Discussant

Growth

Carol S. Dweck*

Stanford University, California, USA

The topic

Why is the topic of this Special Issue so important? As the authors point out, growth is the heart and soul of education – it is the very purpose of education. School removes us from 'real life' for 12, 16, or even 20 years or more – and it does this with the hope that we can grow the skills that make our lives better and that allow us to contribute more to society.

Growth, in fact, is built into us. Infants begin to learn *in utero* and, after birth, they put on display their endless quest for growth. And they get where they are going. Barring disabilities, they virtually all walk and they virtually all talk. In the light of this, it is sad, even ironic, that when schools take these same children in hand to deliberately teach them, the growth slows dramatically for many.

That is what makes this Special Issue so important. It does not allow us to conclude that some students are simply more talented than others and to leave it at that. It invites us to look more closely. The focus on growth leads us to ask: How can we understand motivation for growth and then use that knowledge to motivate all children to learn? It also leads us to ask questions about how educators should evaluate and reward their students' academic work; about how we know when growth has taken place; and about how we can create a culture of growth (and not simply of grade getting) in every classroom and school.

Thus, although it is a current fact of life that there are large differences in achievement among children at any given grade level, it is possible that measuring and rewarding growth, as the authors point out, is one way that all children's learning can be appreciated, and can be appreciated in ways that spur them to further growth.

The task for this Special Issue

What a great idea it was to ask leading thinkers and researchers in this area to reflect on questions of growth and to share with us their latest findings. Following their assigned mission, the authors in this issue take us on a grand tour of current thinking about growth. Each paper isolates a critical piece of the issue: What student goals lead to a growing belief in intellectual growth? What goals or beliefs capture a striving for growth? Can we, through more fine-grained analysis, understand the psychology of growth in order to promote it? And, how do we know when growth has taken place – that is, how can we best

Correspondence should be addressed to Carol S. Dweck, Department of Psychology, Stanford University, Stanford, California, 94305, USA (e-mail: dweck@stanford.edu).

measure and model it? As we read these important articles, we see the complexity but we also see the excitement and the promise – the potential contributions when researchers come together around a central issue in education.

Never forget the psychology of the student

I have always been deeply concerned with what students are wanting, thinking, feeling, and actually doing as they tackle and perform difficult learning tasks. For this reason, big data and fancy statistical models are sometimes mixed blessings. As Anderman, Gimbert, O'Connell, and Riegel (2015, this issue) so aptly point out, even the same data can yield highly discrepant conclusions when different growth analyses are applied to them. This is fascinating and sobering. So, let us try not to rely *only* on large sample correlations and big data models to the point that we forget about the psychology of the student. In all of our (appropriate) concern about which goal measures have which psychometric properties and which state-of-the-art analyses to use, we risk forgetting about the psychological mechanisms that guide students' thoughts, feelings, and behaviour to ultimately determine their academic performance. For this reason, we need to supplement our large-scale correlational studies with smaller scale (1) correlational studies in which we measure students' growth-relevant beliefs or goals and then closely observe their thoughts, feelings, actions, and outcomes as they perform a task, and (2) experimental studies in which we manipulate growth-relevant beliefs or goals and closely observe the results. When we understand these psychological mechanisms, we put ourselves in a better position to design appropriate and effective interventions.

Predicting, producing, and rewarding growth: Some of our recent findings

Our own work has focused on growth for some time, starting with the question of whether students believe in growth (their mindsets about intelligence). We have found that some do and some do not. Some students believe that their intelligence can be developed (a growth mindset), whereas others believe that it is fixed (a fixed mindset). We have also found a whole 'psychology' goes along with these beliefs: How much students value learning over looking smart, how much they value hard work, and how resilient they are in the face of setbacks (Blackwell, Trzesniewski, & Dweck, 2007; see also Dweck, 1999). We have found that these beliefs predict achievement over time, particularly in difficult courses (Good, Rattan, & Dweck, 2012) and across difficult transitions (Blackwell *et al.*, 2007). Along the way, interventions have been developed to teach a growth mindset (Aronson, Fried, & Good, 2002; Blackwell *et al.*, 2007; Good, Aronson, & Inzlicht, 2003), with the consistent finding that learning a growth mindset fosters greater gains in achievement, particularly for groups of students who are at risk for lower achievement.

In recently completed studies, my colleagues and I have taken these interventions to scale. Growth-mindset sessions delivered on the Internet have increased course mastery, grades, and full-time enrolment among large samples of high school and university students, again particularly for those students belonging to groups that are most vulnerable to underachievement (e.g., Paunesku *et al.*, 2015a,b; Yeager *et al.*, 2015).

An extremely important point made in this issue is that better attending to growth can help level the playing field. Unfortunately, however, in a typical educational setting, the advanced students garner the accolades and the struggling students, even if they make progress, may not be recognized in ways that allow them to feel proud of their growth.

Sharing this insight and capitalizing on it, we teamed up with game scientists from the University of Washington to create a maths game for primary school students that would reward growth (O'Rourke, Haimovitz, Ballweber, Dweck, & Popovic, 2014). The typical maths game, like the typical classroom, awards points for solving problems as quickly as possible. However, our new game 'Brainpoints' did not. Students earned no points if a level was easy for them. Instead, Brainpoints rewarded effort, the use of strategies, and persistence, and there were algorithms built into the game that recognized these factors. We found that students who played the Brainpoints game, compared with those who played the standard game, indeed showed more sustained effort, tried more strategies as they attempted to solve problems, and displayed greater persistence on the harder problems we inserted. Perhaps most important of all was this: In the standard game, it was mostly the advanced students who played the longest, but in the Brainpoints game, many more of the less (or even least) advanced students played the maximum time. It was a game they could win at.

What else do we need to know?

I believe we need to understand much more about contexts that foster beliefs and goals that create growth. For example, it might be exceedingly difficult for educators to create an ideal atmosphere for growth in their students if they themselves do not believe that all students can grow their intellectual ability or if their praise, evaluation, and reward practices focused on current ability rather than the development of ability over time.

Equally important, it might be difficult for teachers to create contexts of growth for students if the teachers do not believe in growth for themselves and are not rewarded for their own growth. If teachers have fixed mindsets about their own teaching ability, they are likely to be threatened by low-performing students (who are not responding to their current teaching methods) and may be tempted to blame the students or the students' ability for their poor showing. If, however, teachers believe that their own skills can be developed, each student provides an opportunity for them to learn more about their craft. To me, the motto of such a teacher might be the following: Every student has something to teach me.

Policymakers need to reflect seriously on how current practices, such as high stakes testing, might be creating an atmosphere that works against true growth in both students and educators. I believe it is part of our role as researchers to study these issues and then to inform policymakers how they can best implement new practices that maximize growth.

The work in this issue is only the beginning. We seem to have all the right ingredients at hand – researchers who believe in growth and who are dedicated to learning about and promoting growth in students. It would be wonderful to have a Special Issue like this every few years, so we can continually assess the growth in our knowledge about growth!

References

Anderman, E. M., Gimbert, B., O'Connell, A., & Riegel, L. (2015). Approaches to academic growth assessment. *British Journal of Educational Psychology*, *85*, 138–153. doi:10.1111/bjep.12053.

Aronson, J., Fried, C. B., & Good, C. (2002). Reducing the effects of stereotype threat on African American college students by shaping theories of intelligence. *Journal of Experimental Social Psychology*, *38*, 113–125. doi:10.1006/jesp.2001.1491

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. doi:10.1111/j.1467-8624.2007.00995.x

Dweck, C. S. (1999). *Self-theories: Their role in motivation, personality, and development*. Philadelphia, PA: Taylor & Francis.

Good, C., Aronson, J. A., & Inzlicht, M. (2003). Improving adolescents' standardized test performance: An intervention to reduce the effects of stereotype threat. *Journal of Applied Developmental Psychology*, *24*, 645–662. doi:10.1016/j.appdev.2003.09.002

Good, C., Rattan, A., & Dweck, C. S. (2012). Why do women opt out? Sense of belonging and women's representation in mathematics. *Journal of Personality and Social Psychology*, *102*, 700–717. doi:10.1037/a0026659

O'Rourke, E., Haimovitz, K., Ballweber, C., Dweck, C. S., & Popovic, Z. (2014). *Brain Points: A growth mindset incentive structure boosts persistence in an educational game*. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI 2014). New York, NY: ACM.

Paunesku, D., Gripshover, S., Romero, C., Beaubien, J., Yeager, D. S., Dweck, C. S., & Walton, G. M. (2015a). Two scalable psychological interventions advance progress through community college. *Journal of Educational Psychology* (invited paper), Submitted.

Paunesku, D., Walton, G. M., Romero, C. L., Smith, E. N., Yeager, D. S., & Dweck, C. S. (2015b). Mindset interventions are a scalable treatment for academic underachievement. *Psychological Science*. Advance online publication. doi:10.1177/0956797615571017

Yeager, D. S., Walton, G. M., Brady, S., & Akcinar, E., Paunesku, D., Keene, L., . . . Dweck, C. S. (2015). *Brief pre-matriculation messages can reduce post-secondary inequality at institutional scale*. Unpublished manuscript.