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Bilingual Cognition and Growth Mindset: A Review of Cognitive Flexibility and Its Implications for Dual-Language Education

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Abstract: The United States has seen an increase in cultural and linguistic diversity of student populations. Policy makers have looked toward existing research in dual language education, alternative curriculum, and bilingualism to support the needs of dual-language learners. In this paper, we review two areas of research that have implications for educational policy, and also have theoretical implications for early cognitive development. The first area focuses on cognitive flexibility in bilingual populations. The second area focuses on growth mindset. We highlight the parallels in these constructs, arguing that bilinguals may be uniquely receptive to growth mindset interventions due to their increased cognitive flexibility. We identify specific ways that growth mindset interventions could be applied to support dual-language learners. Lastly, we argue that future research in both areas may provide researchers and educators with a better understanding of early cognitive development in bilingual populations and the emergence of growth mindset in all populations.

Keywords: Dual Language Learners; Bilingual Advantage; Growth Mindset, Multilingual Education Policy; Cognitive Flexibility

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Introduction

Over the past decade, the number of dual-language learners (DLLs) in the United States has grown by 24% (Park et al., 2017). DLLs are defined as children 8 years and younger with at least one parent who speaks a language other than English at home. This population now makes up nearly one-third of all young children in the nation and more than 20% of the early childhood population in 24 states (Park et al., 2017). The DLL population is a subset of English-language learners (ELLs). ELLs are defined as students who are learning to speak English. They now represent approximately 1 in 10 students in public schools (Sanchez, 2017). Despite these large numbers, ELLs and DLLs are less likely than their peers to enroll in high-quality early childhood education programs, which may delay readiness for kindergarten (Park et al., 2017). Without native-language support, students may continue to exhibit academic lags through elementary school and increased school dropout rates (McFarland et al., 2018). These realities have fueled a movement towards supporting dual-language education and increasing its effectiveness.

Policy makers are currently looking to research for guidance on developing effective instructional approaches for diverse classrooms (Sugarman & Geary, 2018). States like California have passed legislation increasing the number of elementary dual-language education programs (e.g., the 2016 Multilingual Education Act and the Global 2030 Initiative), but the transition will take time and effort (e.g., bilingual teacher training, curriculum changes, etc.). There are two promising areas of cognitive development research that may help policy makers and educators identify successful practices in the classroom. The first area of research focuses on the cognitive flexibility exhibited by bilinguals. Many studies suggest that proficiency in two (or more) languages leads to enhanced executive function (EF) and metacognitive abilities, which in turn leads to enhanced problem solving (Wiseheart et al., 2016) and memory abilities (Kroll et al., 2012). By understanding the impact of bilingualism on children's cognition, educators can create more specialized approaches for instructing DLLs. The second area of research that may help identify successful practices in the classroom is the study of growth mindset (GM), which is the belief that one's intelligence can improve. Research suggests that GM may be especially valuable in helping students overcome academic challenges (Dweck, 2000). Indeed, a number of elementary schools have recently incorporated GM training into their curricula (Claro & Loeb, 2017). GM training may promote DLLs' academic persistence and success; however, research is scarce.

In this review, we posit that bilingual students, including DL and/or EL, may be uniquely receptive to GM interventions because they possess enhanced cognitive flexibility. Further, we suggest that the integration of research on GM and the bilingual cognitive advantage has important theoretical and practical implications. First, we will review current literature on the bilingual cognitive advantage. Then, we will introduce a new conceptual model of GM, highlighting parallels between proposed components of GM and the bilingual cognitive advantage, and examine current methods of measuring GM. Lastly, we suggest possible GM interventions for DL and EL students, and their parents and teachers.

The Bilingual Cognitive Advantage

Peal and Lambert (1962) were the first to document the "intellectual advantage" of bilinguals. The authors compared monolingual French and bilingual French-English children on a battery of cognitive tests and found that bilinguals outperformed monolingual peers, and displayed enhanced mental flexibility. There is now a large body of research suggesting that, compared to monolinguals, bilinguals possess enhanced attention (Soveri et al., 2011; Zhou &

Krott, 2016), EF (Blom et al., 2014; Brito et al., 2014), creativity (Kharkhurin, 2009, 2010), metalinguistic awareness (Friesen & Bialystok, 2012), and memory (Brito et al., 2014; Schroeder & Marian, 2012). These advantages are present throughout the lifespan (Bialystok et al., 2008).

Currently EF is considered both an example of cognitive flexibility and a potential mechanism driving the bilingual cognitive advantage. Bilinguals are thought to develop enhanced EF because they are managing their multiple languages all the time (Costa et al., 2009). Several findings support the hypothesis that bilinguals' languages are active simultaneously (Kroll & Dussias 2013, Thierry & Wu 2007; Dijkstra, 2005) and that, in addition to regulating their own language use, bilinguals need to attend to the language of the other speaker, and choose the correct language in which to respond to, while suppressing the interference of other languages. Thus, a bilingual speaker's ability to construct explicit representations of linguistic knowledge may result in an increased ability to control and process information. This cognitive flexibility may lend itself to flexibility and advantages in GM. Research on theory of mind, metacognition, EF, and attention support this possibility.

Another interesting finding regarding bilinguals is that theory of mind emerges earlier among bilingual populations. Theory of mind is a form of perspective taking, specifically the ability to ascribe mental states to others (Premack & Woodruff, 1978). For example, Kovács (2009) found that more than twice as many 2- and 3-year-old Romanian-Hungarian bilingual children passed a false-belief test than intelligence-matched 2 and 3-year-old Romanian monolingual children. Several studies also provide evidence that bilingualism accelerates theory of mind development (Diaz & Farrar, 2017; Farhadian et al., 2010; Goetz, 2003; Han & Lee, 2013); bilinguals' enhanced theory of mind is correlated with higher EF (Bialystok & Senman, 2004; Goetz, 2003; Kovács, 2009). Studies suggest that the degree of EF is a significant predictor of performance on theory of mind tasks (Devine & Huges, 2014), particularly those involving attentional control. Enhanced attentional control could serve to regulate one's own mental state including their own beliefs and knowledge, while also directing attention to someone else's mental state (Devine & Huges, 2014; Schroeder, 2018). Theory of mind not only involves the coordination of EF processes, but also reasoning, and conceptual skills (Carlson & Moses, 2001; Carlson et al., 1998; Frye et al., 1995; Sabbagh et al., 2006; Wellman et al., 2001).

Taken together, this research suggests that young bilinguals possess enhanced attention, metacognition, and cognitive flexibility before they enroll in elementary school. Importantly, these are all proposed components of GM. Therefore, it is possible that the bilingual cognitive advantage also includes GM. In other words, bilingual populations may possess increased frequency of growth mindset and be especially receptive to GM interventions. However, exploring this possibility further necessitates a careful examination of existing research on GM.

Growth Mindset and Cognitive Flexibility

Growth mindsets can be defined as implicit beliefs about the malleability of intelligence—specifically how people perceive their own and others' intelligence (Dweck, 2006). Carol Dweck first introduced the idea of growth mindset (see Dweck & Leggett, 1988, for review), and contrasted it with the idea of fixed mindset, the belief that intelligence is fixed and unchanging (Dweck, 2000). A large body of work has identified multiple aspects of growth mindset, including increased cognitive flexibility, metacognition (Rattan et al., 2018), motivation and goal planning (Bostwick et al., 2017) and perceptions of ability and motivation (Schmidt et al., 2017).

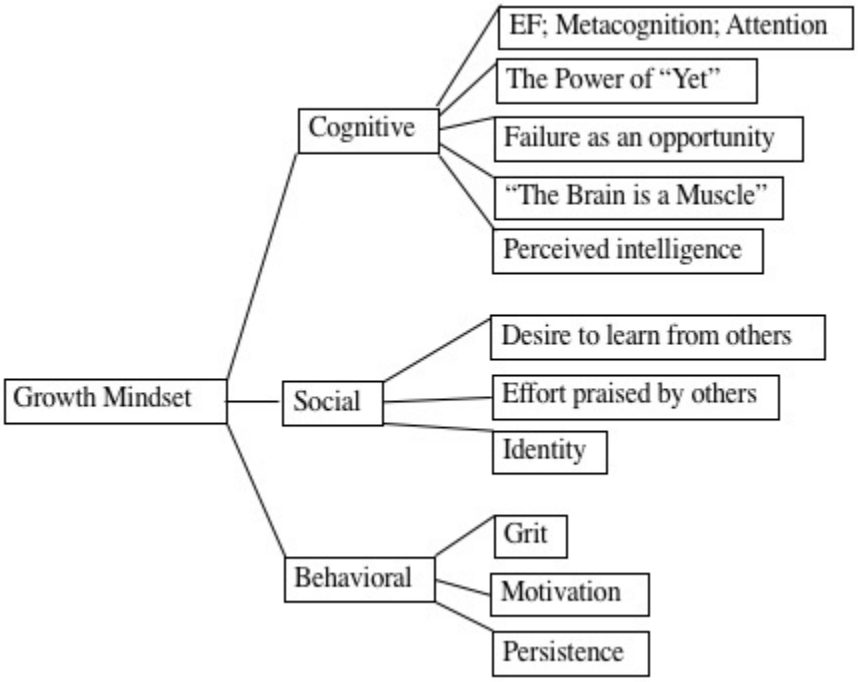
A New Model of GM

Research on GM has spanned across multiple disciplines, including psychology and education. Across studies, inconsistent operational definitions of GM have led to inconsistent findings. Although some researchers and educators tout the positive outcomes associated with having GM (e.g., Boaler, 2013; Yettick et al., 2016), others question the role of GM in increasing cognitive flexibility—and even its validity as a construct (Bahník & Vranka, 2017; Dixson et al., 2017; Orosz et al., 2017). To determine the validity of GM, and the usefulness of GM interventions in educational settings, particularly those involving DLLs, the findings of GM research must be systematically organized. To this end, we created a new conceptual model of GM (see Figure 1).

Through a thorough review of the literature, we identified proposed components of GM that have been supported by data. We then grouped these components into three domains: cognitive, social, and behavioral. We believe this model provides more clear and comprehensive answers to the questions, "What is GM?" and "How is GM nurtured within an individual?". The model also serves to highlights parallel between GM and the bilingual cognitive advantage. We can identify a number of components of GM (e.g., metacognition, attention, and EF) that are also abilities in which bilingual individuals excel. It is these commonalities that should be investigated further, as they may carry important implications for academic interventions for EL and DL populations. We elaborate on the model below.

Figure 1

Proposed Growth Mindset Model Components and Subcomponents



The cognitive domain encompasses components of GM having to do with an individual's mental functions and flexibility (Ravenscroft et al., 2012), specifically EF and attention (Schroder et al., 2017) as well as perceptions of intelligence as malleable. Research has shown

that belief in *the power of "yet"* enhances individuals' ability to apply effective learning strategies in the face of academic and linguistic challenges (Blackwell et al., 2007). The power of "yet" is a type of cognitive reframe and refers to a shift in thought that expands what is possible. It is widely known in the field of cognitive behavioral therapy and the application of cognitive restructuring that shifting one's thoughts can alter one's emotions and behaviors (e.g., Knapp & Beck, 2008). This process can also apply to beliefs about one's academic potential. Using the words "not yet," to contextualize a failure emphasizes to the students that the outcome is not final (Dweck, 2006). Framing failure as temporary may inspire hope of future success and thus increase students' persistence. A concept that dovetails with the power of yet is the idea of *"the brain as a muscle,"* which challenges the commonly-held naive theory that biology trumps experience (Dweck, 2008). In other words, using the phrase "the brain is a muscle" can begin to counter the cognitive schema that intelligence is fixed.

The social domain of GM encompasses the ways in which social partners or norms may influence individual effort as well as the individuals' identity in relation to others. It encompasses *effort praised by others,* which emphasizes how external feedback can influence our formation and maintenance of GM (Dweck, 2007). If only the outcome of effort is praised, individuals may learn to value the outcome rather than the experience of learning. They may seek tasks that prove their intelligence and avoid ones that do not (Dweck, 2006). They may even hide their mistakes (Nussbaum & Dweck, 2007). In contrast, individuals who receive external praise for the effort will be more likely to engage with and seek challenges and be less concerned with how they appear or compare socially. *Identity* speaks to this outcome and the social elements that influences our mindsets and our academic perception of ourselves as learners. For example, the perception of *failure as an opportunity* could impact both a self- and social-identity whereby individuals who view failure as an opportunity may seek to learn from others versus be threatened by their success (Dweck, 2006).

The behavioral domain encompasses individuals' actions that exemplify and/or sustain GM. *Persistence* speaks to an individual's ability to continue on a challenging task. This component may also include increases in strategy use, overall motivation, and overall performance (O'Rourke et al., 2014). We found a similar series of behavioral traits in the component of *grit* (Duckworth et al., 2007). Like GM, grit is a multifaceted construct. Duckworth et al. (2007) discuss grit as both passion and perseverance. Therefore, we suggest that grit falls under both the social domain (e.g., passion and courage) of GM as well the behavioral domain (e.g., perseverance and action) of GM.

Measuring the GM Framework

While each component in the proposed GM model has been investigated experimentally, no studies have examined them in regard to DL and EL populations. In addition, studies on GM have relied on brief, self-report questionnaires, which are limited in capturing cognitive processes through a set of uniform tasks in an experimental design. In other words, self-report questionnaires (a) make it difficult to identify specific areas and components of GM; and (b) have limited validity/reliability among youth who are not yet literate or balanced bilinguals. Recently, studies have begun to use more objective measures of GM, including neurological paradigms (Moser et al., 2011; Schroder et al., 2017). For instance, Mangels, Butterfield, Lamb, Good, and Dweck (2006) tested adults' general knowledge on a variety of academic domains (e.g., art and music history, world and US history, etc.) and measured brain activation via ERP in addition to self-report questionnaires. The researchers found that the participants' beliefs

influenced learning success through increased attention and conceptual processing and that participants were more likely to correct their mistakes on a surprise retest (Mangels et al., 2006). Moser, Schroder, Heeter, Moran, and Lee (2011) extended these initial findings by identifying evidence of conscious attention allocation towards errors, and overall improved performance during a surprise retest. Both of these studies suggest a relationship between attention and GM. Schroder, Fisher, Lin, Lo, Danovitch, and Moser (2017) replicated this previous correlational work and found growth-minded children also demonstrated better accuracy after mistakes (Mangels et al., 2006; Moser et al., 2011). These studies aimed to identify how beliefs influenced attention on a moment-to-moment basis and provide support for a neurocognitive model of a GM. The findings of these studies on the cognitive flexibility associated with GM may inform our understanding of the cognitive flexibility associated with bilingualism. Cognitive flexibility could speak directly to the EF cognitive flexibility. Investigating similarities between the mechanisms underlying both GM and EF may help researchers identify more appropriate measures for DL and EL populations.

The first author of this paper is pursuing two veins of research that investigate the development of GM, and the effectiveness of GM interventions in younger populations. The first aim is to assess GM in younger children who may struggle with language- or literacy-based paradigms. Focusing on younger populations offers the opportunity to understand when GM emerges and how GM interventions might be implemented. Thus far, only a few studies have found that GM is present in kindergarten and first-grade populations (Cain & Dweck, 1995; Smiley & Dweck, 1995). Understanding how and when GM develops among younger children may be especially useful given that initial transitions from pre-K to formal educational settings often have the most impact on academic achievement (Blackwell et al., 2007; Dweck et al., 1995).

We have created a series of vignettes for use with 4- to 6-year-old children that we believe improves on existing measures of GM in younger populations in a number of ways. First, the vignettes are designed to be read aloud to children and are coupled with pictures to circumnavigate any language or literacy barriers. Each vignette describes a problem with a particular outcome (e.g., A child character is asked by the teacher to count to ten [problem] and the child counts to 10 without making a mistake [outcome]). The problems themselves are cognitive, social, and behavioral in nature—in other words, not limited to academic performance, which is a realm in which children of this age are only just becoming exposed to. After being read the vignette, children are asked to reason about the outcome; their attributions of the child character's successes and failures are classified as consistent with GM (e.g., the character's practice, hard work, increased effort) or fixed mindset (e.g., the character's luck or natural talent). This measure will help us determine when cognitive aspects of GM emerge for monolingual and bilingual children. However, we hypothesize that, compared to monolingual children, bilingual children will exhibit GM earlier and more frequently, due to their enhanced theory of mind and EF.

The second area of our research seeks to identify the potential benefit of a GM intervention to enhance persistence in completing a challenging problem-solving task. In this study, 4- to 6-year-old children's baseline GM is measured using the methodology described above. Next, they are asked to participate in a challenging task, during which their degree of persistence is measured. Children then participate in a GM intervention, followed by another challenging task. Lastly, children's GM is assessed. The intention is to compare pre-and-post intervention persistence and GM scores. We predict that an intervention will increase both

persistence and GM scores, but that bilingual participants will demonstrate more flexibility in their perceptions of intelligence and persist longer when challenged. This study builds upon previous research by introducing a novel approach to testing the behavioral components of GM. Both of these studies are in the early stages of piloting, but we are confident they will be integral first steps towards enhancing our ability to assess GM among younger populations, especially those who are bilingual, and improve methodological challenges in assessing GM.

Importantly, each of these studies are coupled with cognitive flexibility tasks commonly assessed with bilingual populations to identify potential relationships between elements of GM and bilingual cognition. However, given our review of EF, attentional control, cognitive flexibility, and reasoning, we see potential for a bilingual GM advantage. We cannot claim that bilingualism leads to GM, but we do suggest that learning more about the mechanisms of cognitive flexibility in bilingual populations may tell us more about how increased cognitive flexibility could benefit all children. Additionally, these studies may provide additional information about how language impacts the brain and how children's educational success can be attributed to learning more than one language.

Implications for Dual Language Academic Achievement and Intervention

Although definitions of GM vary across studies, there is agreement that GM ideology has implications for improving learning environments, class culture, and academic intervention (Schmidt et al., 2017; Rattan et al., 2018). Likewise, many studies suggest that possessing a GM can be advantageous in academic settings (e.g., Blackwell et at., 2007; Bostwick et al., 2017; Schmidt et al., 2017). Conversely, possessing a fixed mindset can lead to lack of persistence during moments of increased difficulty, and feelings of failure or defeat **(**Dweck & Leggett 1988; Rattan et al., 2018; Reavis et al., 2018; Wang et al., 2019**)**. For this reason, promoting GM in students has become a popular academic intervention (Blackwell et al., 2007; Chao et al., 2017; Dixson et al., 2017; Enriquez et al., 2017; Schmidt et al., 2017). However, only recently have studies begun to investigate how students' mindsets predict their learning or achievement (Claro & Loeb, 2017).

Two studies have looked at this relationship on a larger scale (Claro & Loeb, 2017; Yeager et al., 2019). Both studies identified the long-term economic and social impacts of GM in diverse populations. The findings of Yeager et al. (2019) suggest that GM interventions need not be within the classroom at all. Subjects participated in a short online GM intervention, which taught them that intellectual abilities can be developed. Training resulted in improved grades among 6,320 lower-achieving ninth grade students. These results are especially encouraging because they suggest that GM interventions can be successfully implemented with minimal funding, teacher training, and time taken away from the students' other school-related tasks. A recent report from the Brookings Institute assessed the responses to a GM measure from 125,000 students in third-eighth grade, across five school districts in California (Claro & Loeb, 2017). This study found students with a stronger GM learn more in a given year compared to those with lower GM. It also found that traditionally underserved students including students in poverty, ELLs, and ethnic-minority students, are less likely to hold a GM (Claro & Loeb, 2017). Although this study revealed that all groups with a GM learn more over the course of a year than those who do not have a GM, further research is needed to identify how mindsets vary across socioeconomic status, ethnicity, and are particularly important for at-risk populations (Claro & Loeb, 2017).

Additionally, this area of research may reveal why at-risk populations are prone to low levels of GM given factors such as perceptions of structural barriers of success (e.g., perceptions of inequality in accessing opportunity, stereotype threat, etc.; Claro & Loeb, 2017). In the United States, ELLs make up a large part of these at-risk populations, and DLL programs seem to have offered some recourse for these programs, however it is clear that more is needed to close the achievement gap. DL programs are one way to remedy these gaps.

Studies suggest that students enrolled in DL programs excel academically (Valentino & Reardon, 2015) and emotionally (Lindholm-Leary & Borsato, 2001) and develop cross-cultural competence (Lindsey et al., 2009). DL programs can also close the achievement gap for ELLs (Collier & Thomas, 2012). One approach to addressing this gap is to identify the role of language proficiency in cognitive development. We know that balanced bilinguals (i.e., those with proficiency in both languages) demonstrate more success on challenging tasks and tasks that have higher cognitive demand (Bialystok et al., 2005; Yoshida, 2008). Research suggests this is due to the higher demand of switching between languages (Bialystok, 2017). By investigating the relationship between language use and cognitive flexibility among bilingual populations, researchers may be able to identify potential GM interventions for language learners. Together, both EF (Best et al., 2011) and GM are significant predictors of academic performance and GM may be likely to respond with enhanced resilience when challenged and show greater learning and achievement in the face of difficulty (Dweck, 2006).

Since GM studies have been conducted at the elementary school level, we recommend researchers examine the effectiveness of early GM interventions within educational settings particularly during the initial transitions into formal schooling. These years can be challenging for children and often predict later achievement and success within school settings (Duncan et al., 2007). Educators and policy makers alike may become increasingly invested in examining GM interventions to support high quality early childhood multilingual education. Therefore, now may be an opportune time to conduct this research given the increasing need to support ELLs (Park et al., 2018) and DLs (Department of Education, 2015). Incorporating alternative methods to predict student success would require the development of evaluative measures of GM, particularly for accountability and assessment (Goldhaber & Özek, 2019). Thus, multilingual learning environments provide a rich context to explore these questions in order to optimize language learning environments.

There is a clear need to better support native language development in the classroom. Implementing GM interventions may address these concerns, and may inevitably be applicable to all early education populations. There is still very little we know regarding what mindsets children hold, at what age, how mindsets vary from grade-to-grade, the validity and reliability of GM measures, and if whether GMs are significant predictors of academic learning. What we know so far, does show promise of immediate practical application and the benefit of an approach aimed towards helping all children become intrinsically motivated to learn.

Practical Implications

In this paper, we have highlighted GM in bilingual individuals as a promising area of research, with important theoretical implications. We turn our attention now to some possible benefits of using GM inventions in educational settings, especially those with EL and DL populations.

EL and early DL populations face a unique challenge: They are often labeled as "behind"—linguistically and academically—upon entering the classroom. Many ELLs and early

DLLs feel stigmatized and inferior compared to more proficient speakers (Banse & Palacios, 2017). Additionally, their lack of proficiency results in negative preconceptions of ability and intelligence (Jones & Mixon, 2016), resulting in a lack of motivation for learning (Williams, 2014), which may result in more of a fixed mindset. For example, DLLs sometimes experience initial vocabulary delays in one language, which may lead to initial lower academic performance (Meisel, 2004; Paradis et al., 2011; Pearson et al., 1997). Additionally, DLLs often exhibit lower scores in literacy in English due to their ongoing acquisition of two vocabularies (Williams, 2014).

While younger DLLs eventually catch up and exceed monolingual scores in later grades (Scheffner Hammer et al., 2014), these initial dips may leave DLLs feeling inadequate, or behind their peers (Williams, 2014) and therefore may leave DL programs prematurely (Ackerman & Tazi, 2015). Efforts toward addressing the achievement gap for ELLs have often relied on segregation from mainstream classrooms either in the form of (1) temporary instruction (e.g., ELLs are removed for additional instruction) or (2) separate dedicated classrooms (e.g., SEI programs; Jones & Mixon, 2016). However, research suggests these efforts only exacerbate the stigma of being an ELL (Jones & Mixon, 2016) and that separation within schools lead to feelings of social isolation from the greater school community (Klingner et al., 1998). In contrast, researchers suggest greater inclusivity of peers within the classroom, less division, and more positive self-esteem when ELLs are enrolled in DL programs (Plazza et al., 2015).

Research found that when ELL students are instructed in both their primary language and English, they achieve higher scores on tests of reading and math in English when compared to ELLs in monolingual English-only settings (Genesee et al. 2006). However, DL programs are not without their own challenges. DL programs face obstacles in identifying and implementing effective approaches in the classroom to help students through early language dips and maintain motivation for attaining dual language proficiency (Ackerman & Tazi, 2015). Some programs have attempted to utilize vocabulary-building interventions, but findings suggest that they may not be powerful enough to close the achievement gap (Marulis & Neuman, 2013).

In-class GM interventions for ELLs and DLLs may be a way to maximize the benefits of DL programs, by reducing fixed mindsets and improving levels of positive beliefs and approaches towards the learning process as a whole. The potential benefits of GM interventions may also be applicable for both DLL educators and parents.

Developmentally Appropriate GM Pedagogy

One potential solution to address the challenges faced by ELLs and DLLs is to integrate research-based GM pedagogy in the classroom. For example, Brainology is a 4-unit program (40 mins per unit) for children ages 10-14 that integrates GM components (e.g., the brain is a muscle, praising effort to improve self-efficacy) and walks the learner through understanding how the brain grows and learns over time (Mindset Works Inc., 2017). This concept presents learning as something of a long-term ongoing learning marathon, rather than an immediate sprint. There is some promising data suggesting the Brainology training can shift GM – at least in the short-term. After the success of Brainology, another program was developed for younger children. Growing Early Mindsets (GEM), released in 2019, adapts elements of the Brainology program for children in PreK-3rd learning environments, integrating GM, socio-emotional learning, and mindfulness principles and practices (Mindset Works Inc., 2017). The added element of socio-emotional learning and mindfulness is especially applicable since younger children are beginning to self-regulate their emotions and develop their sense of self at this time. More research is

needed to determine the long-term effects of these programs, but GM training with younger children could be useful – especially so for ELLs and DLLs who face early language learning challenges.

We suggest two critical features of a successful pedagogy: a) emphasizing different components of GM at developmentally appropriate times; and b) providing long-term scaffolding to promote long-term retention of ideas and change in mindset. Given that successful DL programs begin early (Pre-K) and build momentum through high school, the implementation of GM pedagogy should be ongoing and evolve to meet the unique demands required for dual language acquisition. To accomplish this, we suggest introducing GM components that map onto children's natural developmental milestones. For example, some GM components may be more salient to younger language learners than others.

In preschool or kindergarten, children who are beginning to recognize and control their own feelings and emotions may be more adept at identifying and contextualizing challenges or problems before they can develop GM strategies to overcome them. Educators can connect the emotional component of learning to help foster children's sense of agency and self-efficacy to build a future framework for how to approach future problems or challenges (Enriquez et al., 2017). This can be done by reading stories about characters experiencing challenges and creating games around identifying those challenges. Once identified, educators can scaffold concepts of resilience, optimism, and early goal setting, in addition to celebrating initial milestones (Lippard et al., 2018). These components of GM are related to the process of learning and directly mirror the process of emotional development among this age group (e.g., recognizing and managing your emotions, planning responses, etc.).

As children develop, early GM pedagogy can begin to form schemas of neuroplasticity- "the brain is a muscle." The idea of the brain as a muscle might be particularly salient because it is a concrete analogy that children can understand. Educators have also introduced the idea/metaphor that problems and challenges are chances to "grow our brains," and that this experience can make people feel strong, happy, and excited to learn new things (Pawlina & Stanford, 2011). Therefore, by engaging a child's imagination through playful and relatable images, GM interventions may also result in children becoming encouraged to make multiple attempts at a hard task- tasks that they tackle because they are framed as "strengthening their brains." In later years, when children strive towards independence, a developmentally-appropriate GM intervention may reinforce efforts towards self-efficacy.

The benefit of this intervention would be two-fold: a) different components of GM are emphasized at developmentally appropriate times; and b) the spaced training would promote long-term retention of ideas and change in mindset. These approaches are crucial for multicultural environments that require more cognitively complex thinking to develop caring about others who exhibit differences linguistically and culturally (Hanson et al., 2016). GM curriculum also supports children's ethno-racial socialization in a context where DL programs value both languages. By growing in the ability to engage multiple perspectives and strategies for solving problems may counter the myth of "one right way" of doing things (Enriquez et al., 2017) and support greater concern for others who exhibit differences linguistically and culturally (Hanson et al., 2016).

DLL educators' professional development

DL educators experience ongoing, targeted professional development that ensures they possess the expertise that is necessary for DLLs' academic success (Ortiz & Fráquiz, 2017). DLL

educators are often overwhelmed by the limitations of bilingual programs, including but not limited to, availability of classroom materials in both languages, everchanging policy changes, and pressure to integrate research and pedagogy (Ackerman & Tazi, 2015). Unlike English-only programs, few DL programs are housed in public schools and are often found within Charter and independent schools (Christy et al., 2014; U.S. Department of Education, 2015). Coincidently, DL educators, like their students, may also feel inadequate within the demands of these language learning environments. Therefore, GM interventions may also have bidirectional benefits for educators in regard to in-classroom practice, professional development and maintaining positive morale.

DL educators must be up-to-date on policy recommendations, and newly available resources for DL programs. Coincidently, DL educators, like their students, may also feel inadequate within the demands of these language learning environments. Therefore, GM interventions may also have bidirectional benefits for educators in regard to in-classroom practice, professional development and maintaining positive morale.

Teacher efficacy matters, especially in implementing the interventions we have described. To achieve much of what has been described thus far, educators must also possess GM (Dweck & Leggett, 1988; Fraser, 2018). Studies suggest that teachers with lower teaching efficacy are also less engaging with children (Lippard et al., 2018). This suggests that teachers may need support as individuals to effectively engage children. If DL educators are fixed in their own teaching methodology, they may not take advantage of opportunities to affirm and validate DL linguistic resources and language learning experiences. Like their students, DL educators may already be feeling ongoing pressure surrounding proficiency and testing and may benefit from GM themselves when feeling overwhelmed. For this reason, we need educators equipped with GM strategies and efficacy to take on the multiple challenges they face within multilingual educational environments.

We suggest that GM interventions become an integrative part of the DL teacher-training process so that educators may feel confident integrating GM into existing classroom pedagogy. Like any K-12 teacher, each educator must possess the necessary foundation knowledge to teach their students effectively. Therefore, educators also need to be well-versed in GM and its components. This GM expertise may help DL educators take on the immediate and upcoming challenges within DL education with a proactive approach that will help in decreasing negative feelings toward the ongoing changes within multilingual education. The potential here is to increase self-efficacy for the educator so that they can model GM for students in the classroom and effectively encourage parents to support GM at home. Teachers can do this by showing enthusiasm for learning new things and bring awareness to fellow teachers, students, and parents, to the times when effort and practice yielded positive results.

DL Parents

Dual language learning is most effective when the support for learning two languages continues at home (Lindholm-Leary, 2005). Several studies support parental involvement both at the school and the home, and in some cases incorporate the community. Ideally, GM curriculum would support both the child in the classroom and at home in developing biliteracy.

Parents of DLLs are often worried about the timing and trajectory of their children's language acquisition. Parents are often dismayed by low test scores, and sometimes prematurely remove their children from DL programs before their children have experienced their eventual vocabulary gains (Jones & Mixon, 2016). For example, English-only parents who enroll their

kindergartener who is in a 90/10 model (where 10% is English instruction), may immediately be concerned their child's lack of English proficiency. In some circumstances, older EL parents may be asked to share with younger parents to trust the process of language acquisition and share their own experiences with early language lags (Ackerman & Tazi, 2015). Alternatively, staff and educators may attempt to teach the parents about DL models and the process of biliteracy development in this context. However, neither of these approaches may be sufficient to yield long-term results.

DL schools are already overburdened and are often tasked with parental outreach and recruitment. One way to ease this burden is to provide GM interventions for parents in an effort to help them understand that language learning is an ongoing process. For example, if parents were to experience a GM intervention, they would learn that the brain as a muscle and incremental growth of intelligence is similar to their child's linguistic experiences. Over time, their vocabulary will grow, just like their brain. GM interventions may also assist parents of early-grade DLLs that the arch of language proficiency takes time and feel encouraged to contribute rather than doubt the DL process entirely. We would also recommend that these GM interventions for parents integrate the families' native language to help promote school-based interventions and to help promote at-home support for children's learning (Mendez & Westerberg, 2012). One possibility is to provide take-home short stories as part of the school curriculum that feature GM and fixed mindset scenarios for parents to read to their children. These stories may be formatted similar to our current research. Through this method, parents can support discussions of mindsets while simultaneously supporting their native language and literacy development. By slowly integrating GM across each of these populations, we may help ease the transition of dual language acquisition for all.

Conclusion

By proposing a new conceptual model of GM, we have identified promising areas of research on both GM and the bilingual cognitive advantage. We have argued that studying GM in younger and bilingual populations presents a unique and important opportunity to learn more about how *all* children develop cognitive flexibility. We have proposed specific ways in which DLLs, and their educators and parents, may benefit from GM interventions. However, prior to significant investment in GM-oriented curricula, further research and improved methodology is necessary. In sum, by understanding how GM emerges in early development and across demographics, we may ensure that all children persist in their learning and thrive academically.

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