



Mindset and standardized testing over time



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ABSTRACT

A longitudinal study was conducted over three semesters within 28 classrooms, in seven schools, with a total of 419 participants to examine the relationship between students' mindset and their standardized test performance. Students in grades 3–6 completed questionnaires in the fall and spring semester across two school years. In addition, students completed standardized testing in math and reading. Multi-level models allowed for a 2-level model suggesting a link between time and academic achievement. Academic achievement and mindset related across the time points. Results suggest that initial mindset has an impact on students' academic achievement, with students who initially reported a more growth oriented mindset having a slower decline on test scores than students with a more fixed mindset.

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1. Introduction

Over the past several decades, researchers demonstrated that students tend to hold self-beliefs about the stability or malleability of their academic abilities (Chen & Pajares, 2010; Dweck, 1999; Dweck & Leggett, 1988; Dweck & Molden, 2005; Yeager & Dweck, 2012). These self-beliefs, termed *mindsets*, can either be fixed (unchangeable) or growth (malleable) (Dweck, 1999). When students hold growth mindsets, sometimes referenced as incremental beliefs, they believe their abilities can improve, which leads to higher grades and greater academic persistence (Dweck, 2006; Dweck, 2012; Yeager & Dweck, 2012). In contrast, students with fixed mindsets, or entity beliefs, generally have lower achievement, especially when facing difficult academic tasks since a fixed mindset inhibits their belief in overcoming academic obstacles (Dweck, 2006; Dweck & Molden, 2005).

There is reason to believe that one's mindset could be affected by environmental and intra-individual factors (Bandura, 1986; Flay, Snyder, & Petraitis, 2009). The Theory of Triadic Influence (TTI) helps explain how different sources of influence affect peoples' adoption of beliefs and behaviors. TTI proposes that intrapersonal (e.g., personal characteristics, achievement), interpersonal (e.g., classmates), and contextual (e.g., the classroom) factors affect self-beliefs (e.g., mindsets; Flay, et al., 2009). TTI suggests that changes in human beliefs are mutually

affected by individuals' characteristics and their social interactions within a socio-cultural environment. That is, TTI supports the possibility that interactions between students and teachers provide opportunity to transmit beliefs about mindsets within the classroom setting.

Previous research suggests that students' motivation aligns with their teacher's beliefs due to the students' presence in the teacher's classroom environment (e.g., Baker, Dilly, Aupperlee, & Patil, 2003). In addition, students' academic achievement and previous beliefs affects current self-beliefs (Dweck & Leggett, 1988; Dweck & Molden, 2005; Murdock, Anderman, & Hodge, 2000). Less understood is whether achievement, classroom setting, and students' prior beliefs alters mindsets, especially over time. Therefore, the current paper longitudinally explores whether changes in mindsets can be partially explained by the intrapersonal and interpersonal factor associations among students' mindsets, classroom contexts, and academic achievement.

1.1. Mindsets

Mindsets are considered to be a range of self-beliefs, with a fixed mindset on one end of a scale and growth mindset on the other (Dweck & Leggett, 1988). Within this range, fixed mindset implies a student's belief that a given ability is unchangeable (Dweck & Leggett, 1988). A growth mindset implies a belief that students can change their ability through effort (Dweck & Leggett, 1988). The main contrast between the two types of mindsets is around the idea of change. When students believe their abilities can change, they have greater perceived self-control over the outcome of future academic events and focus more on learning the material (Yeager & Dweck, 2012). Additionally,

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mindsets vary by domain, in that students can have a fixed mindset for some academic disciplines and a growth mindset for others (Dweck, 2006). The current study examines mindsets for math and reading as these domains are often assessed in students' academic achievement tests (e.g., Iowa Test of Basic Skills).

Fewer studies examine whether mindsets change as a developmental process over time. Yeager and Dweck (2012) found that students with a growth mindset did have a greater belief in their future academic performance, leading to higher expectancy and willingness to work for better academic achievement. Students who believe they will do well are willing to try harder than students who are not expecting to do well, which may then increase academic achievement (Mueller & Dweck, 1998; Plaks & Stecher, 2007). As such, there may be reason to believe that mindsets have a longitudinal component between self-beliefs and achievement.

Having a growth mindset does help with greater future academic achievement (Blackwell, Trzesniewski, & Dweck, 2007; Dweck, 2012; Dweck & Molden, 2012; Stipek & Gralinski, 1996). To our knowledge, little research examines whether the reverse might also be occurring. That is, does achievement alter one's later mindset? Other self-beliefs, such as academic self-efficacy and self-concept, are influenced when students feel academically successful (Bandura, 1997; Marsh & Craven, 2006). For example, academic self-concept and achievement are often reciprocally-related (Chen, Yeh, Hwang, & Lin, 2013; Marsh & Köller, 2004). As students experience academic success, they tend to hold higher academic self-concept and greater self-efficacy. In a similar way, we might presume that higher academic achievement could lead to more of a growth mindset, and vice versa. Still, individuals tend to maintain their self-beliefs and seek out self-confirming information (Jonas, Schulz-Hardt, Frey, & Thelen, 2001; Swann, Stein-Seroussi, & Giesler, 1992). Hence, academic achievement can partially facilitate a confirmation bias for students whose performance confirms their self-beliefs (e.g., "My math test grade shows that I can never get better at math.").

1.2. Relationship between mindset and academic achievement

Students who believe they are able to achieve academically are more likely to be successful (Marsh & Craven, 2006). Academic achievement is related to a student's self-belief in their ability to achieve for that domain (Marsh & Craven, 2006; Robins & Pals, 2002). Several longitudinal studies have investigated mindset and its effect on academic achievement (Anderman & Anderman, 1999; Blackwell et al., 2007). Previous studies suggested that students who have a growth mindset are higher in their academic perseverance (Blackwell et al., 2007; Stipek & Gralinski, 1996). Students with a fixed mindset tend to excel as long as the information comes easily for them, but their achievement lessens when faced with academic challenges (Mueller & Dweck, 1998). Further, fixed mindset leads to a more negative reaction in the face of academic failure (Plaks & Stecher, 2007). Some investigations indicate that students with a fixed mindset may still academically achieve in certain areas, such as on standardized tests, but not in others (Robins & Pals, 2002). Previous research indicates that standardized testing is not the only method of assessing students' achievement, but still standardized tests often measure academic achievement (e.g., Nichols, Glass, & Berliner, 2006).

1.3. Relationships among classrooms, mindsets, and academic achievement

Through teacher–student interactions, the classroom environment can affect students' mindsets and academic achievement. Teachers can develop students' mindsets by providing feedback that encourages the use of effort, instead of praising students' innate ability (Dweck, 2006). By praising effort, teachers encourage students to attribute their academic success to controllable intrinsic factors (Weiner, 2005). Teachers can also teach their students about the malleability of their

innate cognitive abilities (Blackwell et al., 2007). Students who learn that abilities can change develop long-lasting self-beliefs about their capacity to improve their academic performance as they age (Blackwell et al., 2007). Hence, in some, but not all, classrooms, the teacher–student relationship fosters an environment where students acquire growth mindsets, which, in turn, affects academic achievement (Dweck, 1999).

1.4. Present study

The present study seeks to evaluate the relationship between mindset and academic achievement over time. Previous studies looked at academic achievement and mindset, striving to alter mindset through some type of intervention. Students with a growth mindset are better able to take on academic challenges in the classroom, while students with a fixed mindset may struggle to achieve in domains that are more difficult for their learning (Dweck, 2006). Building from this, we look at the interaction between an initial assessment of mindset and achievement on standardized testing. We hypothesize that those who have a growth mindset will achieve at a higher rate than those with a more fixed mindset. In addition, we hypothesize that there will be a difference in mindset based on the classroom from which the students were located.

2. Method

2.1. Participants

Participants were a convenient sample of 419 elementary students, including 203 boys (48.4%) and 216 girls (51.6%), in grades three through six. Students' initial self-reported ethnicities were Black ($n = 271$, 65%), Hispanic ($n = 79$, 18.9%), multiethnic ($n = 20$, 4.8%), White ($n = 18$, 4.3%), Asian ($n = 15$, 3.6%), Native American ($n = 8$, 1.9%), and "other" ($n = 8$, 1.5%). Student initial ages ranged from 7 ($n = 4$, 1%) to 13 ($n = 5$, 1.2%), with an average age of 9 years, 9.25 months ($SD = 1$ year, 4 months). Students were from 28 classrooms in seven elementary schools located within a Southern city in the United States. All schools were part of the same school district. All students were eligible for free lunch programs offered through the school district.

3. Measures

3.1. Mindset

Mindset questions first developed by Dweck (1999) were utilized for the study. Students reported their mindsets related to math and reading in both the fall and spring semesters. By asking questions in both domains, researchers were better able to see if mindsets changed in multiple domains. An example question is, "Your smarts in math/reading is something about you that you can't change very much." In this instance, smarts is a term used to discuss a student's intelligence, which prior work proved to be a valid synonym among youth populations who might not understand the word "intelligence" (Cain & Dweck, 1995). Students answered three items for each domain ($\alpha = .71$, reading; $\alpha = .65$, math), with scores above a 3.5 indicating a presence of a growth mindset (Dweck, 1999). The scale for each question was 6-points (1 = Strongly Agree to 6 = Strongly Disagree).

Previous studies have shown the instrument to have evidence for validity ($\alpha = .78$, Blackwell et al., 2007). The instrument was successfully used in a variety of academic domains, student ages, and with ethnically diverse students residing in low socioeconomic areas (Blackwell et al., 2007, Dweck, 1999). Blackwell et al. (2007) provide evidence of reliability in result similarity with the repeated use of the measure in a longitudinal study.

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