

Learning Styles: Moving Forward from the Myth

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Abstract: Learning styles attempt to describe individual differences among students by identifying students' preferences in how they learn, and adapting their learning to accommodate that style. Since their inception, learning styles have gained mass popularity among teachers, researchers, and the public. Numerous assessments and self-help books are available to discover one's individual learning style. Learning styles, however, have been heavily criticized by researchers who contend that learning styles lack evidence supporting their effectiveness and possess unreliable diagnostic tools. I posit that the case against learning styles is not limited to those two claims; in addition, that learning styles outcomes can be associated with confounding factors, and that learning styles may lead to ineffective teaching practices that negatively affect students and teachers. Through evidence-based practices, we can move forward from learning styles and create learning environments that have a greater probability of positive effects.

Keywords: Learning styles, Evidence-based practices, Classroom instruction

The Problem

Learning, in education, refers to the process by which a learner develops skills and/or abilities (Curry, 1983). Learning styles refer to typologies of learning by which students can be categorized, and which also aim to highlight individual differences among learners (Anderson, 2016; Coffield, Moseley, Hall, & Ecclestone, 2004; Curry, 1983). Teachers are often encouraged to assess their students for typology and, in order to create optimal learning environments, adjust their teaching practices accordingly (Anderson, 2016; Coffield et al., 2004; Venkatesan et al., 2018). In turn, students are encouraged to identify their own learning style to maximize their academic achievement (Anderson, 2016; Coffield et al., 2004; Venkatesan et al., 2018). Over the past decades, learning styles have encountered much criticism from researchers due to the weak evidentiary base and limited assessment validity (Papadatou-Pastou, Gritzali, & Barrable, 2018). Yet, learning styles remain to be popular in many classrooms, from primary to graduate levels. I argue that although learning styles are appealing, their continued use may lead to ineffective teaching and research practices. I also offer recommendations for evidence-based alternatives to learning styles in the classroom.

Background

Learning styles were popularized in the 1970s, but they have been present in education literature since the early 20th century (Coffield et al., 2004; Papadatou-Pastou et al., 2018). According to Coffield and colleagues (2004), learning styles first emerged in the United Kingdom, United States, and Europe. Since then, learning styles gained popularity, and have been reportedly used by the majority of teachers throughout the world (Papadatou-Pastou et al., 2018). A vast number of types of learning styles have emerged over time, falling into three categories: theoretical, pedagogical, and commercial styles (Coffield et al., 2004).

Theoretical Learning Styles

This category involves the development and testing of learning styles constructs. Coffield and colleagues' (2004) review of learning styles theory and assessments identified 71 distinct models of learning styles. Of this vast number, the researchers indicated that 13 models are unique models of learning styles, and 58 are slight adaptations of extant models (Coffield et al., 2004). It is possible, however, that more learning styles have emerged since Coffield and colleagues' (2004) publication.

Theory categorization. Curry classified learning styles theories into three categories: instructional preferences, information processing, and cognitive personality style (1983, 1987). Instructional preferences refer to students' desired learning environments (Curry, 1983). Instructional preferences also include attitudes about one's academic programming, lecture delivery, and coursework (Fox, 1984). Information processing learning styles align with our classic understanding of information processing, that is, path of information from one's sensory processes to long-term memory (Curry, 1983). Learning styles theorists posit that individual stylistic differences exist in this information pathway (Curry, 1983). As demonstrated by Curry (1983), cognitive personality styles are rooted in the psychological understanding of personality as persisting behavioural characteristics. Cognitive personality styles describe learning-related persisting behaviours across different educational situations, such as the amount of reflectivity versus impulsivity when problem solving (Curry, 1983). Despite being published several decades ago, Curry's (1983, 1987)

conceptualization remains to be well-cited in more contemporary learning styles texts (e.g., Riding & Rayner, 2013). In newer developments, some theorists argued that learning styles should be combined into larger explanatory models (e.g., Rayner & Riding, 1997).

Pedagogical Learning Styles

Coffield and colleagues (2004) described pedagogical learning styles as those developed for the purpose of teaching and learning. Coffield et al.'s (2004) distinction between theoretical and pedagogical learning styles appears to be that theoretical styles are pure science while pedagogical learning styles aim to practically enhance learning. Pedagogical learning styles are developed and studied by academics in education, psychology, business, among other disciplines (Coffield et al., 2004).

Commercial Learning Styles

Numerous for-profit organizations have developed constructs and assessments for learning styles (Coffield et al., 2004). This includes organizations that develop tools for educators to use in classrooms (Coffield et al., 2004). Coffield and colleagues (2004) also described a significant market for learning styles assessments to be used by managers to help train employees.

Controversy

Support

Many teachers and course designers find learning styles appealing (Coffield et al., 2004). Coffield and colleagues (2004) posited that this appeal emerged from observations that students learn at different rates than others. What naturally follows is the notion that educators can incorporate students' individual strengths in the learning process, to help them grasp information more quickly and efficiently than cookie-cutter approaches (Coffield et al., 2004; Keefe, 1985). Universal Design for Learning (UDL) aims to create educational environments where all students have equal opportunities to succeed (Gordon, Meyer, & Rose, 2014). In this sense, UDL approaches may embed the notion of learning styles by creating learning experiences that are accessible to all learners, regardless of what learning style they may be attributed with.

Criticisms

Researchers argue that learning styles are not associated with empirical evidence to support their proposed educational outcomes. This lack of evidence may be influenced by the difficulty of measuring learning itself. Moreover, any positive effects of learning styles can be likely attributed to confounding factors, such as the working alliance developed when a teacher takes interest in their students. The risks of using an unsupported technique such as learning styles are significant, and can negatively impact both students and teachers.

Lack of evidence. Given the numerous models that explain learning styles, research on their construct validity is largely fragmented (Coffield et al., 2004; Keefe, 1985). Coffield and colleagues (2004) argued that many learning styles were developed by doctoral students who lacked the resources and capacity to lead large-scale studies to test their theories. As a result, theories and claims for particular learning styles would be limited to the individual characteristics of those small sample sizes, and create difficulties with generalizing those findings to the general population. The authors also identified a lack of interdependent research as a frequent limitation to the generalization of results (Coffield et al., 2004). In terms of dominant learning styles, Coffield and colleagues (2004) argued that none of the well-accepted learning styles they reviewed had been validated through empirical research findings. Largely, researchers agree that learning styles are not supported by evidence (Kirschner, 2017; Pashler, McDonald, Rohrer, & Bjork, 2008; Simmonds, 2014). Other interventions, such as teaching study strategies, were more effective than adapting instruction to learning styles (Husmann & O'Loughlin, 2019; Pashler et al., 2008).

Measurement difficulties. Learning output might be measurable and overt (i.e., test scores), but the process of learning represents a covert event (Keefe, 1985). Some covert events can be studied by asking participants to verbalize their thoughts while they perform a task. Research has consistently indicated, however, that many people struggle with accurately explaining their behaviour and exhibit biases in reproducing their internal experiences (e.g., Metcalfe & Wiebe, 1987). One's difficulty in explaining how they learn can be problematic in developing accurate learning

styles models, as well as in assessing one's learning style. Assessing others' learning styles is also problematic. Papadatou-Pastou and colleagues (2018) demonstrated that teachers' judgments of students' learning styles did not align with students' perceptions of their own learning processes, which suggests that the process of measuring learning styles may be unreliable.

Confounding factors. A teacher who is interested in their student's individual characteristics and aims to accommodate that student communicates several positive messages to the student; namely, that the student is an important agent in the learning process, that their teacher wants to know more about that student's strengths and weaknesses, and that their teacher is willing to adapt their methods for the student. These steps build positive working alliances, which leads to positive learning outcomes (Toste, Heath, & Dallaire, 2010). As such, positive effects of learning styles-based classroom instruction may actually be the result of the teacher-student working alliance.

Risks. Given the lack of supporting empirical findings, using learning styles for diagnostic and intervention runs the risk of incorrectly placing into learning styles, or placing students into learning styles that are not accurate representations of learning. Students and teachers may fixate on this placement, and receive non-optimal instruction. Poor academic results may then be inaccurately attributed to the wrong factors, such as not using one's learning style adequately, rather than assessing evidence-based factors associated with learning difficulties. Students who exhibit learning difficulties may internalize these difficulties as fixed aspects of their learning abilities, rather than malleable aspects such as study skills and environment. As such, learning styles are at risk of doing the opposite of what educators and theorists hope to attain.

All too often, teachers bear the burden of these risks. Educators must take the time to assess their students' learning styles and accommodate those individual differences, which reduces time they could invest in teaching practices that have a higher likelihood of positive outcomes. When learning styles-based classroom instruction proves ineffective, teachers may be blamed for not properly accommodating their students' learning styles, rather than the notion that learning styles are ineffective in themselves. This dynamic places teachers, students, and families at risk for frustration and disappointment as the school year proceeds.

Moving Forward

Evidence-based practice (EBP) is the notion of using empirical research findings to guide decision-making, including teaching methods, assessments, and interventions. When practitioners choose an EBP, they are choosing a practice that has previously demonstrated efficacy in a similar population to the one they serve (American Psychological Association Presidential Task Force on Evidence-Based Practice, 2006; Burns, Riley-Tillman, & VanDerHeyden, 2012). Choosing EBP may have a greater likelihood of a positive outcome, in comparison to a practice that has no supporting evidence. In this section, I offer several evidence-based alternatives to learning styles that educators may consider using and adapting in their classrooms. These alternatives are not exhaustive, as more options certainly exist.

School Community

Student attitudes about their teachers have a profound effect on academic outcomes (Toste et al., 2010; Toste, Bloom, & Heath, 2014). Learners who appear to be well-liked by their teacher exhibit higher motivation than learners who appear disliked by their teacher (Davis, 2007; Toste et al., 2014). Students who feel important to their teachers report higher interest in classroom activities than those who do not feel important (Toste et al., 2014). Positive teacher-student alliances in early years (i.e., Kindergarten to Grade 3) increases the frequency of prosocial behaviour and decreases the frequency of negative behaviours later in childhood (Toste et al., 2014). Working alliances, and developing trusting relationships with teachers, can also reduce the likelihood of early exit from school (Toste et al., 2014). With this in mind, many teachers build a learning community within their classrooms, marked with strong teacher-student working alliances.

Building positive working alliances can be embedded throughout the teaching process and teacher-student interactions. Toste and colleagues (2014) emphasized that conveying caring is integral to positive working alliances. Collaboration is also effective in building working alliances. When possible, teachers can align their curriculum goals with students' goals (Toste et al., 2014). This may be done by creating lesson plans and assignments that incorporate students' learning interests, and allowing students choices in their learning process, for instance. Certainly, the ways that working alliances are built will depend on the teacher, students' age groups, and curriculum demands.

Another way that teachers build a welcoming sense of community and strong working alliances is with culture-responsive teaching. Culture-responsive educational programs lead to a number of positive educational outcomes

(Gay, 2002) including helping students to maintain their culture and identity while using these strengths to accomplish educational goals (Scull, 2016). Wolfram, Adger, and Christian (1999) suggested that culture-responsive education increases student engagement while helping students to feel that their culture is valued in academic environments.

Maintaining positive working alliances can be challenging for teachers when students present with behaviour difficulties. Literature suggests that making behavioural expectations clear to students, and enforcing them calmly and away from the general classroom, can reduce undesired behaviours and reduce the likelihood that the student's behaviour may escalate to coercive cycles (e.g., Gnezda, 2005). Gnezda (2005) encouraged teachers to avoid taking a student's behaviour personally and reframe the behaviour as a learning obstacle that the teacher and student can work towards overcoming. Ultimately, reductions in the frequency of disciplinary events may also reduce teacher stress; as a result, working alliances can potentially be a protective factor against teacher burnout (Gnezda, 2005).

Cognitive Science

Memory is a multi-phasic and reconstructive process. When we are presented with information, our sensory register gathers sensory information about the stimuli (e.g., sight, smell, taste, touch, sound) so long as we attend to it (Baddeley, 2007). The information that we attend to moves into short-term memory. As the name suggests, information in short-term memory is held for a brief amount of time, such as several seconds, giving us enough time to write down a password or address before the information decays from memory (Baddeley, 2007). If we rehearse information, however, it moves to long-term memory and be retained for years and perhaps permanently (Baddeley, 2007).

Memories are not stored as if they were videos to be replayed at some time in the future. Theorists (e.g., Roediger, 1980) contended that memories are stored in the mind as fragments, called cues (e.g., senses, thoughts, feelings). When we retrieve a memory, we piece the cues together, but cues may be confused with other memories (Roediger, 1980). For instance, a person who loses their keys often may do so because they put their keys in several different places, and recalling the last place where they placed their keys may become conflated with the other times and places they have placed their keys. Teachers can reduce memory decay by strengthening their students' memory of the lesson or concept, which bolsters retrieval. This can be achieved by implementing active learning methods such as multimodal practice, elaboration, personal relevance, and the testing effect.

Multimodal practise. Learning styles theories emphasize encoding information using a specific modality (e.g., visual, auditory). Multimodal practise involves encoding information using multiple methods, such as writing about a concept and discussing it. Multimodal practise increases the number of memory cues available for a specific set of information, which can enhance retrieval (Radavansky, 2017; Wammes, Jonker, & Fernandes, 2019). In addition, practicing information using a variety of methods can reduce boredom and enable students to study for longer periods of time (Radavansky, 2017).

Elaboration. Recall can be strengthened by providing students with opportunities to elaborate on information, by connecting new information with existing information (Coane, 2013). Memory aids such as mnemonics are popular elaboration methods used by all ages (Coane, 2013). Elaboration can also include interacting with lesson material; for instance, by inviting students to write sentences using their spelling words, or by asking students to write a reflective piece about a given lesson.

Personal relevance. Making information relevant to students' lives can enhance memory (Nairne, Thompson, & Pandeirada, 2007). Nairne and colleagues (2007) suggested that memory has evolved to be stronger for survival-related information than non-survival relevant information. I also contend that teachers who strive to make information personally relevant for their students achieve positive outcomes because they are building positive working alliances by communicating care and interest in their students' lives. In addition, personally relevant information is likely to be re-encountered when students are at home or in their community, which enables them to rehearse and elaborate on information learned in class. Students may also feel that their classroom learning has practical importance in their lives outside of school (e.g., goals, hobbies, social lives) and this linkage may increase their motivation to study.

Test effects. Students who test themselves tend to recall more information than students who read or re-copy information (Radavansky, 2011). According to Kornell, Hays, and Bjork (2009) testing gives feedback to students about what they know and do not know, which provides them with direction on what items require further study. Teachers can help their students build self-testing abilities and habits by providing class time to support students as they write their own test questions and/or make their own flashcards. Instruction in other self-testing methods (e.g.,

close the textbook and write down as many facts as possible about a specific section) can be given as part of study skills training in high school and university levels.

Motivation

Motivation research suggests that educators can create optimal learning environments by balancing support with opportunities to learn, structuring schoolwork and activities in ways that encourage intrinsic motivation and self-growth. Brophy (2013) described motivation to learn as “a student’s tendency to find academic activities meaningful and worthwhile and to try to get the intended learning benefits from them” (pp. 249). Motivation to learn is also described as a cognitive response to educational tasks, where a student attempts to understand the activity presented by the teacher, acquire the relevant knowledge, and master the material (Brophy, 2013). Brophy (2013) found that classes that reported the highest levels of motivation to learn exhibited four factors: opportunities to learn, press, support, and feedback.

Opportunities to learn. According to Brophy (2013), high motivation to learn was observed when teachers’ lesson plans involved medium-difficulty concepts that were not too easy nor too difficult for students. Teachers in highly motivated classrooms also made key concepts clear (Brophy, 2013). Learning was supported by using concrete illustrations, connecting new concepts to students’ personal knowledge, and elaborating on material rather than reading from a textbook (Brophy, 2013).

Press. Teachers in motivated classrooms expected their students to actively think during lessons, rather than passively absorb information (Brophy, 2013). Teachers encouraged all students to participate in lessons through discussion, voting, comparing responses, while preventing a few students from dominating classroom activities and discussion (Brophy, 2013). As Brophy suggested (2013), pressing students in this manner also helps teachers to check whether the class is grasping the lesson, and adjust accordingly (e.g., chunk the information into manageable steps).

Support. Motivation to learn was associated with teacher support in the learning process (Brophy, 2013). Teachers in motivated classrooms used modelling (e.g., examples and demonstrations) and scaffolding (e.g., reduce support as the student gains mastery and independence; Brophy, 2013).

Feedback. Students reported higher motivation to learn when their teachers’ evaluation emphasized learning and understanding rather than performance and competing against other students (Brophy, 2013). Teachers in motivated classrooms emphasized that mistakes were opportunities to learn, and they provided opportunities for students to revise assignments (Brophy, 2013).

Ryan and Deci’s (2016) self-determination theory is the notion that all people have three basic human needs (i.e., autonomy, competence, relatedness) associated with positive adjustment and growth. Autonomy refers to the ability to engage in behaviours and/or make choices that are congruent with one’s own interests (Ryan & Deci, 2016). Competence describes the notion of gaining mastery (Ryan & Deci, 2016). Relatedness is the sense of feeling connected to others (Ryan & Deci, 2016). Instructors and classrooms that foster autonomy, competence, and relatedness facilitate intrinsic motivation among their students (Ryan & Deci, 2016). In other words, when students feel a sense of classroom community, have some power to make choices in the learning process, and feel a sense of growing mastery, students are also likely to enjoy learning for the sake of learning.

Motivational differences were also described by Dweck’s (2008) account of fixed and growth mindsets. According to Dweck (2008), people with fixed mindsets believe that their abilities and talents are immutable. Students with growth mindsets, in contrast, believe that their abilities and talents are malleable (Dweck, 2008). These beliefs about oneself have a profound effect on further actions—a student with a fixed mindset who believes they are not good at mathematics, for example, would be less likely to persist on difficult math questions than a student who believes that their math potential is unknowable (Dweck, 2008). As Dweck (2008) described, people with growth mindsets are more likely to stick with a task or activity when it is challenging than those with fixed mindsets.

Duckworth (2006) argued that growth mindsets create grit (Hochanadel & Finamore, 2015). Grit is the willingness to persist during challenges—a characteristic marked by optimism and continued self-growth—and is associated with positive outcomes such as higher educational attainment and grades in comparison to students low in grit (Bowman, Hill, Denson, & Bronkema, 2015; Duckworth, 2006). Some researchers suggest that grit influences achievement over and above IQ (Duckworth, 2006).

Dweck (2015) emphasized that most people possess both fixed and growth mindsets and will probably always have some combination of the two. Mindset, however, is not fixed—people can certainly facilitate growth mindset in

themselves and others (Dweck, 2015). In promoting growth mindsets, teachers can emphasize that mistakes are opportunities to learn, by reflecting on the approaches used, and trying to figure out a better approach for next time (Dweck, 2015). Reframing statements such as, “I am not a math person” to “I am not a math person *yet*” can also facilitate growth-mindedness (Dweck, 2015).

Conclusions

Learning styles represent a large body of constructs and assessments that aim to diagnose students’ learning styles and adapt teaching practices accordingly. Lack of agreement on which learning style model is the best account of learning (i.e., and individual differences among learners) suggests that researchers have not developed a valid, reliable measurement tool. Further, learning styles have been heavily criticized due to a lack of empirical evidence, diagnostic difficulties, and confounding factors. Despite being debunked, learning styles remain a thriving industry throughout the world, as many books, research studies, education courses, and assessments maintain the concept of learning styles. As a growing number of teachers utilize evidence-based practices, learning styles are being replaced by universal approaches, community building, cognitive science, and motivational practices.

REFERENCES

- American Psychological Association Presidential Task Force on Evidence-Based Practice. (2006). Evidence-based practice in psychology. *American Psychologist*, *61*, 271-285.
- Anderson, I. (2016). Identifying different learning styles to enhance the learning experience. *Nursing Standard*, *31*(7), 53-63.
- Bowman, N. A., Hill, P. L., Denson, N., & Bronkema, R. (2015). Keep on truckin' or stay the course? Exploring grit dimensions as differential predictors of educational achievement, satisfaction, and intentions. *Social Psychological and Personality Science*, *6*(6), 639-645.
- Baddeley, A. D. (2007). *Working memory, thought and action*. Oxford, UK: Oxford University Press.
- Brophy, J. (2013). *Motivating students to learn*. New York, NY: Routledge.
- Burns, M. K., Riley-Tillman, T. C., & VanDerHeyden, A. M. (2012). *Academic and behavioral interventions*. New York, NY: The Guilford Press.
- Coane, J. H. (2013). Retrieval practice and elaborative encoding benefit memory in younger and older adults. *Journal of Applied Research in Memory and Cognition*, *2*(2), 1-6.
- Coffield, F., Moseley, D., Hall, E., & Ecclestone, K. (2004). *Learning styles and pedagogy in post-16 learning: A systematic and critical review*. London, UK: Learning and Skills Research Centre.
- Curry, L. (1983). *An organization of learning styles theory and constructs*. Paper presented at the Annual Meeting of the American Educational Research Association, Montreal, Quebec.
- Curry, L. (1987). *Integrating concepts of cognitive learning styles: A review with attention to psychometric standards*. Ottawa, ON: Canadian College of Health Executives.
- Davis, H. A. (2007). Exploring the contexts of relationship quality between middle school students and teachers. *Elementary School Journal*, *106*, 193-233.
- Duckworth, A. L. (2006). *Intelligence is not enough: Non-IQ predictors of achievement*. (Unpublished doctoral dissertation). University of Pennsylvania, Pennsylvania. Retrieved from <https://repository.upenn.edu/dissertations/AAI3211063>
- Dweck, C. S. (2008). *Mindset: The new psychology of success*. New York, NY: Random House Digital, Inc.
- Dweck, C. (2015). Carol Dweck revisits the growth mindset. *Education Week*, *35*(5), 20-24.
- Fox, R. D. (1984). Learning styles and instructional preferences in continuing education for health professionals: A validity study of the LSI. *Adult Education Quarterly*, *35*(2), 72-85.
- Gay, G. (2002). Preparing for culturally-responsive teaching. *Journal of Teacher Education*, *53*(2), 106-116.
- Gnezda, N. M. (2005). *Teaching difficult students: Blue Jays in the classroom*. Maryland: R&L Education.
- Gordon, D., Meyer, A., & Rose, D. (2014). *Universal design for learning: Theory and practice*. CAST Professional Publishing. Retrieved from <https://ebookcentral.proquest.com>
- Hochanadel, A., & Finamore, D. (2015). Fixed and growth mindset in education and how grit helps students persist in the face of adversity. *Journal of International Education Research*, *11*(1), 47-50.
- Husmann, P. R.; O'Loughlin, V. D. (2019). Another nail in the coffin for learning styles? Disparities among undergraduate anatomy students' study strategies, class performance, and reported VARK learning styles. *Anatomical Sciences Education*. *12*(1), 6-19.
- Keefe, J. W. (1985). Assessment of learning style variables: The NASSP task force model. *Theory into Practice*, *24*(2), 138-144.
- Kirschner, P. A. (2017). Stop propagating the learning styles myth. *Computers & Education*, *106*, 166-171.
- Kornell, N., Hays, M. J., & Bjork, R. A. (2009). Unsuccessful retrieval attempts enhance subsequent learning. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *35*, 989-998.
- Metcalf, J., & Wiebe, D. (1987). Intuition in insight and noninsight problem solving. *Memory & Cognition*, *15*(3), 238-246.
- Nairne, J. S., Thompson, S. R., & Pandeirada, J. N. (2007). Adaptive memory: Survival processing enhances retention. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *33*(2), 263.
- Papadatou-Pastou, M., Gritzali, M., & Barrable, A. (2018). The learning styles educational neuromyth: Lack of agreement between teachers' judgments, self-assessment, and students' intelligence. *Frontiers in Education*, *3*, 1-5.
- Pashler, H., McDaniel, M., Rohrer, D., & Bjork, R. (2008). Learning styles: Concepts and evidence. *Psychological Science in the Public Interest*, *9*(3), 105-119.
- Radavansky, G. A. (2017). *Human Memory*. New York, NY: Routledge.

- Rayner, S., and Riding, R. (1997). Towards a Categorisation of Cognitive Styles and Learning Styles. *Educational Psychology, 17*, 5-27.
- Riding, R., & Rayner, S. (2013). *Cognitive styles and learning strategies: Understanding style differences in learning and behavior*. London: David Fulton Publishers.
- Roediger, H. L. (1980). Memory metaphors in cognitive psychology. *Memory & Cognition, 8*, 231-246.
- Ryan, R. M., & Deci, E. L. (2016). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. New York, NY: Guilford Press.
- Scull, J. (2016). Effective literacy teaching for Indigenous students: Principles from evidence-based practices. *The Australian Journal of Language and Literacy, 54*(1).
- Simmonds, A. (2014). *How neuroscience is affecting education: Report of teacher and parent surveys*. Retrieved from <https://wellcome.ac.uk/sites/default/files/wtp055240.pdf>
- Toste, J. R., Heath, N., & Dallaire, L. (2010). Perceptions of classroom working alliance and student performance. *Alberta Journal of Educational Research, 56*(4), 371-387.
- Toste, J. R., Bloom, E. L., & Heath, N. L. (2014). The differential role of classroom working alliance in predicting school-related outcomes for students with and without high-incidence disabilities. *The Journal of Special Education, 48*(2), 135-148.
- Venkatesan, L., Perdita, H., Jayanthi, Singh, H., Shelvina, & Flinsi, M. (2018). A pan India study on learning styles of undergraduate nursing students. *International Journal of Academic Research and Development, 3*(1), 277-281.
- Wammes, J. D., Jonker, T. R., & Fernandes, M. A. (2019). Drawing improves memory: The importance of multimodal encoding context. *Cognition, 191*, 1-9.
- Wolfram, W., Adger, C. T., & Christian, D. (1999). *Dialects in schools and communities*. New Jersey: Lawrence Erlbaum Associates.

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