching across schools and districts, they were not firm or inflexible boundaries. When necessary, some instructional coaches coached outside their content or grade-level experience.

Most districts also employed a mix of voluntary, opt-in, coaching and mandatory coaching. Opt-in coaching is when a teacher may voluntarily choose to participate in instructional coaching but is not required to do so. For opt-in coaching, teachers could choose to participate in instructional coaching on their own and at a time they felt they needed it. Opt-in coaching was described in interviews as a mix of targeted coaching for a specific purpose or need, or teachers choosing to access the coach throughout the school year. In voluntary opt-in models, both opt-in/voluntary and mandatory approaches occurred. Opt-in instructional coaching was offered to a mix of new and veteran teachers and sometimes occurred through professional learning community (PLC) meetings in a larger group setting. Professional Learning Communities are an "ongoing process in which educators work collaboratively in recurring cycles of collective inquiry and action research to achieve better results for the students they serve" (DuFour et al., 2006, p. 2). PLCs are often made up of teachers who share common grade levels and/or content areas.

Mandatory coaching is when an instructional coach is assigned to a teacher and the teacher is directed to participate in instructional coaching sessions throughout the school year. In districts that employed mandatory coaching, support for new hires, teachers new to the profession, and teachers implementing a new curriculum were prioritized to receive coaching.

Most districts that participated in the study employed a mix of mandatory coaching for new educators and opt-in coaching for other staff interested in the support. All schools reported having a mix of new and veteran coaches, though instructional coaches in District B reported serving a larger population of new educators overall. Whether schools employed mandatory, opt-in, or a combination of coaching models, six of the teachers supported tended to be either new to the profession, new to their role, or implementing something new, like a new curriculum or instructional strategy.

Individual Participant Demographics

Participants volunteered to participate in this study based on choice and interest. All coaches (see Table 2) in the study identified as white. Nine were female and one was male. Coaches in the study were most commonly full-time with a mean experience of 4.1 years as an instructional coach (see Table 2). The amount of experienced varied for the coaches. Two coaches had 1 year of experience as a coach, two coaches had 3 years of experience as a coach, five coaches had 4 years of experience, and one coach had 13 years of experience as a coach. All coaches worked with various numbers of teachers each year, with most ranging from 14 to 30 teachers. One coach worked with 6 teachers, and another (the most experienced coach) worked with 50 teachers.

Table 2

Instructional Coach Demographics

Coach name	Ethnicity	Sex	Years Of experience as a coach	Number Of teachers coached per year (approximate)
Laurie	White	F	1	25–30

Coach name	Ethnicity	Sex	Years of experience as a coach	Number of teachers coached per year (approximate)
Ella	White	F	1	25–30
Sarah	White	F	4	15
Claudia	White	F	3	Unclear: coach across several school districts
Hannah	White	F	13	50
Marie	White	F	4	15
Ron	White	M	3	14
Allison	White	F	4	Unclear
Darcy	White	F	4	About 3 grade levels at a time
Natalia	White	F	4	6

Eight of the nine teachers (see Table 3) in the study were female with one being Latina. There was one white male teacher. Teachers were a mix of new to the profession (two new) and veteran teachers (seven veteran), though most I spoke with worked with an instructional coach because they were new to a district if not new to the career. It should be noted that it is common practice in Vermont schools to provide new teachers and those new to a district with a coach. In this study four teachers had between 2 and 6 years of experience, three teachers had 8 years of experience, one teacher had 15 years of experience, and the ninth teacher had 29 years of teaching experience. Teachers who participated had a mean teaching experience of 9.5 years and worked with a coach for an average of 3.55 years (range of 2–6 years of work with a coach). I also spoke with two experienced veteran teachers who had opted into coaching voluntarily. They

were neither new to their districts nor new to teaching, but an instructional coach was available to all and they used the support provided.

Table 3

Teacher Demographics

Teacher name	Ethnicity	Sex	Years of experience as a teacher	Years working with a coach
Pal	White/Latina	F	8	5
Earleen	White	F	15	5
Mina	White	F	8	2
Stacy	White	F	8	2
Ted	White	M	29	2.5
Rose	White	F	2	1.5
Eowyn	White	F	6	6
Suzanne	White	F	5	4
Mona	White	F	4	4

Instructional Coaching Models

An interesting trend from all schools who participated in the study was that no Vermont school subscribed to one individual coaching model or structure. Rather, instructional coaches shared universally that they have researched models such as Aguilar (2013), Danielson's (2009) framework for teaching, Knight (2021), Marzano and Brown (2013), and Sweeney and Harris, (2020), and have extracted approaches from each of these or they developed a flexible approach to coaching that drew from a variety of instructional coaching philosophies. For instance, in

District B, coaches collaborated to develop a continuum of coaching support that drew from principles from different models (see Table 4).

Table 4

Instructional Coaching Models in Vermont Schools

Instructional coaching model	Frequency of occurrence	Districts using these models
Jim Knight	5	A, B, C, D, E
Elana Aguilar	4	A, B
Diane Sweeney	1	A, B
Robert Marzano	1	B
Danielson Framework	1	D
Other	3	B, D, Coach Claudia

The schools in this study, all reported taking components of coaching from various models and applying what was most relevant to individual teacher's needs or what would be best for a specific coaching session. This led to all districts and instructional coaches in the study having a flexible, district-created approach to coaching. Some, like District B (which has used full-time coaches for at least 3 years), had formalized their processes. They created common coaching tools, structures, and a continuum of coaching. The continuum helped coaches determine how directive versus flexible coaching could be used to help teachers. Directive coaching is where a coach tells a teacher what to do through direct advice or suggestions (Aguilar, 2013). Flexible coaching is described by Abu-Alghayth et al. (2022) as being adaptable to a teacher's unique needs day-to-day and finding diverse ways to meet their needs individually and in small groups.

Coaches additionally tracked relational timing to help determine when it might be the right time to help a teacher move from relational to instructional support. Relational timing means that a coach has enough of a relationship with and understanding of the needs of a teacher they support that they can effectively gauge at what point in a coaching relationship the teacher is ready to be pushed or encouraged to take on a new challenge. Or, conversely, when they may need things to slow down to reduce the teacher becoming overwhelmed and burned out.

Other districts new to using full-time instructional coaches, like District A, were still in the process of exploring approaches to coaching, researching models, and developing protocols and handbooks. Districts A, B, and C offered both one-on-one instructional coaching and coaching through professional learning communities' content/grade-level teams. Coaches in District A shared that supporting teachers in a group setting often led to individual outreach. Pal, a teacher, shared that she felt supporting teachers in groups was an effective approach and one that could help teachers feel less vulnerable or exposed than they otherwise might in an individual setting.

Results

The following eight themes emerged as a result of my analysis of the data obtained from interviews, artifacts, and follow-up questionnaires: (a) trust and relationships, (b) relational timing, (c) dynamic, (d) growth-focus, (e) human-first, (f) incremental change approach, (g) maintained over time, and (h) selecting quality instructional coaches. Each of these themes emerged as elements of coaching that helped both teachers and coaches to be more successful.

Trust and Relationships

Mentioned at least 64 times across 19 interviews, trust and relationships emerged, unsurprisingly, as the core of the coaching relationship. Teachers and coaches alike found

coaching to be most effective when teachers felt they could trust that their coach supported them, was there for growth and not judgment, and when they felt that the coach was a separate entity from administration. For example, Teacher Mona explained that she needs trust present to be vulnerable and to say to a coach, "I'm still not sure on these things, and I don't want anyone else to know. But you're my confidant like, can you help me with this, please?" Teacher Ted similarly explained how trust allowed for open conversations about practice. Ted explained:

> We'd go down and close the door and closing the door was great, because there aren't many places you can do that, and have a conversation without interruptions and extra ears. So, it was a chance to talk about what had happened, to ask questions without fear.

This trust led to teachers being more willing to show vulnerability in the coaching relationship, be honest about struggles and challenges, and more willingly accept support. The coaching relationship takes some time to develop, and several coaches in the study, like Marie for example, expressed that there is sometimes a need to solely focus on relationships and not on instruction for some time to build that relationship and trust. Marie explained:

> I spent the first several months just making lots of relational deposits and creating positive feedback loops with teachers. Just so they really understood that I was not somebody who was out to get them, that it would feel possibly different than interactions that they've had with administrators in the past.

Coach Sarah stated:

> I think that in order for you to be impactive and effective, you have to have trust, and you have to have a solid relationship with the teachers that you're with. You have to let them know that you care about them, that you're there for them.

Coach Hannah shared:

> Trust is so fragile. Teachers as a group tend to be territorial a little bit, even the new ones, and don't want anybody telling them that they're not doing well. So, you never want to. You may be working with a teacher that's really got a lot to learn, but you don't want them to ever feel that you're disapproving.

Universally, coaches expressed that though slowly building trust may seem to slow down the growth process, the time put in to build a relationship can propel teacher growth once it is there. Mona expressed such a sentiment and that she continued to seek instructional coaching support for years beyond what was mandated by her district due to the relationship she built with the coach and her perception that the coach's support resulted in improved instruction. She explained that she has accessed instructional coaching "the entire time" she has taught in this school, which is 3 years beyond what was required by the district.

Relational Timing

Relational timing is another theme closely related to trust and relationships that participants related is critical to the success of an instructional coach. I define the term relational timing as when the teacher is ready to be "pushed" forward by a coach or when they may need to pause or find a different type of support. In relational timing the coach has a strong understanding of the teacher. This understanding comes from the trust and relationship building that has happened and helps an instructional coach know when a teacher may be ready and receptive to more or deeper feedback about their practice, and when they may be feeling more vulnerable or sensitive to feedback and need a gentler approach.

Both coaches and teachers in this study cautioned against pushing a teacher to do too much or overloading them with growth areas for which they are not ready. Coach Ella described this by saying, "try to push them, you know, to their zone of proximal development, because I

think that everyone has a different tolerance for growth," meaning that she gets to know teachers and their skills and needs before taking action that would push someone to try something new or different. In one instance, teacher Pal shared how when she was new to the teaching profession and already struggling to learn about instruction and classroom management, an instructional coach came in to tell her that her students were disengaged. Pal explained:

> At one point this coach said she was taking notes. [The coach said,] I noticed this percentage of your class was engaged, and this percentage of your class was not engaged. At that moment I felt terrible like, okay, I know these children are disruptive, and you are judging me by how I can engage these children who are giving me a hard time. And you're telling me this right now, like, why don't you tell me how I can engage them?

She explained that she needed someone to empathize with the struggles of a new teacher and ask her what sort of classroom support would feel helpful to her rather than call her out about what she already knew was not going well. In this example, a coach, without taking the time to develop trust and without relational timing, created a situation where the teacher both felt bad about herself and felt unsupported, inhibiting growth. Had this coach spent more time developing a relationship and offering support tailored to the teacher's needs there might have been a different outcome.

I placed trust, relationships, and relational timing at the heart of our district's coaching cycle to help emphasize its importance across all components of the model. Though many educators now know that building relationships is the core of what we do in schools (Aguilar, 2013; Knight, 2018), it can be easily forgotten when things begin to feel urgent and busy. Let this be a reminder that there is always time to build a relationship and the benefit of that time spent is worth it.

Dynamic

The need for instructional coaches to be dynamic comes from the need for flexibility and for the coach to adapt to varied needs. Coaches frequently shared in interviews that they may have prepped and prepared for a certain conversation with a teacher, but when they met, the teacher had a different challenge that was more pressing. Participants explained that instructional coaches, therefore, must be prepared to be dynamic, think on their feet, be prepared to pivot to the unexpected, and adapt their support to meet the unique goals of each teacher. Coach Ella shared "being flexible is to take a couple of different models [of coaching] and different teaching strategies, [to use] with various people in their classrooms depending on what they're seeing with their students."

For this reason, I do not recommend following a set-in-stone script for instructional coaching. Rather, the coach must be a great listener and be skilled at posing reflective questions for the teacher to consider. Though preparing questions in advance is beneficial, the coach must also be skilled at developing questions in the moment as the teacher's needs emerge or change during the coaching conversation. Being dynamic requires the coach to have a vast array of coaching approaches in their toolkit and know, based on a teacher's goal or expressed need, which would be most effective for a given area of need.

Growth Focused

As previously expressed, coaching is more effective when the teacher sets and drives the goals (Goeze & Lewin, 2023; Sims et al., 2021). Coaches consistently expressed that working on the teacher's preferred goal, even when other areas for growth were present, usually led to more teacher engagement and progress. Coach Sarah stated:

The best coaching that I've done have been when the individual being coached has

> identified it. It's been their choice, and I help them support that. Whether it's their professional goal or something, they're just seeing that they want improvement.

Coach Ella stated:

> For a one-on-one coaching session, a teacher would come to me with a problem of practice . . . And then we would kind of think about how we could act on that information so that might be me saying, "Oh, let me do some research and get back to you and see what's out there." So, usually it's teacher driven.

Coach Darcy volunteered, "Really just allowing the teacher to lead the conversation and not feeling like it's top down, or, you know, I really want it to feel supportive, collaborative. And that's when I found the most success."

In addition, being growth-focused opened doors for the coach to use relational timing to suggest additional growth areas over time, based on teacher readiness and a trusting relationship. Using the teacher's self-identified goals lets the teacher take the lead and places the teacher and coach on more equal footing (Knight, 2018). This is also beneficial as teachers expressed a nonhierarchical relationship was the preferred structure.

Human-First Approach

Another theme that emerged from interviews with teachers and instructional coaches was that of a human-first approach, meaning all of the participants are all people with human needs before we are educators (Maslow, 1943). All teachers have real, human emotions and lives outside our classrooms that may sometimes impact us. A human-first approach asks a coach to support the person before the work, and this concept was mentioned over 20 times across all interviews. Coach Claudia explained that her approach is usually to "focus a lot on how well individuals are doing, and kind of putting that oxygen mask on first, before we make suggestions

about how to change your pedagogy or your practices." Sometimes, especially for new teachers, being overwhelmed can leave a teacher feeling like they are drowning. Coach Ron shared that he has seen new teachers in such a state of being overwhelmed that they were not even able to identify a goal. Ron said:

> If I was using the walking metaphor, like they couldn't even ascertain where the sidewalk was to stay in a lane, you know they were like all over the place, and if I wasn't giving them direction it was perpetuating frustration.

In this case, coaches should feel empowered to slow down, care for the person with whom they are working, support their immediate needs, strive to eliminate the stressors helping the teacher regulate and reduce their stress, and offer more directive guidance if the teacher asks for it (Mansfield et al., 2016).

Coach Claudia talked about the need to help teachers remember their "why," why they selected this profession and what they were passionate or excited about when they began their career. Claudia explained:

> I think it's like getting people to really zoom out and think about the why. Why am I here? What do I, what is my higher purpose as an educator? And what am I doing or not doing that's keeping me from being burned out?

She would use this to remind them of their passion and reignite an interest in pursuing growth.

Coach Hannah shared about an intrinsic coaching model where she supports the person first, then the teaching, then the students. Hannah further shared that when a teacher is stressed and dysregulated, she has observed the students mirroring those emotions in classrooms. She told me that supporting the teacher to feel regulated and calm is a critical step before any growth can be made. Certainly, it is related to what we know about Maslow's hierarchy of needs, that self-

actualization cannot be accessed until safety and care needs are met (McLeod, 2025).

This does not mean a coach must become a therapist or counselor. However, the coach should be ready to encounter teacher emotions and may sometimes provide emotional support. Several coaches shared specific examples of meetings with teachers where the teacher had just come out of a challenging moment and needed to process what happened rather than engage in the pre-planned coaching discussion. Coach Sarah explained:

> Maybe something happened that morning with a student, or they want to talk about that. I always allow them that space to kind of clear the air if they need it. And then I'll circle back to whatever it is that we talked about in our previous session.

A coach may also need to rely on their trusting teacher coach relationship to suggest the teacher seek some additional kinds of support.

Incremental Change Approach

Instructional coaches and teachers talked about instructional coaching being more effective when goals or actions were broken into small steps and teachers had one area to focus on at a time. Coach Darcy said she tries to focus on teacher goals by "really just allowing the teacher to lead the conversation and not feeling like it's top down, or, you know, I really want it to feel supportive, collaborative." Instructional coaches almost universally expressed that they never wanted teachers to feel that coaching was an extra, or something more. Rather it should feel like it takes something off a teacher's overfull plate, or as Coach Laurie explained, "it involves positivity and support and willingness to tackle issues which feel insurmountable to teachers in order to make teachers' lives easier."

Because so many schools tend to frontload coaching for new teachers who are already taking on an abundance of new information, it can be most helpful to not be given too much

feedback or too many new things to try at once. Coaching may be more effective if stress is removed while building new skills or strengthening existing skills (Kraft et al., 2018). Coach Darcy described this by saying, "small bite sizes is an effective way of coaching," and teacher Mina gave an example of how her coach approached incremental change saying, "You're doing great like you do awesome work, like I can see that you've done progress monitoring. Here's some little tiny piece of feedback. It was about prompting kids," saying changing a small thing each time they met felt manageable. Teacher Ted similarly felt that too much to change at once is overwhelming, and said of coaches, "don't give me 35 projects in the next week. Give me two, maybe three, that I can think about."

Maintained Over Time

Instructional coaching is best when it occurs at regular intervals, and whenever possible maintained over time (Anderson & Holland, 2025; Knight & Skrtic, 2020; Teement, 2014). Many districts and schools have limited instructional coaching staff, so they tend to frontload instructional coaching for those teachers new to the profession or cycle through small groups of teachers throughout the year, which was the case for districts in my study as well. However, many teachers I interviewed were veteran staff who continued to access instructional coaching well beyond their first few years in the profession and found it just as impactful. Veteran teacher Ted shared that though he had taught for over 25 years, he felt that coaching was an essential support for all teachers and should always be available, as his coach helped him continue to refine and adjust his instruction even with many years of experience to draw from. Ideally, a school system would have enough instructional coaching staff to provide more intensive coaching to new educators, but consistent coaching throughout a school year to all teaching staff as a way to keep a growth-focused culture.

Selecting Quality Instructional Coaches

A significant finding from my research was data on how important it is to place the right people in instructional coaching roles. Though this was not a research question, the topic is critical to the success of any instructional coaching program. Participants, especially teachers, frequently mentioned that an instructional coach needs to have a very specific disposition, background of experience, and personality type. This is consistent with Aguilar (2013) and Knight (2013) who similarly outlined the dispositions needed for one to be an effective instructional coach. Without thoughtful consideration of the attributes needed for effective coaching, a district or school may employ the wrong person for the job which can have negative impacts for teachers. Simply being a veteran or tenured teacher is not enough to qualify one as an instructional coach, and that was mentioned by nearly all teachers in interviews. Teacher Mina described a good instructional coach's qualities. Mina stated:

> Collaborative, positive. I think, trusting like, it's one thing to get, like, constructive feedback, like unsolicited right, but you have to trust the person that's giving you that feedback, because otherwise nobody wants constructive criticism from someone they don't particularly trust or like.

Teacher Earleen similarly explained that coaches need to have a specific type of nonjudgmental and supportive personality. Earleen said:

> I don't see her as judgmental like, she doesn't judge me and I think that takes a certain personality. So, I think some teachers who are instructional coaches can come across as kind of condescending or at least, I've experienced some of that. But my instructional coach currently has just the right personality, like she really cares about how we feel about what we're doing.

Though participants and others in the education profession can agree that one really must have classroom instruction experience before they can be an instructional coach, participants suggested the coach needed to be someone they can trust, someone they like, someone they can easily connect with, and someone who will not pass judgment on them (Aguilar, 2013; Knight, 2018). Teacher Earleen further explained that what makes a coach effective is someone who "walk[s] with the teacher, know[s], show[s] them that they can reflect on their own practices. They can make those mistakes, and then they can, no matter what is done in the classroom, that they can do better next time." The coach is more than an expert in content, they are also a trusted advisor, someone who can help reflect without judgment, who can allow the teacher to grow without pressure or the looming threat of evaluation (Aguilar 2019, Knight 2013).

Both coaches and teachers reflected that coaching was more effective if their coach was experienced in their content area (Ocasio-Stoutenburg et al., 2024). One teacher, Pal, shared that though she liked her coach, their lack of background in her specific content meant that some suggested approaches did not fit well in her context, and conversely, when a professor who provided coaching for a course in Pal's content area modeled a specific practice that is effective for her content, she found that incredibly powerful. Pal explained:

> My coach [at the school] didn't know how to coach me because she was not a coach for languages. Then I have the other coach, who was a language coach, or she taught languages, and she was my coach. But I think what happens is in the language world, things have evolved so much, and she [school coach] was not, she was not up to speed with the best practices, so I really never had a coach in the language field.

The professor's coaching-style approach plus content expertise led to more effective coaching and growth for the teacher. Coach Laurie shared a similar reflection from her own

perspective, explaining that she felt more confident coaching in her area of content expertise than when she supported educators in other contents. Coach Marie similarly explained, "when I'm asked to work with teachers that are outside of math for me, that's just harder. And I think that I'm growing in that space. But it's definitely not my comfort zone." She went on to say that her comfort grew over time as she did more of it.

Discussion

From my work with teachers and instructional coaches I am more convinced than ever that schools and school districts should develop and support great instructional coaching programs for their teachers. One important insight that my study gave to me is that all teachers from the newest to the oldest should have access to great instructional coaches. As I review what is going on just in terms of technology, it is obvious to me that all of our teachers need coaching to ensure that our students are knowledgeable and safe. It is critically important to help all students to become effective producers and consumers of the use of technology.

Teachers, families, and students are living in a world in which there is way too much violence, and many of our students and teachers are nervous just to go to school. Educators and our communities must ensure that our educators and our students teach and learn in environments that are safe and caring (Sousa, 2022). All students deserve a valid education (Armstrong, 2012), no matter their circumstances. The educational gaps in our students must be dealt with successfully for all students but according to the Nation's Report Card (National Center for Education Statistics (2024), in the United States, reading and mathematics scores continue to be in decline. Educators and parents know that the most important people to turn these declines around are teachers (Hattie, 2009, 2023). Unfortunately, as the system stands now, too many teachers are unsupported in their efforts to grow their skills (Hayes, 2023). The present

process perpetuates inequities for both teachers and students in the form of lack of support, lack of changed classroom practices, and unchanged systems. I have come to understand it simply makes no sense to leave the people who have the best chance to improve education, teachers, unsupported.

The good news is that the results of my study and those of other people (Hattie, 2023) have developed recommendations shown to make a positive difference in the abilities of teachers to develop and implement educational strategies that help all students learn. In my study, from my work with and data from teachers and instructional coaches, I discovered eight strategies to help instructional coaches and the teachers with whom they work to increase their knowledge and skills to help their students. These strategies include the following elements for instructional coaching programs: (a) trust and relationships, (b) relational timing, (c) dynamic interactions, (d) a growth-focus, (e) human-first, (f) incremental change approach, (g) maintained over time, and (h) selecting quality instructional coaches. In Part B of this two-part series, based on the findings of my study, I describe my ideas for an effective instructional coaching model.

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Part B

Instructional Coaching's Most Impactful Practices as Told by Teachers and Instructional Coaches in Vermont Schools

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Abstract

Since 2019, student achievement has seen a significant decline, with National Assessment of Educational Progress (NAEP) scores dropping markedly between 2020 and 2023. Addressing the critical link between instructional quality and student outcomes, this grounded theory qualitative study investigates the most impactful instructional coaching practices within Vermont schools. While traditional, compliance-based evaluation systems often prove ineffective for professional growth, instructional coaching offers a nonevaluative, job-embedded alternative that can mitigate teacher burnout—a factor accounting for 27% of attrition variance—and significantly enhance teacher self-efficacy. The research identifies several foundational principles for successful coaching. High-impact coaching is characterized by an equal partnership where teachers and coaches collaborate as peers rather than the coach dictating specific actions. Central to this dynamic is the requirement that coaches remain distinct from administrative or supervisory roles; avoiding evaluative capacities is essential for maintaining the necessary trust for professional development. The study further indicates that classroom observations should be prioritized only after a secure relationship is established, allowing educators to feel safe in their vulnerability. The study advocates for the use of self-assessment tools to guide teacher reflection, especially

for those new to the profession. Coaches facilitate this growth through reflective questioning, a deliberate and purposeful strategy designed to prompt a teacher's own thinking and self-discovery. By adopting these relationship-centered and non-directive practices, instructional coaching serves as a powerful lever for both teacher growth and closing the achievement gap.

Keywords: instructional coaches, impactful practices, instructional practices, student achievement

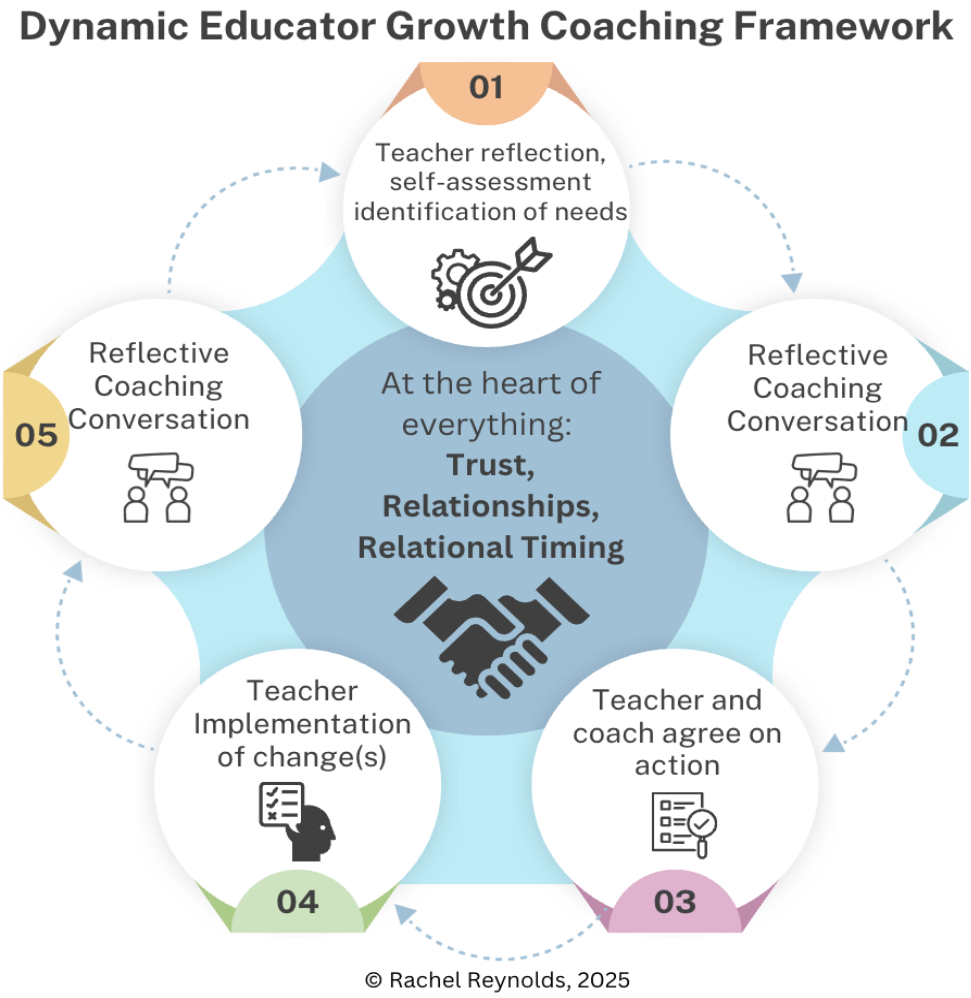
I investigated how to help teachers and instructional coaches work together in ways that will create professional and trusting relationships so that their work would be beneficial to both parties. The results from my study are aligned with other studies demonstrating effective instructional coaching makes a positive difference for teachers and their students (Hattie, 2009, 2023; Knight, 2018; Rhue, 2022; Teemant, 2014). The National Center for Educational Statistics (2024) reported since 2019, achievement scores have continued to decline. Studies have consistently demonstrated that the most important person to help improve educational results is the classroom teacher (Hattie, 2009, 2023). All students deserve to work with teachers who have received the best professional development, and research has demonstrated that instructional coaching done well helps to lead to the high quality teaching all students deserve (Gothart, 2023; Hattie, 2009; Olsen, 2016; Opper, 2019; Shiheiber-Gilmer, et al., 2025).

From my work with and data from teachers and instructional coaches, I discovered eight strategies to help instructional coaches and the teachers with whom they work to increase their knowledge and skills to help their students. These strategies include elements for instructional coaching programs: (a) trust and relationships, (b) relational timing, (c) dynamic interactions, (d) a growth-focus, (e) human-first, (f) incremental change approach, (g) maintained over time, and (h) selecting quality instructional coaches. In Part B of this two-part series, based on the

findings/themes of my study, I describe my ideas for an effective instructional coaching model (see Figure 1)—the dynamic educator growth coaching framework (Rachel Reynolds, 2025).

Figure 1

Dynamic Educator Growth Coaching Framework



Dynamic Educator Growth Coaching Framework

A primary goal of my study was to take the data provided by teachers and instructional coaches and develop a new model of instructional coaching. The data provided by teachers and instructional coaches about what does and does not work when teachers interact with an

instructional coach led to the development of this model, based on common themes/elements and instructional coaching approaches that emerged from the research data. I have named the model the "dynamic educator growth coaching framework" *(DEGCF)*. Like other coaching models, there is a predictable cycle for coaching. The DEGCF contains four components, unique to this model, identified by teachers as critical to their success with their instructional coaches: (a) teacher reflection, self-assessment, and identification of needs, (b) reflective coaching conversation, (c) teacher and coach agree on action, (d) teacher implementation of changes.

Component 1: Teacher Reflection, Self-Assessment, Identification of Needs

The first component of the DEGCF is for teachers to reflect and self-assess their skills, strengths, and growth areas while emphasizing the need to have autonomy over the direction of coaching, which means the teacher needs to be able to take the lead based on their needs and goals (Goeze & Lewin, 2023; Sims et al., 2021). Teachers and coaches both shared that conversations that were goal-driven and focused on a teacher's identified goals resulted in greater improvement and progress. Self-assessment can be a useful tool for teachers, especially new ones, to guide their reflection (Aguilar, 2013; Hattie, 2023). What is most critical, though, is that the self-assessment happens privately and the teacher selects what to share and with whom. Teacher Ted explained how important that privacy and reflection was to him. Ted said, "closing the door was great, because there aren't many places you can do that, and have a conversation without interruptions and extra ears. It was a chance to talk about what had happened, to ask questions without fear." This helps establish and support trust in the teacher-coach relationship. Veteran teachers in the study noted that they often had an idea of their instructional growth needs and felt comfortable reflecting based on past experiences to set goals. It should also be noted that new teachers, especially those in their first year, sometimes do not know where to even begin

therefore a coach may need to be prepared to offer a menu of skills from which a teacher can select. Coach Sarah explained that she and the other coaches in her district developed a continuum of coaching support that showed what type of coaching may be offered and provided types of skills certain approaches may work on. Sarah said:

> So, we came up with this model that goes along with that as well. It's more of, here is a little bit more of the coach leading versus the coachee is doing all the work on the right-hand side . . . Sometimes, if they're not sure where to start that I'll give them suggestions: Do you want to look at classroom management? Do you want to look at relationships? Do you want to look at engagement?

Component 2: Reflective Coaching Conversation

The reflective coaching conversation is an essential element of the DEGCF, especially as reflection and feedback emerged as one of the most helpful tools coaches used. Once a teacher has a goal or growth area in mind, the coach must help the teacher identify how they will enact change by posing some questions to guide their reflection further. The questions asked should not be to push a teacher to a specific action or type of instructional approach, but rather to help the teacher create their own path to goal achievement, with the coach acting as a guide and resource. Coach Ella described how she uses reflective questioning to determine the type of support a teacher needs but still allows the teacher to control the direction of the conversation. Ella explained, "I think, by asking a probing question, it can kind of tap into a teacher's desire to improve for their students, and I think, depending on their capacity as a teacher, you may take on more or less of helping them make those improvements." Coach Claudia also explained that reflective questioning drives her coaching sessions. Claudia said, "I don't do any suggesting, consulting, or mentoring. I simply ask you powerful questions and play back what I'm hearing to

help you arrive at new awareness." Teacher Mona also expressed how reflective questioning helped guide and support her. Mona said:

> I think the thing that my coach did was not tell me what I should be doing, but instead, ask, like, where do you feel like you need support in this moment? And how can we get you feeling ready to go into your classroom?

In these examples, reflective questioning was used to help a teacher identify their own needs and next steps, keeping the teacher as the leaders of the process.

This reflective coaching conversation happens again as step five of the model, after a teacher has implemented a change. At that point in the process, the teacher and coach review how implementation of the change went, what did and did not work, and what should happen next. Data from interviews of both teachers and instructional coaches revealed that reflective conversations and feedback were one of the most significant factors that impacted teacher growth in the coaching process, which is why the reflective coaching conversation happens with frequency and regularity in this framework.

Component 3: Teacher and Coach Agree on Action

In most coaching frameworks, this is the place where observation of instruction occurs. And though that may be the action here, this is where the DEGCF veers from other models. Observation is an effective tool for feedback and teacher growth, but teachers in this study noted that it can feel threatening if done at the wrong time or if a coach comes into a classroom uninvited and provides feedback that is not asked for. As a result, the coaching relationship can be damaged, and trust can be nearly impossible to restore.

For this reason, component three in the DEGCF is where, after goal setting and a reflective conversation has happened, the teacher and coach decide what the right next step is to

support the teacher based on the goal the teacher has set. Observation is an effective approach when the teacher is seeking feedback and growth in an instructional strategy or classroom management approach. But if a teacher has a goal related to planning for instruction using student data, or identifying an instructional approach to improve engagement, the action may be that the coach becomes a resource finder, trouble-shooter, coplanner, or data partner. In short, the instructional coaching tool or approach must fit the teacher's goal by providing the type of support the teacher needs. The data suggests coaching is more effective when it feels like a partnership, where teacher and coach are equal in the partnership versus the coach dictating a course of action (Aguilar, 2013; Goeze & Lewin, 2023).

Component 4: Teacher Implementation of Changes

Component four of the cycle is where a teacher takes the action plan created with their coach and implements it. This could be trying a new instructional strategy or delivering a targeted lesson based on data analysis conducted with a coach. The teacher is applying something new based on their coaching conversation, which is followed up with an additional reflective conversation examining how the change went and what the logical next steps will be. After the second reflection, the cycle can begin again with the teacher's new knowledge and reflection as the baseline for continued growth or a new goal or growth area.

In interviews, many of the teachers, like Ted, Earleen, and Rose, shared that it was helpful for the instructional coach to take notes or document next steps and provide them a copy, and that it helped them stick to and implement changes after meetings ended. Coaches could benefit from creating a simple form for teachers to use that includes a space for the data that drove the change, what action will happen next (For example: will the teacher try something new? Will a tool be developed? Will the coach observe a new strategy?), when it will happen,

and a space or way for teachers to reflect on how the implementation went and self-assess their process.

Component 5: Reflective Coaching Conversation

The reflective coaching conversation is revisited as component five of the DEGCF. This time, it follows the teacher implementing a change based on the goal they set and the previous coaching conversation in component three. The teacher and coach reflect on what occurred, how it went, review any data (if relevant), and then the cycle can begin again, either by focusing on the next steps for the current goal or plan, or by reflecting on where to go next in the teacher's journey.

Discussion

Teacher Autonomy and Ability to Direct Own Growth

A teacher's autonomy and ability to direct their own growth emerged as a characteristic of effective instructional coaching and became the starting point of this model. The model also embeds two coaching conversations, emphasizing the need for a continual feedback loop and ongoing coaching over time. Step three is also unique to the model. In traditional models, a typical cycle would place a classroom observation in position three. However, teachers consistently expressed that though observation could be a valuable tool for some growth areas or goals, they needed the support offered to them to match the growth goal they identified, and observation is not always the best match for a teacher's needs.

For instance, one teacher shared their work to redesign instruction based on student data following an assessment. They explained:

> I've learned from [coach], like a little more about like doing tiered assessments. Like tier one, tier two, tier three like how to roll that out. That's been helpful . . . just like figuring

> out the best way to roll things out with kids and explain it, and how to support them like it's just nice to have somebody to bounce ideas off of.

Teacher Eowyn also gave an example of a time when observation would not have been the right fit. She wanted help adjusting and crafting lesson and unit plans, and her coach opted for a coaching approach that aligned to her specific need. Eowyn stated:

> verbalizing a lesson because I'm always doing them in my own head, and I'm always kind of writing them out on my own, having a chance to also verbalize what I'm thinking, not even writing. It just makes a huge difference, and you can kind of pick up on things that you necessarily wouldn't. And hearing another voice and their opinions on those lessons I feel like just makes them stronger, or unit plans, or whatever plans are happening.

In these instances, the action of coplanning was more aligned to the teachers' needs than observation would have been, again demonstrating why coaching needs to be teacher-directed and flexible enough to include a variety of support strategies. Coaches need to listen to what the teacher's goal or need is and tailor the support they offer to best match that need.

Who Should Be a Coach?

So, who should be a coach? The ideal personality and disposition are that of an experienced classroom educator, one with a nonjudgmental approach, who asks thoughtful questions, who can maintain trust and confidentiality, and can provide support and allow for reflection without telling someone else what to do, which echoes Aguilar's (2013) assertation that coaches need emotional intelligence and strong interpersonal skills, and Knight's (2013) point that coaches must be approachable, worthy, and good at active listening and dialogue. The coach should also be ready to be a listening ear and a supportive arm when the teacher needs it and be able to stay focused on the teacher's goals. When possible, teachers in the study felt

instructional coaches should share common grade and content expertise with the teachers they support (Ocasio-Stoutenburg et al., 2024), as this is more comforting to both the teacher and coach alike. It is also crucial that an instructional coach should not be in a supervisory role of the teacher. Instructional coaches should not be administrative or evaluative in any capacity (Aguilar, 2013; Kdruvenga, 2017).

Effective Coaching Approaches

Both teachers and coaches commonly named some instructional coaching practices that they felt were more effective for improving instruction, student outcomes, and teacher efficacy. In the DEGCF, these practices are emphasized but not prescribed. That is, their effectiveness is based on the instructional coach's relationship with the teacher, knowledge of the teacher's growth goals, and the instructional coach's ability to select the best approach to help the teacher grow. There is no one right path for coaches to follow when supporting a teacher because every coaching relationship and situation is unique.

My research revealed 10 practices referenced most frequently in interviews. Teachers described which coaching approaches had, in their opinions, a significant impact on teacher instruction, student outcomes, and/or teacher efficacy (see Table 1). Though some, like relationships and trust, are essential components of the DEGCF or skills a coach possesses, others are specific coaching strategies that were used in coaching sessions and are decided upon by the teacher and coach in step 3 of the cycle (see Figure 1).

Table 1

Top 10 Impactful Practices

Top 10 impactful practices	Frequency
Relationships and Trust	64
Observing Teaching	48
Reflective Questioning	44
Teacher Goal-Driven	39
Listening	34
Gathering Data	32
Feedback	32
Modeling	31
Co-Planning	23
Flexible Coaching	22

Relationships and Trust

Relationships and Trust were most frequently mentioned in the study by teachers and coaches. Building trusting relationships is the precursor to any successful coaching relationship. Many teachers and instructional coaches linked trust with confidentiality as well, saying that knowing their coach was not reporting back to leadership about them was also part of that trust. Coach Laurie explained:

> I've made a very conscious choice to spend a whole lot of time building relationships with people in the building because I'm not somebody who is hired internally and already knew folks, which is how a lot of coaches get their positions. And so, I spent, you know, the first several months, just like making lots of relational deposits and creating positive feedback loops with teachers. Just so they really understood that I was not somebody who

> was out to get them, that it would feel possibly different than interactions that they've had with administrators in the past.

This approach helped Laurie build relationships and trust by showing her support of teachers and her separation from an administrative role that would maintain teacher confidentiality.

Coach Hannah said:

> I think it's a very trusting relationship. I think all the teachers I work with really do believe that I don't go to principals and say, "Oh, boy, you got your hands full with Sheila," you know, or you know, just it's very confidential.

Teachers described the importance of trust and relationships as essential. Teacher Ted explained:

> Knowing that I'm getting feedback that's completely separate from the evaluation process and that those notes are secured, that nobody is gonna go peek in that hard drive, nobody's gonna corner that coach and say is there something we need to be worried about here? That's huge.

In this instance, he is explaining the importance of the coach maintaining trust by keeping coaching meetings confidential and being able to trust that the growth occurring there will not be used in a punitive way against a teacher later.

Teacher Rose similarly shared that having a strong relationship with the coach led her to feel safe talking about challenging or frustrating situations and knowing those would remain confidential. Rose stated:

> I know for me this past year, especially there was some like things the administrator said that I didn't love, so she was just like a listening ear, someone I could vent to and like give me advice that I know was in my best interest and from a very professional non-biased point of view, which was very useful.

In all cases in interviews, both from instructional coaches and teachers, the bottom line was that teachers would not feel comfortable participating in coaching unless there was first a trusting relationship, and coaches similarly reported that they all spent intentional time building a relationship and trust before moving into a teacher growth process.

Observing Teaching

Observation of a teacher's instruction was mentioned 48 times in interviews by teachers and coaches. Teachers described observation of instruction having the most impact on their instructional skills and student outcomes, as the observations led to pedagogical or classroom management adjustments that improved the classroom culture. Though coaches generally felt it is a very effective tool, teachers would add a caveat about how to use it effectively. Almost unanimously, teachers expressed that observation is effective when coach and teacher have developed a trusting relationship.

Also, teachers shared that observation is more effective when the teacher invites the coach into their classroom versus the coach inviting themselves. Several teachers, like Pal, shared past coaching experiences where, when starting out with a new instructional coach, the coach had reached out to schedule an observation of instruction before meeting with or introducing themselves to the teacher first. In some cases, like with Pal's experience, that observation was immediately followed up with feedback about areas to improve instructionally. Pal shared how disheartening this was, because it felt to her, as a new teacher, that she was judged by someone who did not know her or checked in with her about her needs prior to observing. This resulted in a coaching relationship where Pal lacked trust with the coach, and future growth was limited. Pal suggested:

> After maybe some time, that's when the coach can actually observe you after you have accumulated enough experience that you feel confident, I think that coach could observe you. But 1st you need to be able to trust yourself and trust your coach, because if you don't trust yourself as a teacher yet, you're obviously going to feel like you are observed and criticized.

The DEGCF cycle outlines the coaching cycle as always starting with the teacher's personal reflection and a face-to-face meeting before anything else occurs. Observation could be the appropriate tool, but that should be a result of an invitation for a coach to enter the classroom. Observation should also wait until a relationship is clearly established so teachers feel safe being vulnerable in front of another educator (Aguilar, 2013; Goese & Lewin, 2023). Coach Darcy said, "I am not stepping into someone's classroom unless someone is asking." Teacher Mina felt similarly, saying, "Definitely follow up [coaching conversations] with like observations. Being able to see that classroom teacher, or that service provider professional in action . . . but also like setting a goal, I think that proper coaching requires goals first." In this statement Mina is explaining that a conversation and teacher's goals need to come before someone is observed. Coach Hannah said she offers it after developing a coaching relationship. Hannah shared:

> It starts with a conversation. It starts with a lot of listening, and then we come up with a schedule and a plan. Often, I'll say, would it be helpful for me to come in for a half a day, and just take down what I see?

Finally, Teacher Pal explained:

> I think that observing too early is one that should be avoided . . . I think it is important at first to avoid the I'll go and observe you, and then I'm going to tell you what I think of your lesson, so I think that is important to avoid.

On a related note, observation is also not the only approach a coach can use to help a teacher improve. If the teacher's goal is related to analysis of student data for instructional planning, then co-planning and effective use of data tools is the more appropriate coaching approach.

Listening and Reflective Questioning

Listening and reflective questioning go hand in hand and can impact teacher instruction, student outcomes, and teacher efficacy (Balcı & Özkan, 2023; Smith, 2023; Thomas et al., 2015). Though they were coded separately, I found in my review of interview data that they were impossible to separate, as one must actually listen to the responses to reflective questions in order for the practice to be effective. For this reason, they are described together in this section. In the context of instructional coaching, listening means attending carefully to the teacher to understand their perspective, strengths, and needs, and growth areas, which means listening both analytically and empathetically. Reflective questioning is a deliberate and purposeful strategy that a coach uses to prompt a teacher's own thinking and self-discovery (Aguilar, 2013). Unlike a typical question-and-answer session, the goal is not for the coach to get information, but for the teacher to gain a deeper understanding of their own practice.

Instructional coaches must be great listeners, able to understand what a teacher is expressing, and then be able to ask reflective questions that help the teacher consider how to approach the situation. This also includes listening to the coaching approach a teacher might like. Coach Ron expressed that there are situations where a teacher, especially one new to the profession, is so overwhelmed and lost that they are not in a place to be able to thoughtfully reflect. What they may express is simply wanting a coach to be more direct with them, helping them find their footing and get to a space where they feel they can manage.

Coach Darcy described her experience supporting teachers new to the profession. Darcy said:

> And those first five years really are so important to keeping people and building confidence. And I think that's the one thing that coaching really does is recognize and validate the struggle. Like, teaching is hard. There are all of these things that we're trying to juggle. And here are some things you're doing really well, and you name the thing you want to work on, and then I'm going to help you get there.

Darcy's example shows how she validates and supports struggles while helping new teachers find their footing and identify growth areas.

Ron further explained that rigidly sticking to a reflective and teacher-driven model in such a situation can leave the teacher more frustrated than if the coach had listened to the need in the first place. Ron explained:

> And I really, really struggled with that for one or two years, because the teachers that I particularly was working with as new teachers new to the profession didn't know, I mean, if I was using the walking metaphor like they couldn't even ascertain where the sidewalk was to stay in a lane, you know they were like all over the place, and if I wasn't giving them direction it was perpetuating frustration . . . But the model had taught me to like, you know, not give direction. And so, I would like ask questions and ask questions and ask questions. But the teachers were like, not . . . they weren't frustrated with me specifically, but I could sense the frustration because nothing's changing for them. And so that was almost a disservice to me as a coach to have that be the model that was presented as like do this model, this is the Holy Grail of coaching, because it wasn't what my folks needed.

Ron's explanation here exemplified how a reflective model created teacher frustration when a teacher was struggling and unsure where they should even begin, and Ron argued that coaching is more effective when the coach can pause and adapt to the needs of the teacher in front of them versus rigidly sticking to a specific model or coaching approach.

Teacher Pal also reinforced this approach, sharing that as a first-year teacher she would have liked someone to come in with some structure and supportive guidance. Pal explained, "I remember being a 1st year teacher and thinking, how do I decide this? I don't even know what's right, what's wrong, and what is going to come at me because you make a thousand decisions per minute."

Though there is no specific script for coaches to follow in the DEGCF, there are some reflective questions (see Table 2) that a coach can use. These should be adapted based on the individual's situation or needs. I have generated seven areas of questions as examples for coaches to use at the appropriate times The examples include the following kinds of questions (a) for a new coaching relationship, (b) goal related, (c) personal learning needs or instructional improvement, (d) collaboration and support, (e) assessment and evaluation of learning, (f) resource allocation and utilization, and (g.) data and use of data,

Table 2

Reflective Questioning Prompts

For a new coaching relationship
1. What do you hope to grow or develop about your teaching practice this year? Why? 2. How do you see me supporting that? 3. How do you like to receive feedback? 4. What happens when you get stressed or overwhelmed? 5. How can I best support you in those moments?

Goal-related questions
1. What data source did you use to help shape this goal and why? 2. What support can I offer you to help you achieve this goal? 3. How will the goal impact student performance/your classroom culture/your assessment approach/etc.? 4. How will progress towards the goal be tracked/measured? What specific action steps will you take to move towards goal attainment?
Personal learning needs and instructional improvement
1. What specific skills or knowledge do you need to acquire to effectively achieve your learning goals? 2. What adjustments to your teaching practices can you make based on your reflection of content, pedagogy, and skills? 3. How could instruction change when you adjust your identified instructional practice? What will be different in your classroom as a result of your change?
Collaboration and support
1. How can you leverage the expertise of colleagues to support your professional growth? 2. What kind of collaborative relationships can you foster to enhance student learning? (With colleagues? With students?) 3. How can you effectively provide and receive support from colleagues to address challenges and celebrate successes? 4. What can I offer you as a coach that can help you on your growth path
Assessment and evaluation of learning
1. What strategies can you use to effectively monitor student progress and inform instruction? 2. How can you communicate student progress and achievement clearly and meaningfully? 3. What challenges might you encounter in assessing student learning, and how can you overcome them? 4. How do you use formative assessment data to inform your instructional planning?
Resource allocation and utilization
1. What resources (time, materials, technology) are essential to achieving your learning goals and supporting student success? 2. What additional resources or support would be beneficial for you in addressing identified challenges?

Questions regarding data/use of data
1. How well aligned is this data to the goal or growth area? What might make it better aligned or more beneficial? 2. What patterns emerge in this data? 3. Is this format for data presentation/analysis/instruction providing you with the information you are looking for? If not, what do you need to change or adjust? 4. How are you involving students in understanding and using their own learning data? 5. How will you use this data to inform your next steps?

Reflective questioning is part of the dynamic nature of coaching. The list in Table 1 is not all-inclusive and coaches should be free to adapt questions based on the teacher and situation in front of them, feeling empowered to take a more directive approach if needed, until the teacher finds their footing.

Teacher Goal-Driven

Instructional coaching sessions, according to study participants, are most successful when they are driven by a teacher's own goals and identified growth areas versus when a teacher perceives a coach is telling them what they need to do to improve (Goeze & Lewin, 2023; Sims et al., 2021). Coach Laurie explained that she usually opens coaching sessions by asking the teacher what their area of focus is. Laurie said:

> We have talked about what it is that she wants to get out of it, and then I do a lot of questioning about kind of where she wants to go. With that information and what she currently has and then we do some brainstorming together around what that could look like, and I might make some suggestions.

Coach Darcy similarly noted that coaching works best when it is "really just allowing the teacher to lead the conversation and not feeling like it's top down, or, you know, I really want it to feel supportive, collaborative. And that's when I found the most success." Darcy also added, "It's just

not successful if it's not teacher led, and if it's not what they are looking for, so I will give teachers almost a menu of options, for how I can support them after that initial observation happens."

Teachers similarly shared their experiences with having conferences that are focused around the goals they identify. Teacher Earleen explained about her coach:

> Always, I don't say holding my hand, because that's not it, but she's walking with me and kind of, guiding me, based on what I feel like. I'm the one in charge, but she's kind of helping me gather the resources. Helping me fine tune.

In her response, Earleen explained that her goals drive her coaching sessions, and she feels the coach is the guide and support person who helps her find her way to the goal. Teacher Pal suggested that coaches should "offer to coach on what interests the teacher until trust is established," then they could offer observations about potential growth areas.

Coaches did provide a caveat to completely teacher-driven goal setting and that is in the event a teacher is struggling so much that they cannot identify an area of focus or growth, then it would make sense for a coach to take a more directive approach and provide some suggestions in a more guided way. Coach Marie described a situation like this, adding that the intention is not to guide the teacher forever, but rather to get the teacher to a place where they can own the growth and reflection process.

Coach Ron similarly explained that if a teacher who is too lost and overwhelmed is asked to drive the goal and direction, it can lead to more frustration. Ron explained, "if I was using the walking metaphor, like they couldn't even ascertain where the sidewalk was to stay in a lane, you know, they were like all over the place, and if I wasn't giving them direction it was perpetuating

frustration." In a case like this, coaches in my study agreed that providing more structure or direction for the teacher would be appropriate.

Gathering Data

An instructional coach must be skilled at gathering data to help inform a teacher's progress toward their goals and help teachers improve their own data analysis skills (Knight, 2007). Data could include information on the effectiveness of instructional strategies. Teachers mentioned the need for instructional coaches to be effective with data, highlighting it as an essential component of the DEGCF. Teacher Rose explained that she finds data helpful. Rose expanded:

> having just them be present and like willing to do and collect data that you want, I think that's really effective because they'll be able to, like, know what you're going with and like have data to back that up and also like on the flip side of that, if like we're our own worst critics so having them like go and be like, oh no, you're actually doing this really well, it's kind of good too.

Teacher Earleen similarly said, "she's walking with me and kind of, guiding me, based on what I feel like. I'm the one in charge, but she's kind of helping me gather the data. Helping me fine tune."

Overall, teachers and coaches shared that data about their teaching performance needed to be objective. Many spoke in measurable terms, reporting strictly on what the frequency numbers are or providing observation evidence of what was seen and heard without any judgment. Coach Darcy said:

> One thing I'm really careful about is when I'm doing the note taking about the classroom observations, I'm as objective and factual as possible so I don't make inferences about

> what I see or conclusions about what I see. I ask the teachers to do that which is really important to the trust part in the relationship building in that cycle.

Coach Sarah echoed this stating, "when I do data collection, I try super hard to be completely neutral with how I take it. And it's very much just this is the data, and there's no judgment. I let them form their own conclusions." Both teachers and coaches felt data was better received when it was factual and objective. Regardless of the method of data collection, instructional coaches must be skilled at collecting data in a way that is not judgmental or subjective.

First, teachers expressed the importance of their instructional coach knowing what kind of data would be most beneficial to their growth. Teacher Earleen, who set a goal to work on engagement in her library classes, needed the coach to first gather data on what student engagement looked like through observation so she knew the challenge areas. She then needed her coach to support her implementation of different instructional approaches and to observe and gather data again on engagement to note if growth was occurring and if students were showing improvement. For this, the coach needed to be very clear on the teacher's growth area, know exactly what she was tracking in the classroom, and track what student participation and engagement looked like before and after the instructional adjustments. Earleen explained:

> I'm like, can you sit here? She writes down literally everything I say and do and just has me read it back, and it was like, you know, [Earleen], you know what, and will ask me then clarifying questions like, what felt really good for you? What felt challenging? How would you like to make those challenging pieces not so challenging in the future? What do you think your ideas could be around that?

Teacher Pal shared that she likes to know the research behind an instructional approach and its potential outcomes before she implements it and likes a coach to provide that data in their presentation of new ideas. Pal explained:

> I think they need to come with evidence. So come to me with some evidence that works come to me with the studies. Come to me with the literature, and don't come to me with your opinions, because well, you know, some opinions would work. But if you come to me with something that has proven to work and has been researched and has proven to be best practices in the content area, I am more likely to believe you, and to apply what you're saying.

Another way instructional coaches must be skilled with data is in the use of student data (Kdruvenga, 2017; Melvin & Vargas, 2021). Coaches must be experts in examining, disaggregating, and sorting student learning data in order to find patterns and trends and to help teachers determine their next instructional moves in order to move learning forward for all students. Additionally, though they need to be experts, they need to use their knowledge as the base for asking reflective questions to support their teachers in learning and identifying those same patterns and not simply doing it all for a teacher. Coach Claudia said she incorporates data because we need to know what its showing to know if coaching is working. Claudia said, "what's the student data showing like, are they leading where we want them to? Are they understanding and using evidence?"

Teacher Stacy described an effective coaching session focused on coplanning and data analysis. Stacy and her coach reviewed student learning data Stacy had gathered from a lesson and used it to determine what students needed reteaching of skills and which had mastered the concept. Finally, they came up with in-time instruction to address the needs of these different

groups. Stacy explained, "I think like on top of that, like I've learned from [coach], like a little more about like doing tiered assessments. Like tier one, tier 2, tier 3 like how to roll that out. That's been helpful." Again, the coach's role here was not to simply tell a teacher what their data means and what to do about it, but to use one of the core DEGCF principles of listening and reflective questioning to help the teacher unearth meaning in the data and then decide appropriate next steps.

Certainly, the dynamic nature of coaching and varied teacher needs are necessary considerations as well (Sweeney & Harris, 2020). A brand-new teacher who may be overwhelmed by both the data and all that teaching requires of them may ask the coach to be more directive with them as they learn and develop their skills. A more veteran teacher with varied instructional experience may be able to craft new instructional approaches based on data without significant guidance. A coach must be ready to adapt their approach to the teacher's needs.

Figure 2 is a data analysis tool for instructional coaches to use in the event a teacher is asking for support with student data. The data tool helps a coach and teacher sort data and plan for next steps instructionally. My research showed that gathering and providing useful data to teachers impacted improved student outcomes, improved instruction, and teacher efficacy. Figure 2 helps the teacher consider how to appropriately help students at their different levels or tiers. By working with an instructional coach, this task can be more manageable than working on one's own.

Figure 2

Data Analysis Tool

Teacher Goal:		
Data Source:		
General Data analysis (What does the data show about student understanding?)		
Sort the students based on the data for in time instruction:		
Students who require reteaching/content in a new way	**Students who are close to mastery**	**Students who mastered the skill/concept**
Instructional Approach	**Instructional Approach**	**Instructional Approach**
Outcome/Reflection:		

Feedback

Feedback is embedded throughout the dynamic educator growth coaching framework. During my study, teachers discussed how important feedback was to them, but most important to

instructional coaches is the delivery of that feedback. Teacher Rose, who was new to teaching, shared how feedback from her coach helped her. Rose shared, "I got to have her observe me and, like, give me feedback that could be applied like all throughout the board, but she was seeing it with different classes." Rose felt the feedback from her coach led to improvements in multiple classes she taught. Teacher Mona said she liked coaching feedback and that her coach "offers feedback in a very neutral manner. I think she's good at having hard conversations." The most effective instructional coaches are providing neutral feedback in bite-sized, incremental ways, pairing with some observed strengths or areas in which they have seen improvement and providing the just-right next step to continue growth (Aguilar, 2013).

Teachers emphasized in interviews that receiving only praise is not effective because it is too non-specific and does not identify any areas to take the next action steps (Benson-Goldberg & Erickson, 2021). Teacher Ted described this as "too much sunshine," and that someone praising positives and building up a teacher, especially after a hard day, was nice. However, there is not anything to base changes or growth on, and that feels frustrating to teachers. In Ted's words some praise can feel encouraging but, "I also need that honesty of here's the thing I can work on." Teacher Mina recalled a coaching experience where praise without structured feedback left her feeling a little lost and frustrated as well following an observation. Mina said, "It was just "you're done. You're good." I got threes [proficient] on everything out of four . . . there wasn't a lot of room for collaboration, feedback, talking it through improvement."

What matters most to teachers is that feedback is both honest about where they stand in relation to their goals and growth areas, and that the feedback feels manageable (Benson-Goldberg & Erickson, 2021). Teachers and coaches described this as being supportive but not adding extra work.

Feedback was an area teachers identified as most impactful for their own efficacy and improved instruction in the classroom. This was because the feedback helped them see strengths they possessed and the incremental changes over time showed them they were capable, which resulted in better instruction for students.

Modeling

Modeling is an instructional coaching approach preferred by both teachers and coaches alike, and, according to teachers and coaches in this study, it is most effective in one of two ways: when a coach models instruction for a teacher in their classroom, then follows up later to see how it is going over time; and when a teacher observes another teacher's instruction as an example of effective practice via a video or visiting another classroom (Aguilar, 2013; Knight, 2018; Kraft et al., 2018).

Coaches and teachers in my study reflected on modeling that seeing certain strategies in action are far more effective than reading about them or discussing them in theory. Teacher Pal shared that someone modeling a specific immersive approach to teaching world language was the only way she truly grasped it. Reading about and discussing the immersive language approach only resulted in confusion about how it looked in practice. Pal shared her observations of how transformative this modeling practice was for her and its impact on student learning. Pal said:

> You base all of it in content that is produced for native speakers. So that was revolutionary for me. That is what I learned. This is, and I have been applying it this year, and my most advanced student can speak with me for 75 minutes [in Spanish] . . . So, I have seen this student go from knowing nothing three years ago to talking with me for 75 minutes.

This process was eye-opening for the coach as well as the student.

Showing is better than telling, so if the coach is an expert in an instructional skill the teacher wishes to learn, showing this to the teacher is often welcome. Teacher Rose also shared how modeling was helpful, explaining how it helped her see an instructional approach in action. She explained, "last year I struggled to do like rotations and like group rotations, so her showing me how to do that was really beneficial." Coach Laurie also described modeling as a powerful experience for transforming instruction, because it can help teachers see the potential in their students and bring about higher quality instruction. Laurie described a situation where modeling led to a teacher's practice improving instantly. Laurie said:

> And then, you know, like I had a teacher turn to me and say you were right. I thought they [students] couldn't do it, and they can and so that that is like that is so powerful to have a teacher see that their own students and their own kids, whose maybe their expectations weren't high enough. And that's a moment that will last for that teacher. And that's like a moment that, like, you know, that teacher is now like, can we meet regularly, right? Because it's just. It's so important that they can kind of see that that they can do more.

Coach Allison also noted that modeling is her favorite approach. Allison said:

> I feel like you can sit and talk and co-plan and things like that, but just jumping in and doing it often is the best way to do it with kids in front of you, so they can kind of see what the strategy is, how it works, how kids respond.

The model does not necessarily have to be the coach.

If the coach knows of another teacher who is a great example of practice, observing that instruction as the model is just as effective as the coach being the model. Coaches and teachers

discussed this type of modeling as powerful as well, and it was a tool many instructional coaches in the study used as a version of modeling. Coach Hannah explained:

> One of the things I really try to do often is arrange for teachers to visit other teachers, other schools in our district, maybe similar grade or same grade just to have that experience of seeing how someone else does it? I think I read a quote years ago about we all of us humans learn more from our peers than we learn from any adult in our lives. So, giving teachers a chance to see what other teachers are doing and break down those walls. I think that's something that's very, very powerful, more than anything I could say.

Teacher Pal further explained about observing other teachers and modeling that it can take away an emotional or vulnerability barrier for teachers. Pal said:

> I think it is actually more effective when you're not feeling observed yourself, because then you don't have your emotional barrier up there. So, you're watching someone else, you're not feeling criticized, you are getting instruction on how to teach, and it's not, not making you vulnerable.

This is a powerful point, because it shows how modeling and observing other teachers carrying out instruction can result in teachers learning and positively transforming their own instruction while not feeling nervous or vulnerable about receiving feedback or criticism about their own teaching.

In this research process, one caveat about modeling emerged that is worthy of mention. Coach Marie noted that "as much as they say it [modeling] was helpful to see, I don't always see the return," meaning that in some cases, teachers do not implement the instructional practices that are modeled through a coach or observation of another teacher, which means instructional practice remains unchanged. Therefore, modeling is not an effective tool if the coach notices the

teacher is not making any instructional changes. If that is the case, the coach should either revisit their steps in the DEGCF Cycle (see Figure 1) to ensure there is an action plan and follow-up conversation surrounding the modeling, or explore other coaching approaches with the teacher to see if another coaching method is needed.

Overall, modeling was a practice teachers and coaches felt most impacted their instructional abilities and student learning outcomes, with it being most frequently named as effective in interviews. Teachers felt that seeing effective instruction in practice helped them better incorporate effective approaches in their own classrooms, and the outcome was students demonstrating deeper understanding, or the classroom environment becoming more structured and conducive to learning.

Coplanning

Coplanning emerged as a highly effective practice for teachers. Coplanning is a coaching session where the teacher and coach plan for instructional next steps together. Teachers in my study also discussed some approaches related to coplanning that they described as "troubleshooting" and "brainstorming sessions." In this approach, the coach is sitting alongside the teacher helping to identify the next logical steps for the teacher to take based on a goal or need.

Coplanning was most impactful at improving teacher instructional practice and teacher efficacy (Knight, 2018). Teachers shared that it helped them design more effective instruction, and that it helped them feel more confident in their abilities. Coach Ella described a coaching session where co-planning led to the teacher designing and implementing more effective strategies. Ella explained:

> Having the ability to sit down with a teacher, think about what they want their lesson to look like giving them the opportunity to have input on that and thinking about what would work for their strengths, and then going in and maybe doing a piece of the lesson, or a part of the lesson that they were less comfortable with and then giving them the opportunity to replicate that.

Ella also told me this approach resulted in the teacher having control over the instruction, but also through the coach, implementing something that was more effective than previous instruction, resulting in improved engagement and learning for students.

Teacher Eowyn also described coplanning with a coach to be powerful for her. Eowyn said:

> I find that coplanning with somebody else, especially someone who might have different strengths than your own will only kind of make your lesson better and more suitable to a diverse group of students. Just like for me, verbalizing a lesson because I'm always doing them in my own head, and I'm always kind of writing them out on my own, having a chance to also verbalize what I'm thinking, not even writing. It just makes a huge difference, and you can kind of pick up on things that you necessarily wouldn't. And hearing another voice in their opinions on those lessons I feel like just makes them stronger.

In examples from interviews, coplanning was effective because a coach reinforced an idea a teacher developed or wanted to try which built confidence and efficacy. It was alternatively effective because the coach helped the teacher design and understand why a particular approach might be more effective, and then the act of doing it helped the teacher see what they and their students were capable of. Teacher Earleen explained coplanning as an experience where "I'm the

one in charge, but she's kind of helping me gather the resources. Helping me fine tune." This shows the coach provided support and resources, but the teacher felt it was resulting in instructional improvements.

Also worthy of mention was a key point four coaches made that their role should be to make teachers' lives easier, and they often described coplanning as an avenue to do that. Coach Laurie described it as "taking a bit of the lift for teachers. I just think that goes such a long way, and like actually creating some things for teachers, so they don't have to create everything all themselves all the time." What Laurie is describing is how coaches, as part of the co-planning process, sometimes offer to create tools, lesson materials, or do research for the teacher to provide support. This helps the teacher focus on delivery of quality instruction while freeing up the teacher's time, since the coach is more likely to already have a pool of instructional resources available than the teacher.

Summary

I developed the dynamic educator growth coaching framework (DEGCF) seeking to answer the question: In what ways do coaches and teachers being coached describe effective instructional coaching and how is it effectively implemented? In this study, effective instructional coaching approaches were described by teachers and coaches as most effective for improving teacher instructional practice, teacher efficacy, and student outcomes. The key themes of effective practices that emerged from the interviews were relationships and trust, observing teaching, reflective questioning, being teacher goal-driven, listening, gathering data, feedback, modeling, co-planning, and flexible coaching. These practices, once identified, were used as the foundation for creating the DEGCF (see Figure 1), which contains at its core an emphasis on trust and relationships and then follows a cycle through teacher reflection, self-assessment, and

identification of needs, to a reflective coaching conversation, then to the teacher and coach agreeing upon an action to take, teacher implementation of the identified change(s), a follow-up reflective coaching conversation, and then the cycle begins again. What makes the DEGCF model different is the flexibility for the teacher to drive the growth and the coach to remain flexible and adaptive to the teacher's needs.

The model, based on the research I conducted, also reveals a need to develop strong relationships prior to engaging in classroom observation, and to approach coaching with a humanistic lens, seeking to support the person before the work. Because of this, the research also revealed the need for a specific type of personality and skillset for instructional coaches, which requires:

1. An experienced educator who ideally supports teachers within the coach's scope of experience (Ocasio-Stoutenburg et al., 2024).
2. Someone who is non-judgmental and can ask questions and listen thoughtfully (Balcı and Özkan, 2023; Smith, 2023; Thomas et al., 2015).
3. Someone who maintains trust and confidentiality (Aguilar, 2013; Knight, 2013).
4. Someone who can be supportive to meet the needs of the person in front of them while also developing skills incrementally over time (Aguilar, 2013).

Certainly, instructional coaching is a role that can create significant teacher growth and even aid schools in retaining teachers. The DEGCF is a pathway to offer teacher support and encourage the development, confidence, and retention of teachers.

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Breaking the Chains: Montessori and the Fight for Educational Justice

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Abstract

Too often, children with disabilities enter school already bound by labels, restrictive placements, and rigid systems—chains that limit their potential before they even have a chance to learn. This literature review examines whether Montessori education provides a genuinely inclusive and developmentally responsive approach for children with disabilities. Montessori's emphasis on autonomy, sensory-rich materials, and purposeful activity positions it as a promising framework for breaking the chains of restrictive labels and educational barriers, supporting cognitive, social-emotional, and physical development. Evidence across diverse learner populations indicates gains in literacy, executive functioning, motor skills, and engagement when Montessori principles are implemented with fidelity. At the same time, persistent challenges—particularly related to teacher preparation, confidence, and limited specialized training—continue to tether inclusion to inconsistent practice, restricting the effectiveness of Montessori's promise. Research has largely focused on student outcomes, with far less attention to how teachers understand, interpret, and enact inclusion in their daily work. This review synthesizes developmental, philosophical, and empirical studies to clarify both Montessori's potential and its practical constraints. Findings highlight the need for deeper qualitative insight into teacher experiences, stronger professional learning systems, and clearer supports to ensure that Montessori environments unshackle diverse learners from educational limitations imposed by traditional

systems**.** Taken together, the literature has underscored that Montessori education can offer an inclusive alternative to traditional models, but its success depends on addressing gaps in implementation and expanding research that connects foundational principles with classroom realities.

Keywords: Montessori education; inclusion; teacher preparation; developmental practice; diverse learners; implementation fidelity

Imagine going through an entire school experience—from preschool through high school—never included in the cafeteria, gym, or library. Before anyone has a chance to truly know the student, the school assigns a formal disability label. That label dictates the so-called "services" the child receives—often isolating the student in a resource room or structured classroom—limiting opportunities to participate fully in school life. Parents often later describe this diagnosis process as rushed, procedural, and shaped more by institutional requirements than by a genuine understanding of the child, influencing how the child's needs are interpreted from the start.

What if those early conclusions were incomplete—or even wrong—and the label placed on the student robbed them not just of the opportunities, but of one's sense of self, joy, and place in the world? The family is handed an "individualized" plan that many parents see as anything but individualized—instead standardized, designed to check legal boxes rather than meet the child's needs (DeMatthews & Parker, 2025, p. 671). The parents and child are told that the student cannot be in the general educational classroom, instead placing the child somewhere stark, plain, and unwelcoming—where friendships, choice, and agency are stifled. The student's days become defined by compliance, token rewards, and the limits imagined for them by others.

But education can be different. Maria Montessori recognized that children develop

according to natural laws, and that their full potential unfolds when environments provide freedom, appropriate materials, and opportunities for self-construction (as cited in Ramani, 2020). Every child deserves an environment that provides the materials and conditions to support their growth, allowing them to exercise choice, and revealing their innate capabilities rather than one that imposes ceilings on development. Montessori classrooms, when implemented with fidelity, are spaces where children are seen for whom they are—their preferences, personalities, and abilities—and are given real tools to contribute, to work, to exercise agency as full human beings (Barrameda, 2020).

This review examines the extent to which Montessori education provides a truly inclusive and developmentally responsive alternative for children with disabilities, or whether its inclusive promise remains unrealized in practice. By analyzing how Montessori's practices relate to cognitive, social-emotional, and holistic development for children with disabilities—and exposing the barriers, gaps, and inconsistencies that block full inclusion—this review clarifies Montessori's potential and highlights implementation challenges and areas where further research is needed to fully realize its inclusive promise. It also highlights how evidence-based principles can inform equitable, inclusive classroom practices, break chains, dismantle systemic barriers, and challenge the injustice that conventional schools have long enforced on children silenced by rigid labels (Di Blasi et al., 2025; Kersna et al., 2025; Montessori, 1967b).

Literature Review

Montessori Education: A Radical Vision for All Children

Many children experience early labeling and segregation that shackle their opportunities long before their abilities can fully emerge (Dubovoy, 2020; Montessori, 1967b; Vaz, 2020). Traditional educational structures often emphasize deficits, rely on restrictive placements, and

prioritize compliance over genuine learning and development (Joosten, 2020b). These systemic barriers can stifle potential and obscure children's strengths, particularly for those with disabilities (Montessori, 2012; Vaz, 2020).

Montessori education offers a radically different vision. Montessori's work was not primarily about conventional education in the sense of teaching as a direct transmission of knowledge (as cited in Ramani, 2022). Rather, her studies emphasized supporting the full emergence of every child's potential. This means creating conditions where children can actively engage with their environment, explore, and exercise agency—because learning occurs naturally through their interaction with the world, not through imposed instruction (Barrameda, 2020; Montessori, 1979). In many ways, contemporary university studies of Montessori's methods may be better situated within human development programs rather than traditional education courses, which often equate teaching with learning (Ramani, 2022).

Rooted in careful observation, respect for natural development, and child-centered pedagogy, Montessori education provides an environment where children, including those with disabilities, can explore, make choices, and develop at their own pace (Vaz, 2020). In Montessori classrooms, children exercise autonomy, refine fine motor skills, develop self-regulation, and engage in purposeful activity—all within a prepared environment designed to meet diverse needs (Lillard, 2017). Every material and activity support the formation of the whole child, ensuring the conditions of freedom necessary for self-construction as an aid to life (Ramani, 2020).

To examine how Montessori education serves all children, including those with disabilities, this literature review is organized around four key areas:

- Historical and philosophical roots of Montessori's inclusive foundations,
- Montessori principles as an inclusive educational framework,

- Empirical evidence on outcomes for diverse learners, and
- Gaps, barriers, and current challenges in Montessori inclusion.

Collectively, these areas outline Montessori's inclusive foundations, reveal evidence of its transformative potential and expose the structural challenges that must be dismantled to make its promise fully accessible to all children (AuCoin & Berger, 2024; Long et al., 2022; Montessori, 2012).

Historical and Philosophical Foundations of Montessori and Inclusion

Maria Montessori's (1967b) approach to education emerged directly from her medical and psychiatric training, which shaped her reliance on systematic observation and scientific pedagogy. As a physician working in psychiatric settings, she observed institutionalized children who were living in impoverished and highly restricted environments (Lillard, 2017; Montessori, 1967b). Through close, clinical observation, Montessori (1966) noted that when these children were provided meaningful sensory and motor activity, their once-restlessness, wandering movements began to organize into purposeful action as their hands and bodies became guided by a mind newly eager to explore and understand the world and a directed search for knowledge replaced their "aimless curiosity" (p. 156). Casas-Cortes (2020) highlighted that one of Montessori's key contributions, beyond her concrete pedagogical development, was to make children both the object of scientific research and a central concern of social policy, an approach grounded in systematic observation rather than speculative assumptions.

Montessori's work built directly on the earlier efforts of Jean-Marc Itard and Édouard Séguin. Itard's work, *Victor de l'Aveyron*, focused on developing the child's senses (Itard, 2009), demonstrating the importance of careful sensory engagement in fostering learning. Séguin's (1866) experimental methods emphasized motor training, individualized instruction, and the idea

that progress follows careful observation. Montessori credited Séguin as a major influence, adopting his belief that education must awaken the child's latent capacities rather than impose external form (Montessori, 1967b).

These insights informed Montessori's early development of educational materials that isolate specific sensory concepts and allow for repeated, purposeful practice, supported by built-in controls of error (Barrameda, 2020; Montessori, 1967b). She paired these materials with an environment designed to free the child from imposed limit, fostering autonomous growth rather than adult-driven control (Joosten, 2020a, 2020b). Her observations led her to conclude that independence, spontaneous concentration, and inner discipline emerge naturally when children engage in purposeful activity under conditions of freedom (Montessori, 1967a). She described this progression "from inertia to work" as the natural path through which children construct themselves (Montessori, 1967a, p. 92).

These early experiences formed the basis of Montessori's child-centered philosophy. She maintained that all children possess the potential for development when provided with conditions that allow them to actively shape their own growth and cultivate their innate capacities (as cited in Joosten, 2020a, 2020b) and believed that the same principles that supported children with disabilities could also nurture typically developing children (Montessori, 1967b). When Montessori later opened the *Casa dei Bambini*, a program serving 3- to 6-year-old children in impoverished neighborhoods, particularly in San Lorenzo, Rome, Italy, as an early childhood education and day-care setting, she found that the same materials and methods developed in clinical settings enabled children to engage joyfully with their activities and discover their own capacities (as cited in Krumins-Grazzini, 2020). Observing the children's spontaneous concentration, happiness, and eagerness to work, Montessori (1966) realized that these principles

were not just remedial for children with disabilities but revolutionary for all children, leading her to dedicate her life to understanding and supporting the child's development.

Montessori (1966) argued that pedagogy cannot be abstract, self-referential, or detached from reality, but must fight for the concrete, the lived experience, and the agency of each child. She maintained that education must follow the methods of the sciences—rooted in observation, open to experimentation, verifiable, and adaptable—so that teaching can respond effectively to individual and social needs. By insisting that educational environments be intentionally prepared to support each child's development while maintaining the social dimension of learning, Montessori helped establish the foundations for later inclusive and integrative educational models (Curatola, 2016).

Montessori Principles as an Inclusive Educational Framework

Montessori education emphasizes the child as the active agent in learning, with a philosophy grounded in respect for individual development, autonomy, and purposeful engagement (Joosten, 2016; Montessori, 1967a; Vaz, 2020). As Baker (2020) noted, all children possess inherent human rights from birth that must be preserved, and education must honor these rights by supporting the child's growth into an adult who understands and participates in a society that safeguards these rights. This focus means that instructional decisions begin with the child's developmental needs rather than with predetermined expectations. Building on her early work and informed by her observations of children with special needs, Montessori developed an approach that emphasizes careful observation, respect for the child's independence, and the facilitation of confidence and perseverance (as cited in Vaz, 2020). Vaz (2020) highlighted that children with special needs often display remarkable courage and tenacity, reducing what appear as major disabilities into manageable challenges through determination and engagement with

their environment. The integration of children with special needs into Montessori classrooms benefits all students, supporting their development through practical life activities that engage thought, will, and action (Vaz, 2020).

A key principle of the method is independence and autonomy, which Montessori (1967a, 1967b) observed emerge when children are provided freedom within a carefully prepared environment. Through freely chosen, purposeful activity, children develop self-regulation, inner discipline, and concentration (Barrameda, 2020; Ramani, 2020; Tiryaki et al., 2021). These competencies support both cognitive and social-emotional growth for all learners (Tiryaki et al., 2021). These principles apply to all learners, including those with special needs, reflecting the universality of her approach (Lillard, 2017; Lillard et al., 2017; Montessori, 1967a).

The prepared environment is foundational to inclusion, structured intentionally to meet developmental and sensory needs rather than forcing children to conform to rigid expectations (Joosten, 2016; Leonard, 2020). This environment fosters autonomy, engagement, and meaningful relationships while supporting a sense of belonging for every child (Barrameda, 2020; Taylor, 2020). Features such as mixed-age groupings, individualized pacing, and hands-on materials allow for natural differentiation, aligning closely with modern inclusive education principles, including respect for neurodiversity and developmentally appropriate practice (Demangeon et al., 2023; Lillard et al., 2017; McKenzie & Zascavage, 2012).

Montessori pedagogy's focus on observation ensures that instruction is guided by the child's developmental needs, rather than assumptions based on disability labels (Krogh, 1982). Observation-driven teaching allows educators to adjust supports responsively and to recognize emerging strengths. Fidelity to these principles supports the emergence of each child's potential, fostering equity and inclusivity (AuCoin & Berger, 2024; Somma et al., 2024). Research also has

demonstrated that Montessori classrooms inherently support inclusion through multi-age groupings, individualized lessons, and peer-assisted learning, allowing children to learn from older and more experienced peers, while promoting engagement, social learning, and confidence (Danner, 2015).

However, successful implementation depends on teachers' knowledge, beliefs, and preparation, highlighting the importance of professional development tailored to inclusive practices within Montessori settings (Danner & Fowler, 2015; Somma et al., 2024). Taken together, these principles (i.e., autonomy, purposeful work, individualized learning, observation-driven teaching, multi-age classrooms, and peer-assisted learning) offer a strong foundation for inclusive education. When faithfully applied, these principles enable all children to access meaningful experiences aligned with their developmental needs. They also expand opportunities for learners who have historically been marginalized within traditional educational systems to realize their full developmental potential.

Empirical Evidence on Outcomes for Diverse Learners

Montessori education emphasizes a carefully prepared environment and specialized materials that isolate sensory concepts, allowing repeated, purposeful engagement, and natural control of error (Barrameda, 2020; Lillard, 2017; Montessori, 1967b; Vaz, 2020). These materials support children in building concepts through hands-on exploration rather than passive instruction, fostering independence, autonomy, and sustained attention (Montessori, 1967a; Vaz, 2020). By providing freedom within structured, developmentally appropriate conditions, Montessori classrooms enable children with disabilities to actively participate in their learning, while teachers tailor guidance according to each child's individual developmental needs.

Courtier et al. (2021) conducted a pre-registered, randomized controlled study examining disadvantaged preschoolers in a French public school assigned to either conventional or Montessori classrooms. The Montessori curriculum was adapted to the public-school context, with fewer materials, shorter work periods, and relatively limited Montessori teacher training. Cross-sectional analyses in kindergarten (n = 176; M age = 5–6) and longitudinal analyses over three years of preschool (n = 70; M age = 3–6) showed that the adapted Montessori curriculum produced outcomes comparable to the conventional curriculum in math, executive functions, and social skills. However, children in the Montessori classrooms significantly outperformed their peers on reading (d = 0.68), with performance comparable to advantaged children from an accredited Montessori preschool. Children also reported feeling as competent in reading as those in the private Montessori program, suggesting that Montessori methods can enhance early literacy and self-awareness among children facing socio-economic challenges.

This study has several methodological strengths, including its preregistered design, randomized assignment within the public preschool, and longitudinal follow-up over 3 years, which reduced analytic flexibility and potential biases (Courtier et al., 2021). Limitations included that assessors were not blind to group assignment, which could introduce testing bias, and the adapted Montessori curriculum had lower fidelity compared to high-fidelity Montessori programs, potentially limiting generalizability. Additionally, sample sizes were constrained by the number of children in the participating schools, and differences between public Montessori and private Montessori groups could reflect confounding variables such as parental involvement or socioeconomic status rather than curricular effects.

Kaya and Torun (2022) investigated the effects of Montessori education on children with

Down syndrome and autism, comparing 10 children receiving Montessori education with 10 children receiving traditional education using Eurofit test batteries for motor skills. They found statistically significant improvements in the plate tapping (fine motor) and standing long jump (gross motor) tests for the Montessori group ($p < 0.05$), whereas the control group showed improvement only in the sit-and-reach test. While this study provided preliminary evidence that Montessori materials can support motor development in children with neurodevelopmental disabilities, the small, all-male sample, limited reporting on intervention duration, and partial details about teacher training reduce generalizability and the strength of conclusions.

Similarly, Di Blasi et al. (2025) reviewed studies on children with intellectual disabilities and autism, finding evidence that Montessori-based interventions enhanced motor skills, visual perception, school readiness, and executive functions**,** with moderate to large effect sizes reported in several studies (e.g., Lillard & Else-Quest, 2006; Randolph et al., 2023). Effects on social skills and creativity were observed but smaller and less consistently reported, and variability in sample sizes, intervention duration, and fidelity reporting further limited the generalizability of these findings.

Afshan et al. (2024) conducted a randomized controlled trial (RCT) examining the impact of Montessori Sensorial Training on 30 children with mild intellectual disabilities. Participants in the intervention group ($n = 15$) demonstrated significant improvements in cognitive abilities (i.e., classification, seriation, recognition, ordination, and visual and auditory discrimination) and enhanced communication and self-care skills compared to the waitlist control group ($n = 15$). This RCT design strengthens the methodological rigor of the study; however, the small sample size, focus on mild intellectual disabilities, and limited reporting on fidelity and practitioner training may constrain the generalizability of the results.

Despite these positive outcomes, limitations in the research should be noted. Kaya and Torun (2022) had a small, all-male sample, with limited reporting on intervention duration and practitioner training, which may limit generalizability. Di Blasi et al. (2025) noted small sample sizes, underrepresentation of females, variable intervention durations, and inconsistent reporting of methodological details such as teacher training, fidelity, and treatment goals. Cultural and school-system factors, as well as limited geographic distribution of studies, may have also affected generalizability. Furthermore, outcome measures varied across studies, limiting direct comparisons.

Nevertheless, the evidence indicated that, when properly implemented, Montessori education can promote engagement, autonomy, and meaningful learning for children with diverse abilities, supporting both cognitive and adaptive development in special education contexts. Vaz (2020) emphasized that children with special needs often showed remarkable courage, perseverance, and determination, and that adults should observe carefully and provide just enough support to foster independence and confidence. Consistent with Montessori's philosophy, this approach respects each child as an individual, aiming to help every learner reach their fullest potential through thoughtfully prepared environments and practical activities that integrate thought, will, and action (Joosten, 2013; Ramani, 2013; Vaz, 2020). Together with the findings of Courtier et al. (2021), Afshan et al. (2024), Di Blasi et al. (2025), and Kaya and Torun (2022) indicated that Montessori education—through its sensorially rich, hands-on, individualized, and structured approach—can enhance cognitive, social, motor, and adaptive skills across diverse learner populations, reducing early inequalities related to socio-economic background or developmental disabilities.

Gaps, Barriers, and Current Challenges in Montessori Inclusion

Despite strong theoretical and empirical support for Montessori education as an inclusive approach, significant gaps remain in understanding its implementation. Research has indicated persistent challenges related to teacher beliefs, confidence, and limited specialized training, which affect the enactment of inclusive practices (Long et al., 2022; Somma et al., 2024). Studies have largely focused on student outcomes, with limited attention to teachers' perspectives on how inclusion is operationalized daily (Shaw & Baker, 2024). Danner and Fowler (2015) found that American Montessori Society (AMS) trained teachers reported positive support for inclusion but had fewer professional development opportunities in special education compared to non-Montessori peers, and Association Montessori Internationale (AMI) trained teachers, whose programs adhere more strictly to Montessori principles, were not included in the study, highlighting a key gap.

Qualitative insight is limited, with few studies examining the lived experiences of Montessori teachers in inclusive classrooms (Doğru & Doğru, 2024; Somma et al., 2024). Existing research has emphasized the dynamic process of inclusion, requiring intentional adaptation of the environment, collaboration with specialists, and reflection on philosophy to meet diverse learner needs (AuCoin & Berger, 2024; McKenzie & Zascavage, 2012). Moreover, fidelity of Montessori implementation influences outcomes, yet variation in adherence to core principles remains underexplored (Demangeon et al., 2023; Lillard, 2017; Marshall, 2017; Murray et al., 2019).

Li (2025) offers further insight, examining Montessori education specifically for children with autism spectrum disorder (ASD). In a systematic review of 15 studies, Li (2025) identified

Montessori as a sensory-focused, individualized, and play-based learning approach that aligns well with the developmental needs of children with ASD. She noted this approach is particularly effective for enhancing communication and social skills in these children. However, methodologically, the review was limited: only 15 of 1,740 screened articles met inclusion criteria. The studies included in the review were heterogeneous in design. Most were non-RCTs**,** and there was sparse data specific to children with ASD. The review also highlights geographic disparities, noting an underrepresentation of low- and middle-income countries. Li (2025) emphasized that there is a lack of culturally adapted empirical research in this area. Furthermore, the review relied on narrative synthesis rather than meta-analysis because of the variability in sample sizes, interventions, and outcome measures, which limited causal inferences.

Li (2025) also underscored the practical implications of her findings. She explained Montessori's low-arousal, self-paced, multisensory learning environment may be particularly suitable for children with ASD who experience sensory processing challenges and executive function differences. The review identified theoretical matches between Montessori principles and ASD learning profiles. However, Li (2025) emphasized that the empirical evidence supported Montessori as a targeted pedagogy is weak. The studies had small sample sizes, lacked control groups, and there were scarce longitudinal or RCT data. This situation pointed to the need for more rigorous, culturally sensitive, and geographically diverse studies to establish Montessori's effectiveness as an intervention for children with ASD.

In addition, Lillard (2019) highlighted that Montessori education remains highly effective across multiple developmental domains, including social, emotional, and academic outcomes, due in part to its alignment with educational psychology and its holistic approach to independence and self-determination. They underscored that challenges in implementation often

arise from Montessori's incommensurability with conventional schooling culture, which can result in poor fidelity even when the basic elements are supported by research. Lillard (2019) emphasized that Montessori's effectiveness is not reducible to individual components (e.g., teacher, peer learning, or materials) but emerges from the system as an interconnected, self-reinforcing whole. These insights reinforced the need for careful, culturally informed, and well-supported implementation of Montessori approaches in inclusive settings.

Conclusion

Montessori education offers a powerful bridge between developmentally appropriate practice and inclusive education, directly challenging the systemic isolation, restrictive placements, and procedural barriers entrenched in traditional educational systems**.** Thoughtfully prepared environments, sensory-rich materials, and opportunities for autonomy enable children with disabilities to reclaim agency, develop literacy, self-regulation, and social-emotional skills, and actively construct themselves (Lillard, 2017; Montessori, 1967a; Ramani, 2020). In this way, Montessori fulfills the vision introduced at the start: a childhood where every child can engage, grow, and thrive rather than be constrained by labels, rigids placements, or low expectations.

Montessori (1967a) framed this as a matter of educational justice, which she described as profoundly spiritual rather than procedural. For her, justice was not a flat fairness that forces every child to receive the same thing; she warned that this kind of equality merely drags everyone to the lowest level, "as if, in a spiritual sense, we were to behead the tallest in order to have them all of the same height" (Montessori, 1967a, p. 260). True educational justice, she argued, means giving each child the specific help they need to reach their fullest potential and spiritual stature. Vaz (2020) expanded this idea, noting that Montessori's vision of justice operates as an individual education prescription, an individualized education plan carried in the

teacher's mind, crafted uniquely for each child to support their path toward independence. Unlike standardized, procedural IEPs that can restrict and isolate students, Montessori's approach centers the child's lived capacities, developmental needs, and dignity, challenging the labeling systems that too often confine rather than liberate.

However, realizing this promise depends on more than philosophy; significant gaps in teacher preparation, fidelity, and understanding of inclusion persist, reflecting the challenges highlighted in the literature review on historical and philosophical foundations, principles as an inclusive framework, and empirical outcomes for diverse learners. Many Montessori educators remain unarmed with the specialized training needed to dismantle barriers, and research is limited on how they translate inclusion principles into daily practice (AuCoin & Berger, 2024; Danner & Fowler, 2015; Somma et al., 2024). Addressing these gaps is critical to ensure that Montessori's inclusive approach is not just aspirational but a lived reality that frees children from educational chains.

Bridging theory and practice requires connecting Montessori's developmental vision to classroom realities. Evidence has shown that autonomy, purposeful activity, and structured freedom can shatter the constraints of conventional schooling and unleash the potential of every child, yet implementation is uneven without targeted professional learning and systematic study (Kersna et al., 2025). By tackling these challenges directly and weaving together the historical insights, core principles, and empirical evidence reviewed in this review, Montessori can forge truly inclusive environments that honor, amplify, and defend every child's potential, bringing full circle the childhood imagined in a world bound by systemic constraints—one where no child is chained by labels, underestimated, or excluded.

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The Epistemology of Ignorance: Why We Don't Know What We Don't Know

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Abstract

Epistemology is the theory of knowledge, concerned with the nature of reality, what counts as knowledge, and how knowledge is acquired. While epistemological questions often center on "what" we know and "how" we know what we know, far less attention is given to the inverse: "what" don't we know and "why" don't we know it? Tuana argued that ignorance is not merely a passive gap in knowledge but can be actively produced and sustained through systems of power and oppression. Such constructed ignorance can benefit some people and disadvantage others. To further understand the epistemology of ignorance, students in *HEA8100: Teaching and Learning in Higher Education*, offered in the New England College Doctor of Education in Higher Education Administration program, explored the concept through a course assignment. This article includes those brief papers and synthesizes their collective inquiry.

Keywords: epistemology, epistemology of ignorance, systems of power and oppression, constructed ignorance

Epistemology of Ignorance

Bethany Jones

Ignorance can be defined as not knowing something because of missing information (Merriam-Webster, 2025). Is ignorance something society chooses, or is it chosen for them? Arango and Lustig (2022) claimed that "ignorance is often overlooked and underexamined, and so are its ethical consequences" (p. 2). In my experience, ignorance stems mainly from two factors: unfamiliarity and fear. I have heard phrases like, "Well, I didn't know," which seem to be attempts at or justifications for one's ignorance. Usually, this happens when language barriers occur.

Research published by the American Psychological Association (2023) claimed, "when given the choice to learn how their actions will affect someone else, 40% of people will choose ignorance, often in order to have an excuse to act selfishly" (para. 1), which the researchers called "willful ignorance" (para. 2). Essentially, people choose to avoid learning or creating new knowledge. The challenge then becomes the task of finding ways to increase people's knowledge. According to Farnum Street (n.d.), "knowledge then, is made up of things we infer, things we experience, and the way our brain processes both" (para. 35). Based on this statement, people should consider having more experiential learning opportunities allowing them an ability for knowledge growth.

While there are many ways to acquire knowledge, one is through language (W, 2023). Antony W. (2023) stated "The basic goal of language is to communicate knowledge, which can be imperfect at times" (Section 1. Language). The knowledge being conveyed is not received correctly similar to the childhood telephone game. In this game, children sit or stand in a line and the person at one end whispers a phrase into the ear of the student next to them. This

transmission continues to the end of the line. What the last student states they heard is often dissimilar to what was originally whispered. For example, the original phrase, “The purple dog ate my math homework,” could result in “The blue cat chewed my algebra test.”

The imprecision of knowledge transmission through language is compounded by the fact that not everyone speaks the same language. Currently, approximately 7,000 languages are spoken around the world, giving people at least 7,000 ways to acquire knowledge (Boroditsky, 2017). Boroditsky (2017) argued that language can shape the way people think and how they transfer knowledge to one another. An interesting point she argued is that languages can have various sounds and structures, leading us, as humans, to think differently when we hear different words or phrases (Boroditsky, 2017).

Sometimes, the challenge focuses more on how language is produced and received, while other times languages have specific phrases that are unique to that language. I think back to the time I sat in my 4th grade classroom. We did a unit on idioms, and each day we were introduced to phrases like “frog in your throat,” “bee in your bonnet, “or “break a leg,” which, to someone who does not know the meaning behind these, might be concerned that I had a literal frog in my throat.

Boroditsky (2017) discussed how language can differ for example assigning a number to count something or a color, can be different across languages, and even how a word might be assigned a gender. Flashback to my high school French classroom days, I can remember my French teacher saying, “this object is a masculine object, so you say le in front of it, versus this object, which is feminine, you would say la.” At the time, I was confused as to how an object could have an assigned gender. But now I realize I was a bit ignorant, because I did not take the time to listen or truly understand how the French language worked.

Boroditsky (2017) discussed in her presentation that the human mind has flexibility; "Languages, of course, are living things, things that we can hone and change to suit our needs. The tragic thing is that we're losing so much of this linguistic diversity all the time" (12:19). I cannot help but agree with Boroditsky's (2017) final thoughts of her lecture; "why do I think the way I do? How could I think differently?" If language is what shapes the mind, and can be a method of knowing, then people need to consider the vast differences languages have, including idioms or the structures of languages.

Through using language people gain the ability to form new knowledge but ignorance inhibits the process of forming new knowledge. Stockly's (2011) "The epistemology of ignorance" taught some valuable lessons regarding ignorance. It becomes necessary to examine who is harmed and who benefits from blatant use of ignorance (Stockly, 2011). Stockly explained that ignorance can make some knowledge invisible, so that not even the best lenses or glasses can help see it. When viewed in a larger context, ignorance does not serve any real benefit and should be something to be addressed and overcome. Arango and Lustig (2022) suggested that it:

> . . . is important to be able to distinguish the origins of our ignorance because when it comes to addressing it, the remedies are different: either correcting wrong beliefs, acquiring information we did not have (which we probably did not know we did not have) or a combination of both. (p. 5)

If language effects one's capability of forming knowledge, society should have a willingness to better understand the power of language and communication.

Epistemology of Ignorance

Cynthia Burns Martin

Some people (Stockly, 2011) believe that ignorance happens because an oppressive group in power intentionally and actively seeks to erase or make invisible or invalidate the experiences of oppressed identity groups. Some people (hooks, 1994; Stockly, 2011) argued that science and rationality are tools of oppression which should be cast aside in favor of qualitative, non-scientific, identity-based experience, confessions, testimony, and polemics of underrepresented individuals and identity groups.

I firmly concur with those (Cushman, 2016; hooks, 1994; Stockly, 2011) who believe that ignorance happens when diverse voices are drowned out by strident voices, and when diverse epistemologies are supplanted by one epistemology. Where we part ways is over the question of which voices are most strident and which epistemologies are most dominant in the academy now in 2026.

Before I elaborate on my belief about which epistemologies are most dominant in higher education in the United States now in 2026, let me offer a few observations on "Epistemology of Ignorance" (Stockly, 2011). This essay is an opinion piece, editorial in nature. I say this because it is not a logically constructed argument. Instead, Stockly (2011) examined some examples of 20th-century medical practices, the latest in 1951, through a 2011 lens. Stockly loosely cobbled together these few examples as evidence to support Tuana's (2004) assertion that some types of knowledge or ways of knowing are made invisible by an oppressive class. One example of evidence out of context is when Stockly cited another author (Martin, 1991) who claimed that Henrietta Lacks's contributions to public health were deliberately "silenced" by the epistemology of ignorance. Stockly's claim that Lacks's contributions were "silenced" is not

consistent with the epitaph on Lacks' gravestone, written by her grandchildren, that clearly states the family's perspective that "her immortal cells will continue to help mankind forever" (Henrietta Lacks, 2025). It is true that Lacks's contributions to medical science do not meet 2025 standards for medical research and patient rights, nor 2011 standards for medical research and patient rights. But Stockly is silent on the point of whether Lacks' treatment met 1951 contemporary standards for medical research and patient rights. Stockly is silent, so we will accept Stockly's evidence and agree with Stockly's assertion.

While I believe there is some merit in Stockly's argument that some ways of knowing are less visible, an argument supported by a few secondhand historical examples judged by current standards are not persuasive evidence for a sweeping statement that critical epistemologies ways are intentionally silenced and made invisible by dominant classes to oppress subordinate classes.

As to the question of which voices are most strident and which epistemologies are most dominant in the academy today in 2026, I believe that more than 30 years later, the social sciences have thoroughly embraced what was once a radical rallying cry for change, bell hooks' (1994) recommendation that we should see lived experience of oppression as epistemologically more important than science. Conservative voices are silenced in higher education in the United States today (Gallup & Lumina, 2025), even though the electorate chose a conservative majority in government. The divide between higher education and society has negatively impacted the credibility of higher education in the eyes of the general public (Jones, 2025). This is not good for institutions of higher education, nor is it good for society.

In 2025, the arguments offered in favor of foregrounding critical epistemologies or "ways of knowing" (hooks, 1994) are every bit as aggressive towards rationality and scientific method as the aggression they claim has been wielded against critical ways of knowing. Those who

claim they are oppressed have, in fact, become oppressive dominant voices in the literature of higher education in the United States. Evidence, based on my experience, for this is the foregrounding of the keywords “social justice,” “critical theory,” and “diversity, equity, and inclusion” in accreditor standards and scholarly journal submission guidelines. Critical ways of knowing have quite thoroughly replaced quantitative scientific method and rationality in the social sciences, as evidenced by the literature of this course and program, which I have no reason to believe is not representative of recent literature of higher education in the United States.

I cannot agree with hooks (1994) that in the academy, the epistemology of science should be invalidated or discarded because excesses were committed by zealots in the past. I can agree that epistemology has been used to justify many excesses. For example, faith-based epistemologies or ways of knowing were justification for many excesses throughout history, including events as long ago as the execution of my ancestor Rebecca Nurse at Salem, Massachusetts on July 19, 1692, and as recent as the murder of thousands of people in the Twin Towers on September 11, 2001. However, I believe the real problem for higher education is zealotry, not diverse epistemologies.

Zealots who prioritized scientific epistemology did not invalidate scientific epistemology. Zealots who prioritize critical epistemology do not invalidate critical epistemology either. While the favored epistemologies for the social sciences have changed, zealous intolerance remains rife in higher education in the United States today, in 2026.

Understanding Ignorance: The Perspective of a Red Sox Fan

Caitlin MacNeil

I grew up in a family of generational Boston Red Sox fans, where knowledge about baseball—and particularly the Red Sox—was transmitted as a form of cultural and familial

epistemology. This fandom traces back to my great-grandfather, who drove the MBTA subway through Fenway and Kenmore stations, and passed his love of the team to my father and other relatives. From a young age, my childhood was filled with lessons about Ted Williams' heroism, the injustice of the 1975 World Series, and, above all, the importance of disliking the New York Yankees. Through repeated storytelling, commentary, and shared experiences, I internalized these perspectives as a framework for interpreting not only baseball but also social allegiances and rivalries. In this way, fandom served as an early form of epistemic training, shaping the ways I attended to, valued, and processed information about the world around me.

I understand knowledge to be situational and if situations limit a particular set of knowledge, ignorance is the result (Alcoff, 2007). One's social, cultural, and historical contexts shape the knowledge that is obtained by an individual (Alcoff, 2007), so a lack of knowledge is a consequence of those contexts intersecting in such a way. Ignorance, then, can be reinforced by continued access to the same contexts, limiting one's knowledge even further. When ignorance is rooted in circumstance, it reveals that knowledge is not fixed but can be shaped through intentional and thoughtful effort.

What I learned about the Red Sox, baseball, and fandom are all examples of generational knowledge built on the values of love, trust, and commitment. Being a Red Sox fan was a structurally embedded belief system that was acquired by my personal and regional contexts. Like others with values and opinions, I am only a partial knower in terms of baseball teams and limited in my scope as someone who has lived in Massachusetts my entire life. If all knowledge is partial (Alcoff, 2007), then perspectives limit knowledge and how the knower understands the world to be. The gift of generational fandom and my New England regional experiences are examples of my limited yet unintentional ignorance.

On the opposite, willful ignorance is the act of actively choosing to not know information or experiences, with concern for responsibility or guilt of not knowing (Vu et al., 2023). Individuals who engage in willful ignorance engage in decisions that keep them aligned with their values and moral responsibilities (Kirfel et al., 2025). Willful ignorance is more than simply not knowing, but rather it is a state of transferring blame or responsibility to others (Kirfel et al., 2025). Although unintentional ignorance may cause harm to the knower and others, there is more harm at stake when the knower willfully ignores knowledge. For example, a large portion of my student peers in college from New York and New Jersey also held belief systems similar to mine but with an affinity for Yankees baseball. There would be significant interpersonal or community conflicts if I held my exact beliefs about my strong dislike for the Yankees and their fans. For a Red Sox fan who actively chose willful ignorance, this may show up as avoidance of their fans, dismissing positive stories about the team, or prevent seeing any game highlights that may acknowledge skills or talent. In this case, willful ignorance functions as a way of protecting identity or emotional investment (Reher et al., 2025).

People's group memberships, including race, gender, class, and cultural affiliations, influence what knowledge is deemed relevant, accessible, or valuable. Social norms and power hierarchies can actively discourage engagement with certain perspectives (Koski et al., 2017). A factor to maintaining my beliefs as a Red Sox fan was the social norms of being a part of my family. Being a fan of any other team, in particular any New York team, was deemed unacceptable and would create distance in my relationships. Structural conditions, such as access to media and other information resources, even further perpetuated my fandom. Red Sox commercials and advertisements are constants in the media in New England, which even

furthered my selective attention to the team. My way of knowing in Sox fandom was impacted by my personal and environmental contexts.

I have intended here to use the analogy of baseball fandom in comparison to the epistemology of ignorance. I recognize that following a professional sports team does not weigh in comparison to the personal identities and social positions that Alcoff (2007) and other theorists have emphasized, but the analogy illustrates how ignorance can operate in low-stakes contexts too. Just as a fan may selectively attend to information that aligns with their team allegiance, individuals with more consequential domains may similarly avoid knowledge that challenges their beliefs or threatens their power. By sharing this context of my personal life, I hope to illustrate that ignorance serves not merely as a lack of knowledge but as a socially and psychologically motivated mechanism for maintaining group cohesion and emotional comfort for group belonging.

Epistemology of Ignorance

Jamie Wronka

Ignorance is often assumed to be a lack of knowledge, an accidental gap that can be filled by acquiring new information. However, scholars in feminist, decolonial, and critical race traditions have asserted that ignorance is not merely an absence, but something actively produced and maintained (Mills, 1997; Tuana, 2004). The epistemology of ignorance is the study of how not knowing is socially constructed, for what purposes, and with what effects (Tuana, 2004). Ignorance is not neutral, but often works in service of power, protecting social hierarchies, and silencing marginalized voices (Mills, 1997; Tuana, 2004).

Why Ignorance Happens

Ignorance happens because knowledge production is deeply tied to power (Mills, 1997). Mills (1997) described "white ignorance" as a systemic feature of racial domination, allowing dominant groups to deny the realities of racism while continuing to reap benefits. Similarly, Tuana (2004) chronicled how patriarchal science erased and distorted women's sexual knowledge. For centuries, scientific discourse framed the vaginal orgasm as the "mature" form of female pleasure, pathologizing women whose experiences did not align with this model and erasing the centrality of the clitoris. These distortions preserved male authority by subordinating women's bodies and experiences (Tuana, 2004).

Institutions such as universities, governments, and scientific bodies claim the authority to define what counts as legitimate knowledge, shaping curricula, research funding, and access to academic prestige (Weiler, 2011). David-Chavez et al. (2024) noted that privileging empirical and objective forms of evidence marginalizes experiential, relational, and Indigenous forms of knowing. Institutionalized ignorance preserves hierarchies of race and gender and sustains the legitimacy of dominant institutions.

How Ignorance Happens

Ignorance is actively produced through distortion, omission, and institutional practices. Harvey (2016) demonstrated this in her analysis of Henrietta Lacks and the HeLa cell line. Scientists initially assumed Lacks was White, erasing her identity and later racialized her cells as hypersexual when contamination occurred (Harvey, 2016). Narratives deemed true within the scientific community dehumanized Lacks and reinforced stereotypes, while obscuring the exploitative conditions under which her cells were taken (Harvey, 2016). The ignorance was not an oversight but a racialized construction.

Martin (1991) analyzed how biology textbooks described the egg and sperm using gendered metaphors. Sperm were depicted as active, powerful agents, while eggs were portrayed as passive, waiting to be fertilized. Such language naturalized male dominance and female passivity, embedding stereotypes into what was presented as objective science.

Ignorance is also embedded in educational and assessment systems. Cushman (2016) criticized how the concept of validity in testing creates hierarchies of knowledge. By defining what counts as valid evidence, testing systems exclude forms of knowledge not aligned with Western norms. Even reforms meant to address fairness remain tied to imperial logics (Cushman, 2016). Huff (2022) showed how U.S. public schools reproduce ignorance by teaching Eurocentric histories that celebrate figures like Columbus while erasing Indigenous perspectives.

Factors That Influence Ignorance

First, power and authority play a central role in producing ignorance. Institutions define what counts as legitimate knowledge, reinforcing dominant perspectives while excluding marginalized voices (David-Chavez et al., 2024). Second, cultural narratives justify and normalize ignorance. Myths of discovery, progress, and Manifest Destiny frame colonization as inevitable and beneficial, erasing the violence of dispossession and silencing Indigenous perspectives (Huff, 2022).

Third, epistemological frameworks matter. Western epistemologies emphasize objectivity, individualism, and abstraction, privileging knowledge detached from relationships. In contrast, Indigenous epistemologies emphasize relationality, reciprocity, and humility. David-Chavez et al. (2024) proposed a relational science model grounded in Indigenous values, showing how knowledge can be produced through community accountability and respect for

interconnectedness. When Western frameworks dominate, relational approaches are dismissed, sustaining epistemic inequities.

My autistic son's public-school team preferred applied behavioral analysis methods to approaches that center relationship building and sensory needs. Refusing alternate strategies harmed his ability to participate in public-school education. The educators were not consciously choosing to harm him; they believed they were supporting his education. However, when we presented an alternative viewpoint, there was a power struggle, and they refused to consider another viewpoint. In this way, my son's teachers were rooted in their ignorance and firm in their belief that the "objective" strategies of behaviorism were the only appropriate option, despite many first-person testimonies of harm (Stop ABA, Support Autistics, 2019).

Finally, political agendas influence ignorance. By prohibiting the teaching of systemic racism, policymakers not only restrict knowledge but actively promote White ignorance, framing equity efforts as threatening or divisive thereby protecting their power (Mills, 1997).

Personal and Societal Impacts

On the personal level, distorted knowledge shapes identities and lived experiences. Tuana (2004) delineated how scientific distortions of female sexuality produced shame and pathology for women. Harvey (2016) highlighted how the erasure of Henrietta Lacks' identity and the exploitation of her cells devastated her family, who were denied recognition, consent, and control.

Within society, ignorance justifies and reproduces inequities. Mills (1997) argued that white ignorance sustains systemic racism by preventing acknowledgement of injustice. Huff (2022) showed how colonial curricula limits students' ability to critically engage with history, weakening democratic participation. Cushman (2016) revealed how assessment systems act as

gatekeepers in higher education, disproportionately disadvantaging marginalized students by defining validity in exclusionary terms. The broader effect is a society where inequities are normalized, mistrust in institutions grows, and opportunities to learn from diverse epistemologies are lost.

Conclusion

Ignorance is not merely the absence of knowledge but an active social construction to preserve power. It occurs through omission, distortion, and institutional practices. Factors such as authority, cultural narratives, epistemic frameworks, and politics all shape how ignorance is produced and maintained. The consequences are both personal, affecting identity, agency, and dignity, and societal, reinforcing systemic inequities and narrowing the scope of what can be known. Addressing ignorance requires valuing plural epistemologies and cultivating what Harvey (2016) called an "ethic of knowing," one that respects difference and seeks knowledge on just and relational terms.

Epistemology of Ignorance

Julie Hackert Zahn

Why Ignorance Happens

The epistemology of ignorance examines how and why ignorance persists, even when evidence is readily available. Studying this concept is important because it reveals the mechanisms through which individuals and societies remain unaware of information or truths that are directly accessible to them. Moreover, it invites critical reflection on whose knowledge is legitimized and whose perspectives are marginalized or silenced. As Mills (1997) argued, ignorance is not merely the absence of knowledge; rather, it is often actively produced and sustained in order to preserve existing systems of power. Similarly, Tuana (2004) emphasized

that “ignorance is not a simple lack. It is often constructed, maintained, and disseminated and is linked to issues of cognitive authority, doubt, trust, silencing, and uncertainty” (p. 194). Together, these perspectives position ignorance as a social and political phenomenon rather than an individual failure.

How Ignorance Happens

Reflection on my own upbringing highlights several of the processes through which ignorance can develop. I was raised in a household where access to information was limited, and much of what I knew about the world came directly through my parents. As a result, certain forms of knowledge remained inaccessible. These limitations were reinforced by broader social and cultural structures. For instance, we were not permitted to watch television, which significantly restricted exposure to alternative viewpoints and contemporary social discourse. Additionally, being raised within a strict Catholic cultural tradition meant that many questions were addressed primarily through a faith-based framework, leaving little room for negotiation, critique, or alternative interpretations.

Stockly (2011) explained that “if we want to more fully understand how our culture produces information, we must also understand the practices that account for not knowing” (para. 1). In my own experience, such practices of “not knowing” were embedded within familial expectations and cultural norms that shaped both what information was available and which questions were considered acceptable. These early structures contributed to a narrow understanding of the world that persisted well into adulthood.

Factors That Influence Ignorance

Human beings can only process and retain so much information and the way knowledge is presented has a significant impact on understanding. People learn in different ways, and when

information does not match their learning style, comprehension can break down. I experienced this myself when I first read about the epistemology of ignorance. In written form, the material was difficult to fully understand and retain. However, during the doctoral residency during which the topic was discussed in a group setting, I was able to grasp the concept much more clearly. Dialogue and discussion helped me process the material in a way that simple reading did not.

In addition to cognitive limits, psychological factors contribute to ignorance. People often avoid information that might challenge them. For instance, fear of being wrong, embarrassed, or uncomfortable may keep someone from exploring new knowledge. Confirmation bias, the tendency to notice or accept only information that supports existing beliefs, reinforces this process. Fricker (2007) described this as an *epistemic injustice*, where certain voices or perspectives are excluded, leaving gaps in understanding that are socially reinforced. Ignorance can also stem from choice. At times, individuals consciously decide not to know. This form of willful ignorance occurs when people choose to accept only what they already believe, closing themselves off to new perspectives. Medina (2013) called this *meta-ignorance*, not only failing to know, but also failing to recognize the limits of one's own knowledge. In such cases, ignorance does not result from limited resources or cognitive barriers but from a lack of openness to change.

Broader Personal and Social Impact

The personal and social impacts of ignorance are far-reaching. On a personal level, ignorance may restrict growth, limits perspective, and narrows one's understanding of the world. In my own experience, growing up in an environment with limited access to outside information delayed my ability to consider diverse perspectives until later in life.

This awareness has strongly shaped how I reflect on my own political beliefs. I recognize that my views are influenced by the knowledge I hold, the environment in which I was raised, my education, my career path, and the experiences that have shaped my values over time. As I have grown older, I have come to understand that beliefs do not develop in isolation, but rather through a complex interaction of personal history and social context. At times, I find myself questioning how I arrived at certain conclusions or why I continue to support or challenge particular political ideas.

Although this process of self-examination is often uncomfortable, I believe it is necessary. I strive to approach my own beliefs with curiosity rather than certainty, recognizing that ignorance can exist even when one feels confident in their views. By acknowledging the limits of my understanding and remaining open to learning, I aim to engage with political differences thoughtfully and without undue bias, even when doing so challenges my deeply held assumptions.

On a societal level, ignorance is not neutral. As Mills (1997) described, it can serve as a tool to maintain social hierarchies, privileging some forms of knowledge while silencing others. Ignorance can reinforce systemic inequalities, particularly around issues of race, gender, and class, by obscuring marginalized voices. For example, ignoring the lived experiences of women or people of color in educational settings diminishes the richness of collective understanding and sustains existing power structures. Stockly (2011) underscored this point when noting that “the epistemology of ignorance serves to marginalize types of knowledge and erase or simply make invisible what was once and has always been available” (para. 1). Recognizing the epistemology of ignorance allows us to challenge these dynamics and create more equitable spaces for knowledge and truth.

In conclusion, it is the responsibility of each individual to seek knowledge actively so that they do not remain ignorant. While learning from others can be valuable, it is not the responsibility of individuals, particularly those from marginalized groups, to educate us through their lived experiences. We must take ownership of our own learning by engaging with diverse sources of knowledge, questioning our assumptions, and remaining open to perspectives that challenge our worldview.

Conclusion

Gavin W. Henning

Through their essays, Bethany, Cynthia, Caitlin, Jamie, and Julie explored the epistemology of ignorance in their own lives illustrating how knowledge is cultural, historical, and contextual and articulated. Through their examples, they show how familial upbringing, religious traditions, sports affiliations, language, and social norms shape what is both known and not known. Ignorance does not always result from systems of power and oppression; however, when it is, voices, perspectives, and ways of knowing are silenced limiting available knowledge. Ignorance produced through power and oppression reifies those systems to privilege some and subjugate others. For educators to fulfill their responsibilities to advance knowledge, we must investigate not only what we do not know, but why we do not know it.

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"What If They Aren't Ignoring You?"

How Poor Working Memory Affects Students and How Educators Can Mitigate This Impact in the Classroom

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Abstract

For educators today, it can be challenging to support students with weak working memories, as working memory difficulties are often associated with increased distractibility, inattention, and struggles with executive function tasks. This article delves into the current literature on working memory, how a weak working memory can impact students' learning experiences, and researchers' suggestions for ways to support students with working memory difficulties. Additionally, this article makes clear connections between the brain research on working memory, the reality of what is feasible to implement in a classroom environment, and my experiences as an educator; the recommended strategies and next steps included in this text are meant to be practical, easy-to-implement, and supportive scaffolds for "all" students, not just those who struggle with working memory.

Keywords: executive function, working memory, working memory duration, working memory span, dyslexia, ADHD

Imagine you are a first-grade student sitting down for a lesson on the carpet. Your teacher has instructed you to bring a clipboard, a worksheet, and a pencil. You grab the worksheet on your work table, find a clipboard across the room, and sit down only to notice you forgot your

pencil. You get up, go back to your work table, grab your pencil, and sit back down on the carpet to realize that you have already missed the next set of directions while you were locating your materials. You look around at your peers in the hopes of a visual aid or clue that you can use to find your way, but feel absolutely lost. You settle for doodling on your worksheet until you can find another way to access the lesson.

Unfortunately, this scenario is a reality for at least 10% of students (International Dyslexia Association, 2020). Students who demonstrate inattentive behavior, which can appear to many educators as a learner "spacing out," "refusing to do work," or "being off task" could actually be the effects of a weak working memory (Holmes et al., 2010). For example, Kofler et al. (2018) found that 38%–57% of working memory's effects on executive functioning was "conveyed by working memory's association with inattentive behavior" (p. 57). Thus, this article is a call to action for my fellow educators and my way of working toward what Gathercole et al. (2008, as cited in Holmes et al., 2010) believe is the first step to supporting students who experience challenges with focusing and sustaining attention, especially those with poor working memory: educating educators. As someone who has dedicated her life to supporting and advocating for the students who have been deemed "distracted," "unmotivated," or "lazy," due to struggles with attention, I seek to provide a robust review of the current literature on working memory, how a weak working memory affects students, and ways that educators can support students with weak working memory in the classroom. I then discuss my own experiences as a professional who educates students with poor working memory before making final recommendations for the reader. Despite the fact that this article focuses on supporting learners with weak working memory, I must emphasize that these strategies are helpful and necessary for

all of the children in our care. As a result, I recommend and encourage the reader to give these strategies a try with all of your students.

Review of the Literature

What Is Working Memory?

The concept of working memory and its role in the learning process has been researched, explored, and theorized for decades, but how to intervene when a child struggles with working memory is still a topic of conversation (Gathercole & Alloway, 2007; Holmes et al., 2010; Santacruz & Ortega, 2018; Sousa, 2022; Sousa, 2024; Woodin, 2022). Researchers have described working memory in a number of ways, and all of these ways speak to its multifaceted, complex, and sometimes perplexing, nature. For example, Sousa (2022) described how the Information Processing Model "represents working memory as a work table, a place of limited capacity where we can build, take apart, or rework ideas for eventual storage somewhere else" (p. 43). This model was originally developed by Robert Stahl (as cited in Stahl & Murphy, 1981), who called it the Stahl perceptual information processing and operation model. The model showcased the locations in the brain that information can go through, including through working memory, in an effort to store it in long-term memory. Specifically, Stahl and Murphy (1981) indicated that information must be attended to by the sensory or perceptual register before being transferred to short-term memory, which differs from working memory in that it retains basic features of recently received information for a short amount of time (p. 15). From there, in this model, the executor, or the director of the information, determines if and how the information will be transferred to working memory by assigning meaning to it. When the information arrives to the working memory, Stahl and Murphy (1981) described this location, or Sousa's aforementioned "work table," as the "arena where newly received information actively interacts

with information obtained via Long Term Memory" (p. 18). Thus, in Stahl's model, working memory was considered to be the setting for an information dance, or exchange, between working memory and long-term memory. This exchange determines whether the information is stored in Long Term Memory, depending on how many connections can be made between the new information and the old, stored memories.

In comparison, Baddeley and Hitch's (1974) incredibly famous multicomponent theory of memory showcased how working memory itself has many systems rather than focusing on the information processing system as a whole. Baddeley and Hitch's (1974) working memory model included: the phonological (which deals with speech-based information), the visuospatial (which deals with visual and spatial information), the central executive (which deals with when and where information is delivered, task switching, focusing, and dividing attention), and their later addition, the episodic buffer (which integrates information from the various multiple parts into episodes); these components all contribute to "the possibility to combine information from different sources (verbal and visual) into episodes, manipulate information, modify it, and ultimately link it to the knowledge stored in the individual's long-term memory" (Santacruz & Ortega, 2018, p. 32), their version of Stahl's dance. Baddeley and Hitch (1974), explained that this transfer of information from working memory to long-term storage is "the most specific function which has so far been identified with working memory" (p. 86). Thus, it is evident that working memory is complex but that its main purpose—as is reiterated in these two models, albeit in different ways—is to process sensory, or immediate, information to potentially store, and later retrieve, it from long-term memory (Sousa, 2022).

Therefore, without having some link to long-term storage, it is clear that the working memory system cannot hold on to information for a very long duration. Additionally, the amount

of information that it can temporarily store, called the working memory span, varies from person to person (Sousa, 2022, 2024); working memory span even varies based on whether the information being held is verbal or visual-spatial (Working Memory for Educational Psychologists, 2015, March 29b), and based on the cognitive strategies that individuals use when acquiring the information (Pearson & Keogh, 2019). To compound this unfortunate truth about working memory span, new research has demonstrated that working memory's capacity could actually be lower than previously conjectured spans (Sousa, 2024), like the "magical number seven" items (Working Memory for Educational Psychologists, 2015, March 29b) or the averages of five items for 5- to 13-year-olds and seven items for individuals fourteen and older (Sousa, 2024). It is unclear why working memory spans are seemingly decreasing; however, Sousa (2024) speculates that working memory spans could be smaller due to people becoming more distractible or students learning more about where to find information rather than learning the information itself, thanks to the immediacy of technology. For example, students may remember that information about Ancient Greece can be located by navigating to a certain website rather than by memorizing or noting the information itself.

Working Memory's Role During the Learning Process

Despite its limitations in storage capacity and duration, working memory is a central component of the learning process and is a key factor in whether students are able to perform a task and how many they can accomplish. For example, working memory processes include holding onto, or attending to, a question long enough to formulate an answer, remembering multi-step directions, and performing mental math computations, among many others (International Dyslexia Association, 2020). As previously explained, working memory also captures verbal and visual information and serves as the "go-between" for short and long-term

memory (International Dyslexia Association, 2020, para. 10). On top of these purposes, working memory aids with focusing, ignoring distractions, and switching between tasks (International Dyslexia Association, 2020). Thus, it is an essential piece of the memory storage process.

What Happens When Students Have Weak Working Memory?

One of the most difficult aspects of supporting students with weak working memory is identifying whether weak working memory is actually the culprit. After all, as Working Memory for Educational Psychologists (2015, March 29a) explained, students with working memory challenges may find remembering information difficult because of a small capacity for recalling it, may take more time to process information, and may be more easily distracted. These effects look similar to effects of other types of learning difficulties, like ADHD or a specific learning disability.

It has been proven that genes, rather than the child's background, play a seminal role in working memory (Gathercole & Alloway, 2007) and that working memory is especially difficult for students with ADHD, Inattentive Type (International Dyslexia Association, 2020). Working memory challenges are also associated with a broad range of genetic and neurodevelopmental disorders, such as dyslexia and ADHD; this creates confusion about whether academic and behavioral difficulties are due to these disorders or working memory issues (Holmes et al., 2010). Today, as working memory span and attention duration decrease among students, it will perhaps become more prevalent that we treat all students as learners with weak working memory, meaning that we cannot differentiate between learners with a learning disability and those without.

Despite it being difficult to ascertain what the originating cause of these difficulties is, it is clear to a number of researchers that the effects of poor working memory are vast, so educators

should be on the lookout for a multitude of impacts on both learning and behavior (Holmes et al., 2010; Working Memory for Educational Psychologists, 2015, March 29a). Specifically, educators should be aware of challenges in the following areas:

- Reading, specifically phonological processing. Sousa (2022) attested students with working memory challenges have difficulty retaining phonemes, or segments of sound, and therefore are unable to remember words long enough to understand a sentence. This extends to readers with strong decoding skills too, who may not be able to remember what they read due to weak working memory (International Dyslexia Association, 2020).
- Math, specifically storing and retrieving numbers and number facts (International Dyslexia Association, 2020). Math involves a large amount of retrieval and recall, as well as multi-step directions. As Gathercole and Alloway (2007) explained, activities like this "require the child to hold in mind some information . . . while doing something that for them is mentally challenging . . . These are the kinds of activities on which children with poor working memory struggle with most" (p. 9).
- Learning another language. Similarly, learning another language involves holding onto information while applying that information to another context, especially when acquiring new vocabulary (Santacruz & Ortega, 2018).
- Overall academic achievement. This is another "chicken or the egg" scenario, as poor working memory is three times higher in students with low academic achievement (Holmes et al., 2010). At the same time, learners with poor working memory struggle with tasks related to academic achievement and will therefore, often make poor academic progress (Gathercole & Alloway, 2007).

- Executive function skills and habits of learning. Not only do problems with working memory make it difficult for students to hold onto information long enough to perform a series of tasks, such as following directions, listening, taking notes, and focusing, but because students with weak working memory have limited working memory spans, it is easier for their working memory to allow irrelevant information or stimuli to interfere with their thinking (Holmes et al., 2010). Therefore, they may space out or find something else to do with their bodies (Working Memory for Educational Psychologists, 2015, March 29b).

What Experts Recommend for Supporting Students With Weak Working Memory

Fortunately, there are a number of different strategies that experts in the field recommend for supporting individuals with weak working memory that can be easily translated to the classroom environment. Of these strategies, researchers like Holmes et al. (2010) agree that there are three overarching intervention categories: (a) educators reducing memory loads in the classroom; (b) educators teaching children memory strategies (like rehearsal, chunking, story generation, and visual imagery); (c) and training children's working memory through repeated practice.

Although there is positive evidence for all three intervention types, especially training children's working memory through training programs (Holmes et al., 2010), in my opinion, educators reducing students' memory loads seems to be the most feasible to implement in the classroom environment. One reason for this is that working memory training involves repeated, intensive, and adaptive training tasks, which could be extremely time-consuming for teachers to research, develop, and administer. Conversely, strategies for reducing students' memory loads are ones that could be more easily created and implemented in the classroom because, in many

cases, they are similar or identical to accommodations or scaffolds that may appear in students' documents like individual education plans (IEPs) or 504 plans (accommodations to ensure equal access, without altering the curriculum). It could be argued that teaching children memory strategies is also doable, but this approach has not yielded strong transfer effects in improving academic achievement (Holmes et al., 2010).

Therefore, to reduce memory loads in the classroom, Gathercole et al. (2008) developed the seven stages, (as cited in Holmes et al., 2010):

1. Educate teachers in working memory and how to identify students with working memory challenges.
2. Monitor how children "cope with mentally challenging activities" (p. 20).
3. Evaluate activities to determine which ones will be difficult for children with working memory challenges.
4. Adjust/revise activities to reduce working memory loads.
5. Frequently repeat information, like directions.
6. Provide and promote memory aids.
7. Encourage children to find their own strategies (pp. 20–21).

These seven stages are, understandably, quite broad and can lead educators in a number of different directions. As a result, this literature review also contains more specific strategies that researchers recommend, which seem to relate to steps four and six of Gathercole et al.'s (2008) aforementioned stages. The following are some of these more specific strategies:

- Get students' attention with meaning. For better or for worse, emotions decide what information gets processed in our working memory (Sousa, 2024). This is because sense and meaning are needed to retain learning, and of the two, meaning has a

greater likelihood of retention (Sousa, 2022); therefore, if an educator makes the information meaningful by appealing to learners' interests or emotions, modeling, or creating fun mnemonic devices (Sousa, 2022), there is greater likelihood that learners will hold onto the learning. This is an especially important approach for students who have a negative self-concept, as "the self-concept controls the feedback loop and determines how the individual will respond to almost any new learning situation" (Sousa, 2022, p. 51).

- Incorporate music and creativity. As many musicians know, a number of processes are involved in making music and communication occurs between brain regions that do not typically interact during "noncreative thinking" (Sousa, 2024, p. 94). Therefore, when an educator incorporates creative elements in students' learning experiences, more areas of the brain are involved in acquiring and storing the information; this increases the likelihood that the learning will be stored and recalled later on, which all translates to what Sousa (2022) deemed "less mental effort" (p. 221).
- Take advantage of prime-times. The primacy-recency effect dictates that new information should always be presented in prime-time-1 and closure should be made in prime-time-2. This is because, in a class period, students remember the first and last sections the most (Sousa, 2022). When using a 40-minute instructional period as an example, Sousa (2022) explains that prime-time-1 is about 20 minutes while prime-time-2 is about 10 minutes; anything in between is the down-time.
- Involve multiple modalities and types of activities. Whenever possible, combine verbal, visual, and physical information so that information is stored in a variety of

places in a number of ways. Sousa (2022) suggested using strategies like visualized note-taking or incorporating movement.

- Chunk, chunk, and chunk some more. Chunking involves breaking a task into manageable pieces, which is especially helpful for students who have difficulty holding on to a lot of information at once. Spencer (2025) recommended a chunking approach for project-based learning in particular, which consists of providing students with a blueprint/chunking the project, giving them tools with which to visualize the corresponding deadlines, and assisting students with creating to-do lists that contain smaller steps to reach each deadline/chunk. He recommended progress bars or maps for this, which also caters to students' need for multisensory approaches.
- Model what you, the educator, would like to see. Demonstrating processes for students is a multisensory approach because it involves verbal stimuli and visual stimuli; modeling provides opportunities for worked examples and repetition too, which are two approaches that the International Dyslexia Association (2020) recommended for students with working memory challenges.

Conclusions

Working memory is a key component of the memory storing and retrieval processes in the brain (Sousa, 2022). I believe that, regardless of whether students have weak working memory as a consequence of other diagnoses or whether their diagnoses are a consequence of poor working memory, it is necessary for educators to support students with working memory challenges in whatever ways possible. This is because, when students have weak working memory, it can result in challenges both academically and behaviorally, which lead to low academic achievement (Gathercole & Alloway, 2007). Researchers have recommended countless

strategies. As an educator, I believe that the most feasible ones are those that aid in reducing students' working memory loads so that they are better able to acquire, retain, and recall essential information. After all, as classroom educators, we do not readily have access to working memory training programs like researchers do, and though teaching students working memory strategies that they can use later on may seem like a beneficial intervention, its transfer effects on academic achievement have yet to be seen (Holmes et al., 2010).

Discussion

From my experiences as an educator, I have found that educators spend a lot of time trying to find the root cause of behaviors, such as a diagnosis or explanation. Although identifying a cause is helpful and can guide our response to behaviors, it is crucial not to delay action while waiting for an explanation. As the researchers have attested, it is unclear whether poor working memory is a cause or an effect of certain learning and behavior struggles. Therefore, as educators, we have to respond to our students' struggles in a way that makes sense for any scenario or cause. In the following section, I present two case studies of students with varying challenges whom I have encountered during my career as an educator. (All names have been changed to protect the identities of these students.). In both scenarios, I used one (or several) of the aforementioned working memory support strategies to address their challenges. As you read through each scenario, see if you can identify each child's potential working memory challenges and what strategies I used to support them.

Scenario 1: Lila

Lila was an extremely hard worker and a very motivated high school student. She had an individualized support plan for a specific learning disability and struggled with reading and writing in particular. She loved to write, however, and had just finished her first essay for my

class. I read through it, eager to see what she had come up with, and felt a mounting pressure in my chest. I noticed that she had written the essay in a "stream of consciousness" fashion, with minimal punctuation or complete sentences. She had also merged multiple ideas into one, seemingly moving on to her next thought before finishing the one that she started with. I gave her feedback and suggestions on her Google Document and sent it back to her. She started working through my comments, and I noticed that she did not make the changes that I recommended. I started to feel frustrated and wondered what I was doing wrong.

After a couple of written back and forth exchanges in her essay with little to no change, I sat with Lila and worked through her writing in person. I asked her to read through her essay with me, and we took turns reading her words out loud. I repeated pieces of her essay where I was trying to emphasize certain areas of confusion. She and I laughed and poked fun at each other, and she started to hear where sentences fused where they should not have. Lila also noticed that we both ran out of breath when there was little to no punctuation.

This went well for a while, and we eventually read through Lila's entire essay. However, I started to panic once again when I saw what used to be her excitement and pride about her essay begin to morph into overwhelm. I pulled out a sticky note and wrote down the first step that Lila needed to take to revise her work: "Add periods after each complete thought." I let her know to meet with me again when this was done, and I added the next step: "Read each sentence out loud to make sure it makes sense." We engaged in this back-and-forth exchange until Lila was once again proud of her work and I, too, felt as though she had a complete piece.

Scenario 2: Gus

Gus "could not sit still" and "did not listen." He was an elementary student who rolled around on the floor when his teacher was talking, hid under tables, and refused to do any work

because he "did not know what to do." At times, his brain could move really fast, so when we did a listening activity, he could forget an important word or message. At this point in the year, we were working on the CUPS revision strategy (i.e., capitalization, usage, punctuation, and spelling) in our small group and he kept shutting down. I said a sentence out loud, and his job was to write it down to the best of his ability, keeping in mind all of the aspects of CUPS. He did not want to revisit his sentence and believed that it was likely all wrong. As a result, he wrote his sentence down, hid it from me, and then erased it before he could make any changes to it. This continued day after day, and I started to feel frustrated that I had minimal evidence of his progress or understanding of how to write a complete sentence. I then decided to flip the scenario.

After I said the sentence out loud, I wrote my own version down, making sure to incorporate a number of incorrect elements. As a small group, we looked at my version and compared it to theirs. Gus began to notice that I struggled with this activity too and that, at times, he did better than I did with it. He showed me how to fix my version of the sentence, one piece of CUPS at a time: C: "No, you need to start with a capital letter, Mrs. Rosenberg!" U: "You forgot a part. It doesn't make sense." P: "Wait, it's a question. You need to add a question mark!" S: "No, you do not spell 'was' like that! It is not 'wuz!'" From there, I watched as he started to show me what he knew, and with that, I saw his self-concept improve too.

Conclusions

In both of these scenarios, I was not confident that Lila or Gus had working memory challenges. Did they exhibit some symptoms of weak working memory, like reading and academic challenges, inability to follow directions, distractibility, and poor self-concept? Yes. Therefore, I opted to use some of the strategies that I knew worked for children with poor

working memory to see if they worked. In these scenarios, they definitely did. Do these strategies work every single day, every single time, with every single kid? Absolutely not. However, the important piece of this working memory puzzle is that, as educators, we try.

Recommendations

This information on working memory can be applicable to a number of settings and people. For the purposes of this article, I will cater my recommendations to educators and children's caregivers, but I am confident that these recommendations can be transferred to many other contexts and individuals.

Recommendations for Educators

As I explained in the introduction to this article, my goal with this piece is to educate and to provide educators with current research and tools from today's experts on working memory. I highly recommend that educators who read this article further explore the corresponding research by reading the sources in the attached reference list for more information. Afterward, I encourage every educator to simply give the recommended strategies a try. I think that you will find that many of these strategies are what we in the field fondly refer to as "best practices" and that many of them can be found in recommended frameworks, like universal design for learning (UDL), or in accommodations sections of individualized education plans and 504 plans.

Recommendations for Caregivers

As the literature demonstrates, there are many reasons why a child may appear distracted, inattentive, or disorganized. If your child is struggling in some of the ways described in this article, please talk to your child's pediatrician and school team. It is essential that children with poor working memory are provided support so that they do not fall behind or "make poor general academic progress" (Gathercole & Alloway, 2007, p. 13). Additionally, repeated academic

failure or redirection can lead to a poor self-concept, as I demonstrated in my second example with Gus. This is devastating, and it is something we can avoid with compassion and early, prompt, and targeted intervention.

Conclusions

As professionals, caregivers, and lifelong learners, we must remain committed to understanding more about students' experiences and the science behind them, including struggles with the brain and learning. Throughout my educational career, I have realized how much I truly did not know before and how essential it is to continue the learning process as an educator. As Maya Angelou famously stated: "Do the best you can until you know better. Then when you know better, do better" (Goodreads, n.d.). We are starting to learn more about how poor working memory truly affects our students and what we can do to mitigate these devastating impacts. However, the process does not stop when we gain this knowledge. As our understanding of working memory and its effects on students grows, so too does our ability to reduce its impact on students. With this awareness, we must act: do our research, get to know our learners and the ways they think, and design our lessons with "all" of our students' needs at the forefront. This is how we will start to transform the learning experience for all of the children in our classrooms, but especially those learners who are struggling.

Resources for the Reader

If you are eager to learn more about strategies or approaches that can assist students in retaining and recalling information, this short list of resources is a good place to start:

1. Beachboard, C. (2022). *The school of hope: The journey from trauma and anxiety to achievement, happiness, and resilience*. Corwin.

(Beachboard explores how to assist students, especially those who have experienced trauma, in creating new neural pathways in the brain through hope.)

2. CAST. (2024). Universal Design for Learning guidelines version 3.0. https://udlguidelines.cast.org

(CAST has a wealth of information about the Universal Design for Learning guidelines.)

3. Florida Center for Reading Research. (n.d.). FCRR student center activities. https://fcrr.org/student-center-activities

(FCRR contains a number of resources, and student center activities in particular, that incorporate the recommended strategies that I detailed, such as modeling, chunking, and including multiple modalities.)

4. Muhammad, G. (2023). *Unearthing joy: A guide to culturally and historically responsive teaching and learning*. Scholastic.

(Muhammad highlights the importance of meaning-making throughout this text, which emphasizes connecting learning to students' identities, cultures, and backgrounds to make learning joyful.)

5. thinkAUM. (2025). What is think SRSD? Think SRSD. https://thinksrsd.com/what-is-srsd/

(Think SRSD is an example of a writing approach that incorporates several of the recommended strategies that I detailed as well.)

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memory?srsltid=AfmBOopZEvkyOIUJQMOmfV7vd2W-KoS1Z5ApjU-4ZR4zt4XGC1LhaFmu

(Warren and Namdaran give a detailed explanation of working memory, its function, and strategies to strengthen it.)

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The Brain's Quest for Novelty in a Technology-Rich Environment: How Educators Can Help

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Abstract

The brain's quest for novelty has been essential for human survival and development for the entirety of our existence. Novelty refers to unfamiliar situations or stimuli that lack a known or predetermined response or solution. In prehistoric eras, encountering the new—such as a potential threat like a saber tooth tiger—could mean life or death. Today, while such threats are no longer common, the drive for novelty continues to influence brain development and function. In the classroom, this innate pursuit of new experiences contributes to the ongoing competition for students' attention, especially in today's technology-rich environment where numerous extraneous distractions compete with instructional content. Understanding the neuroscience behind the brain's response to novelty—including the physiological benefits that extend beyond the classroom—can help educators identify high-impact strategies for capturing and maintaining student engagement. By leveraging insights into how the brain reacts to novel stimuli, teachers can create learning environments that not only attract attention but also foster deeper learning and resilience.

Keywords: novelty, valence, arousal, technology-rich environment

This article explores the importance of novelty in the learning process. Today's student faces the daunting task of navigating a technology-rich environment full of distractions, and, in the contemporary classroom, educators compete for attention against that technology—a

formidable opponent. Combatting the ever-present source of novel content that exists all around our students, in particular the personal cell phone within their grasp, requires a bifurcated approach consisting of controlling for outside stimuli that can be distracting and creating dynamic and varied instructional strategies that meet the standard to appease the novelty-seeking brain (Sousa, 2022). Educators regularly review and revise instructional strategies based on data from their students in the form of formative assessment. Educators should stay current on research related to brain science in a technology-rich environment and incorporate it into practice.

Literature Review

Connecting our ancestors' experiences with saber tooth tigers to the challenges our students face today begins with an exploration of the physiology of teaching and learning. There are many instructional strategies that support the movement of information from short-term, working memory to long-term storage. Instructional strategies such as think-pair-share, concept mapping, and problem-based learning are examples of innovative teaching that support the acquisition of knowledge and skills and commit them to memory (Owens & Tanner, 2017). However, as Owens and Tanner (2017) described, at the most fundamental level, this process is a "neurological phenomena arising from physical changes in the brain cells" (p. 1). Though different models of information processing exist, it is widely agreed upon that the brain receives information from the outside world through the five senses (sight, hearing, touch, smell, and taste), associates sense and meaning either from contextual clues or past experiences and learning, and either moves the information from immediate memory to working memory, to long-term storage, or dismisses it somewhere along the way (Sousa, 2022, 2024). Whether the

stimulus is a jungle cat with oversized bicuspids or the steps of solving an algebraic equation, the basic process remains the same.

Valence, Arousal, and Novelty

Obviously, not all stimuli are created equal. Based on prior learning, past experiences, or the intensity or severity of the stimuli, certain experiences or knowledge pass to long-term storage more seamlessly (Sousa, 2022). As Weierich et al. (2010) conceptualized, "affect" is the capacity of a stimulus to modulate neural physiology within the context of a mental state, essentially attaching emotions to the stimuli (p. 2871). In the brain, that is the function of the amygdala. According to Weierich et al., (2010) the influences of this emotional attachment can be categorized by two properties: valence and arousal (p. 2871). Valence refers to the positive or negative attachment to the stimuli. Arousal refers to the intensity of the activation of the affective state. Experiences that are either positive or negative and highly arousing are more likely to be committed to long-term storage. The appearance of a saber tooth tiger would likely evoke a negative, highly arousing experience for the observer. Solving an algebraic equation for some students certainly evokes a neutral (maybe negative) and minimally arousing experience. Occurring in a vacuum, the experience with the saber tooth tiger would more likely be remembered for a longer period of time than solving the algebraic equation.

The amygdala, seated at the control of learning in the affective state, responds to positively and negatively valanced stimuli and experiences of high arousal with increased activity (Weierich et al., 2010). Weierich et al. (2010) explored the relationship among valence, arousal, and novelty by examining functional magnetic resonance imaging (fMRI) images of brain activity as participants viewed images that were categorized in various combinations of valence and arousal. The experiment included two conditions: one to explore familiarity, and

another to explore novelty. Findings revealed that novelty, like valence and arousal, plays a role in learning in the affective state. In fact, participants reported more elevated feelings of arousal by novel stimuli compared to familiar stimuli (Weierich et al., p. 2877). Novelty impacts other biological functions, as well. For example, in a study on the physiological response to social interactions, Mendes et al. (2007) examined how people reacted upon discovery of whether others either adhered to or violated expectations of physical characteristics. They found that when expectations were violated (an indication of novelty), participants exhibited a cardiovascular response similar to that of experiencing a threat (p. 714). A stimulus impacting the brain and body in this manner is more likely to catch the attention of the amygdala, facilitating the attachment of an emotion and further supporting passage to long-term storage (Mendes et al., 2007). By understanding how novelty, valence, and arousal influence learning—and applying this insight practically—educators can design and implement instructional methods that most effectively meet their students' needs.

Competition for Attention

In today's technology-rich environment, the volume of novel information causes greater demand for attention. According to Sousa (2024), the brain's primary function is survival and to that end, it constantly surveys the environment for potential threats. With particular sensitivity to novel stimuli, for the purpose of assessing whether it poses a threat, the brain experiences a constant pull in various directions. In today's classroom setting, where most students possess a cell phone, this has become a common source of novel content. In two separate studies, Thornton et al. (2014) examined how the mere presence of a cell phone affects attention and performance, finding that the cell phone acted as a distractor and led to deficits in both attention and performance, in particular as the complexity of the task increases (p. 485). It is important for

educators to understand and acknowledge that while delivering instruction they face a constant competition for students' attention.

Benefits of Novelty

Novel stimuli do not just create distractibility in the classroom; they can aid knowledge and skill acquisition, as well. In a study of insightful learning, Zhang et al. (2025) explored the impact of novel stimuli on memory. Associative novelty, or forming new connections or relationships between information or experiences, promotes long-term memory and slows forgetting over time (Zhang et al., 2025). When introducing curriculum, educators can rely on this understanding and create instructional strategies that take advantage of the positive impact of novel stimuli on memory.

The positive impact of novel stimuli on the brain goes above and beyond promoting long-term memory in the learning process. Velàzquez-Delgado et al. (2024) studied the impact of exposure to novel stimuli on cognitive resilience against the accumulation of the protein beta-amyloid peptide, which has been associated with cognitive dysfunction and neurodegeneration found in individuals diagnosed with Alzheimer's disease. The participants of the study were mice that were exposed to elevated levels of beta-amyloid peptide and were subjected to varying conditions, including a group involved in a novelty protocol. The data showed those exposed to novel stimuli demonstrated "remarkable resilience" against an infusion of the protein beta-amyloid peptide (Velàzquez-Delgado et al., 2024). The results of this study highlighted the physiological importance of exposure to novelty and allowed researchers to explore new and different therapeutic strategies for those diagnosed with conditions such as Alzheimer's disease (Velàzquez-Delgado et al., 2024). As educators introduce instructional strategies infused with

novel stimuli, they not only engage the contemporary learner's brain, but also contribute to its health and functionality over the lifespan.

Conclusion

Novelty refers to stimuli, either information or an experience, such as a noise, a visual stimulus, or a novel experience that is unfamiliar and absent a known or predetermined response. The brain seeks novelty and that quest serves its owner well in terms of survival (Sousa, 2022) and also has benefits in the classroom (Zhang et al., 2025), and in the overall functionality of the brain (Velȧzquez-Delgado et al., 2024). In a classroom setting, educators face the challenge of competing with a technology-rich environment for the attention of their students (Sousa, 2024). Meeting that challenge by introducing instructional strategies that leverage the benefits of novelty supports knowledge and skill acquisition—transferring that information to long-term storage—and the overall health and functionality of the brain (Zhang et al., 2025).

Discussion

The influence of novelty on the brain can be addressed in two specific ways—managing the educational environment and creating and delivering instructional strategies emphasizing novelty. The brain continuously seeks out novelty (Sousa, 2024). In classrooms today, sources of novel stimuli appear in a variety of formats. The external stimuli that can cause distractions can be managed through a safe and secure classroom environment and established routines and procedures (Sousa, 2022). Furthermore, educators can plan and deliver instructional strategies that pique the interest of the novelty-seeking brain (Sousa, 2022, 2024). Armed with this information, educators can create a superhighway of information, allowing the curriculum to be the source of content satiating the brain's desire for novelty.

Mitigating Novel Stimuli

In today's classroom environment, novel stimuli are ever-present—from what is actually seen and heard to what is perceived and practiced. A technology-rich environment contributes to distraction both physically, due to the proximity of devices, and virtually, through the potential for distractions that exist at the other end of the device (Thornton et al., 2014). The conflicting roles of technology in education—as both a tool for engagement and a source of distraction—create an ongoing debate. Technology can be used to capture the intrigue of the 21st century student (Sousa, 2022) and it also can cause attention to be drawn away from the lesson (Thornton et al., 2014). In my experience, even the presence of approved classroom technology, such as iPads or Chromebooks pursuant to 1-to-1 initiatives, provides abundant distractions for students—despite being issued and monitored by educators in the school. Technology also provides one of the largest sources of distraction that exists in the classroom—the student's personal cell phone (Thornton, et al., 2014). The mitigation of cell phone use in schools has been a topic of discussion at the school, district, and state levels over the past couple of years. School districts and municipalities have responded by introducing policies and laws governing the use of cell phones in schools (State of New Hampshire, 2025). As a building administrator, I have implemented a school-wide classroom-based cell phone ban and found the most success when all educators are implementing it in a consistent manner. Ensuring effective classroom routines and procedures has been a staple of teacher education programs and, as the environment that requires control extends beyond the physical space, it is the responsibility of educators to adapt their practices and include specific routines to address the use of technology in the classroom. As Sousa (2022) stated, "an environment that contains mainly predictable or repeated stimuli (like some classrooms) lowers the brain's interest in the outside world and tempts it to turn within for novel experiences" (p. 27). An expansion of the boundaries of where the stimuli exist results in

an increase in that which must be managed in the classroom to facilitate learning. An educator must be aware of that which distracts their students and establish routines and procedures to mitigate the impact.

Instructional Strategies Leveraging Novelty

To compete with the technology-rich environment for attention, educators should consider implementing instructional strategies that appeal to the novelty-seeking brain, varying them to address unique student dispositions and needs (Sousa, 2022, 2024). By enhancing the lesson with strategies that appeal to the brain's quest for novelty, educators can best position the curriculum to become the source of novel content that the brain seeks (Sousa, 2024). Understanding the association between novelty and the functionality of the brain informs instructional practices, including the development of instructional strategies that can support the acquisition of skills and knowledge in a technology-rich environment.

In two separate texts, Sousa (2022, 2024) articulated six different characteristics of instructional strategies that emphasize novelty as a mechanism for learning: humor, music, movement, quiz games, choice, and multi-sensory instruction. The following are descriptions and suggestions related to these strategies:

- Sousa (2024) described the specific benefits of infusing humor into the lesson, such as an endorphin surge during laughter and the creation of a positive classroom culture (p. 58). The internet can be a great resource for humorous content for all subjects.
- Incorporating music into the lesson has been shown to increase student focus and productivity (Sousa, 2022, p. 230). However, educators must be cautious when it comes to the selection and use of music to ensure it does not become a distraction or source of consternation. Consider playing music during independent work time or inviting students to connect the content to the lyrics of a familiar song.

- Movement increases blood flow to the brain—within a minute of moving around, there is about 15% more blood in the brain (Sousa, 2024, p. 34). A countdown timer set at regular intervals can be used as a reminder to take a movement break. Vote-with-your-feet or station-rotation are opportunities to move during the lesson, too.
- Quiz games can introduce more than friendly competition into the lesson. Asking students to create and rehearse the quiz game creates additional opportunities to interact and practice the skill or knowledge that is being taught. Incorporating choice into the lesson plan increases engagement by fostering autonomy (Sousa, 2024, p. 45).
- By introducing multisensory instructional activities into the lesson, the classroom content mirrors the characteristics of the technology-rich environment found in the personal cell phone. Introducing technology into the lesson, or adding visually stimulating content, appeals to what today's students are used to.

These strategies can equip the educator with suggestions to enhance the lessons used in the classroom in the battle for attention. Generative Artificial Intelligence (AI) such as ChatGPT or Gemini are great tools for suggestions on how to augment an existing lesson to be more engaging, incorporating these strategies. A resource such as *The artificial intelligence playbook*: *Time-Saving tools for teachers that make learning more engaging* (Hargrave et al., 2025) guides an educator through the process of exploring the power of AI and how it can be helpful to educators.

With all the above strategies at the ready, it may seem as if today's educator must be a comedian, musician, quiz-game host, or an expert at bedazzling classroom materials. The pursuit for the attention of our students is a constant struggle. As a building administrator, while working with teachers, I ask them to reflect on their practices, respond to student data, and allow

the data to inform instructional practices. When considering the research on novelty and the brain, it would be beneficial for educators to incorporate the above strategies into their lessons. Obviously, it is the classroom teacher who knows their students and the curriculum the best. Therefore, when implementing strategies that emphasize novelty, it is important to consider the diverse and individual needs of students, as well as the context and curriculum. It is important to consider how novelty influences brain functionality and use it to our advantage.

The Novel and the Routine

In the acquisition of knowledge and skill, as previously discussed, the information travels from immediate memory to long-term storage—that process can be facilitated by specific learning activities tailored to meet this need (Sousa, 2022). Each time a piece of information makes the journey through the brain, a neural pathway is formed; it is strengthened through processes such as rehearsal and practice (Sousa, 2022). The strengthening of the neural pathway allows the new skill or knowledge to transfer to long-term storage. The juxtaposition between the focus on novelty and the importance of routine mirrors the connection between instructional strategies that pique the attention of our students and the control of novel stimuli for the purpose of enhancing classroom activities. Goldberg (2018) discussed the connection between the novel and the routine and the interconnectedness between the two hemispheres of the brain. The process of transferring information from temporary to long-term storage begins with it being novel and gradually evolves into a routine, well-established memory. As Goldberg (2018) described, the right hemisphere of the brain is predominantly involved in processing novel information, while the left hemisphere becomes more engaged as the information becomes more routine. The connection between the novelty-seeking brain and the acquisition of skills and knowledge, moving the information to long-term storage, highlights the interconnectedness

between the two hemispheres and how they work together to process both new and old information.

Conclusions

In my experiences working in education, as a classroom teacher and now an administrator who supervises teachers, the cycle of evaluating the efficacy of instructional practices should rely on multiple data points. With new research on brain science and the influence of an ever-changing technological landscape on students, it is the responsibility of educators to review and update our instructional strategies to best meet students' evolving needs. Harnessing the power of the brain's quest for novelty by focusing on the specific strategies that emphasize this quest allows educators to compete for attention in a technology-rich environment. As educators, we can no longer accept the status quo—the students we are teaching now are not the same as those we taught even five years ago (Sousa, 2024). Educators must review and revise our instructional practices, incorporating strategies that appeal to the novelty-seeking brain in a technology-rich environment, to meet the unique and varied needs of our students.

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When Curiosity Leads the Way: Teaching for Neurodivergent Strengths

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Abstract

This article explores how reframing attention-deficit/hyperactivity disorder (ADHD) through a neurodiversity-affirming lens reveals not only challenges but also distinct strengths that can be cultivated in classrooms. Research has highlighted those students with ADHD often excel in divergent thinking, hyperfocus, adaptability, and leadership potential, especially when learning tasks are meaningful and engaging. Neuroscientific evidence has further demonstrated that ADHD brains activate networks associated with imagination and rapid idea generation, underscoring their capacity for originality and innovation. The universal design for learning (UDL) framework provides a practical pathway for educators to harness these strengths by offering multiple means of engagement, representation, and expression. Strategies such as emphasizing choice, balancing novelty with structure, and recognizing creativity as an asset shift the focus from remediation to empowerment. Ultimately, teaching to neurodivergent strengths enriches learning environments for all students, positioning ADHD-related traits as vital contributions to classrooms, workplaces, and communities.

Keywords: attention-deficit/hyperactivity disorder (ADHD), neurodivergent, neurodiverse affirming, neurodiversity, universal design for learning (UDL)

Imagine walking into a classroom and noticing students whose ideas seem to spill out faster than they can capture them on paper. These same students often spot connections others

miss, grasp the big picture instantly, and light up and engage when the learning feels meaningful. For many learners, especially those with attention-deficit/hyperactivity disorder (ADHD), this is not just a feature of their personalities, it is how their brains are wired. Research on creativity and neurodivergence (Armstrong, 2015; Hoogman et al., 2020; Nordby et al., 2023) has shown that traits that are often labeled as distractible or impulsive can drive innovation, curiosity, and extraordinary focus when the right conditions are present. Yet these strengths are not always accessed in today's schools that are designed around uniformity and compliance. By reframing how we view differences and how we structure opportunities for exploration, educators can tap into these strengths and help create opportunities for learning that benefit every learner (Armstrong, 2012, 2015; Hoogman et al., 2020; Nordby et al., 2023).

Literature Review

Creativity and Divergent Thinking in ADHD

A growing body of research has suggested that ADHD is not only associated with challenges in executive functioning but also with creative strengths. Hoogman et al. (2020) reviewed behavioral studies and found consistent evidence that individuals with ADHD tend to outperform peers on divergent thinking tasks (e.g., generating multiple novel ideas to open-ended prompts). This suggests that ADHD brains can be especially strong in flexibility, range of perspectives, and idea generation. Armstrong (2015) argued that such findings challenge deficit-oriented assumptions and call for embracing neurodiversity, or valuing difference as variation, not deficiency.

Neuroscience research has provided additional support for this way of thinking. Kuang et al. (2022) conducted a meta-analysis of 57 functional magnetic resonance imaging (fMRI) studies, showing that divergent thinking and insight rely on distinct neural networks. Kuang et al.

(2022) found divergent thinking activates brain regions associated with imagination, associative memory retrieval, and flexible combination of ideas—consistent with fast, intuitive "system 1" processing (automatic, effortless thinking). By contrast, insight depends more on control, monitoring, and emotional/memory circuits—typical of slower, deliberative "system 2" thinking (conscious, effortful reasoning). Sousa (2022) similarly emphasized that effective teaching must account for how the brain encodes and retrieves information across these networks, providing a foundation for instructional frameworks like universal design for learning (UDL).

These findings align with UDL, whose guidelines are anchored in neuroscience and the learning sciences (CAST, 2024; 2025). UDL describes three brain networks: affective, recognition, and strategic. They correspond to the UDL design principles of engagement, representation, and action and expression (Novak & Rose, 2016). By offering multiple means of engagement, educators can provide choice, novelty, and opportunities to explore while leveraging ADHD learners' divergent thinking advantage, mitigating the constraints of narrow, rigid tasks. Sousa (2022) reinforced this connection, noting that learning is strengthened when instruction deliberately activates multiple neural pathways, making information more accessible and memorable.

Hyperfocus, Adaptability, and Leadership Potential

Although ADHD is often stereotyped as distractibility, qualitative research has revealed a different side. In a thematic analysis of adults with ADHD, Nordby et al. (2023) reported that hyperfocus—sustained, deep concentration on meaningful tasks—can drive productivity and achievement. Participants also described strengths in adaptability, energy, and the capacity to act decisively in fast-changing contexts. Fung et al. (2022) similarly framed neurodiversity as an

"invisible strength," noting leadership traits such as vision, enthusiasm, and motivational influence, even when organizational or executive capacities are weaker.

UDL's principle of multiple means of action and expression provides a structure for turning these strengths into classroom assets. By allowing students to choose how they demonstrate mastery—projects, presentations, visual maps, podcasts, or leadership roles—teachers can let hyper-focused energy, creativity, and adaptability surface meaningfully.

Conditions That Unlock Strengths

These strengths do not flourish automatically; they require environments designed to reduce barriers. Cherewick and Matergia (2023) showed how supportive contexts unlock autistic strengths, a logic that applies to ADHD as well. Foundations Cognitive Schools (2025) emphasized that different neural networks confer different advantages, and thus learning environments should be designed to cultivate those advantages rather than suppress them.

This is precisely the goal of UDL. The CAST (2025) UDL Guidelines present concrete design options across three core principles: engagement, representation, and action and expression, to proactively address common barriers. For example:

- In engagement, the UDL Guidelines suggest optimizing choice, relevance, emotional support, and persistence scaffolds to sustain motivation (CAST, 2024).
- In representation, the UDL Guidelines encourage teachers to use multiple modes (text, audio, visuals) to support perception and comprehension (CAST, 2024).
- In action and expression, the UDL Guidelines recommend offering alternatives (writing, speech, drawing) and planning scaffolds to reduce executive load (CAST, 2024).

Bridging Research and Practice: Applying UDL to ADHD Strengths

Taken together, the ADHD strength literature (Armstrong, 2012, 2015) and UDL research (CAST, 2024, 2025) converge: ADHD learners often bring divergent thinking, deep focus, energy, adaptability, and untapped potential. UDL offers a research-grounded design framework to make those abilities visible and scaffolded. Rather than retrofitting accommodations, UDL asks educators to design learning spaces from the start to reduce barriers and elevate strengths, recognizing learner variability as the norm (CAST, 2024, 2025).

When teachers integrate UDL principles, offering choice, multimodal representation, scaffolded planning, and multiple ways to show mastery, they create environments where students with ADHD not only cope but thrive (CAST, 2024, 2025). This shifts the paradigm from remediation to asset cultivation, rooted in both cognitive science (Armstrong, 2015; Foundations Cognitive Schools, 2025; Sousa, 2022, 2024) and classroom evidence (Fung et al., 2022; Nordby et al., 2023).

Discussion

From Theory to Classroom Practice

Research on attention-deficit/hyperactivity disorder (ADHD) and creativity has highlighted the importance of learning environments that both unlock curiosity and reduce barriers. The universal design for learning (UDL) framework provides a practical way to translate these insights into classroom practice. UDL emphasizes providing multiple means of engagement, representation, and action/expression so that all learners can access content, stay motivated, and demonstrate their knowledge in diverse ways (CAST, 2024, 2025). For students with ADHD, this means creating a balance between novelty and predictability, an approach supported by Cherewick and Matergia (2023), who argued that neurodivergent strengths flourish

when environments provide both freedom and support. Sousa (2024) made a similar point from a brain-based perspective, showing that novelty sparks curiosity and attention while predictable routines allow for consolidation and retention.

One effective strategy is to integrate novelty with purpose through project-based learning, STEM/STEAM challenges, or creative outlets such as drama and writing. These allow students with ADHD to channel divergent thinking into authentic problem-solving and innovation (Armstrong, 2015; Hoogman et al., 2020; Nordby et al., 2023). At the same time, consistent structures, like clear routines, visual schedules, and task checklists, help reduce the executive functioning barriers that can otherwise prevent students from sharing their creative insights (Foundations Cognitive Schools, 2025). This dual emphasis mirrors the findings of Kuang et al. (2022), who showed that divergent thinking relies on fast, intuitive brain networks while insight depends on slower, controlled processing. Classrooms designed with both systems in mind provide opportunities for rapid idea generation while scaffolding the reflective processes needed to refine and communicate those ideas.

Finally, UDL encourages teachers to offer choice and flexibility, enabling students to pursue areas of personal interest while still meeting learning goals. For learners with ADHD, this not only increases motivation but also creates opportunities to demonstrate originality and hyperfocus, with periods of intense, sustained attention on a task of high personal interest (Nordby et al., 2023). For example, a student who struggles with traditional writing tasks may thrive when allowed to design a video, podcast, or model as an alternative means of expression. In this way, UDL helps educators move beyond deficit-based approaches to ADHD, designing classrooms where neurodivergent strengths are not incidental but intentionally cultivated.

Beyond the Classroom Walls

It is important that educators, especially those in high schools, think about what skills teachers are helping our students build that will allow them to be more successful in their postsecondary endeavors. The creative strengths associated with ADHD do not end in the classroom; they extend into postsecondary life and can be powerful assets in professional and community settings. Nordby et al. (2023) found adults with ADHD described hyperfocus as a driver of achievement, enabling them to maintain deep attention and be highly productive when tasks are personally meaningful. This ability, paired with adaptability and high energy, makes individuals with ADHD well-suited for fast-changing environments such as entrepreneurship, the arts, or crisis management.

Fung et al. (2022) described these qualities as an "invisible strength," noting that enthusiasm, vision, and the ability to inspire others can signal leadership potential even when organizational skills fall short of conventional expectations. The same divergent thinking that sparks unconventional ideas in school can later drive innovation and problem-solving in workplaces and communities. Increasingly, businesses value employees who can recognize patterns others overlook or generate creative solutions under pressure—capacities that individuals with ADHD often display naturally (Armstrong, 2015; Norby, 2023).

Educational systems that embrace frameworks like UDL prepare students not only for academic success but also to apply their neurodivergent strengths in broader society (CAST, 2024, 2025; Stapleton-Corcoran, 2022,). Through classroom practices that emphasize choice, flexibility, and scaffolding, teachers foster skills that equip students to navigate professional environments where originality and resilience are prized. In doing so, the connection between

school and life beyond it is reinforced, positioning ADHD-related strengths not as exceptions to be accommodated but as valuable contributions that enrich workplaces and communities.

Practical Tips for Educators

Recognizing ADHD as a source of creativity and innovation may be a shift in the mindset for some, but by doing so and implementing intentional classroom practice, one can help students access and refine those strengths. The following strategies align with research on neurodivergence and UDL, as well as taking a neurodivergent affirming approach, in hopes to offer educators practical ways to create inclusive and empowering learning environments.

- **Notice and Highlight Creative Strengths**: Many students with ADHD have learned to view themselves through a deficit lens. By age 10–12, children with ADHD may receive roughly 20,000 more negative comments than their peers. This steady stream of criticism can damage self-esteem, create a sense of flaw, and reduce emotional resilience (Frye, 2020). Teachers can help counter this by explicitly positively recognizing moments of originality, curiosity, or persistence in student work. As Armstrong (2015) noted, reframing difference as variation rather than deficit helps students internalize positive identities as learners.
- **Design Tasks That Invite Original Solutions**: Research has shown that divergent thinking is a relative strength for ADHD learners (Hoogman et al., 2020). Open-ended projects such as designing experiments, writing plays, or developing community proposals, allow students to highlight creativity while also meeting core standards.
- **Balance Novelty with Predictability**: Cherewick and Matergia (2023) emphasized that neurodivergent strengths emerge when environments balance curiosity and

exploration with supportive routines. Teachers can structure lessons with consistent expectations (visual schedules, checklists, or step-by-step rubrics) while building in choice and flexibility so students can pursue personal meaningful pathways. As Sousa (2024) explained, novelty activates reward networks in the brain, but these must be paired with repetition and structure to strengthen neural connections and ensure lasting learning.

- **Leverage Hyperfocus for Deep Learning**: Nordby et al. (2023) found that adults with ADHD described hyperfocus as a powerful strength when tasks are intrinsically motivating. Educators can harness this by creating opportunities for passion projects, extended inquiry, or leadership roles in areas where students' engagement runs especially deep.
- **Value Energy and Leadership Potential:** Learners with ADHD often contribute high energy and enthusiasm to group settings, motivating and inspiring their peers. Fung et al. (2022) framed this as an invisible strength in leadership contexts. Teachers can channel these qualities through rotating leadership roles, peer mentoring, or presenting ideas to authentic audiences.
- **Apply UDL as a Guiding Framework**: The UDL guidelines (CAST, 2024, 2025) emphasize multiple means of engagement, representation, and expression. By offering varied options—such as visual projects, oral presentations, or multimedia storytelling, teachers can ensure that creativity and originality are recognized as essential parts of learning, not incidental to student success.

Taken together, these strategies move the focus from remediation to recognition and affirmation of neurodivergent strengths (Armstrong, 2015). By intentionally designing learning opportunities

that celebrate originality, curiosity, and leadership, educators not only help students with ADHD thrive but also model inclusive, strengths-based practices that enrich learning for all.

Next Steps and Resources

For educators who are ready to take the next step in designing neurodiversity-affirming classrooms, the following resources offer practical guidance:

- **CAST UDL Guidelines (2025):** An interactive framework with checkpoints and examples for applying multiple means of engagement, representation, and action/expression. (http://udlguidelines.cast.org)
- **Sousa (2022, 2024):** Accessible texts on how the brain learns and adapts, highlighting the role of novelty, memory, and attention in classroom practice. (*How the brain learns; Engaging the rewired brain)*
- **Novak and Rose (2016), *UDL Now!*:** A step-by-step guide for K–12 educators looking to bring UDL into daily instruction with concrete strategies.
- **Armstrong (2015):** A neurodiversity-affirming perspective that reframes ADHD and other differences as valuable variations rather than deficits. (The myth of the normal brain: Embracing neurodiversity. *AMA Journal of Ethics*)
- **Understood.org and CHADD.org**: Free educator and parent resources that provide classroom strategies, checklists, and strength-based approaches to supporting students with ADHD. (https://www.understood.org/ and https://chadd.org/)

These resources extend the conversation beyond theory, offering concrete tools to implement practices that recognize and elevate the strengths of neurodivergent learners.

Conclusion

Across the research, a clear theme has emerged: ADHD is not defined solely by distraction or deficit but by a range of strengths that fuel creativity, adaptability, and leadership. Studies on divergent thinking (Hoogman et al., 2020) and hyperfocus (Nordby et al., 2023) have highlighted how ADHD brains thrive when offered opportunities for originality and meaningful engagement. Armstrong's (2012, 2015) challenge to the "myth of the normal brain" underscored the need to reframe difference as diversity, while Fung et al. (2022) and Cherewick and Matergia (2023) demonstrated how strengths flourish in environments that balance novelty with structure.

For schools, the implication is clear: strength-based practices and frameworks like UDL (CAST, 2024) are essential. By designing lessons that provide multiple entry points, encourage curiosity, and validate diverse ways of demonstrating knowledge, teachers can help students with ADHD thrive. Foundations Cognitive Schools (2025) further emphasized that different neural networks bring distinct advantages, and it is the responsibility of educators to notice and nurture these.

Ultimately, I believe viewing ADHD through a neurodiversity affirming lens shifts the goal from fixing students to empowering them as contributors. When classrooms embrace creativity, flexibility, and risk-taking, they become spaces where all learners benefit. As Sousa (2022, 2024) underscored, teaching grounded in brain science equips educators to design learning that not only reduces barriers but also amplifies the originality and adaptability students bring. By recognizing potential rather than focusing solely on problems, educators can ensure that neurodivergent students' sparks of creativity are protected, cultivated, and celebrated as essential to the learning community and to society at large.

As a special education administrator, educator, neurodivergent person, and parent of neurodivergent learners, I have witnessed the transformative impact of strength-based practices. My multifaceted perspective reinforces this research because I have seen the positive effects of an asset-based approach: when schools design for creativity and adaptability, they empower students not only to succeed academically but also to flourish as contributors in their communities.

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Benefits of Tier 1 Instructional Strategies for High School Students

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Abstract

This mixed-methods capstone investigated high school students' academic, social-emotional, behavioral, and executive-functioning needs and examined how tier 1 instructional practices aligned with SEL, UDL, and MTSS may better address those students' needs. Prompted by a Section 504 prevalence nearly three times the New Hampshire state average, the study analyzed three years of 504 accommodation patterns and surveyed 60 educators regarding student needs and their familiarity with tier 1 frameworks. Quantitative findings showed substantial overlap between commonly assigned 504 accommodations and instructional strategies educators believed should be universal, particularly organizational tools, chunked tasks, flexible assessments, and regulation supports. Qualitative themes highlighted widespread attention and executive-function challenges across classrooms. Results indicated that inconsistent tier 1 design—not increased disability incidence—likely has contributed to elevated 504 referrals. Strengthening tier 1 through integrated SEL, UDL, MTSS implementation, professional learning, and fidelity structures may reduce unnecessary identification and improve equitable access to supports.

Keywords: tier 1 design, Section 504, social-emotional learning (SEL), universal design for learning (UDL), multi-tiered systems of support (MTSS)

The rapid expansion of Section 504 plans (accommodations for students with disabilities that do not alter curriculum) in schools in the United States has raised critical questions about equity, access, and identification practices. In New Hampshire—where rates are among the highest in the nation—these concerns are especially urgent (Zirkel & Gullo, 2024). At one comprehensive high school in southeastern New Hampshire, Section 504 rates have remained consistently and substantially above the state average. Nationally, Section 504 prevalence increased from 1.02% in 2009–2010 to 3.26% in 2020–2021 (Zirkel & Gullo, 2024, p. 934). In contrast, New Hampshire's rates have remained more than double the national average for over a decade, rising from 5.47% in 2013–2014 to 7.76% in 2021–2022 (Zirkel & Gullo, 2024, p. 934; Zirkel & Huang, 2018, p. 9). Locally, the school examined in this study reported Section 504 rates of 15.30% in 2022–2023, 15.48% in 2023–2024, 13.82% in 2024–2025, and 13.9% in 2025–2026 (Alma Technologies, 2025).

Though these figures have suggested a persistent higher than state average trend, they have not illuminated the systemic, instructional, or perceptual factors driving this growth. Existing research has underscored longstanding inconsistencies in evaluation, eligibility interpretation, and school-level implementation that contribute to state-level disparities (Holler & Zirkel, 2008; Zirkel & Gullo, 2024; Zirkel & Huang, 2018). Yet little is known about how teachers' perceptions of student needs, their understanding of evidence-based instructional frameworks, or the strength of tier 1 instruction may shape referral patterns. This gap has highlighted the need for local, context-specific inquiry.

An initial review of Section 504 plans at the study site revealed that many accommodations—such as check-ins for understanding, chunked assignments, organizational tools, and flexible workspaces—represent strategies that contemporary instructional frameworks

recommend for all learners (CAST, 2024). This observation redirected the investigation from a narrow analysis of 504 prevalence toward a broader examination of how universal design and whole-child models might support students more effectively. Three complementary frameworks—social and emotional learning (SEL, CASEL, 2020), universal design for learning (UDL, CAST, 2024), and multi-tiered systems of support (MTSS, Thurlow et al., 2020)—provide a coherent foundation for designing inclusive, accessible tier 1 instruction that anticipates rather than reacts to learner variability.

What began as a concern about high Section 504 identification thus evolved into a larger inquiry into educators' perceptions of student needs, their conceptual understanding of SEL (CASEL, 2020), UDL (CAST, 2024), and MTSS (Thurlow et al., 2020), and the tier 1 practices they view as essential for supporting diverse learners. By integrating these perspectives with Section 504 data and an analysis of common accommodations, this study seeks to understand whether strengthening tier 1 instruction may reduce unnecessary reliance on individualized plans and increase equitable access to supports (Tucker, 2025, January 15).

Accordingly, the purpose of this study is to examine how educators conceptualize student needs and how their understandings of SEL (CASEL, 2020), UDL (CAST, 2024), and MTSS (Thurlow et al., 2020) inform the instructional practices they employ. This inquiry aims to illuminate the systemic, pedagogical, and perceptual factors contributing to Section 504 identification patterns and to generate evidence that can guide professional learning, promote instructional coherence, and strengthen schoolwide capacity.

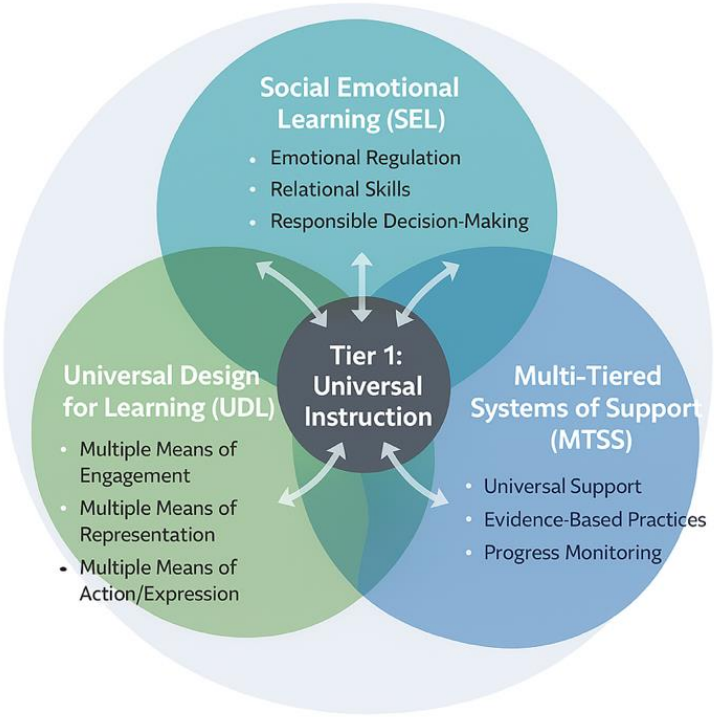
Literature Review

Contemporary students are developing under markedly different conditions than those experienced by previous generations. As opportunities for free play, independent exploration,

and unstructured peer interaction have declined, digitally mediated and adult-managed activities have become dominant (Haidt, 2024). This shift—paired with early and persistent exposure to social media—has contributed to increases in anxiety, attentional difficulties, and other mental health concerns that directly affect students' readiness for learning (Haidt, 2024). These developmental patterns highlight the need for instructional systems that proactively address learner variability rather than relying on reactive, individualized responses (CAST, 2024). SEL (CASEL, 2020), UDL (CAST, 2024), and MTSS (Thurlow et al., 2020) provide complementary frameworks for understanding learning as the interaction between student readiness, instructional design, and systemic supports. Taken together, these models offer an integrated foundation for inclusive and adaptive schooling (see Figure 1).

Figure 1

Integration of SEL, MTSS, and UDL



Note. Figure 1 created using ChatGPT (Open AI, 2025) based on the author's framework.

A growing body of research on adolescent development has underscored the urgency of such frameworks. Adolescents today exhibit rising rates of anxiety, depression, diminished self-worth, and self-harming behaviors (Borg et al., 2025). Youth are negatively influenced by digital harassment, academic pressure, and constant exposure to global crises (Conti, 2025). Haidt (2024) identified early digital immersion, reduced autonomy, and limited opportunities for independent problem-solving as factors that disrupt executive functioning and emotional resilience. Hyperconnectivity often results in dysregulation and mental fatigue, diminishing students' capacity to engage with curriculum effectively (Haidt, 2024).

Scholars also noted shifts in how adolescents interpret their academic experiences. Many overattribute success or difficulty to external factors, particularly teacher relationships and instructional quality, rather than to personal agency or sustained effort (Horanicová et al., 2024). Longitudinal data has shown continued increases in adolescent anxiety and depressive symptoms, driven more by acute stressors than chronic disorders, with the COVID-19 pandemic and heightened digital exposure functioning as accelerants (Borg et al., 2025). Although debate persists regarding the magnitude of these generational changes, consensus holds that heightened emotional dysregulation, attention-related challenges, and motivation variability now substantially affect schooling. These trends highlight the necessity of school-based frameworks that strengthen emotional regulation, relational competence, and responsible decision-making. SEL (Haidt, 2024) addresses these needs by cultivating intrapersonal and interpersonal competencies foundational to student learning and productive participation in their community (see Figure 2). Evidence has demonstrated that SEL implementation improved academic performance, reduced behavioral challenges, and enhanced school climate (Durlak et al., 2025). CASEL's (2020) core competencies—self-awareness, self-management, social awareness,

relationship skills, and responsible decision-making—align with research on executive functioning and socio-cognitive development, positioning SEL as a structural framework for academic success (Durlak et al., 2022; Immordino-Yang et al., 2018). However, its effectiveness varies widely, conditioned by implementation fidelity, teacher preparation, and resource availability. These constraints underscore the importance of embedding SEL within broader, coordinated instructional systems (CASEL, 2020).

Figure 2

Interactive CASEL Wheel

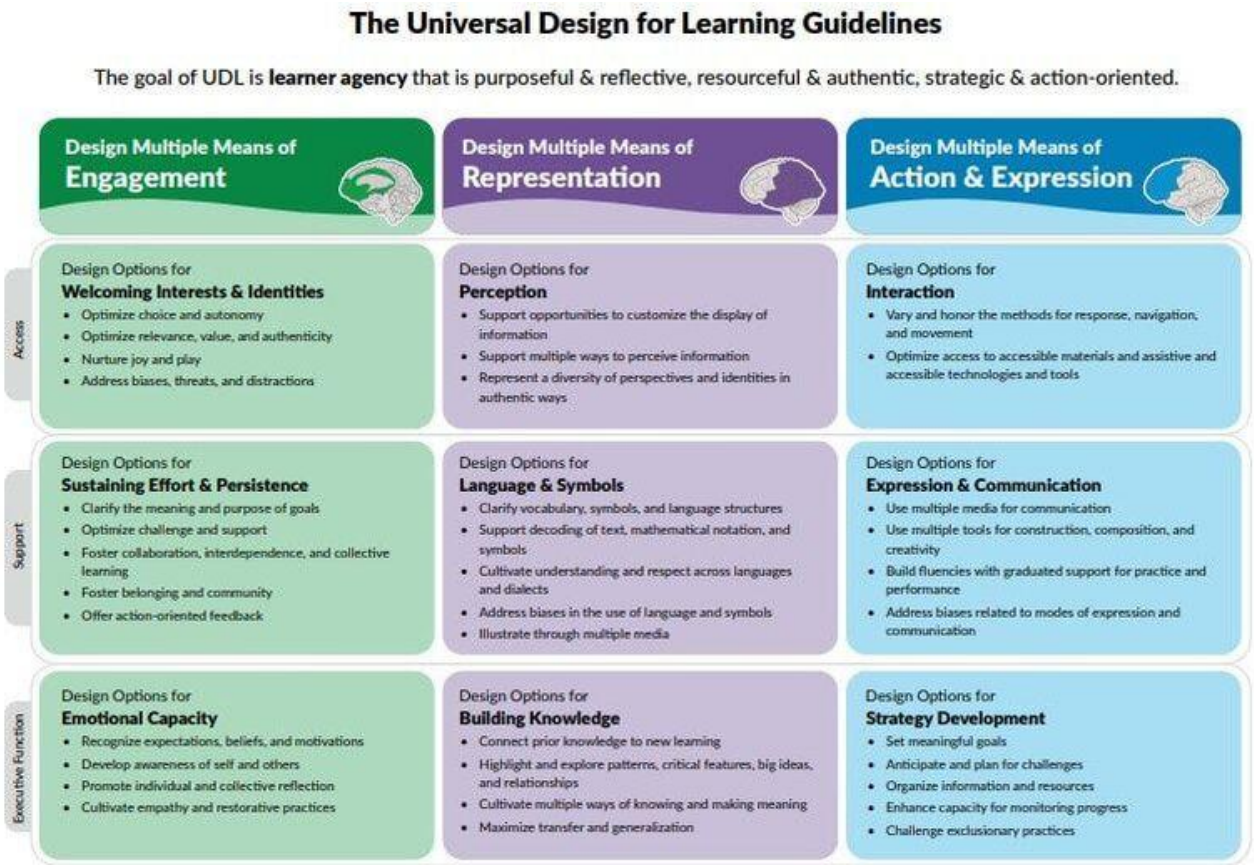
Note. Source—CASEL (2020)

UDL (CAST, 2024) complements SEL (CASEL, 2020), by addressing structural barriers to learning. Rather than designing instruction around a presumed "average" learner, UDL

promotes anticipatory planning that accommodates learner variability from the outset (Thomas et al., 2023). Grounded in cognitive neuroscience and disability studies, UDL frames learning challenges not as deficits within students but as mismatches between rigid instruction and diverse learner needs (Chen, 2008). Its three core principles—multiple means of engagement, representation, and action/expression—conceptualize accessibility as a design priority (see Figure 3).

Figure 3

The Universal Design for Learning Guidelines (CAST, 2024)

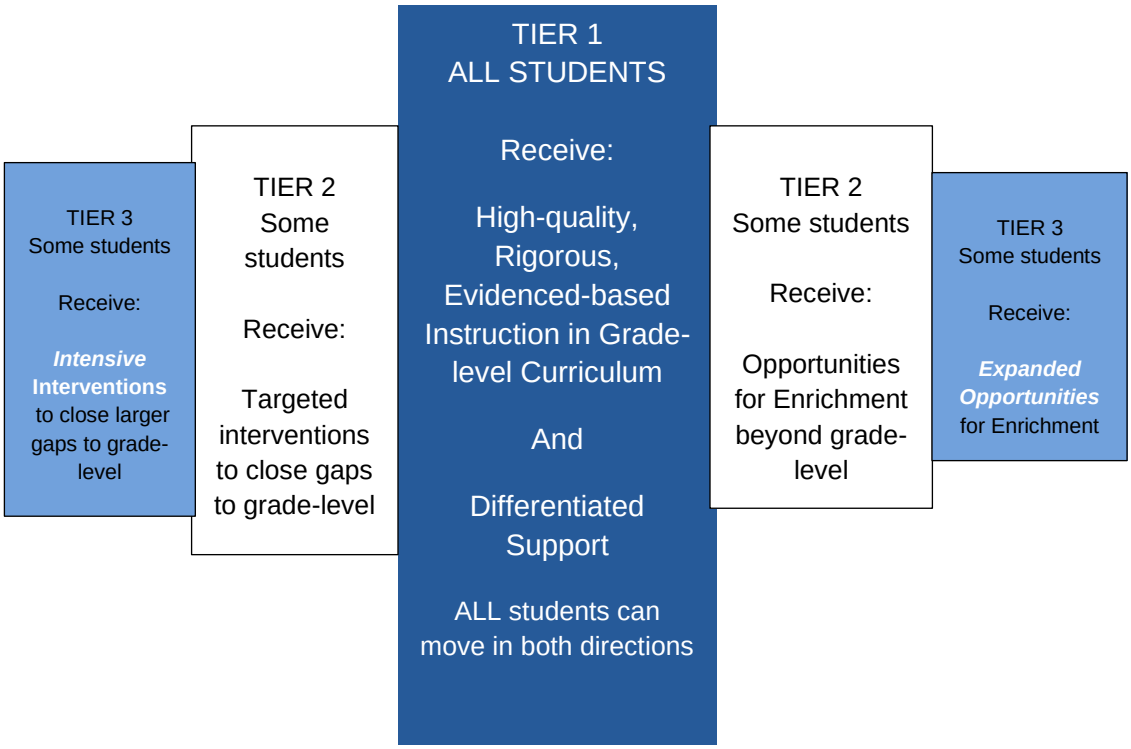


MTSS (Tucker, 2025, January 7) situates these instructional and relational components within a coherent organizational structure (see Figure 4). Though MTSS originated as a

framework for students whose academic needs did not meet criteria for special education, contemporary models position MTSS as a universal, prevention-oriented system designed to support all students (Thurlow et al., 2020). An effective tier 1 strategy must deliver high-quality, evidence-based instruction that meets the needs of roughly 80% of students; when this threshold is unmet, academic and behavioral interventions become overextended. Thus, both SEL and UDL meaningfully strengthen tier 1 by promoting relationally integrated, accessible, and flexible instruction (Thomas et al., 2023). MTSS provides the structural architecture needed to integrate these practices through early identification of needs, targeted interventions, and continuous progress monitoring (Tucker, 2025, January 15). Despite its promise, MTSS implementation remains inconsistent, particularly in under-resourced schools or those serving highly diverse populations (Thurlow et al., 2020).

Figure 4

MTSS Process



Together, SEL (CASEL, 2020), UDL (CAST, 2024), and MTSS (Thurlow et al., 2020) represent interdependent elements of a unified educational framework. SEL develops the emotional and social competencies that underpin learning readiness; UDL ensures that instruction is accessible and responsive to learner variability; and MTSS organizes these practices into a coherent systemwide model supported by evidence-based decision-making. As with academic interventions, SEL practices within an MTSS structure rely on clear, consistent expectations and relationally grounded communication to shape a positive school climate (Thurlow et al., 2020). When integrated, the three frameworks mutually reinforce one another, advancing both academic success and social-emotional well-being through coordinated attention to student needs, instructional design, and systemic organization (Immordino-Yang, et al., 2018; Thurlow et al., 2020).

Developing agreed-upon tier 1 practices within a school culture that strives to create a unified image and system of supports to create positive development of personal interactions and consistent expectations throughout the building has been shown to decrease disciplinary referrals and increase graduation rates (Bruhn, et al., 2022). In a 2019 study of 9th grade students, researchers found that students, who received explicit instruction in goal setting, decision making, problem solving, as well as study skills and test taking strategies, demonstrated statistically significant positive results in motivation and engagement, credits earned, and school attendance when compared with peers who did not receive this instruction (Flannery et al., 2020). These studies have demonstrated the positive implications of thoughtful, systemic tier 1 implementation.

For the present study, tier 1 implementation is of particular importance. As the universal instructional core, tier 1 must be simultaneously rigorous, inclusive, and accessible. Weak tier 1

systems lead higher tiers to operate reactively rather than proactively, overwhelming resources and exacerbating inequities. Strengthening tier 1 is therefore not merely procedural but theoretically essential for achieving comprehensive support for all learners. Understanding how tier 1 practices shape students' academic and social-emotional experiences provides critical insight into the intersection of emotional development, instructional design, and systemic organization—an intersection that increasingly defines contemporary schooling (CAST, 2024; Immordino-Yang et al., 2018; Thurlow et al., 2020).

Methodology

Purpose of the Study

This study investigated the academic, social, emotional, and behavioral needs of high school students as identified by educators, as well as educators' self-assessed familiarity with the complementary frameworks of SEL (CASEL, 2020), UDL (CAST, 2024), and MTSS (Thurlow et al., 2020). The work was prompted by the school's Section 504 prevalence, nearly three times the New Hampshire state average, which raised significant questions regarding whether tier 1 instruction adequately meets the needs of the general student population (Zirkel & Gullo, 2024). To address this concern, in this study, I analyzed Section 504 accommodations, compared them with educator-endorsed tier 1 instructional strategies, and identified areas where universal practices may reduce unnecessary reliance on disability-based supports.

In addition, I examined the professional learning structures, progress-monitoring systems, and organizational capacity required for sustained, high-fidelity implementation of tier 1 practices. An overarching aim was to determine whether strengthened tier 1 systems could improve instructional equity, enhance universal access to supports, and reduce the

disproportionate number of Section 504 referrals, consistent with whole-child and ecological models of learning (CAST, 2024; Darling-Hammond et al., 2020).

Hypothesis

In the study, I hypothesized that a substantial proportion of accommodations documented in Section 504 plans would overlap with educator-endorsed tier 1 instructional practices aligned with SEL (CASEL, 2020), UDL (CAST, 2024), and MTSS (Thurlow et al., 2020), suggesting that strengthening tier 1 coherence may reduce reliance on individualized accommodations over time. Additionally, there is potential to increase educator instructional capacity and consistency through collaboration.

Research Questions

The investigation was guided by four central research questions:

1. Student Needs: What student needs are most frequently diagnosed, perceived, or observed by educators?

2. Tier 1 Practices: Which tier 1 instructional strategies do educators consider most effective for addressing these needs, and how do these strategies align with SEL (CASEL, 2020), UDL (CAST, 2024), and MTSS (Thurlow et al., 2020)?

3. Professional Learning: What professional development and administrative supports are necessary to implement and sustain effective tier 1 instructional practices?

4. Data Use: How can meaningful quantitative and qualitative data be collected and assessed efficiently to inform instructional practice and systemic decision-making?

Research Goals

In this study I aimed to (a) develop a coherent set of tier 1 instructional strategies aligned with evidence-based SEL (CASEL, 2020), UDL (CAST, 2024), and MTSS (Thurlow et al.,

2020) principles; (b) enhance student readiness, engagement, and belonging through universally designed instruction; (c) articulate a professional learning plan to support consistent implementation; and (d) identify potential system-level benefits, including improved academic and behavioral outcomes, increased instructional coherence, and a reduction in unnecessary Section 504 referrals.

Design and Methods

This study employed a mixed-methods design (Creswell & Guetterman, 2025) to develop a comprehensive understanding of student needs and educator perspectives on tier 1 instruction. Quantitative data consisted of Section 504 prevalence rates and accommodation patterns extracted from the school's student information system for the 2022–2023 through 2025–2026 academic years. These data provided a descriptive profile of identification trends and the most frequently documented accommodations at a single, comprehensive high school in southeastern New Hampshire.

Qualitative data were collected through an anonymous electronic survey distributed to approximately 175 certified and non-certified educators, including classroom teachers, special educators, counselors, and instructional support staff (see Table 1). A total of 60 respondents completed the survey, yielding a response rate of 34.3%. The survey instrument was designed to capture educator perceptions of student academic, social-emotional, behavioral, and executive-functioning needs, as well as their familiarity with and use of tier 1 instructional practices aligned with SEL (CASEL, 2020), UDL (CAST, 2024), and MTSS (Thurlow et al., 2020). Survey items incorporated DSM-5 descriptors associated with anxiety and attention-related impairments—conditions frequently represented in Section 504 plans during the 2025–2026 school year (American Psychiatric Association, 2013). Additional items were adapted from

The Elements of Effective Instruction (Great Schools Partnership, 2025) and Reimagining MTSS Through UDL: A Practice Profile (McSheehan & Nelson, 2019), ensuring alignment with established frameworks for high-quality tier 1 practice. The instrument included a four-point Likert scale (ranging from “minimal” to “pervasive” or “never” to “frequent,” depending on the item) and targeted open-ended prompts designed to elicit contextual detail about observed student needs and classroom supports.

Table 1

Respondents’ Years in Education

Years of service	*n*
0–5 years	3
6–10 years	4
11–20 years	24
20+ years	29

Note. $n = 60$

Data analysis proceeded in parallel for quantitative and qualitative strands. Descriptive statistics were used to summarize Section 504 accommodation frequencies and survey response patterns, with particular attention to overlap between formal accommodations and teacher-endorsed tier 1 strategies. Qualitative responses were coded inductively to identify recurring themes related to attention, executive functioning, emotional regulation, instructional level differences, and perceived system gaps. Findings from both data sources were then triangulated and interpreted in relation to existing SEL, UDL, and MTSS structures at the school to identify points of alignment, areas of inconsistency, and opportunities for targeted professional learning.

Results

The purpose of this study was to identify high school students' academic, social-emotional, behavioral, and executive-functioning needs; determine which tier 1 instructional practices educators considered most effective in addressing those needs; and examine how these practices align with the complementary frameworks of SEL (CASEL, 2020), UDL (CAST, 2024), and MTSS (Thurlow et al., 2020). A further aim was to explore whether strengthening tier 1 instruction may help reduce the school's disproportionately high rate of Section 504 referrals and plans.

Table 2 presents educator self-ratings of their familiarity with SEL. Patterns in the quantitative data revealed a clear developmental relationship between years of experience and confidence in implementing SEL-, UDL-, and MTSS-aligned practices. Educators with 11–20 or 20+ years of experience were substantially more likely to report that they routinely utilize or feel prepared to implement all three frameworks (see Tables 2–4). In contrast, early-career educators (0–5 years) most frequently reported introductory exposure or unfamiliarity, particularly with UDL and MTSS. These findings aligned with research demonstrating that pedagogical expertise develops through iterative cycles of practice, reflection, and collaboration (Darling-Hammond et al., 2020).

Table 2

Educator Understanding of SEL by Years of Experience

Years of experience	Unfamiliar	Introduced	Ready to implement	Implementing	Routinely utilize
0–5 years	0	1	1	1	0
6–10 years	0	2	1	0	2

Years of experience	Unfamiliar	Introduced	Ready to implement	Implementing	Routinely utilize
11–20 years	0	5	7	8	11
20+ years	0	11	7	7	13

Note. SEL = social and emotional learning.

Across experience levels, UDL emerged as the least understood framework. Even veteran educators reported high frequencies of "introduced but need more training" or "unfamiliar" responses (see Table 3), reflecting national patterns in which UDL implementation often lacks coherence and sustained professional development (CAST, 2024). SEL demonstrated the strongest systemwide adoption, likely reflecting its accessibility for daily instructional use and the intensified focus on student well-being in the post-pandemic era (CASEL, 2020; Durlak et al., 2022; Domitrovich et al., 2008). MTSS fell between these two patterns (see Table 4)—more familiar than UDL but less consistently internalized than SEL—echoing national findings at the secondary level (Thurlow et al., 2020).

Table 3

Educator Understanding of UDL by Years of Experience

Years of experience	Unfamiliar	Introduced	Ready to implement	Implementing	Routinely utilize
0–5 years	1	1	1	0	0
6–10 years	0	1	2	0	2
11–20 years	1	4	7	4	14
20+ years	2	9	7	7	14

Table 4

Educator Understanding of MTSS by Years of Experience

Years of experience	Unfamiliar	Introduced	Ready to implement	Implementing	Routinely utilize
0–5 years	1	2	0	0	0
6–10 years	0	2	1	1	0
11–20 years	0	10	5	3	6
20+ years	0	10	6	7	6

Note. MTSS = multi-tiered system of supports

Beyond their own familiarity with frameworks, educators rated the frequency and instructional impact of a range of attention, executive-functioning, and behavioral regulation indicators. These patterns revealed that such challenges were not isolated to a small subset of students but were widespread across classrooms (see Table 5).

Table 5

Conclusions Derived From Attention and Executive-Functioning Ratings

Area of need	Evidence from ratings	Assumptions about student functioning	Tier 1 implications
Attention & focus	High Occasional and Frequent ratings across items (e.g., maintaining focus, distractibility, redirection)	Attention difficulties are widespread and interfere with instruction for many students.	Tier 1 needs built-in routines for attention, pacing, chunking, and active engagement.
Executive functioning	Several items show high frequent and notable pervasive ratings (planning, sequencing, task initiation, organization)	EF deficits significantly impact academic performance and are a major barrier to independence.	Universal EF supports such as organizers, modeling, checklists, and chunked tasks should be consistently embedded.

Area of need	Evidence from ratings	Assumptions about student functioning	Tier 1 implications
Processing speed & working memory	High occasional but low pervasive ratings for extended processing/response time	Most students benefit from more time and repetition, but do not show severe impairment.	Tier 1 should include predictable routines, wait time, repeated cues, and multi-modal instruction.
Task completion & work production	Frequent ratings for incomplete work, difficulty meeting deadlines, inconsistent performance	Work avoidance stems from cognitive load, not motivation; students need structured supports.	Tier 1 must incorporate scaffolding, guided practice, and clear expectations.
Behavioral regulation	Frequent impulsivity and distractibility noted across grade levels	Behavioral challenges reflect regulation deficits rather than intentional misconduct.	SEL-aligned routines for regulation, goal-setting, and self-monitoring should be universal.
Instructional variability impact	Needs occur across classrooms and groups, not just among students with 504s	Challenges are systemic, not isolated; Tier 1 inconsistency likely drives accommodation requests.	Schoolwide coherence in SEL–UDL–MTSS implementation is essential.
Section 504 patterns	Overlap between rated needs and common 504 accommodations	Many needs currently treated as disability-related could be addressed universally.	Strengthening tier 1 can reduce unnecessary Section 504 referrals.

Note. Information derived from survey respondents.

Most indicators clustered within the occasional and frequent ranges, suggesting regular interference with learning. Executive functioning deficits—particularly task initiation, sequencing, planning, and organization—received the highest number of pervasive ratings, indicating that these needs substantially disrupt classroom functioning. In contrast, items involving processing speed, working memory, and response time showed high occasional but

low “Pervasive” ratings, implying that many students benefitted from predictable pacing, scaffolded tasks, and repeated cues rather than disability-based interventions.

Taken together, these findings indicated that many student struggles reflect systemic instructional mismatches, not disability-specific needs. When tier 1 structures are inconsistent or underdeveloped, predictable needs related to attention, organization, and regulation are more likely to be externalized into Section 504 accommodation requests. This dynamic contributed to inflated identification rates even when the underlying needs could be addressed universally through strengthened tier 1 designs.

A comparison of Section 504 accommodations with educator-endorsed tier 1 strategies (see Table 6) revealed substantial overlap. Common 504 accommodations (e.g., check-ins for understanding, chunked assignments, organizational supports, and flexible assessment options) were also identified by educators as essential daily instructional practices. This alignment suggested that many supports formalized through 504 plans represent strategies that should exist universally within tier 1 instruction.

Yet the analysis also revealed gaps. Organizational tools, written directions, and checklists appeared in 14–25% of Section 504 plans, despite 60–88% of educators identifying them as essential student needs. Emotional regulation supports showed similar discrepancies. These disparities indicated that core executive-functioning and SEL-related needs extended far beyond students with formal plans, reinforcing the argument that tier 1 inconsistencies—not disability prevalence—drive elevated 504 rates.

Table 6

Comparison of Section 504 and Educator-Endorsed Tier 1 Instructional Strategies

Section 504 accommodation	% Plans	Parallel tier 1 strategy	% Educators endorsing	Tier 1 implication
Check-ins for understanding	62.33% (96)	Checks for understanding	85%	Should be embedded as Tier 1 routine.
Short breaks	43.5% (67)	Opportunities for breaks/movement	50%	Supports regulation; can reduce 504 requests.
Extended time	53.24% (82)	Flexible timing	48.3%	Need universally flexible assessment windows.
Chunking assignments	34.41% (53)	Task chunking	70%	Should be standard tier 1 practice.
Access to counselor/nurse	24.67% (38)	Help-seeking routines	63.3%	Supports SEL and destigmatizing support.
Preferential seating	34.41% (53)	Strategic seating	60%	Attention-supportive seating should be proactive.
Alternate workspace	25.32% (39)	Flexible workspaces	30%	Tier 1 may need environmental redesign.
Graphic organizers/checklists	24.67% (38)	Organizers and checklists	88.3%	Strong case for universal EF supports.
Cues to stay on task	13.63% (21)	Prompting, reminders	40%	Embed self-monitoring strategies.
Alternative assessments	12.34% (19)	Flexible assessment pathways	60%	Strong support for UDL-aligned assessments.
Written instructions	14.28% (22)	Written directions/notes	60%	Predictable, accessible materials needed.

Note. Percentages reflect survey comparisons between Section 504 accommodations and educator-endorsed tier 1 practices.

The findings also displayed notable variability in educators' perceived readiness to implement SEL (CASEL, 2020), UDL (CAST, 2024), and MTSS (Thurlow et al., 2020). While experienced educators reported greater confidence, early-career teachers frequently indicated unfamiliarity or limited training. Because new teachers play a central role in delivering tier 1 instruction, and experience high turnover rates, these gaps highlighted the need for structured onboarding and sustained professional learning.

Ultimately, the data across all sources pointed to a consistent conclusion: the school's elevated Section 504 identification rate reflected systemic inconsistencies in tier 1 instructional design rather than an increase in disability prevalence. Educators valued tier 1 practices and recognized their importance, but uneven training, variable experience levels, and limited understanding of UDL contributed to fragmented implementation. Strengthening tier 1 through coherent, schoolwide professional learning in SEL (CASEL, 2020), UDL (CAST, 2024), and MTSS (Thurlow et al., 2020) is therefore essential to ensuring equitable instructional access and reducing unnecessary reliance on individualized accommodations. Taken together, the findings indicated that the school's elevated Section 504 rate was less a reflection of increased disability prevalence and more a symptom of inconsistent tier 1 instructional design.

Integration of Qualitative Findings by Research Question

RQ1: Student Needs

Analysis of both quantitative ratings and qualitative comments revealed that academic, behavioral, and executive-functioning needs were widespread across the student population, not confined to those with documented disabilities. Educators reported frequent challenges with attention, task initiation, organization, persistence, and emotional regulation—patterns consistent with national research on post-pandemic adolescent development. These findings suggested that

many classroom barriers stemmed from predictable developmental needs and instructional mismatches rather than disability-specific conditions, reinforcing the necessity of strong universal tier 1 supports.

RQ2: Effective Tier 1 Strategies

Educators identified a consistent set of tier 1 practices (e.g., check-ins for understanding, chunking of assignments, organizational supports, written instructions, flexible seating, and alternative assessments) as most effective in addressing student needs. Notably, these practices closely mirrored the accommodations most frequently included in Section 504 plans. The strong overlap indicated that many formally documented accommodations reflect strategies that educators believe should be available to all students as part of high-quality tier 1 instruction.

RQ3: Alignment With SEL, UDL, and MTSS

The tier 1 strategies endorsed by educators aligned closely with the core components of SEL (CASEL, 2020), UDL (CAST, 2024), and MTSS (Thurlow et al., 2020). Organizational and scaffolding supports reflect UDL's principles of engagement, representation, and action/expression. Strategies related to regulation, relationships, and help-seeking paralleled CASEL's social-emotional competencies. Predictable routines, differentiated supports, and progress-monitoring elements aligned with MTSS tier 1 expectations. These intersections demonstrated that teachers intuitively gravitated toward SEL–UDL–MTSS-aligned practices, even when their formal knowledge of the frameworks varied.

RQ4: Potential to Reduce Section 504 Plans

Given the substantial overlap between Section 504 accommodations and universally endorsed tier 1 practices, strengthening tier 1 instruction holds clear potential to reduce unnecessary referrals. The most striking example—organizers and checklists appeared in only

14–25% of 504 plans but were endorsed by 88.3% of educators as essential, illustrating how gaps in universal instruction may be misinterpreted as disability-related needs. Improved tier 1 coherence, consistency, and professional learning could therefore mitigate inflated 504 identification and promote equitable access to support.

Discussion

Recommendations for Future Research and Practice

The study's findings indicated several areas for continued investigation and practical action. The following recommendations provide direction for researchers, practitioners, and school leaders seeking to strengthen tier 1 systems and address disproportionate Section 504 identification.

1. Strengthen Tier 1 Instruction Through Integrated SEL, UDL, MTSS Design

Future efforts should prioritize universally designed tier 1 practices that proactively address attention, executive-functioning, and regulation needs. Professional learning should focus on UDL-aligned scaffolds for engagement, action and expression, and representation; SEL routines for regulation and belonging; and MTSS decision rules for consistent implementation. High-frequency strategies such as chunking, organizational supports, and flexible assessment pathways should be explicitly embedded in daily instruction.

2. Establish Professional Learning Communities as the Core of Tier 1 Improvement

Professional learning communities (PLCs) should engage in shared inquiry, analysis of student work, calibration of expectations, and collaborative UDL lesson design. These structures can reduce instructional variability, promote coherence, and build collective efficacy. PLCs also provide an ongoing forum for aligning tier 1 practices with MTSS and SEL frameworks.

3. Expand Co-Teaching and Collaborative Planning Structures

Purposeful co-teaching assignments, supported by dedicated planning time and training in evidence-based instructional models, can increase access to tiered supports and reduce reliance on formal accommodations. Co-teaching offers an effective mechanism for embedding UDL and SEL strategies into the general education environment.

4. Provide Instructional Coaching to Improve Fidelity

Instructional coaching offers sustained, job-embedded guidance that bridges the gap between knowledge and implementation. Coaching can support differentiation, UDL-aligned design, SEL routines, and MTSS progress monitoring, ensuring more consistent tier 1 delivery across classrooms.

5. Develop Tier 1 Fidelity Tools and Progress Monitoring Systems

Schools should establish clear expectations for what tier 1 instruction should look like, supported by checklists, observation tools, and common formative assessments. These structures can create transparency, guide professional learning, and help educators to self-reflect and leaders and teams to monitor implementation without adding unnecessary burden. To facilitate and assess fidelity to the initiatives, a self-reflection tool and student check-in survey are offered in Appendix B and Appendix C.

6. Offer Training on Section 504 Eligibility and Legal Standards

Educators should receive training on distinguishing universal supports from disability-based accommodations, interpreting documentation, and documenting tier 1 interventions prior to initiating referrals. Clarifying these distinctions strengthens equity and reduces inappropriate identification.

7. Conduct Future Research on Tier 1 Strengthening and 504 Patterns

Longitudinal and multi-site studies should explore how tier 1 improvements affect academic, behavioral, and SEL outcomes; whether executive function supports reduce referrals; how educator beliefs influence accommodation decisions; and how universal practices impact students without formal plans. These lines of inquiry will further illuminate the system-level factors driving 504 identification patterns.

Limitations

As with any mixed-methods design, several limitations should be noted when interpreting the results. Because the study relied on educator self-report measures, responses may reflect subjective perceptions or individual interpretation of survey items rather than objective indicators of practice. The brevity of many qualitative comments also constrained the depth of thematic analysis, limiting the extent to which nuanced perspectives could be explored. In addition, practical factors such as time, workload, and resource availability within the school context may influence the feasibility of implementing identified tier 1 practices. Due to the relatively small sample size, it would be inappropriate to generalize results. While the findings are specific to a single comprehensive high school, the methodological approach—combining Section 504 pattern analysis with educator perceptions of SEL (CASEL, 2020), UDL (CAST, 2024), and MTSS (Thurlow et al., 2020)—offers a transferable model for other schools seeking to examine and strengthen their tier 1 instructional systems.

Conclusion

This study examined high school educators' perceptions of student needs, the tier 1 practices they considered most effective, and the degree to which these practices aligned with SEL (CASEL, 2020), UDL (CAST, 2024), and MTSS (Thurlow et al., 2020) frameworks. The

analysis was motivated by the school's disproportionately high Section 504 prevalence and the broader national increase in 504 identifications.

Across all data sources, a consistent narrative emerged. Many accommodations formalized through Section 504 plans, such as check-ins, chunked assignments, organizational supports, flexible seating, and alternative assessments, are strategies that educators in this study overwhelmingly indicated should exist universally within tier 1 instruction. This convergence suggested that the school's elevated 504 rate reflects gaps in tier 1 instructional design rather than an increase in disability prevalence.

Educators also described widespread attention, executive-functioning, and self-regulation challenges, particularly in ninth grade and academic-level courses. These patterns mirrored current research on adolescent development in a digitally saturated, post-pandemic context (Haidt, 2024). When tier 1 instruction does not proactively support these predictable needs, formal accommodations become a reactive mechanism for accessing supports that should be available to all students.

The study affirms the importance of integrating SEL (CASEL, 2020), UDL (CAST, 2024), and MTSS (Thurlow et al., 2020) as the conceptual and practical foundation for coherent tier 1 instruction. SEL provides competencies essential for readiness and regulation, UDL offers a blueprint for designing accessible learning experiences, and MTSS supplies the systemic structures necessary for early intervention and consistency. Together, these frameworks offer a powerful model for strengthening tier 1 and reducing unnecessary reliance on individualized accommodations.

Ultimately, this study underscored that effective tier 1 instruction is not a collection of isolated strategies but a systemwide commitment to equitable, universally designed teaching. By

prioritizing shared instructional norms, coherent professional learning, and consistent implementation, schools can better meet the diverse needs of contemporary learners and create environments where all students can thrive without requiring formal identification to access appropriate supports (Friziellie et al., 2025).

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Appendix A

Ratings for Attention, Executive Functioning, and Behavioral Regulation Indicators

1- Minimal: Rarely observed; Little to no impact; May or may not occur in daily class.

2- Occasional: Sometimes interferes; Manageable; May occur daily with little to no impact on learning

3- Frequent: Regularly interferes with academic functioning; Inhibits classroom environment

4- Pervasive: Severely limits instruction; Behavior management significantly impedes learning

Students	**1**	**2**	**3**	**4**
demonstrate difficulty maintaining focus during instruction.	6	28	26	0
require frequent redirection to stay on task.	6	28	24	2
appear easily distracted by peers, sounds, or internal thoughts.	3	29	27	1
avoid tasks requiring sustained mental effort.	2	36	17	5
struggle to complete independent tasks without support.	7	29	23	1
have difficulty organizing thoughts to begin tasks.	10	31	18	1
struggle with planning or sequencing steps	10	31	18	1
frequently act impulsively or answer without thinking.	10	26	21	3
require extended time to process information.	9	37	14	0
require extended time to respond to questions.	10	39	11	0
need repeated cues to recall or apply concepts.	4	33	23	0
demonstrate inconsistent academic performance.	8	34	18	0
forget instructions or misplace work/materials.	8	39	11	2
require frequent reteaching or clarification.	5	37	17	1
have difficulty completing assignments on time.	7	34	17	2
perform below cognitive ability due to lack of focus.	7	37	15	1

Appendix B

Tier 1 Self-Reflection Fidelity Tool

Aligned with SEL • UDL • MTSS

Section A: Classroom Environment & Culture (SEL-Aligned

Indicator	Fully Implemented	Partially Implemented	Not Yet Implemented
Clear, predictable routines are in place for transitions, work time, and group tasks.	☐	☐	☐
Classroom expectations are explicitly taught, modeled, and reinforced.	☐	☐	☐
Teacher uses relationship-building practices (greetings, check-ins, positive narration).	☐	☐	☐
Students have access to regulation strategies (movement, breaks, breathing, tools).	☐	☐	☐

Evidence/Notes:

Section B: Instructional Design & Delivery (UDL-Aligned)

Indicator	Fully Implemented	Partially Implemented	Not Yet Implemented
Lessons include **multiple means of engagement** (choice, relevance, collaboration).	☐	☐	☐
Lessons include **multiple means of representation** (visuals, modeling, scaffolds).	☐	☐	☐
Lessons include **multiple means of action & expression** (flexible assessment options).	☐	☐	☐
Instructions and expectations are provided in **both verbal and written** formats.	☐	☐	☐
Tasks are chunked and supported with clear steps, models, or organizers.	☐	☐	☐

Evidence/Notes:

Section C: Executive Function Supports

Indicator	Fully Implemented	Partially Implemented	Not Yet Implemented
Students use checklists, organizers, or planners to manage tasks.	☐	☐	☐
Time-management supports are embedded (timers, countdowns, posted agenda).	☐	☐	☐
Teacher provides chunked deadlines and monitors progress.	☐	☐	☐
Frequent verbal and nonverbal check-ins are used to maintain engagement.	☐	☐	☐

Evidence/Notes:

Section D: Assessment & Feedback Practices

Indicator	Fully Implemented	Partially Implemented	Not Yet Implemented
Formative assessments are used routinely to adjust instruction.	☐	☐	☐
Students receive clear, actionable feedback.	☐	☐	☐
Flexible assessment pathways are available when appropriate.	☐	☐	☐
Misunderstandings are addressed through reteaching or flexible grouping.	☐	☐	☐

Evidence/Notes:

Section E: MTSS Tier 1 Systems & Data Practices

Indicator	Fully Implemented	Partially Implemented	Not Yet Implemented
Teacher monitors attendance, behavior, and work completion patterns.	☐	☐	☐
Classroom-level interventions are attempted **before** referring for Tier 2 or 504.	☐	☐	☐
Data is brought to PLCs for collaborative analysis and action planning.	☐	☐	☐
Instruction is adjusted in response to data.	☐	☐	☐

Evidence/Notes:

Areas of strength:

Areas for improvement:

Next steps (team or teacher action plan):

Appendix C

Student Check-In Survey

Note to Educator,

These questions are intended to give you, the educator, feedback regarding how students are receiving the instruction you provide. Responses to these questions may help individual educators to better meet the needs of their students.

Student Check-In Survey

About Your Learning Experience

Student Note:
This survey helps your teacher understand what helps students learn best in this class. There are no right or wrong answers. Your honest feedback will be used to improve instruction and support student learning.

Please choose the response that best matches your experience with the teacher.

Classroom Environment & Routines

1. **My teacher has clear routines and expectations for how class runs and how we treat each other.**
   ☐ Not yet ☐ Sometimes ☐ Usually ☐ Always

2. **My teacher treats mistakes as part of learning and encourages us to keep trying.**
   ☐ Not yet ☐ Sometimes ☐ Usually ☐ Always

3. **The classroom setup works for different ways of learning (working alone, in groups, or getting extra support).**
   ☐ Not yet ☐ Sometimes ☐ Usually ☐ Always

Instruction & Learning Supports

4. **My teacher changes lessons or materials to help different students understand.**
   ☐ Not yet ☐ Sometimes ☐ Usually ☐ Always

5. **My teacher uses different teaching strategies to help all students learn, even if we start with different levels of understanding.**
   ☐ Not yet ☐ Sometimes ☐ Usually ☐ Always

6. **My teacher encourages us to think about different viewpoints and ideas.**
   ☐ Not yet ☐ Sometimes ☐ Usually ☐ Always

7. **My teacher provides tools or supports (examples, organizers, technology, checklists, etc.) that help me learn in ways that work for me.**
   ☐ Not yet ☐ Sometimes ☐ Usually ☐ Always

Time, Support, & Assessment

8. **My teacher is flexible with timelines when students need more time or support to succeed.**
   ☐ Not yet ☐ Sometimes ☐ Usually ☐ Always

9. **My teacher gives us different ways to show what we know (for example: projects, tests, presentations, or written work).**
   ☐ Not yet ☐ Sometimes ☐ Usually ☐ Always

Optional

10. **One thing my teacher does that really helps me learn is:**
    (short response)

11. **One thing that could help me learn better in this class is:**
    (short response)

Need for Cognition in Recall and Recognition Tasks

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Abstract

Need for cognition (NFC), the extent to which individuals engage in and enjoy effortful thinking, is associated with various abilities that are important in education (e.g., intelligence, academic outcomes). Typically, students' education involves use of different types of memory. When students take an essay test, they draw predominantly on recall memory, whereas a multiple-choice test can be navigated using primarily recognition memory. Although this sits well as common wisdom, to date, very little research has examined the relationship between test taking and memory. In this study I examined how memory types can aid or inhibit academic performance, as indicated by their grade point averages. Participants completed two facial activities (one relying primarily on recognition memory and one relying on recall memory) and two vocabulary tasks. One vocabulary task relied primarily on recognition memory while the other relied on recall memory. The results showed that NFC is related to and predictive of success for recall tests but not for recognition tasks. In addition, students who scored higher in NFC did better on the recall tasks.

Keywords: need for cognition (NFC), recall memory, recognition memory, study strategies, academic success

Learning draws on both recall and recognition memory. Recall tasks require students to remember information without relying on cues and/or prompts (Stern & Hasselmo, 2009). In

contrast, recognition memory tasks provide cues and tend to be easier than recall tasks (Rich, 2011; Liu & Nesbit, 2023). When it comes to testing, students take some exams that rely primarily on recall memory, like essay exams (Liu & Nesbit, 2023; Roediger & Karpicke, 2006), and other exams that rely primarily on recognition memory, like multiple-choice exams (Little & Bjork, 2014). Researchers have examined factors, such as self-efficacy (Honicke, et al., 2023; Schneider & Preckel, 2017) and intelligence (Blanco et al., 2022) which influence performance on both kinds of tests. In the current study, I compared differences in scores on two recall tasks and two recognition tasks and explored the extent to which NFC influenced student outcomes.

Literature review

Need for Cognition

Need for cognition is an inherent tendency to enjoy engaging in thinking activities (Cacioppo & Petty, 1982; Liu & Nesbit, 2023). People who have higher levels of need for cognition often engage in thinking about a variety of topics, enjoy the thinking process, and require little prompting to get them to engage their thinking skills (Bost, 2024). According to Liu and Nesbit (2023), “Need for cognition is not an intellectual capacity, but a cognitive motivation” (p. 2). Whereas intelligence describes a person’s ability to acquire, understand, and apply knowledge and skills (Blanco et al., 2022), NFC describes a person’s tendency to enjoy and engage in thinking (Cacioppo & Petty, 1982; Liu & Nesbit, 2023).

Research has indicated there is a relationship between NFC and student performance (Sadowski & Gulgoz, 1992; Liu & Nesbit, 2023) as well as between NFC and college students’ reported satisfaction with their lives (Coutinho & Woolery, 2004; Zerna et al., 2024). Furthermore, Hawthorne and Sealey (2019) found that, for graduate students in an online program, students with higher levels of NFC reported greater satisfaction with the program and

with their professors than did students with lower NFC. In contrast, individuals with low NFC tend to feel more anxiety and stress when faced with complex tasks, in part because they are not comfortable with cognitive challenges and have low levels of confidence in their ability to solve problems (Heppner, et al., 1983; Zerna et al., 2024).

Students who report a higher level of NFC often invest greater levels of effort in information-processing activities (Cacioppo et al., 1996; Fleischhauer et al., 2024) and are more likely to pay attention during cognitive tasks (Osberg, 1987; Zerna et al., 2024). They also tend to find and use relevant information for problem solving (Berzonsky & Sullivan, 1992) and are more likely to base judgments on deliberative, rational considerations rather than affective responses (Reuter et al., 2025, Zerna et al., 2024). They also tend to find and use relevant information for problem solving (Berzonsky & Sullivan, 1992) and are more likely to base judgments on deliberative, rational considerations rather than affective responses (Reuter et al., 2025; Zerna et al., 2024).

Both high school GPA (Weissgerber et al., 2018) and college GPA (Strobel et al, 2019) have positive correlations with NFC scores. Because students with high NFC enjoy and want to engage in cognitively demanding tasks (Reuter et al., 2025; Zerna et al., 2024)., they make a greater effort to seek out, acquire, and reflect on information relevant to the task (Jebb et al., 2016). This increased effort and enjoyment of the process tends to help students in their work.

In contrast, Conzola and Klein (1998) and a Wogalter et al. (2002) found that, when presented with product warnings, students with lower levels of NFC recalled more information about warning instructions. The authors hypothesized that a lack of guiding features designed to grab the students' attention would result in students with low NFC not engaging in deliberate cognitive processing. Coppens et al. (2019) failed to find a significant relationship between the

NFC and the transfer of problem-solving procedures from one task to the next. Warden and Myers (2017) found a negative correlation between NFC and GPA for students older than 25. Neigel et al. (2017) found that NFC and performance of standardized tests (e.g., SAT, ACT) were positively related.

Although Conzola and Klein (1998) found greater recall of warning instructions among individuals low in need for cognition (NFC), more recent research suggests that this effect is context-specific**.** Contemporary studies generally show that higher NFC is associated with deeper processing and better recall of complex or information-dense warnings; however, low-NFC individuals may recall simple, directive warning messages more effectively when such messages rely on salience rather than elaboration (Champlin, 2022; Zerna et al., 2024).

Research has indicated that students who have high NFC remembered more arguments from an editorial-style text passage than did their peers with low NFC (Cacioppo et al., 1983; Wagaman et al., 2025). Similarly, Champlin (2022) and Kuo et al. (2012) showed that participants with higher levels of NFC remembered more product features described in advertising. Furthermore, consistent with earlier findings by Kardash and Noel (2000), more recent evidence suggests that NFC is positively associated with recall-based memory performance but shows weaker or inconsistent relations with recognition tasks, reflecting the greater cognitive demands of self-initiated retrieval (Wagaman et al., 2025; Zerna et al., 2024). Given that the two types of memory require distinct levels of processing and have different levels of difficulty, it is reasonable to expect that they would have different requirements regarding NFC.

In the current study I examined the relationship between NFC on recall and recognition tasks. Although there is a large verbal component in learning materials, students also study

diagrams and charts that rely more heavily on visual processing. Therefore, the experimental tasks included vocabulary tests and visual recognition tests, as both are relevant to learning.

Method

The goal of the current study was to compare the relationship between NFC scores and performance on recall and recognition tasks. After receiving IRB approval, students in a mid-sized university participated in a series of tasks. Two tasks were vocabulary recall or recognition tasks and two were visual recognition or recall tasks. The tasks were completed in random order with the exception that the visual recall task had to be completed before the visual recognition tasks. This was done to avoid order effects (the systematic influence of task sequence on performance) and fatigue effects (a decline in performance due to participant becoming tired).

Participants

After IRB approval and participant consent was received, 146 undergraduate students participated in the study. Participants consisted of 48 males and 98 females with an age range from 18 to 48 (mean age = 21.7 years). For other participant demographics, see Table 1.

Table 1

Participant Demographics

Demographic	Elements	Number
Race/Ethnicity	African American	29
	White	85
	Latinx	28
	Biracial/Multicultural	3
	No response	1
Class	First-Year	15
	Sophomore	27

	Junior	60
	Senior	20
Generation	First generation	50
	Second generation	96

Materials and Procedure

After completing the informed consent document, participants completed a demographic form and each task. Participants completed all tasks, except for distractor tasks (i.e., completing mazes), on the laboratory computers. The tasks were programmed using E-Prime and were presented on Dell UltraSharp 24-inch monitors. Participants also completed 3 minutes of mazes between tasks.

Vocabulary Task

In this task, participants saw 20 word-pairs (e.g., toy; banana). The word pairs were matched for length, difficulty, forward associative strength (the strength of association from cue to target, and backwards associative strength (the strength of association from target to cue). Participants studied each word pair for 30 seconds. A blank screen appeared for 3 seconds after each word pair, then the next word pair would appear. After studying the word pairs, participants spent 3 minutes completing mazes. For the test phase, participants saw the first word of each word pair and provided the second word. Participants typed their answer using a Dell wireless keyboard.

Word-Pairs Task

Participants studied 20 word-pairs (e.g., house, car). The word pairs were matched for length, difficulty, forward associative strength, and backwards associative strength. Participants saw each word pair presented for 30 seconds each, then a blank screen appeared for 3 seconds

followed by the next set of word pairs. After studying the word pairs, participants spent 3 minutes completing mazes. Finally, participants saw a set of 30 word-pairs and judged whether they had studied each word-pair. Participants pressed the “a” key for Yes and the “l” key for No. Labels on the keys facilitated participant response.

Face-Name Task

Participants studied 36 face-name pairs. Each face-name pair was presented for 30 seconds. The names were chosen from the top 50 most common names in the United States (Forebears, 2021) to avoid any distinctiveness effects, and the faces were taken from Experiment 4 of the Bartlett et al. (2009) facial recognition study (used with permission) (see Figure 1). The use of black and white photos reduced potentially distinctive characteristics, such as hair and eye color. The photos were split equally between females and males. The pictures, which were presented using E-prime, appeared in random order for each participant.

Figure 1

Sample face/name pairs

Faces Recall Test

Participants saw each face along with a prompt for the participant to enter the name that matched the face. Participants used the keyboard to type the name they recalled belonging with the face. The test phase was self-paced. The recall test always occurred prior to the recognition test to lessen the chance of task overlap influencing participant recall.

Faces Recognition Test

Participants saw each face one at a time accompanied by two names. Participants chose the name belonging to the face by pressing the number associated with the name. Participants pressed the "r" key if they thought the name on the right side of the screen was the correct name; similarly, they pressed the "l" key for the name on the left side of the screen. Labels on the keys facilitated participant response. Participant responses were self-paced.

Need for Cognition Task

This task consisted of eighteen statements and asked participants to rate the extent to which they agreed with each statement (Cacioppo et al., 1984). The statements were designed to assess participants' level of cognitive engagement and enjoyment of complex thinking. The questions were presented as a Likert format with 1 being "extremely uncharacteristic" to 5 being "extremely characteristic." To minimize bias, some statements were reverse scored. Higher scores indicated a greater level of need for cognition.

Results

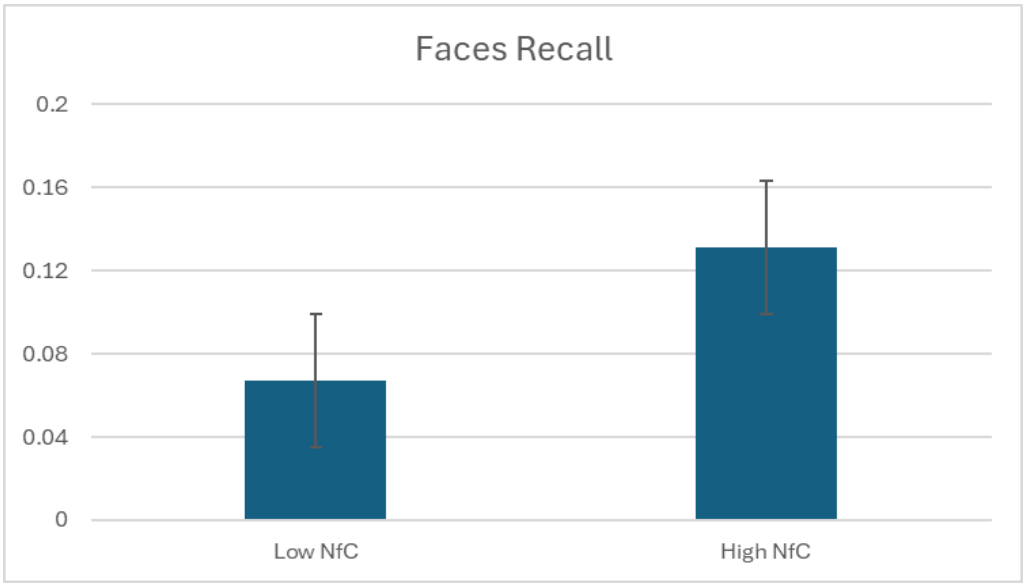
A Pearson correlation analysis revealed that NFC was positively correlated with the vocabulary task, $r = .300$, $p = .043$, and the faces recall task, $r = .441$, $p = .003$, but not with the word pairs task, $r = .064$, $p = .667$, or the faces recognition task, $r = .042$, $p = .781$.

Next, two multiple linear regression analyses using the enter method were conducted using NFC as the predictor variable; faces recall and the vocabulary measure were the criterion variables. A Bonferroni correction (1936) was used to limit the effect of type 1 error (p = .025). The results showed that for the vocabulary measure, NFC accounted for 9% or the variance in scores (r^2 = .09; adjusted r^2 = .07). NFC was a significant predictor of vocabulary score, β = .004, t = 2.09, p = .004. For the faces recall task, NFC was a significant predictor, β = .005, t = 3.18, p = .003, and accounted for 19% of the variance, r^2 = .194, adjusted r^2 = .175).

Next, two independent sample t-tests were conducted using NFC as the independent variable; faces recall and the vocabulary measure were the dependent variables (see Figure 2). A Bonferroni correction limited the effect of type 1 error (p = .025). The results showed that for the faces task, participants with higher levels of NFC scored better than participants with lower levels of NFC, t = 4.135, p < .001, Cohen's d = .11.

Figure 2

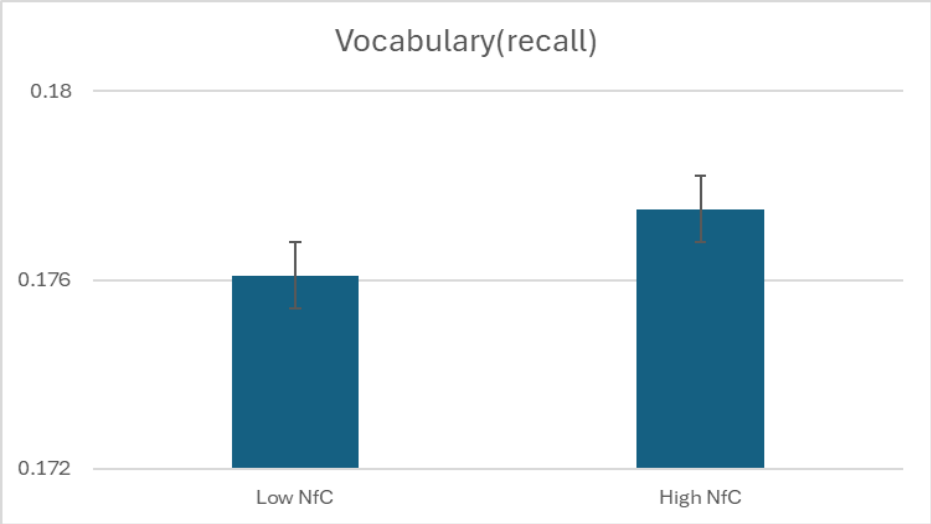
Differences in Faces Recall Score Based on NFC



However, the same was not true for the vocabulary task, $t = .057$, $p = .477$, Cohen's $d = .08$ (see Figure 3).

Figure 3

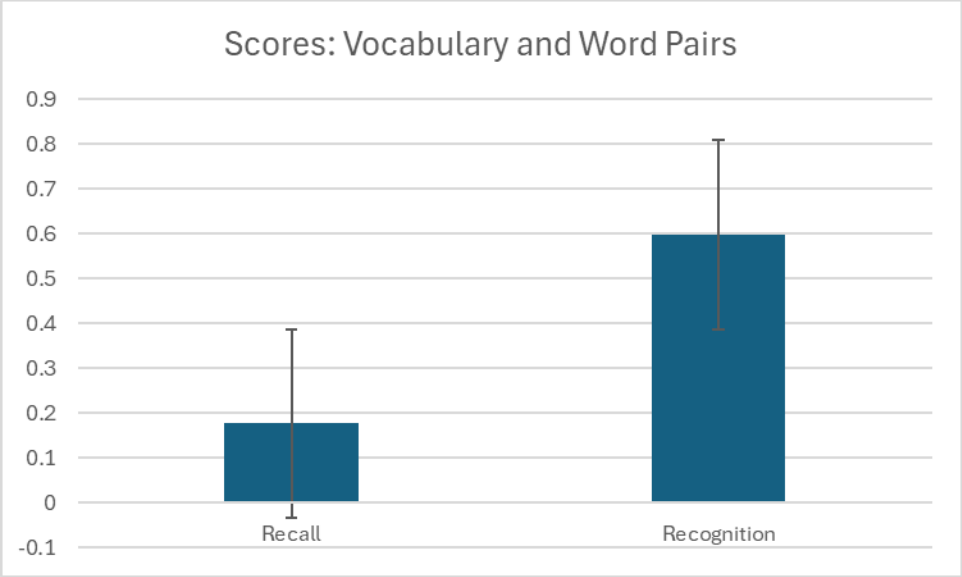
Differences in Vocabulary Score Based on NFC



Finally, to determine whether recall tasks are more difficult than recognition tasks, I used two paired sample *t*-tests to check for differences between the vocabulary task and the word pairs task and between the faces recall task and the faces recognition task. A Bonferroni correction limited the effect of type 1 error ($p = .025$). The results indicated that the vocabulary task was more difficult than the word pairs task, $t = 13.37$, $p < .001$, Cohen's $d = 1.471$ (see Figure 4).

Figure 4

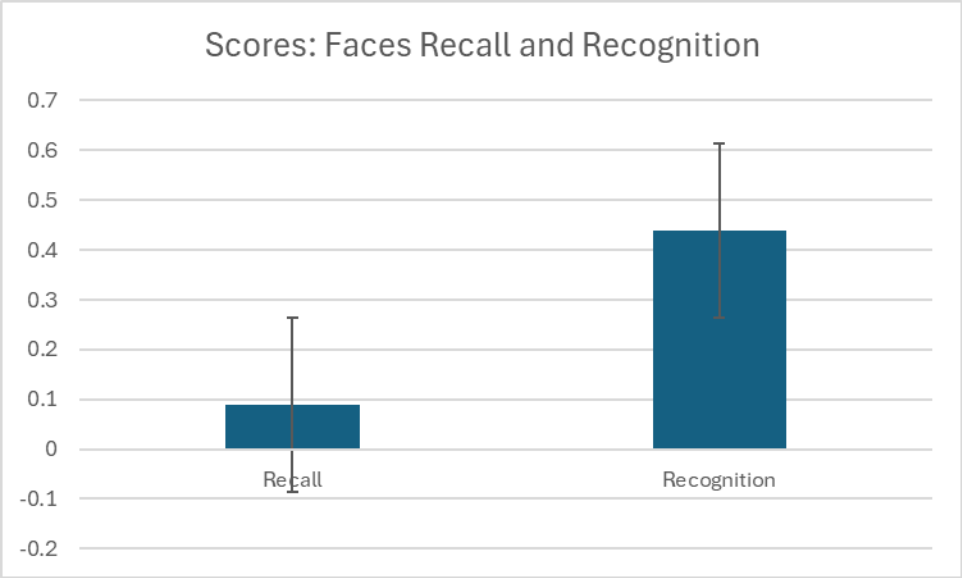
Differences Between Vocabulary (Recall) & Word Pairs (Recognition)



Similarly, the faces recall task was harder than the faces recognition task, t – 21.07, $p < .001$, *Cohen's d* = 2.44 (see Figure 5).

Figure 5

Differences in Scores Between Faces Recall & Faces Recognition Tasks



Discussion

Need for cognition is linked to higher academic achievement, perhaps because it promotes deeper processing of information, is associated with higher levels of control, and can compensate for poor reasoning skills (Zerna et al., 2024). From my analysis of the data, I concluded the association between academic success and NFC likely comes from teacher preference for using deep learning activities, that are found in students with higher NFC, rather than repetition and memorization. I expected that NFC would influence recall tasks more than recognition tasks given that recall requires greater cognitive effort and self-initiated retrieval processes than recognition (Rich, 2011; Wagaman et al., 2025; Zerna et al., 2024). The results somewhat supported this contention with NFC levels predicting performance on the verbal and visual recall tasks but not on the recognition tasks. However, when I applied a median split and analyzed the effects of having a higher NFC, only the Faces Recall test showed a significant difference on scores.

Limitations and Future Research

One limitation of the study is the low scores students tend to have on some tasks. It is possible that task difficulty influenced or interfered with the impact of NFC levels. Further research is needed to clarify the role of task difficulty and interference with NFC's influence on recall and recognition tasks.

The photos used were also limited. Although the decision to use black and white photos was made to reduce distinctive features, using color pictures could give a different response. Having features such as hair color could provide markers and guides to help enhance memory in one, or both, groups (i.e., high in NFC and low in NFC). A study using color photos is needed to address this question.

Conclusion

Having higher levels of NFC is related to better academic outcomes (Sadowski & Gulgoz, 1992; Liu & Nesbit, 2023), particularly when tests involve recall memory. However, students with lower levels of NFC do equally well on tests of recognition memory (Wagaman et al., 2025; Zerna et al., 2024). A better understanding of NFC will help teachers and students understand performance differences between test types. In turn, this understanding can lead to better study strategies for students (Liu & Nesbit, 2023).

Although need for cognition is typically considered to be like a personality trait, some researchers (i.e., Cacioppo et al. 1996; Jebb et al., 2016) have determined that the trait is malleable. Research has suggested that NFC may be shaped by educational and social experiences, including interactions with faculty, as well as broader developmental and contextual factors (Aerts et al., 2024; Liu & Nesbit, 2023; Padgett et al., 2010). Students should also be encouraged to extend their interest in reading materials, which connects to improvement across various measures of intelligence (Jebb, et al, 2016). Another approach involves exposing people who are low in NFC to learning situations where they will be successful (e.g., more recognition memory tasks and assessments). Over time, NFC may become a self-reinforcing pattern of behavior, if supported by teachers. If the need for cognition itself becomes rewarding, it might also become self-motivating (James, n.d.)

Knowing a student's NFC level would allow for matching the student with the correct resources. For example, a student with high NFC could be matched with content that inspires deep thinking whereas a student with low NFC might prefer content that moves quickly while covering the basic information (James, n.d.). In addition, someone with low NFC would need more external motivators than someone with higher NFC. Although teachers probably would not

know a student's NFC, they can be aware of their students' attitudes toward different task requirements and adapt their learning program to fit each type of student (James, n.d.).

For teachers, there are several ways to encourage the development of NFC. Students require a safe learning environment where they can take on challenging tasks (Visser, 2024). Offering optimal challenges (i.e., ones that are slightly above the student's current skill level) increases the chances of success, which in turn can lead to higher NFC. Teachers can ensure success by providing structure to tasks, adapting materials and methods to the needs of the students, and giving constructive feedback (Visser, 2024). Furthermore, teachers can give students tasks that match their interests and encourage them to reflect on why the activities are important to them. Teachers can also serve as role models by engaging in and showing enthusiasm for cognitively challenging tasks. Applying strategies that enhance students' self-efficiency and their appreciation of cognitive challenges, teachers can help develop life-time learning in students.

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Consent to participate: All participants provided consent through the Prolific electronic signing feature.

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Teenagers' Decision Making: Implications for Learning

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Abstract

In this study we investigated high-school students' decision-making using the dual process theory, a prominent framework in cognitive and social psychology for understanding decision-making. Our study pursues two main objectives. The first is a systematic review of the existing literature on dual process theory. For the first part we analyze the theory's explanatory power in human decision-making and critically evaluate the empirical evidence comparing the effectiveness of different cognitive processing systems (i.e., system 1, intuitive; system 2, analytical). Following this critical assessment path, we aim to establish the relative strengths and weaknesses of each system in various decision-making contexts. The second objective involves original research designed to identify which cognitive processing system (system 1 or system 2) leads to superior decision-making outcomes (i.e., decisions whose consequences produce optimal or highly favorable results) for high-school students. The research component consists of experimental studies where participants are presented with decision-making tasks designed to elicit responses predominantly driven by either system 1 or system 2 processing. These tasks vary in complexity, time pressure, or the type of information provided to influence the cognitive system engaged. Statistical methods are used to analyze the data to compare the accuracy,

efficiency, and other relevant assessments of decisions made using each system. Based on our investigations, we suggest that system 1 impairs the thinking process generating biased decisions significantly more than system 2. Contrary to some previous studies that show the accuracy of heuristic thinking when determining "good" decision making, our results show the system 1 process did not help improve the thinking process for good decision-making for high school students.

Keywords: dual process theory, decision-making, cognitive systems, high school

"Life is a sum of all your choices," a famous quote by Albert Camus (2006 translation), emphasizes the centrality of judgement and decision-making. Judgement and decision-making are studied in many disciplines, including statistics, economics, politics, philosophy, medicine, and law (Henrizi et al., 2021; Mactavish et al., 2018; Steiger and Kühberger, 2018). Despite the abundance of literature on the topic, judgement and decision-making continue to garner public and media interest because they address phenomena that people experience on a daily basis, from their latest dietary decisions to an excessive stock market trading (Weber, 2009). In 1959, Herbert Simon put forth the classical economic theory, which argued that given enough data, individuals could make decisions that maximize their economic utility. However, research by Kahneman and Tversky (1973) showed that people often disregarded their own financial best interests and bypassed opportunities that could maximize profits, even when they were aware of the advantages of doing so. Dual process theory has provided a new explanation for why people sometimes make irrational choices even when they have all the knowledge, they need to make rational decisions (Kahneman, 2003).

Literature Review

Dual process theory (Kahneman, 2003) contends that two types of mental processing can be used to categorize and understand various human cognition elements, including reasoning, judgement, and decision-making. The idea of "lower" mental processes is related to perceptual and emotional operations like attentional cueing and motor-response preparation. The lower mental processes are portrayed as automatic, experiential, heuristic, implicit, associative, adaptive, unconscious, and reflexive. The term system 1 or type 1 processing is frequently used to describe this type of mental functioning (Evans, 2003). In contrast, the idea of higher mental processes is related to cognitive processes that need a lot of energy, like deductive reasoning and hypothetical thinking (Evans et al., 2008). These processes are controlled, rational, systematic, explicit, rule-based, analytic, conscious, and reflective. The terms system 2 or type 2 are widely used to describe this group of mental operations.

Though the dual process theory has been widely used in multiple fields and has become one of the most influential theories about the human thinking process, which system performs better in the human thinking process remains controversial (Fiedler & von Sydow, 2023). Most dual process theorists support the view that when people are thinking, whether reasoning, making a judgement, or trying to give out a decision, they intuitively use system 1 to process and generate a heuristic answer, and the answer generated by system 1 may be modified and corrected by system 2 (Evans & Stanovich, 2013). However, due to the notion that system 1 is automatic and effortless, people tend to overuse system 1 instead of using system 2, which needs effort, is time-consuming, and requires cognitive control. When the system 1 process result is not corrected by system 2, heuristic biases will occur and eventually lead to a bad decision (Evans et al., 2008; Evans & Stanovich, 2013). Though this default-interventionist model has been

supported in some literature (Evans & Stanovich, 2013), other evidence has highlighted the value of system 1 thinking. Gigerenzer and Brighton (2009) argued that heuristics (namely system 1) are effective cognitive techniques that eliminate irrelevant data. Contrary to what is commonly believed, some studies of heuristics have demonstrated that less time, information, and calculation can improve accuracy.

To explain our investigation, the research team first reviewed the contradictory evidence supporting different approaches related to decision-making, then discussed our results, and integrated the literature findings with our own data, which suggest that system 2 is often better for making judgements and decisions.

System 1

The benefits of system 1 thinking have been widely discussed, though it may appear counterintuitive that spending less time on a topic can lead to a better answer (Gigerenzer & Gaissmaier, 2011). Gigerenzer and Gaissmaier (2011) proposed a fast-and-frugal heuristic (i.e., heuristics are simple mental rules or shortcuts people use to make judgments and decisions quickly, especially when information, time, or certainty is limited) thinking approach, which can help people find an optimal solution to a problem quickly and with limited information.

These researchers have proposed the adaptive toolbox theory to show the value of system 1 in judgement and decision-making. The adaptive toolbox theory includes heuristics, heuristic building blocks, and fundamental cognitive abilities (e.g., recognition memory) of the building blocks used in daily decision-making. The building blocks are the three pillars of the adaptive toolbox theory: (a) Search rules to determine search space direction. (b) Search stopping rules to determine when to stop. (c) Develop decision rules to outline the final decision (Gigerenzer et al., 1999, pp. 13–14). Based on these three pillars, the fast-and-frugal heuristic requires basic

cognitive skills. In other words, the adaptive toolbox includes both the heuristics that create the desired result and the cognitive processes they necessitate. One example of a heuristic from the adaptive toolbox that has received extensive research is the "recognition heuristic," which involves forming an opinion based on the knowledge that only one of two items is recognized. For example, Goldstein and Gigerenzer (2002) asked Americans and Germans, "Which city, San Diego or San Antonio, has a bigger population?" The correct answer is San Diego. About two-thirds of the Americans accurately stated the correct answer, but all Germans correctly identified the correct answer. In this example, most Germans recognized San Diego (due to its international profile, tourism, or media exposure) but did not recognize San Antonio (a less globally known U.S. city).

Applying the recognition heuristic: "I have heard of San Diego, not San Antonio, so, San Diego must be larger." This led them to the correct answer, even though they had little detailed knowledge of U.S. city sizes. However, for Americans both cities were likely recognized because they are well-known within the U.S. Since the recognition heuristic can only be used when only one of the two is recognized, Americans could not rely on it. Instead, they had to use other knowledge or guesses, which were less accurate. This illustrates the "less-is-more effect": sometimes knowing less (Germans not recognizing San Antonio) can lead to more accurate decisions when a simple heuristic fits the environment's structure.

A second example was developed when researchers asked 50 Turkish and 54 British students to predict the 32 English FA Cup third-round soccer matches. This process produced a similarly unexpected result. The British participants have substantial knowledge regarding English football teams compared to the Turkish participants, who had a limited understanding of

them. Nevertheless, the accuracy of Turkish forecasters was comparable to that of their English forecasters, with a success rate of 63% compared to 66% (Goldstein & Gigerenzer, 2002).

The research paradigm adopted by Basehore and Anderson (2016) was similar to that used by Goldstein and Gigerenzer (2002), with the exception that the participants were given the names of two fictitious cities. Basehore and Anderson asked participants to determine which city has a larger population by exposing only one of the two city names before the experiment. The utilization of this particular methodology offered an improvement over Goldstein and Gigerenzer's approach, which is the benefit of experimentally manipulating recognition. These fictitious cities experimental process enabled an unbiased assessment of the influence of familiarity on people's decision-making, devoid of any other potential disparities between the two cities. The recognition heuristic was successful in this experiment as well, predicting the correct response 74% of the time.

In the context of naturalistic situations, making effective judgments and decisions becomes more difficult. Uneven and erratic factors can affect people's logical thinking and forecasts about current situations (Wang et al., 2022). In our study the research team members believed that additional data was required to establish precise findings regarding the interaction among relevant variables. However, it is often surprising how well system 1 (fast-and-frugal heuristics) works in real life (Wang et al., 2022). For example, a patient with acute vestibular syndrome (a condition characterized by vertigo, nausea, and a shaky gait) can be scanned with a magnetic resonance imaging (MRI) machine to help doctors determine if patients have suffered from a stroke. Despite being a highly effective diagnostic instrument, MRI is notably expensive. The clinical decision rule HINTS (head impulse, nystagmus type, test of skew) is another method for the diagnosis of stroke. If these tests indicate abnormalities in eye movements, then a stroke

could be diagnosed. Contrary to MRI screening methods, the HINTS test is much more cost-effective and less burdensome. According to Newman-Toker et al. (2013), HINTS, which uses system 1 thinking, was more accurate in identifying strokes than an MRI.

One more real-world application of heuristics is picking the optimal course of action in the context of financial decision-making. It is true that deciding how to spend retirement savings is a multifaceted process, as there are many unknown factors that can have disastrous consequences. However, people can also consider using a heuristic known as 1/N strategy or rule. This naive diversification strategy entails putting the same amount of money into each of N different funds (Hafenbrädl et al., 2016). Interestingly, a study by De Miguel et al. (2009) compared the 1/N strategy with several much more complicated models, including the mean-variance portfolio, for which Harry Markowitz was awarded the Nobel Prize (1990) in economics. However, none of the 14 intricate models they evaluated were able to outperform the simple 1/N strategy (De Miguel et al., 2009). This is likely due to the fact that sophisticated models assign significant value to historical stock market performance indicators. However, most of the historical data are "noise" in the data and its underlying structure, leading to the production of unnecessary information and skewed models (Hafenbrädl et al., 2016). In this case, the use of heuristics can effectively help investors avoid the overuse of irrelevant information, potentially helping them make more optimal decisions.

In conclusion, the benefits of system 1 can be seen in both literal situations (e.g., determining which city has a larger population) and real-life situations (e.g., medical diagnosis and financial decision-making). Despite the evidence pointing to system 1's usefulness, educators should proceed with caution when relying on the results it produces, as there are still major

disagreements about where and how to acquire these heuristics, and which ones are the most effective when applied to a given problem (Otworowska et al., 2017).

System 2 Thinking

Despite the abundance of evidence demonstrating system 1's efficacy, advocates of system 2's superiority have maintained that system 1 is associated with many logical fallacies and cognitive biases that undermine probability theories and rational thought (Fiedler & von Sydow, 2023). Our research team identified several studies that deeply investigated several biases, including: the representativeness heuristic (Basehore & Anderson, 2016), framing effect (Steiger & Kühberger, 2018), loss aversion (Sokol-Hessner and Rutledge, 2019), and the anchoring-and-adjustment heuristic (Henrizi, et al., 2021). These biases serve to demonstrate how the limitations of system 1 reinforce the significance of system 2.

One of the most common fallacies of system 1 is the representativeness heuristic (Basehore & Anderson, 2016), which ignores base-rate information, and shows the probability of specific events based on a given assumption (Fiedler & von Sydow, 2023). When seeking the best solution under uncertainty, Bayesian decision theory is considered to be the best approach for rational inference (Johnson & Tubau, 2015). Bayes' theorem requires people to weigh the probabilities and likelihood of the two hypotheses. To identify the optimum solution under Bayes' theorem, one must consider the essential facts: the relative probabilities that the hypothesis would happen under the given probability (Johnson & Tubau, 2015). However, if people rely solely on system 1 processing, they are likely to overlook this foundational data. In another study participants were asked to read a narrative description of a person, the participants were divided into two groups, informing one group that 70% of the description was relevant to a lawyer and the other group was told that 70% of the description was relevant to an engineer. On

average, all participants guessed that the narrator was an engineer with a 90% probability, these results strongly suggested that people who used system 1 processing overlooked the base-rate data despite its clear presentation (Kahneman, 2003; Kahneman & Tversky, 1973).

System 1 can also generate the framing effect, when situational factors like the description used, or irrelevant information affect decisions. Using an Asian disease problem, Kahneman and Tversky (1981) demonstrated the framing effect (Tversky et al., 1982). They gave two groups of participants the same summary of an Asian disease problem but framed the solution differently. For example: Frame 1 (gain) was described in terms of survival (e.g., 250 people will be saved); Frame 2 (loss) was described in terms of death (e.g., 450 people will die). Though both solutions had the same loss and gain probability, 72% of participants chose the one with the gain. In a meta-analysis study by Steiger and Kühberger (2018), the researchers found 81 experimental findings that supported the existence of framing effects in judgment and decision-making. They claimed that the framing effect had a significant impact on people's evaluations.

Tversky and Kahneman's (1981) experiments provided evidence of how the wording of a question, and the presence of extraneous data, can influence participants' final choices. These findings further demonstrated another fallacy associated with system 1 thinking: loss aversion, the fear or pain of losing is felt more intently than the pleasure of an equivalent gain (Trippas et al., 2013). Due to the utilization of system 1 in cognitive processes and the influence of emotional elements, individuals may demonstrate a tendency towards loss aversion. This means that although losses and gains have the same amount, individuals who exhibit loss aversion are more concerned with losses than with gains (Sokol-Hessner & Rutledge 2019).

The anchoring-and-adjustment heuristic, which contends that once a judgement is made, any further adjustment is negligible, is another system 1 error. System 2 users are much more likely to adjust their judgements based on new information received, because it requires a lot more effort. In contrast, system 1 thinkers may overlook new information that can help them alter their initial judgements while focusing solely on the initial information, but this can help them save more energy. In this practice, people are more likely to use system 1 and will only make a little adjustment to the judgement. For example, after playing the roulette wheel, the number shown on the roulette wheel will significantly bias people's later judgement of the total number of countries in Africa, even though these two cases have no relevance to each other (Fiedler & von Sydow, 2023).

Furthermore, the anchoring-and-adjustment heuristic can also affect judgement in financial decisions, for example, audit judgements. The audit judgements require high cognitive ability and involve four main stages. The auditor needs to:

1. Form an analysis of the data provided by clients and form their expectations.
2. Define the possible deviations from their expectations.
3. Run the deviations on the computer.
4. Complete an analysis of the deviations.

The first stage is the most important part. The auditor needs to gather information about the field they need to audit, then analyze how reliable the data is and form an expectation of the client's data (Mactavish et al., 2018). This expectation requires the auditor to have a solid understanding of clients and industries. To form a clear expectation, the auditor must use independent and professional judgements without being influenced by unaudited data. However, if the auditor has

an anchoring-and-adjustment heuristic connected to the unaudited data, they may neglect the statistics rules and the information they gathered (Henrizi et al., 2021).

Though there is reliable evidence that system 1's heuristic biases impair people's judgement and decision-making, the strategy to demonstrate system 1's failure is still criticized (McDowell & Jacobs, 2017). First, biased processing does not always cause erroneous judgements. Instead, people often make false decisions due to a small and biased sample of information (an environmental factor). For example, in the engineering problem, those who chose engineer have proof in the description. Further, incorrect judgement may not be caused by system 1. However, it can also be argued that people may make bad decisions in these artificial settings (McDowell & Jacobs, 2017).

Connection of the Literature to This Study

The question of whether system 1 could produce an optimal result still remains controversial. Based on current literature, many studies have examined the impact of system 1 thinking on the questions' outcomes, without incorporating the questions that yielded positive and negative findings for joint analysis (Da Silva, 2023). Thus, our research team conducted our investigations in an attempt to fill this gap and test whether and under what circumstances system 1 impairs people's performance or boosts people's performance. Previously conducted research questions, suggested that individuals in a particular scenario tend to rely on fast-and-frugal heuristics. Another type of question in the research suggested that individuals' decision-making abilities would be compromised by the use of system 1 thinking, when presented with a particular phrasing or task. Thus, by putting these two types of questions in the same questionnaire and comparing the average scores of participants who use the different systems, we can analyze whether and/or when system 1 boosts or impairs the thinking process. The team

chose the most representative scenarios; (some have been reviewed above) to test people's thinking. Our study focused on high school students' thinking and reasoning performance when using system 1 and/or system 2. The research team established questions that show the value of heuristics thinking, which is taking the best heuristic and the fastest and most frugal heuristics. Question types that show the deficit of system 1 processing were also included, which are representative of heuristics and loss aversion.

Methodology

The objective of this study was to assess the degree to which system 1 processing characterized as fast, heuristic-based thinking (i.e., using simple mental shortcuts or rules of thumb to make judgments and decisions quickly) is associated with detrimental and/or constructive factors on individual decision-making. More specifically, the study tested two hypotheses. Hypothesis 1 stated that the majority of students would choose to use system 1 thinking or system 2 thinking to answer all of the questions. Hypothesis 2 stated that students who choose system 1 to respond to all of the questions would more likely cause more impairment than enhancement in cognitive responses than students who chose system 2 for all of their responses.

To assess this issue, 42 students from an AS-level (equivalent to AP-level) psychology course were enrolled in the study using a random number table to guarantee unbiased selection. The study was undertaken in a controlled atmosphere, namely an 80-square-meter classroom in Shenzhen College of International Education (SCIE), which kept the test conditions uniform for all participants.

Variables

The independent variable was the type of thinking process that the participants used. If participants used less than two minutes to resolve questions, we inferred they used their fast-thinking process, as it takes very little time to resolve the question. If participants used more than two minutes, we inferred they used the slow thinking process. The dependent variable was the score the participant received in the question, operationalized by calculating the total scores for participants.

Experimental Procedures

Our experimental study was designed as a laboratory experiment in an artificial situation. We presented participants with questionnaires and our subjects completed them. By analyzing the results, we were able to test the effectiveness of system 1 and system 2. The room temperature has been controlled at 23 degrees (Celsius), and the two sets of experiments both took place at 10:45 and lasted for 15 minutes each.

Experiment Method and Design

To test our hypotheses that one of the systems, either system 1 or system 2, would preferentially be used by teenagers in decision making; and students who chose system 1 would cause more impairment than enhancement than students who chose system 2 responses, we provided participants with two types of determining questions using online questioners. We used the WenJuanXing website (2025) to send out a link to the participants to complete this experiment. We implemented three questions based on our review of other studies. We generated one question that was based on recognition heuristics, fast-and-frugal heuristics; the correct or accurate answer should indicate that missing knowledge can be used to draw accurate conclusions. The second type of questions were based on the results from studies that indicated

system 1 thinking would lead to inaccurate decisions, based on system 1 issues (e.g., loss aversion and base rate neglect).

The question that tested the recognition heuristics was comparing the two American cities' population sizes. The question was, "Which has the smaller population, San Diego or San Antonio?" The key to the recognition heuristic is to only recognize one option out of two and choose the option that a student recognized most. As the participants were all Chinese students, we could presumably predict they had little knowledge about the American city populations, just like the German participants in the original experiment. In this instance, the recognition heuristic can be tested like the original experiment. If there were notable improvements in the performance of participants who employed the system 1 method in this question, it would lead the team to infer that system 1 enhances cognitive processing.

In the second set of two questions, we concentrated on bias in the representativeness of a heuristic strategy for decision making. In the first of these two questions that tested representativeness heuristics, we presented the participants with a probability question. By telling the participants that "a dice has 4 red faces and 2 green faces" and letting them choose the rolling sequence that has the most possibility in coming up. Three sequences included: 1. RGRRRR; 2. GRGRRR; 3. GRRRRR. The second choice contains all the possibilities, so most likely the participants will choose the second one if they neglect the base rate and rely on system 1 thinking. The correct answer is 1, since with increasing rolling numbers, the possibility of rolling a full sequence actually decreases. In this scenario, if a substantial number of participants who employ system 1 opt for the second option, it may be inferred that system 1 exhibits a deficiency in the process of decision-making.

The final question aimed to test loss aversion, which puts the participants in a position to choose whether to leave the door or not. "Suppose you are on a game show and you are given the choice of three doors. Behind one door is a car, behind the others, goats. You pick a door, say, Number 1, and the host, who knows what is behind the doors, opens another door, say Number 3, which has a goat. He then says to you, "Do you want to switch to door Number 2?" "Is it to your advantage to switch your choice?" Though the correct answer is to choose to change the option if the participants really have a thorough thinking on this question and calculate the probabilities. If the participants rely on system 1 process their decision-making process may be defaulted, and they are likely to be affected by loss aversion.

In this scenario, people who employ system 1 thinking and use intuitive decision-making might be affected by loss aversion and feel worse when they choose to give up the thing they have now and decide not to change their option. Thus, if the participants who utilized system 1 thinking process performed significantly worse than those who used the system 2 thinking process, then the team would conclude that the system 1 thinking process did worsen people's objective judgement.

Ethics

Following the APA psychology guide's ethical criteria (Young, 2017), the research team made it clear that participants could leave the experiment at any moment without any negative consequence. Also, any person who withdraws could ask for their data to be removed. Before starting, I told each participant, "This experiment is about the psychology of decision-making" to avoid deception. The debriefing also followed after the experiment ended by clearly stating what this experiment was trying to find and what knowledge the participants could gain.

Results

By conducting the experiment in two classes, we gathered two sets of data for the same questionnaires. We conducted a *t*-test and a Cohen's *d* effect size to analyze the means of the scores of two samples of the questions answered. We also selected the subjects who used more than 180 seconds to finish all three questions as those who used system 2 thinking. We designated the subjects who used less than 180 seconds to finish all three questions, were those using system 1 thinking. We denoted those who answered the questions correctly with a 1 and those who answered incorrectly with a 0.

Our results highlight the statistically significant performance differential between system 1 thinkers (fast, intuitive) and system 2 thinkers (slower, analytical). The results demonstrated that students who worked rapidly through the questions (less than 180 seconds) scored means of 0.217, 0.174, and 0.169, while those who took more time (system 2) scored 0.588, 0.706, and 0.588 (i.e., a perfect score was 1.000). All three sets of scores were statistically significant. Thus, for teaching and learning, speed is often the enemy over accuracy, when students act on recognition heuristics (e.g., when they go with their intuition or their first word that comes to mind), they often are more likely to be wrong than when they take more time to process their responses intentionally. Teachers need to realize this difference because today's educational institutions often tend to inadvertently reward quickness, e.g., timed tests and first to raise hand participation (Ritchhart et al., 2011).

Question 1

The first question was: "Which has the smaller population, San Diego or San Antonio?" As displayed in Table 1, 42 students responded to the first question, with 24 participants using system 1 thinking and 18 participants using system 2 thinking. We denoted those who answered

the questions correctly with a 1 and those who answered incorrectly with a 0 (a perfect score would have been mean score of 1). People who used system 1 for the first question earned a mean score of 0.217, with a standard deviation of 0.492. For the people who used system 2 in the first question, their mean score was 0.588 and the standard deviation is 0.370. In order to evaluate whether the difference is significant, we used a two-sample *t*-test and the Cohen's *d* effect size score. The *p*-value is less than 0.001, which indicates a highly significant statistical difference. For this question the Cohen's *d* effect size score was 0.84, which is considered to be a large effect size. These scores in our study disagree with some previous studies that asserted that the utilization of recognition heuristics can enhance individuals' speed and accuracy in responding to questions (Basehore & Anderson, 2016). The results from the present study suggest that participants using system 1 (heuristics) performed substantially worse than those using system 2 in terms of efficiency.

Table 1

Question 1

System type	Mean	Standard Deviation	Number of Correct Answers	Number Choosing Each System
1	0.217	0.492	5	24
2	0.588	0.370	10	18
t-Statistic	Degrees of Freedom	*p*-value	Cohen's *d*	
3.95	38	<0.001	0.84	

Note. *p* value < 0.001 is highly statistically significant; the Cohen's *d* = 0.84 is a large effect size

Question 2

The second question for students was: "With a dice that has four green sides and two red sides, which of the following sequences has the highest chance of being rolled:

1. RGRRRG; 2. GRGRRR; 3. GRRRRR? The statistical performance of the two systems differs considerably. People who used system 1 for the second question earned a mean score of 0.174 with a standard deviation of 0.379. For those who used system 2 for the second question, their mean score was 0.706, and the standard deviation was 0.456. In order to evaluate whether the difference is significant, we used a two-sample *t*-test and the Cohen's *d* effect size. For this question, the *p* value is < 0.001, which is considered to be statistically very significant. The Cohen's *d* effect size score is 1.29, which is considered to be a very large effect size. The difference between system 2 and system 1 has more than a 99% chance of being caused by the differences in the two systems (see Table 2).

Table 2

Question 2

System type	Mean	Standard Deviation	Number of Correct Answers	Number Choosing Each System
1	0.174	0.379	4	24
2	0.706	0.456	12	18
t-Statistic	Degrees of Freedom	*p*-value	Cohen's *d*	
5.018	38.428	< 0.001	1.29	

Note. p <0.001 = highly statistically significant; Cohen's d 1.29 = very large effect size

Question 3

The final question was: "Suppose you are on a game show and you are given the choice of three doors. Behind one door is a car, behind the others, goats. You pick a door, say, Number 1, and the host, who knows what is behind the doors, opens another door, say Number 3, which has a goat. He then says to you, "Do you want to switch to door Number 2?" "Is it to your

advantage to switch your choice?" In this practice, people who employ system 1 thinking and do the intuitive decision-making might be affected by loss aversion and feel worse when they choose to give up the thing they have now and decide not to change their option. Thus, if the participants who utilize system 1 thinking process perform significantly worse than those who use the system 2 thinking process, then the research team shall conclude that the system 1 thinking process does worsen people's objective judgement.

The difference between scores that generated from system 1 compared to system 2 had a significant difference. Participants who used system 1 thinking earned a mean score of 0.169 and a standard deviation of 0.378. People who chose system 2 thinking earned a mean score of 0.588 and a standard deviation score of 0.489. From the calculation, the *p*-value is less than 0.001, a highly significant difference, and the Cohen's *d* was 0.98, a large effect size. The findings revealed a highly significant difference between the two systems, with system 2 outperforming system 1 (see Table 3).

Table 3

Question 3

System type	Mean	Standard Deviation	Number of Correct Answers	Number Choosing Each System
1	0.169	0.378	4	24
2	0.588	0.489	10	18
t-Statistic	Degrees of Freedom	*p*-value	Cohen's *d*	
-5.018	38.428	< 0.001	0.98	

Note. $p < 0.001$ is highly statistically significant

Does the Type of Question Used Affect the Performance?

The third question included in the original study was aimed at indicating the value of

system 1, as it can improve thinking, and the second question was aimed at showing that system 1 ultimately generates biases. To see whether the type of question asked led to a different performance of system 1, we used an ANOVA test to assess if there was a significant difference in the score of the type of question that the people using system 1 received under different types of questions.

From the ANOVA statistics in Table 4, the *p*-values between question 1 and question 2 and between question 1 and question 3 are both less than 0.01, indicating that there is a statistically significant difference between the groups. This raised another question did the three different questions have different results? To test this question, we conducted post-hoc tests. The post-hoc tests were conducted using the Tukey's HSD method (The Tukey's honestly significant difference test is used to test differences among sample means for significance. The Tukey's HSD tests all pairwise differences while controlling the probability of making one or more type I errors). As shown Table 4, there is a significant difference in means between questions 1 and 2, and between questions 1 and 3, but not between questions 2 and 3. Since there is a significant difference between question 1 and 2 and between question 1 and 3, it suggests that system 1 thinking process does function differently with different kinds of questions.

Table 4

Comparison of Question Types

Questions Compared	Mean Difference	Standard Error	*t*-value	*p*-value	Cohen's *d*
1 vs. 2	-0.370	0.098	3.78	0.001	0.58
1 vs. 3	-0.347	0.102	3.42	0.003	0.53
2 vs. 3	0.023	0.104	0.22	0.997	0.03

Note. $p < 0.001$ and $p < 0.003$ are highly statistically significant; $p = 0.997$ is not statistically significant. Cohen's *d* 0.58 and 0.53 = medium effect sizes; 0.03 = negligible effect size

Summary

To compare system 1 (fast, heuristic-based thinking) against system 2 (slow, more analytical thinking) thought, the study generated data from two groups. The participants were divided by whether they took over or under 180 seconds to answer three questions. For all three questions, 24 students used system 1 thinking and 14 students used system 2 thinking to respond to each of the three questions. In all three cases students who used system 2 thinking had statistically significant higher scores than students who used system 1 thinking. These results were clear evidence of a vast performance disparity: those in system 2 had statistically significant higher mean scores (0.588; 0.706; 0.588) than the system 1 group (0.217; 0.174; 0.169). The results of a two-sample *t*-test (*p*-value <0.001 for each question) and Cohen's *d* (0.84; 1.29; 0.98) confirmed the differences were highly significant. These scores indicated that while some earlier studies focused on recognition heuristics, the participants in this study who used quick, heuristic-based thinking performed substantially worse than those who took extra time in deliberation.

Conclusions

Based on these results, we can conclude that although the type of question asked has a different performance within the group, system 1 impaired the thinking process significantly more (in bias generation) than system 2. Contrary to previous studies (Gigerenzer & Brighton, 2009), that showed the accuracy of heuristic thinking when determining the decision making, the participants in our study only recognized one. Our experimental results show that system 1 thinking did not help improve the thinking process for good decision making in our participating high-school students for the questions we posed to participants. Thus, we conclude that, at least for our high-school students, to make good decisions and avoid biases, they should rely more on

the use of the system 2 process rather than system 1. This was evident from the results of the three different questions.

We are very much aware that our investigation is limited to a small sample of subjects, and that based on our statistical analysis, the type of question used will affect system 1 processing. Thus, there is a possibility that the performance difference among participants may be attributed to the question types or wording. Therefore, future studies are needed to investigate whether the wording of the question will affect participants' performance. Moreover, even though, dual process theory has been heavily debated in the literature, neurological evidence is also needed to make the dual process theory a solid theory for human reasoning, judgement, and unbiased decision-making.

How and Why the Findings Matter for Teachers and Students

Our study indicated that students' intuition, which is linked to fast thinking, often leads to quicker completion of academic tasks through the use of heuristics. However, while this approach may improve time-efficiency, it is not always effective, as reliance on mental shortcuts can sometimes result in errors or superficial understanding rather than deep, accurate learning.

Recommendations for Students

Based on our study, we can suggest that that fast, intuitive decision-making, using system 1 thinking, can increase speed but also elevate the risk of errors due to cognitive biases or oversimplification. Therefore, when time allows, we would advise students to deliberately re-check answers/work, this would not be a sign of uncertainty or inefficiency, but rather a strategic practice aimed at improving accuracy, depth, and coherence. Rechecking validates the ideas that needs to go into any answer, thinking critically and not just responding to what is asked and shifts cognition toward system 2 (slower, more analytical thinking) enabling critical evaluation,

detection of inconsistencies, and refinement of ideas, ultimately leading to stronger, more validated outcomes.

A very relevant study by Metcalfe and Finn (2008), on metacognition and error correction, showed that students who engaged in deliberate re-checking and self-explanation significantly improved their performance on problem-solving tasks, particularly by catching heuristic-based mistakes that arose from rapid initial responses. This aligns with the idea that revisiting answers facilitates deeper processing and reduces overreliance on intuition.

Thus, our study contributes to the growing body of work on metacognitive strategies in education by empirically linking system 1 and system 2 frameworks to practical classroom interventions. Specifically, it offers evidence that structured re-checking protocols can mitigate the pitfalls of fast thinking, providing a teachable method to foster critical thinking and accuracy (areas often emphasized in theory but less frequently tested in applied, in-situ educational research). Future studies could explore longitudinal impacts or variations across disciplines to further validate and refine this approach.

Recommendations for Teachers

The researchers in this study recognize the importance of the fact that classroom pace needs to be adjusted, sometimes it needs to be slowed down, so that students can move from superficial to deep analytical thinking. The argument that classroom pace should be strategically adjusted (often slowed) rests on a fundamental cognitive principle: deep analytical thinking requires time and cognitive resources that are unavailable during rapid, high-pressure instruction (Sweller et al., 2019). When the pace is relentlessly fast, students are often forced into a reactive mode, relying on surface-level recognition, memorization, or guesswork (system 1 thinking) to keep up (Brown et al., 2014; Hattie & Yates, 2014). This can create an illusion of fluency or

engagement while bypassing the crucial stages of elaboration, connection-making, and critical evaluation (Sweller et al., 2019). Slowing the pace intentionally creates the necessary "cognitive space" for students to:

1. **Process Information Deeply:** Instead of simply recording facts, students can interrogate them, connect them to prior knowledge, and explore underlying principles.
2. **Engage in Metacognition:** Students can ask themselves, "Do I truly understand this?" and "How does this relate to what I already know?"
3. **Practice Retrieval and Application:** With more time, activities can shift from quick recall to applying concepts in novel contexts, a key driver of long-term retention.

Educators should realize that on one hand a quick response is often associated with lower accuracy (system 1 thinking), but that on the other hand time constrains often require quick responses, thus presenting a pedagogical dilemma. In order to illustrate to students on these variables, and to apply these variables, teachers should:

1. Introduce Cognitive Systems

Teachers should consider instructing students on the concepts of system 1 (fast, intuitive) and system 2 (slow, analytical) thinking. It is crucial for learners to understand the mechanics of their own decision-making processes, and to learn how to deliberately take time to learn. This deliberate deceleration shifts the cognitive load from keeping up with the flow of information to actively constructing understanding (Sweller et al., 2019). The outcomes are not just "better grades" on a single test, but higher accuracy due to fewer heuristic-based errors, and higher retention due to the creation of stronger, more connected memory traces (Brown et al., 2014; Hattie & Clarke, 2018).

2. Prioritize Thinking Under Pressure

Educators play a vital role in teaching students how to adapt their thinking strategies based on time constraints. Specifically, students need guidance on:

- **Time-Critical Decisions:** Understanding when it is necessary to rely on quick judgment due to a lack of time.
- **Managing Dilemmas:** Learning how to weigh options when facing conflicting demands or limited resources.
- **Strategic Reconsideration:** Knowing when to pause and re-evaluate their initial thoughts as circumstances change.

3. Application for Teachers

Teachers must also recognize that they cannot always adopt a slow, deliberative approach. Therefore, they should actively reflect on their own practice to determine when it is appropriate to utilize system 1 efficiency and when the situation demands the depth of system 2 analysis.

Teach "Wait Time." Teachers can promote students' slow thinking time after asking a question, so that the "quickest" kids do not take over, and everyone will experience system 2 thinking.

Redefine Proficiency. Instead of defining intelligence as being quick, teachers can demonstrate that deep thinking takes time, and that those who put more than one thought in the right context often perform better.

Teach Metacognition. Teachers can guide students in what they should be aware of for these two ways of thinking, so that they can identify when they are in a rapid-evaluating mode to reach the outcome and when they need to slow down to validate their answers.

Conclusion

Our study makes a valuable empirical and practical contribution to this existing body of studies:

- **From Theory to Classroom Practice:** While CLT and the science of learning provide the "why," our study investigates the "how" and "what happens" in a real classroom setting. We suggest moving beyond the laboratory to show what "slowing down" looks like operationally (e.g., through structured re-checking, think-pair-share pauses, extended problem-analysis periods) and measure its direct effects on accuracy and retention metrics.
- **Bridging Cognitive Psychology and Pedagogy:** Our work directly connects the dual-process theory (system 1 vs. system 2) to a specific, actionable teaching strategy (pace adjustment). We provide evidence to suggest that by manipulating an environmental factor (pace) teachers can effectively encourage a shift in the cognitive process students use, thereby validating a key link in the educational application of cognitive science.
- **Addressing the "Coverage" Dilemma:** A major barrier for teachers is the perceived tension between covering required material and teaching for depth. Our study contributes data showing that the trade-off may be worthwhile; the gains in accuracy and retention from a deeper, slower approach on core concepts may offset the "loss" of covering fewer topics superficially. This provides a research-backed argument for curricular prioritization.

In summary, our study strengthens the call for pedagogical patience by providing concrete evidence that when we slow the race to cover content, we win the longer, more important race toward durable and meaningful learning.

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