FOSTERING A GROWTH MINDSET IN PHYSICS

Laura Goldhorn[a], Thomas Wilhelm[a], and Verena Spatz[b]

Presenting Author: Laura Goldhorn (goldhorn@physik.uni-frankfurt.de)
[a]Department of Physics Education, Goethe-University, Frankfurt, Germany
[b]Department of Physics Education, Technical University of Darmstadt, Darmstadt, Germany

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Students hold different beliefs about the nature of intelligence. While some believe in intelligence as a fixed trait (fixed mindset), others believe in a more malleable nature of intelligence that can be actively developed (growth mindset). These often unconsciously held beliefs can influence students' engagement in learning and (therefore) their academic performance. Especially when facing difficulties and/or overcoming setbacks, a growth mindset is more supportive for students' engagement. Students with a growth mindset focus on the learning process, while students holding fixed beliefs feel like they won't ever be able to master the difficult tasks and tend to give up. Since mindsets are beliefs, they can be changed, for example, by targeted interventions to foster a growth mindset (Dweck, 1999; Yeager et al., 2019).

While most of the mindset research targets students' general academic mindset, we focus on their physics specific beliefs. Physics is described as "challenging" and "difficult" and in Germany, a majority of students choose to drop physics as soon as possible. We designed and evaluated a physics specific mindset questionnaire, asking students not only about their beliefs about intelligence, but also about their beliefs about learning physics and a (potential) giftedness in physics. The results of this survey show: students' physics specific mindsets change over time, without targeted interventions. While in the beginning of physics classes in middle school, a majority of students hold a growth mindset in physics, this percentage decreases drastically during the years of learning physics. The biggest mindset change is observable during the first year of physics classes: the growth mindset decreases to from 69.1% to 43.5% and the fixed beliefs about an innate giftedness in physics extend from 4.3% to 13.4% (Goldhorn et al., 2022).

Aiming to support a growth mindset in physics, we designed a subject-specific intervention based on the work/research of Yeager et al. (2016). Working on tasks about learning strategies in physics, middle school students learn implicitly about the growth mindset. Based on the knowledge of neuroplasticity, the metaphor of the brain as a muscle that builds strength through (hard) learning is used to teach the malleability of intelligence (Blackwell et al., 2007). Connecting this knowledge directly with a physics topic should support the domain-specific growth mindset. The talk focuses on a first pilot study with eight graders.

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