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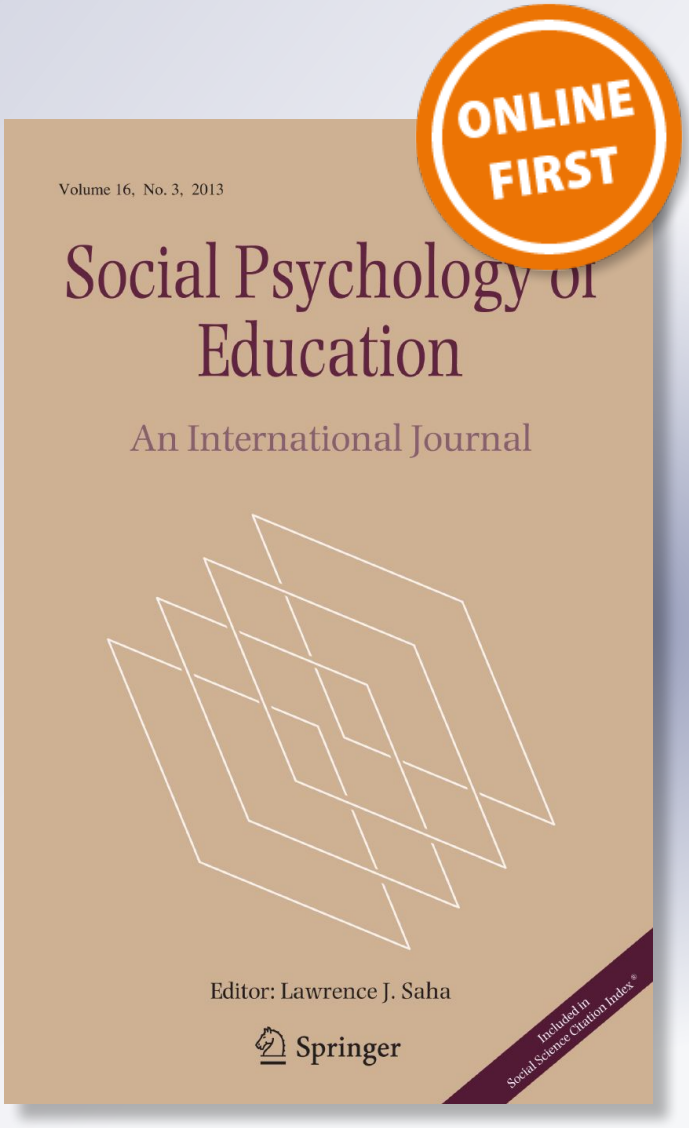
Social Psychology of Education
An International Journal

ISSN 1381-2890

Soc Psychol Educ
DOI 10.1007/s11218-018-9444-z



Springer

Soc Psychol Educ
https://doi.org/10.1007/s11218-018-9444-z

The impact of teacher language on students' mindsets and statistics performance

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Received: 15 August 2017 / Accepted: 10 March 2018

Abstract Studies have shown that performance feedback provided by teachers can communicate mindset messages to students and subsequently impact students' performance. We sought to examine whether non-feedback related comments could also influence students' mindsets and performance. We utilized a sample of undergraduate students enrolled in a research pool ($n = 106$) and compared their mindset and quiz scores after receiving a statistics lesson under one of three conditions. In two conditions the instructor introduced the lesson making comments that communicated either a fixed or growth mindset. A third condition served as a control. Students receiving growth comments moved towards growth mindset beliefs more so than those who received fixed mindset comments and had higher quiz scores when compared to the control group. These results provide early evidence that even non-feedback related comments can influence students' mindsets and performance. We discuss implications for teaching, teacher training and future research.

Keywords Motivation · Intelligence · Beliefs · Teaching · Achievement

1 Introduction

The concept of mindset or theories of innate intelligence (Dweck 2006; Dweck et al. 1988) refer to the belief that an individual holds regarding the nature of intelligence. Individuals who believe that intelligence is a static innate characteristic are said to have a fixed mindset. On the other end of the continuum is a growth mindset where individuals believe that intelligence is malleable and can be changed overtime with

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Published online: 03 April 2018

effort and careful incorporation of feedback into one's behaviors. This distinction in belief about the nature of intelligence (fixed vs. growth) has been shown to have profound effects on students' performance in school such that a growth mindset has more positive impacts while a fixed mindset has more negative impacts (Blackwell et al. 2007; Paunesku et al. 2015; Yeager et al. 2016). As such, interventions have been designed to move students toward a growth mindset (e.g., Smith 2017). Research has shown that these interventions are effective in helping students adhere to a growth mindset (Blackwell et al. 2007) and this in turn has had positive impacts on their school performance (Blackwell et al. 2007; Paunesku et al. 2015; Yeager et al. 2016). Interventions on their own are not the only way in which mindset can be affected. In this study, we focus on the way that instructor comments can influence students' mindsets and academic performance. While other studies have examined such comments when related to performance feedback, we examine the impact of other non-feedback based comments made by instructors.

1.1 Effects of instructor mindset and feedback

Instructors' beliefs and mindsets are important when considering student learning. Studies have shown that teachers' beliefs about ability can shape their classroom practices, which impact their students' learning. Teachers that hold a growth mindset regarding their students' ability are more likely to create classroom environments that are conducive to learning such as having a mastery classroom goal structure (Trouilloud et al. 2006). However, when teachers have a fixed mindset about ability, they are more likely to emphasize performance over process, create a high-risk classroom environment (e.g., threatening tests or communicating low expectations) and allow students limited autonomy over their learning (Stipek et al. 2001). Further, teachers who hold a fixed mindset regarding their students' ability are more likely to believe that their effort as a teacher cannot help their students improve (Deemer 2004) and they tend to direct attention to students who they believe have greater ability. These behaviors negatively impact the classroom by both creating a performance-goal classroom orientation and limiting the attention and support that lower performing students receive (Shim et al. 2013). These relationships are supported by experimental research (Rattan et al. 2012). Rattan et al. (2012) ran a series of experiments during which they primed participants with a fixed mindset. They subsequently found that participants were more likely to judge a student who has made a mistake or underachieved academically as "not being smart enough" to succeed. Further, the fixed-mindset participants reported being more likely to use future strategies that would reduce their engagement with the students who struggled academically (Rattan et al. 2012). Together these results suggest that instructors with fixed mindsets will be more likely to have negative classroom environments, attribute failure to a fixed inability, and use strategies that decrease engagement with their students. It may not be surprising then that research has shown that low performing students are more likely to maintain their low performance levels when their teacher had a fixed mindset about ability; however, when the teacher had a growth mindset,

low performing children are more likely to move towards moderate and even high levels of performance (see Rheinberg 2000).

Another important mechanism at play in the teacher mindset-student mindset relationship is the instruction and feedback teachers provide to students. To create a classroom that is goal or mastery oriented, for example, a teacher must communicate certain expectations for the students through directions and provide feedback on adherence with those directions. Through these communications with students, teachers may also be able to reveal their beliefs about the student's ability. Research has shown that teacher comments can indeed influence students' mindset and academic performance. Yeager et al. (2013) demonstrated what they labeled "wise feedback" to have a large effect on students' willingness to revise work as well as overall performance. Across four independent blind randomized studies where students received two versions of feedback on a written assignment, results consistently showed that adding a small phrase to the end of feedback had a large effect on the number of revisions students made to an assignment, and their performance on the assignment. The feedback statements communicated to the students that the instructor was providing feedback because they had high expectations for students, however half of the students randomly received the additional phrase "and I know you can achieve them". Although this feedback does not necessarily communicate whether the teacher believed that they were capable due to a fixed ability or effort, the effects of the teacher believing in a students' ability at all was profound, suggesting that the way feedback comments are shaped is very important.

Research that has examined feedback that explicitly communicates the teacher's mindset beliefs has also shown that the feedback students receive regarding their performance can indeed shape their mindset. For example, Mueller and Dweck (1998) found that a slight change in the language used to praise students when completing a puzzle was predictive of students' choice of future task, success with that task and likelihood to lie about their performance. After completing a puzzle, students were randomly given either growth mindset related praise, "you must have worked very hard", or fixed mindset praise, "you must be very smart" and then asked which type of puzzle they would like to do next. Those who received fixed praise were more likely to subsequently choose to do an "easy" puzzle rather than a difficult puzzle compared to students who were given growth praise. The difference in students' choices was regardless of the fact that all students were being praised for doing a good job and differed only on whether that praise implied their success was due to effort or innate "smartness". Importantly, the effects found by Mueller and Dweck for several variables, including task enjoyment, interest to persist, and performance, were large ($d \geq .84$). Mueller and Dweck's findings are consistent with studies that show mindset is related to a host of academic behaviors, such as self-efficacy, academic worry, and academic performance (see Dai and Cromley 2014), but also provide further evidence that the feedback students receive about their performance can influence their future academic behaviors.

1.2 Current study

Given that it has been demonstrated that feedback based comments that differ in their underlying mindset messages can have such large effects on students, it seems important to understand if other comments made by instructors could have similar impacts. That is, while feedback comments about students' performance can aid in shaping students' mindsets, it may also be that comments made in other scenarios that are not feedback related, such as comments about the subject in general or introductory comments about a course can also impact students' mindsets. Encouraging instructors to use growth mindset feedback may be mute if other comments made to students outside of the feedback setting relay fixed mindset messages and this in turn has negative impacts. While feedback is an important part of the communication that happens between an instructor and student, it is neither the only form of communication nor the most common one as classroom time is filled with opportunities for the instructor to send messages to their students. Feedback on assignments, on the other hand, only happens as frequently as assignments are given, which is unlikely to exceed classroom time. In this study we focus on the way in which non-feedback related comments made by instructors influence students' mindsets.

While two studies have shown the way in which feedback on performance can influence these mindsets, we were unable to find any studies that examined the way in which comments at the beginning of an experience with an instructor, such as the first day of class, can impact students' mindsets and academic performance. As such, we tested the ability of such comments, made by an instructor outside of performance feedback situations, to impact students' mindsets. Similarly to other studies on instructor comments (Mueller and Dweck 1998; Yeager et al. 2013), we also utilized brief one-time comments made by an instructor (see Sect. 2) and expected that the various comments (fixed vs. growth) would influence students' mindsets and academic performance.

We hypothesized that compared to students in a control group, students' mindsets would shift overtime towards a growth mindset for those who had an instructor who made growth mindset comments and towards a fixed mindset for those who had an instructor who made fixed mindset comments. We also expected that students' quiz scores after receiving a lesson from their instructor would differ such that those with an instructor who made growth comments would have the highest scores when compared to students who had an instructor who made fixed mindset comments and students in a control group.

2 Methods

2.1 Participants

Data were collected from a sample of undergraduate students at a private University in the northeast ($n = 106$). Students were part of a research participant pool comprised of students completing psychology courses. Students received credit for participation in their respective psychology course(s) in which they were currently

enrolled. The sample was mostly female, 77.5%, and Caucasian, 57.7%, with African American/Black making up 26.8% of the sample. Students were most likely to be in their first (55.6%) or second year (23.9%) of university and split between psychology majors, 44.0%, and non-psychology majors, 56%.

2.2 Compliance with ethical standards

Cabrini University's Institutional Review Board approved all research activities. Informed consent was obtained from each participant prior to beginning the study. An alternative assignment was available for students who did not wish to participate in research; however, all students consented to participating in the study. The researchers had no conflict of interest in pursuing the research reported here.

2.3 Materials and procedure

Students signed up to report to a psychology laboratory to complete the research during predetermined time slots. Each time slot had been assigned to one of three conditions a priori: fixed mindset instructor, growth mindset instructor, and control. Upon arrival (T1), all participants, regardless of condition, completed two surveys using laboratory computers to assess their mindset and collect demographic information. The participants completed 6-items used to measure mindset (see Wang and Ng 2012) that have been used in large-scaled randomized trials of mindset interventions, allowing us to compare effects observed in those studies to the effects observed in this study. Items are rated on a 5-point Likert scale with higher scores indicating agreement with fixed-mindset statements. Three items measured students' beliefs about intelligence (e.g., "a student's smartness is not something s/he can change very much") and three measure students' beliefs about school performance ability (e.g., "there is not much a student can do to influence his/her performance in school"). This two factor model has been validated and shown acceptable estimates of reliability (intelligence, $\alpha = .72$ and school performance $\alpha = .67$; Wang and Ng 2012), and similar reliability estimates were found in this study for intelligence, $\alpha \geq .80$, however school performance items yielded lower estimates, $\alpha = .36$ to .56.

After completing the surveys, each student participated in a lesson that was either self-paced (control group) or guided by an instructor (fixed and growth group). For the control group, students read a brief welcome that included directions to go through a slide presentation on the computer that had detailed notes explaining each slide. The fixed and growth groups viewed the slides projected at the front of the classroom while the instructor presented the material in the notes from a podium. The notes were identical to those used in the control condition, however instructors memorized the notes prior to the study so that they could be to presented to students in such a way as to mimic a typical classroom presentation format rather than a verbatim reading of notes. Prior to the presentation, the instructors welcomed students and provided directions during which language was manipulated to include either fixed statements or growth statements. For example, in the fixed group, students were welcomed, told they would be going through a lesson on introductory statistics and then told "not everyone is good

at statistics". The growth group received an alternative statement at this point, "everyone can learn statistics if they try." The full scripts for each group are provided in the "Appendix". This method was used to ensure that all three groups had identical exposure to content material but that the fixed and growth groups could experience a manipulation in instructor comments to examine the potential for such comments to affect student mindset and performance based on whether the comments were fixed- or growth-mindset oriented. While our focus was on the differences between the fixed and growth conditions, we included a control group to provide a baseline for changes in mindset and quiz scores overtime when no instructor interactions were present. This allowed us to determine if the presence of an instructor alone led to more positive or negative changes.

Three instructors ran a total of six sessions. Each instructor ran one growth session and one fixed session. The lesson took approximately 20 min to complete after which students completed the mindset items a second time (T2) as well as seven items from the first section of the Research Methods Skills Assessment (RMSA; Smith and Smith 2018) that cover introductory statistics content. The RMSA has been shown to have high reliability ($\alpha = .78$) and validity (Smith and Smith 2018). Using the first seven items of the RMSA in this study yielded an internal reliability estimate of $\alpha = .67$. The content of all the items was covered in the lesson including central tendency and variability, *z*-scores and outliers. Items were graded as correct or incorrect and averaged on a scale of 0–100% correct.

2.4 Statistical analysis

In addition to reporting the results of null hypothesis significance tests (NSHT), effect sizes for all tests were also calculated using Cohen's *d*. We reported full test statistics (e.g., *t*, *p*, and *d*) as recommended by the APA Publication Manual (American Psychological Association 2010), but, given the concerns with null hypothesis significance testing (Cumming 2008, 2014) such as the unreliability of *p* values, we placed interpretative emphasis in our discussion on the changes or relationship between variables using effect sizes. Cohen's *d* effect sizes were interpreted using common interpretations: between 0.20 and 0.49 small, between 0.50 and 0.79 moderate and 0.80 and above to be large (Cohen 1992). However, we also compared effect sizes to prior studies that demonstrate effects of comments on students performance (Mueller and Dweck 1998; Yeager et al. 2013). This comparison is key to our analysis. Rather that attempting to demonstrate that an effect exists, which is the standard in NHST, we looked to compare how the effect of general instructor comments is similar or different to past findings of effects of feedback comments. Table 1 provides a summary of effects observed in past studies examining instructor feedback on performance that are comparable to the two key areas under investigation here: mindset and performance.

Table 1 Effect sizes observed in past studies examining instructor feedback

Study	Effect for area under investigation
Mueller and Dweck (1998)[a]	Effects of comments on student mindset
	$d = 1.61$, growth group versus fixed group
	Effects of comments on performance
Mueller and Dweck (1998)[a]	$d = .68$, growth group versus control group
	$d = 1.36$, growth group versus fixed group
Yeager et al. (2013)[b]	$d = .59$, growth group versus control

All effect sizes were transformed into Cohen's d so that comparisons could be made with the analyses run in the current study

[a]Mueller and Dweck (1998) examined the effect of "intelligence and effort praise" on students. Intelligence praise refers to comments about ability being innate and is identified in the table as the "fixed group". Effort praise refers to comments about ability being malleable and is identified in the table as the "growth group"

[b]Yeager et al. (2013) examined the effects of "wise feedback" on students. Wise feedback included growth-oriented phrasing that indicated to students that the teacher believed in their ability, identified in the table as the "growth group". Although this feedback is not matched directly to mindset, we use it here as it is the only study available that utilized randomly assigned control groups across four studies and reported the effects on the same outcomes being measured in this study including performance

3 Results

To estimate the impact of the instructors' comments on students' mindsets, we ran repeated measures ANOVAs examining the change in mindset IQ scores and school performance scores from T1 to T2 between the three conditions. Using the methods of estimation, we focused on the effect sizes resulting from this analysis. For mindset IQ scores, the control group showed very little change from T1 to T2; however, the fixed and growth mindset groups both moved towards a growth mindset after receiving instruction from a teacher indicated by a decrease in scores. This change towards a growth mindset was more pronounced for the growth mindset group than the fixed mindset group shifting 2.72 times the amount of the fixed group. The growth group had a larger decrease overtime than control group, $t(61) = 2.48$, $p = .015$, $d = 1.75$ and the fixed mindset group, $t(47) = 2.87$, $p = .04$, $d = 2.02$. The effects of instructor comments on students' beliefs about IQ in past research were estimated at $d = 1.61$ when comparing students who received feedback that was effort based (e.g., growth) compared to intelligence based (e.g., fixed; See Table 1). The estimated corresponding effect between the growth and fixed group in this study was $d = 2.02$, indicating that instructors' comments that were not feedback related yet communicated ideas about the origin of intelligence did in fact impact students in a similar way as feedback comments directly related to the students' performance examined in past studies.

For school performance ability belief scores, very small changes were observed from T1 to T2 when comparing the increase for the growth group to both the control and fixed groups, $t(61) = 0.25$, $p = .80$, $d = .11$, and $t(47) = -1.12$, $p = .26$, $d = .16$, respectively.

There was a small effect of condition on scores on the RMSA quiz with the growth condition having higher average scores, $M = .74(.25)$ than the control condition, $M = .67(.22)$, $t(61) = -.96$, $p = .337$, $d = .24$ and fixed condition, $M = .65(.23)$, $t(47) = -1.25$, $p = .214$, $d = .36$. These effects were small and were below the effect estimates from past studies that ranged from $d = .59$–1.36.

4 Discussion

In past studies, feedback given to students that communicates either a fixed or growth mindset has been shown to have a large effect on students' mindsets as well as their performance in school. We sought to examine if general introductory comments could have a similar effect on students. After assigning students to three groups that differed in the types of introductory comments students received, we observed a large effect on beliefs about IQ and smaller effects on beliefs about school performance ability and quiz score. We took these results as early evidence of the ability for brief introductory comments made by an instructor to influence students' mindsets and to a lesser extent their academic performance in a course.

Manipulating the instructors' comments to reflect a fixed or growth mindset had a large effect on students' beliefs about IQ. These findings are consistent with previous studies that have shown growth related comments led to students shifting towards a growth mindset. The size of the effect in this study, however, exceeded that of previous findings ($d = 2.02$ vs. 1.61). Together, we took these results as evidence of the instructors' brief introductory comments having impacted students' mindsets with respect to IQ.

The effect of the instructors' comments on students' mindset was small for beliefs about school performance ability and slightly larger, but still limited, on students' quiz performance. This may be indicative of the fact that the session students attended was short and although devised to mimic a classroom lesson, was in fact laboratory based and had no impact on their actual grades. If in fact the quiz scores had bearing on their grades, students may have reacted differently. For example, a larger difference may have resulted if students in the growth group had additional motivation to do well because the quiz would count towards their grade. In contrast, having the quiz grade count for the fixed group may have had a cumulative effect in conjunction with the fixed comments that would have lead to greater anxiety and in turn lower quiz scores.

While our focus was on the differences between fixed and growth mindset groups, we included a control group to ensure that changes were not simply a function of an instructor being present. If in fact the presence of an instructor alone has a positive effect, this should be evident regardless of the types of comments made. We did not observe this. Although the control group was different from both the fixed and growth groups, both experimental groups also differed from each other suggesting that the assigned comments to each group affected students' mindset and quiz scores.

When examining students' mindset related to school performance between two points in time, we observed very little change for all three groups in the study.

This is contrary to what was expected—movement towards a fixed mindset for the fixed group and towards a growth mindset for the growth group. The reason for the small change may be that the comments were not specific enough to elicit a positive change that is moving towards a growth mindset with respect to school performance for the growth group. An alternative explanation may be that the results are due to measurement error given that the internal reliability estimates for the school performance scale were low for this sample.

4.1 Future research

Future studies are needed to more thoroughly examine the effect of instructor language in actual classrooms to determine whether differences will exist in the real world. Although there are ethical concerns to deliberately using language that may be damaging to students' performance in an actual course, there is precedent from the data collected here under random conditions to justify further investigation. Rather than dictating language for instructors, researchers could observe classrooms for existing language being used and classify it according to the types of mindset messages it sends. While this would only allow for correlational analysis with student outcomes rather than random experimentation, if done on a large scale with diverse samples, it could provide convincing evidence as to the type of comments that can be helpful or hurtful to students. Such findings have implications for teacher training, continued development and certainly student success.

4.2 Implications

As aforementioned, teachers' beliefs have consequences on their classroom practices and in turn students' learning. Knowing that comments that reflect a growth or fixed mindset can influence students' mindsets and academic performance is important and creates impetus for teacher education on mindset. However, if teacher beliefs shape their practices, it is important that teacher education does not simply dictate that the comments used in the classroom are growth-oriented, but also ensures that teachers are aware of the underlying theory supporting the use of growth mindset comments. There are many resources available for such education, for example, several free online sources (e.g., mindsetonline.com; mindsetworks.com) that provide bulleted steps for how to change your mindset to be growth-oriented as well as information that discusses the way in which mindset influences not only academic performance but the neuropsychological process underlying it. Being equipped with this knowledge and background would allow teachers to embrace a growth mindset about students' ability as well as their ability to teach, which are both shown to be important factors related to positive teacher practices and student learning (Deemer 2004; Shim et al. 2013). A background in mindset would also be helpful to teachers when choosing language that is growth mindset oriented when communicating with students.

4.3 Limitations

A limitation in this study was the lack of investigation into potential group differences. The literature has shown that mindset interventions have disproportionate effects on minority students based on race, ethnicity and socioeconomic status. It will be important for future studies examining instructor comments to compare the effects between demographic groups to determine whether such comments have a stronger effect on particular groups.

In additional to examining differences between race, ethnicity and socioeconomic status, it is also important to examine differences in effects between undergraduates studying different subjects. A large body of literature exists that highlights the gender, race and ethnicity gaps in STEM disciplines. Currently, only 26% of people employed in STEM are female, and racial and ethnic minorities make up only 29.2% of STEM employees (Landivar 2013). Examining group difference, whether based on race, ethnicity, socioeconomic status, major, or an interaction of these variables also has important implications for teacher training, professional development and student success.

5 Conclusion

The findings in this study suggest that when instructors have growth-oriented comments when introducing a course, even if the comments are brief, the comments can have a large effect on students' beliefs about IQ being malleable. This highlights the influence that instructors can have on students during the first few moments of their class time with students—something that all instructors have an opportunity do. Although the comments used in this study were brief, mindset interventions that have been shown to be effective in past studies have been as brief as 30-min. This suggests that beliefs about intelligence can be changed in a short window of time. The results of this study, in combination with past research, begin to paint a larger picture of the various ways in which student mindsets can be shaped: through interventions that instruct students about the nature of intelligence, feedback given on assignments and task performance as well as comments made when introducing a course. As research on teachers' roles in shaping mindset moves forward, it will be important to understand how these behaviors interact and differ between groups so that we can better provide a supportive and growth-oriented classrooms for students that allow for their academic success.

Appendix

Introductory script for growth and fixed conditions

Growth condition Welcome to our project. Today, we are going to discuss introductory statistics. We are going to take everything step by step; I'm not going to just throw everything at you and wish you good luck! I'll be here every step of the way.

Everyone can do well with statistics if they work at it. There are a lot of students who believe that they are not good with statistics or math, students with poor math grades in the past, even some with learning disabilities, and with the right effort they have been very successful. Please make mistakes while we are here and ask questions! [IF A QUESTION ARISES: Answer directly *without* making extra comment (e.g., "good question").]

Fixed condition Welcome to our project. Today, we are going to discuss introductory statistics. I am going to go through all the information up here on the slides. It is up to you to follow along. Some people do better with math than others. Sometimes doing badly in math in the past, or having a learning disability can make doing statistics harder. Be careful not to make mistakes while you are here. We will not have time for questions, please focus on the information [IF A QUESTION ARISES: I'm sorry, we don't have time for questions].

References

American Psychological Association. (2010). *Publication manual of the American Psychological Association*. Washington, DC: American Psychological Association.

Blackwell, L. S., Trzesniewski, K. H., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and an intervention. *Child Development, 78*(1), 246–263. https://doi.org/10.1111/j.1467-8624.2007.00995.x.

Cohen, J. (1992). Statistical power analysis. *Current Directions in Psychological Science, 1,* 98–101. https://doi.org/10.1111/1467-8721.ep10768783.

Cumming, G. (2008). Replication and p intervals. *Perspectives on Psychological Science, 3*(4), 286–300. https://doi.org/10.1111/j.1745-6924.2008.00079.x.

Cumming, G. (2014). The new statistics: Why and how. *Psychological Science, 25*(7), 7–29. https://doi.org/10.1177/0956797613504966.

Dai, T., & Cromley, J. G. (2014). Changes in implicit theories of ability in biology and dropout from STEM majors: A latent growth curve approach. *Contemporary Educational Psychology, 39*(3), 233–247. https://doi.org/10.1016/j.cedpsych.2014.06.003.

Deemer, S. (2004). Classroom goal orientation in high school classrooms: Revealing links between teacher beliefs and classroom environments. *Educational Research, 46*(1), 73–90. https://doi.org/10.1080/0013188042000178836.

Dweck, C. (2006). *Mindset: The new psychology of success*. New York: Ballantine Books.

Dweck, C. S., Leggett, E. L., Cain, K., Clore, G., Erdley, C., Markman, E., et al. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*(2), 256–273. https://doi.org/10.1037/0033-295X.95.2.256.

Landivar, L. C. (2013). Disparities in STEM employment by sex, race, and hispanic origin. *American Community Survey Reports, 29,* 911–922.

Mueller, C. M., & Dweck, C. S. (1998). Praise for intelligence can undermine children's motivation and performance. *Journal of Personality and Social Psychology, 75*(1), 33–52. https://doi.org/10.1037/0022-3514.75.1.33.

Paunesku, D., Walton, G., Carissa, R., Smith, E. N., Yeager, D. S., & Dweck, C. S. (2015). Mind-set interventions are a scalable treatment for academic underachievement. *Psychological Science*, *26*(6), 784–793. Retrieved from http://pss.sagepub.com/content/26/6/784.full.pdf.

Rattan, A., Good, C., & Dweck, C. (2012). It's ok–not everyone can be good at math": Instructors with an entity theory comfort (and demotivate) students. *Journal of Experimental Social Psychology, 48*(3), 731–737.

Rheinberg, F. (2000). *Motivation* (3rd ed.). Stuttgart: Kohlhammer.

Shim, S. S., Cho, Y., & Cassady, J. (2013). Goal structures: The role of teachers' achievement goals and theories of intelligence. *The Journal of Experimental Education, 81*(1), 84–104. https://doi.org/10.1080/00220973.2011.635168.

Smith, T. (2017). Reducing anxiety in the statistics classroom. In J. R. Stowell & W. E. Addison (Eds.), *Activities for teaching statistics and research methods in psychology: A guide for instructors* (pp. 1–9). Washington, DC: American Psychological Association.

Smith, T., & Smith, S. (2018). Reliability and validity of the research methods skills assessment. *International Journal of Teaching and Learning in Higher Education, 30*(1), 80–90.

Stipek, D. J., Givvin, K. B., Salmon, J. M., & MacGyvers, V. L. (2001). Teachers' beliefs and practices related to mathematics instruction. *Teaching and Teacher Education, 17*(2), 213–226. https://doi.org/10.1016/S0742-051X(00)00052-4.

Trouilloud, D. O., Sarrazin, P. G., Bressoux, P., & Bois, J. (2006). Relation between teachers' early expectations and students' later perceived competence in physical education classes: Autonomy-supportive climate as a moderator. *Journal of Educational Psychology, 98*(1), 75–86.

Wang, Q., & Ng, F. F. Y. (2012). Chinese students' implicit theories of intelligence and school performance: Implications for their approach to schoolwork. *Personality and Individual Differences, 52*(8), 930–935. https://doi.org/10.1016/j.paid.2012.01.024.

Yeager, D. S., Purdie-Vaughns, V., Garcia, J., Apfel, N., Brzustoski, P., Master, A., et al. (2013). Breaking the cycle of mistrust: Wise interventions to provide critical feedback across the racial divide. *Journal of Experimental Psychology: General, 143*(2), 804–824. https://doi.org/10.1037/a0033906.

Yeager, D. S., Walton, G. M., Brady, S. T., Akcinar, E. N., Paunesku, D., Keane, L., et al. (2016). Teaching a lay theory before college narrows achievement gaps at scale. *Proceedings of the National Academy of Sciences of the United States of America*. https://doi.org/10.1073/pnas.1524360113.

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