Teaching Intelligence Mindsets with Student Data

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Abstract

BACKGROUND: Believing that intelligence can be grown and developed powerfully impacts academic success. How can we best teach and foster growth mindsets in the context of an introductory psychology course?

OBJECTIVE: Our goal was to empower and teach students about intelligence mindsets using their own qualitative and quantitative data.

METHOD: We collected and presented student scores to the validated mindset scale alongside their responses to open-ended writing prompts about intelligence. Students rated the classroom activity in a subsequent feedback survey.

RESULTS: Students found learning about mindset using their own data useful and insightful, commenting that the activity pushed them to invest more effort in difficult classes and acknowledge failures as lessons rather than setbacks.

CONCLUSION: Students' written responses to prompts about intelligence can be used to teach students about intelligence beliefs and how mindsets manifest within their classroom.

TEACHING IMPLICATIONS: This classroom activity is one example of promoting growth mindsets in the learning process, which we suggest adapting to other contexts as well.

Keywords: *intelligence mindsets, introduction to psychology, motivation, pedagogy*

Introduction

In a 1969 Presidential Address to the American Psychological Association, George Miller famously urged academic psychologists to "give psychology away" to "the people who really need it." A prime example of how psychologists have met this call is with research on intelligence mindsets (Dweck, 2006): individual beliefs about whether intelligence is a static trait that cannot change (*fixed mindset*) or a malleable trait that can be developed through effort and experience (*growth mindset*). Holding a growth mindset can boost motivation, learning, self-regulation strategies, agency, and self-esteem for students across subfields and cultures (Blackwell et al., 2007; Burnette et al., 2013; Chen & Wong, 2015; Costa & Faria, 2018; Dweck, 2006; Yeager et al., 2014; Yeager & Dweck, 2012). Interventions aimed at fostering a growth mindset can even reduce disparities in academic achievement between student populations (Claro et al., 2016; Davis et al., 2011; Paunesku et al., 2015; Yeager et al., 2016, 2019). As the authors of this paper can attest to personally, understanding our abilities as something we nurture, rather than as gifts we do or do not have, can be transformative.

Given the oft-discussed benefits of holding a growth mindset, educators may wonder how to teach about mindsets in a way that nurtures growth mindsets in their students. It is especially unclear how best to nurture growth mindsets day-to-day, outside of the context of programmatic intervention strategies. Although the concept of growth mindset has seen broad exposure, we suspect that confidence in implementing practices consistent with the conceptual framework remains low (cf. Dweck, 2014; Gero, 2013). In a national study of over 600 K-12 teachers (Yettick et al., 2016), most teachers believed that students should hold growth mindsets, but only 20% strongly agreed they are good at fostering growth mindsets in their students. This gap between application and research may have consequences, such as an increase in *false growth*

mindsets (Dweck, 2015, 2019). For example, praising effort rather than the learning process itself, or telling students that they are capable of achieving anything without offering concrete guidance on how to fulfill such potential, is not effective (Dweck, 2006; Mueller & Dweck, 1998). Eighty-five percent of K-12 teachers surveyed reported wanting more training in promoting a growth mindset in their classrooms (Yettick et al., 2016), indicating strong interest in discovering new solutions and strategies.

A logical context in which students might learn and cultivate a growth mindset is within an introductory psychology course. Taken by 1.2-1.6 millions of students each year (Clay, 2017), introductory psychology introduces students to major concepts and methods of psychology and offers an avenue for teaching students about the beliefs they hold. How can instructors harness this opportunity?

Fortunately, many topics taught in an introductory psychology course are included in interventions designed to cultivate growth mindsets, including the topics of brain plasticity (often included in a unit on the brain and nervous system) and the benefits of adopting a growth mindset (potentially covered under the topic of learning or intelligence). Formal mindset interventions introduce these topics through classroom exercises or mentoring emails (see mindsetkit.org and perts.net/programs), and some include more extended exercises tailored to specific study skills and audiences (e.g., community college adults: Paunesku et al., 2015; middle schoolers: Blackwell et al., 2007). Introductory psychology instructors may introduce these topics through lecture, textbook readings, or class discussions.

We aimed to build on the strengths of introductory psychology as a context for teaching about growth mindset with a novel and adaptable activity that uses students' own data and, critically, their own words. Previous work suggests that students find analyzing their own data to

be motivating and engaging (Hewer, 2018) and centering student voices in the classroom can enhance student agency (Trauth-Nare et al., 2016). Prior to an Introductory Psychology lecture on intelligence, we collected student responses on the commonly used Theory of Intelligence (TOI) scale (Dweck, 2006) to assess student mindsets. Students also identified and wrote about someone they believed to be intelligent and what they think caused the person to become that way. These descriptions served to capture qualitative data regarding students' beliefs about effort and the source of ability (i.e., innate vs developed through experience). The instructor incorporated students' TOI score distribution and illustrative responses describing effort and ability into the intelligence lecture. In the following sections, we describe the activity and students' perceptions of its effectiveness. To preview, students found this activity useful and insightful, and some students reported directly changing their behaviors as a result.

Method

Participants

Participants were 246 students enrolled in an Introductory Psychology course at a selective, private university. The sample skewed female (123 female, 108 male, 1 other, 14 no response) and first-year (N = 198; sophomores, N = 36; juniors, N = 12).

We report additional demographic characteristics in **Supplemental Table 1**. This study was approved by the Institutional Review Board.

Procedure

Measures. In an online survey given before a lecture on Intelligence, students responded to the open-ended prompt, "Think of someone who you'd describe as 'intelligent.' In just a

sentence or two, say WHY you would describe that person as intelligent" (descriptive prompt). They responded to a second question asking, "What do you think CAUSED the person you described to be so intelligent" (causal prompt). These prompts were embedded as part of a larger survey offered for modest extra credit: one bonus point on a 100-point exam. 94% of students (232 total) provided responses.

After students responded to the prompts, they completed the four-item TOI scale (α = 0.92) shown in **Table 1** (Dweck, 2006).

Although the instructor regularly incorporated surveys into the class design, students were not informed about the purpose of the prompts or TOI scale before their upcoming lesson.

Lesson. The lecture (slides available at bitly.com/2Q9uIqV[1]) focused on origins and changing conceptions of intelligence, ways to increase intelligence, and underestimating intelligence.

In the subsection on increasing intelligence, the instructor introduced several studies suggesting that intelligence, at the level of behavior and the brain, changes with the right experiences and opportunities (e.g., Cooper & Zubek, 1958; Duyme et al., 1999; Rosenthal & Jacobson, 1966; van Praag et al., 2000). Next, the instructor introduced the concept of intelligence mindset (Dweck, 2006) and discussed different academic trajectories predicted by intelligence mindset (Blackwell et al., 2007). Critically, student responses and data from the survey were incorporated into this lesson. Although students filled out the descriptive and causal prompts, the instructor only shared student responses to what had caused the person they

[1] This links to a blinded OSF project with sample slides. After blinded review, this link would be replaced by the full OSF page.

described to become intelligent, highlighting language that aligned with fixed or growth mindsets: e.g., “They are **highly motivated and work hard**. They also partake in **challenging activities** to grow as a person,” “**Genetics** caused them to be this way. They were **born smart and will always be smart**. they are gifted from birth [*sic*].” Emphases were added by the instructor. The instructor viewed and selected all quotes without knowing student identity and took care to choose quotes without identifying details. Then, the instructor introduced the TOI scale and presented the classroom distribution of TOI scores (Figure 1**)**. Thus, students saw concrete examples from their peers, as well the distribution of their present classroom.

Feedback Survey. We solicited student feedback on the course overall and specifically the activity described above within a broader survey of other unrelated measures. 232 students (92.4% of the class) completed this survey for modest extra credit.

Students first indicated what ideas or concepts they anticipated being useful to their life or schoolwork beyond the immediate context of the course. Then, they were presented with the same distribution of the TOI scores presented in the intelligence lecture (Figure 1). On this page, students rated how useful it was to see actual student responses from the class (1 = *not at all useful*; 5 = *very useful*) and explained their reasoning.

Next, they were asked whether this activity or the concept of intelligence mindsets gave them any insight into their own beliefs, behaviors, or life. Finally, they were asked if they would advise the instructor to include a version of this intelligence mindset activity in future lessons on intelligence (1 = *definitely don’t include*; 2 = *probably don’t include*; 4 = *probably include*; 5 = *definitely include*), if they had any suggestions on how to improve this classroom exercise, and if they had attended the intelligence lecture.

Results

Student Perceptions. Overall, students indicated seeing their own data in the intelligence lesson was engaging and contextualizing and recommended that this activity be included in future iterations of the course.

Students rated seeing their own responses in the context of their lesson on intelligence as useful: $M = 4.11$, $SD = 0.96$, range = [1, 5], $N = 226$. In describing insights from this activity or why seeing their own responses was useful, many students highlighted the utility of seeing the class's overall distribution in contextualizing their own responses:

> "… very useful to see how other kids in my class think."
>
> "I always like to see where I stand compared to others because then I wonder if I should adjust my way of thinking a little."
>
> "It made me evaluate where I fit into the spectrum of fixed vs. growth mindset and made me consciously want to believe in myself more."

Some students were struck by how *dissimilar* others' beliefs were, and found that the activity highlighted the diversity of beliefs in the classroom:

> "… showed that both mindsets really did exist, even right in our classroom."
>
> "…We often live in a bubble, feeling or believing that others feel that same what we do. It is good (and interesting) to see other perspectives."
>
> "… it made everything we learned about much more tangible and real… We often think what we say is what everyone else would say, but that wasn't the case."

Others noted how *similar* others' beliefs were, and some students noted feelings of solidarity in the classroom:

> "Puts into perspective that you're not alone in what you're feeling."
>
> "It was great to see that I am in an environment full of opportunities surrounded by people who mostly have growth mindsets. But it was also nice to know that I am not alone in needing to improve some small aspects of my life about which I have a fixed mindset; there is room for improvement for everyone."

Students also reported feeling more inclined to trust the research presented in class because they had seen the concepts represented in a sample of their peers. While research described in a classroom can feel outdated or removed from the student experience, this exercise made clear the immediate relevant of the ideas:

> "It reaffirms my beliefs and puts more faith in the lecture because it feels personalized."
>
> "Helped reinforce the ideas and could appreciate how evidence came from the population I am a part of right now, not data from a long time ago that might not be reliable."
>
> "… [T]he statistics being about us made it more relatable and more immediate. It's one thing to look at statistics from a study, but when those stats involve people you know or care about, it's much more relevant."

In general, students tended to highlight that pulling their own responses into the activity made the content of the lecture ring truer and feel more relevant. They saw the applicability of psychology to the world and felt like participants in that learning process:

> "It helps me to relate the information to the real world and recognize that we are learning about real things that happen to real people, like the ones sitting around me in class."
>
> "It felt more like a community in a big lecture hall- we got a chance to voice our own opinions."

Students overwhelmingly endorsed incorporating this activity into future lessons on intelligence ($M = 4.31$, $SD = 0.71$, range = [2, 5], $N = 227$). The few comments judged as not explicitly positive included:

> "It reinforced many of the ideas I had already had."
>
> "I always knew that I had a fixed mindset so this was not anything new."
>
> "Slightly too revealing."
>
> "I don't really concern myself with what others think. I just focus on myself."

These comments suggest that this activity may be more successful in a larger class or a context in which student responses can feel anonymous, especially if some students feel that their quotes are revealing. The results should be communicated in a way that does not single out

students who have more of a fixed mindset, which is not seen as being as socially adaptive or desirable.

Most students did not have suggestions for improving this activity. We summarize the 10 concrete suggestions for improving this exercise in the Discussion.

Effects of Activity. We asked students whether this activity or the concept of intelligence mindsets gave them any insight into their own beliefs, behaviors, or life. Some students noted that this activity, and thinking about their own intelligence mindsets, provided inspiration to work harder and apply a growth mindset to other classes:

> "...when I came into [University] I often questioned whether I was intelligent enough to be here. ... After learning about Carol Dweck, I adopted the growth mindset and started believing that I was good enough and can improve my intelligence."

> "… I liked the idea that we can also become smarter or work more and do better. It makes me feel less hopeless when I did badly on a test, knowing that I can always improve."

Students recognized the benefits of holding a growth mindset about their own intelligence. Those students who held fixed mindsets wanted to change:

> "… I realized I have a fixed mindset and... need to change. I need to embrace challenges and failure more than I have."

> "Sometimes I get caught in the fixed mindset, especially being in a high stress competitive environment like [University]. This activity was a useful reminder to reflect on the growth mindset and incorporate those views more into my everyday life."

> "…I felt as though I presented myself as someone with a growth mindset, but truly believed that I operated under a fixed mindset. Being able to acknowledge that was really powerful."

Others noted that this activity was useful in contextualizing their experiences outside of class and thinking about success and happiness more generally:

> "… [intelligence in general] does not describe just academic capabilities… [T]his resonated with me a lot because it is important to recognize that receiving good grades is not necessarily a good measure of how intelligent someone is."

> "… I've had a pretty 'fixed mindset' for most of my life, that was bound to ruin what I thought of myself and my capabilities as life progressed and more hardships emerged… I was able to realize that that mindset is not the most effective for success and happiness in an environment such as this."

Some students found the activity interesting but did not describe any consequences of the activity. Some had previously learned about intelligence mindsets. Nonetheless, even these students suggested that:

> "...what I learned about growth mindsets in high school has made me more confident in my ability to learn things."

> "...it was refreshing to be reminded of [mindsets] especially in the context of college. It reminded me to really focus on the process and enjoy the learning [I] have to do at [University] instead of focusing on how to materialize my education into a career."

According to students, seeing their own data used to illustrate intelligence mindsets was an effective classroom activity that encouraged them to work harder in their classes, focus more on the level of effort they expended than performance metrics like grades, and acknowledge their failures as lessons rather than definitive markers of intelligence.

Discussion

We examined how open-ended writing prompts could be used as a tool for teaching undergraduates about different beliefs about intelligence. We embedded student responses and data into an Introductory Psychology lecture on intelligence, contextualizing how intelligence mindsets affected students within that very classroom. Students found this activity insightful, describing that the activity pushed them to invest more effort in difficult classes and acknowledge failures as lessons rather than setbacks.

Of course, teaching students with their own data is not a new idea. One differentiating feature of this activity is the rich nature of student quotes. This approach creates a personalized moment for students and contributes to the sense of community in the classroom, which

promotes academic engagement (Juvonen et al., 2012). Our results suggest that prioritizing student voices while teaching, which serves as an "in-house" demonstration of intelligence mindsets, may even increase trust in scientific research. Moreover, the components of this activity – incorporating quantitative and qualitative student data into a lesson to illustrate a concept – can be adapted to various topics within psychology, such as individual responses to stress and different coping strategies, prime material for more involved classroom discussions.

Finally, teaching intelligence mindsets within a lesson context of increasing intelligence is one way for the instructor to communicate their own growth mindset, which can subsequently influence student mindset. For example, Smith and colleagues (2018) show that non-evaluative instructor comments about an introductory statistics course ("I'll be here every step of the way" versus "It's up to you to follow along") can affect mindsets and classroom performance. Instructor mindset also impacts student motivation (Rattan et al., 2012) and classroom environments (Deemer, 2004), including the size of the gaps in performance between underrepresented minoritized and non-minoritized students in STEM courses (Muenks et al., 2020). Our classroom activity can thus help instructors show students that they hold a growth mindset of student ability.

Extending this Classroom Approach to Other Learning Contexts

There are many ways to vary or build on the classroom approach described here. One suggestion comes from student feedback: students of disparate mindsets could "get together and talk about/explain their perspectives." Students in our study only saw the data of the class as a whole and did not receive their personal measured mindset score from the TOI scale. However, individual results could also be provided to students. In a smaller environment such as a

discussion group setting following a larger lecture, students could dive deeper into the nuances of intelligence mindsets and consider the limitations of different mindset measurements.

Other students expressed interest in learning more about how to adopt a growth mindset in their own lives. The classroom activity we presented, like many mindset interventions, focused on teaching students the concepts. While becoming aware of intelligence mindsets can be an effective intervention on its own, what could come next? One suggestion is to discuss how intelligence beliefs impact everyday academic behaviors. Educators could discuss how different academic strategies reflect performance or mastery goals (e.g., learning a concept for its own sake versus learning to seem smart and get good grades) and distinct beliefs about intelligence.

Finally, educators can incorporate the student quotes into at least two contexts beyond Introductory Psychology. First, in a more quantitatively oriented class, students could conduct analysis of their de-identified prompt responses, mindset scores, and other measures. One of the authors conducted a pilot study of this approach in a statistics course. Students were asked to rate the intelligence of a hypothetical student who always put in a lot of effort to do well in school and one who did well in school without putting in a lot of effort. These data were then included in lessons where students investigated the distribution of the data (e.g., central tendency measures, shape, and spread) and performed one-sample and paired *t*-tests within and across groups. Future work could formally assess the efficacy of these proposed activities, but previous research supports the idea that students enjoy analyzing their own data (Hewer, 2018) and thinking about what these data reflect about their world and respective beliefs.

Second, educators might share students' quotes with the broader community. As one example, the authors curated a library exhibit that featured student responses to the intelligence prompts collected from several classrooms (beyond Introductory Psychology) at their university

(Daly, 2020). These prompts provided rich data, allowing the authors to pose questions for students to ponder, like, *Is intelligence different across disciplines? Can you be intelligent in different ways*? Similar exhibits could be scaled to individual classroom activities and spark discussion about effort attributions and discipline-specific practices while centering the participants who often fuel psychological research.

Conclusion

We describe an approach for incorporating student data as a way of teaching intelligence mindsets in the context of introductory psychology. Students responded favorably to the immediacy and relevance of seeing their own mindset scores and written descriptions incorporated into a lesson on intelligence. We propose that integrating student voices into a lesson about intelligence mindsets invites future student participation and conversations.

We hope that the pedagogical exercise and suggested extensions of the activity within and beyond the classroom prove useful to educators looking for novel ways for help their students explore their beliefs about the nature of intelligence.

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Tables and Figures

Figure 1.

Classroom Distribution of Mindsets

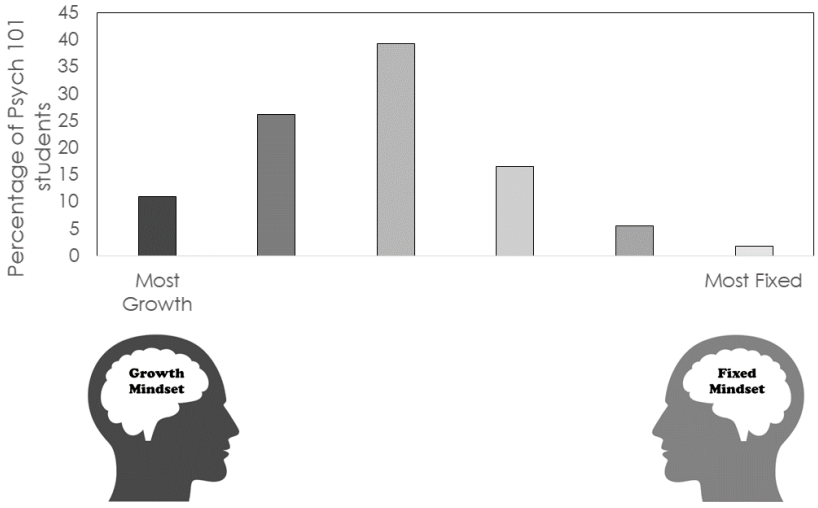

Table 1.

Theory of Intelligence Scale

Item
1. Your intelligence is something very basic about you that you can't change very much
2. You can learn new things, but you can't really change how intelligent you are
3. No matter how much intelligence you have, you can always change it quite a bit
4. You can always substantially change how intelligence you are

Note. Items are from Dweck, 2006. Anchors were 1 = strongly disagree, 2 = disagree, 3 = mostly disagree, 4 = mostly agree, 5 = agree, 6 = strongly agree

Supplementary Materials

Supplementary Table 1.

Participant Demographics for Fall 2018

Gender	Class	Race
108 Male	198 First-year	67 Asian/Asian American
123 Female	36 Sophomore	14 Black/African American
15 Other or Not Reported	12 Junior	1 Native American
	0 Senior	124 White/Caucasian
		1 Pacific Islander
		9 Hispanic/Latino
		14 Multiracial
		16 Other or Not Reported