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Education Research with the Engineering Curriculum

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Background

The purpose of this research is to understand the tendencies of engineering students to cheat on exams, assignments, etc., and how those tendencies can be prevented and/or reduced. Beliefs about the nature of intelligence are identified as the key lever of several aspects of engineering. Reviewed literature provides a framework for the beliefs about people's intelligence: most individuals believe that intelligence is static and remains constant (fixed mindset), while some believe it is ever-growing and changes through focus and practice (growth mindset). Research has shown that exposing people to the growth mindset can impact their beliefs. This study contributes to this area of research by asking the research question: How do engineering students react to an in-depth growth mindset intervention?

By obtaining qualitative data through interviewing freshmen and senior engineering students (statistics show that they are most likely to cheat), we will determine what type of mindset that these students are governed by. If our data shows that the majority of students are under the fixed mindset of their intelligence, we plan to advance to selecting students to read Dweck's 2006 Mindset book, and meet to discuss about their reactions to what they read. Through these discussions, we plan to shift the students' perspectives on intelligence.

This research is useful for educators who are interested in implementing an environment where students are exposed to the growth mindset about the nature of intelligence. Future work will include studying how the growth mindset will change over the undergraduate experience and the development of engineering courses that implement the growth mindset into their course work.

Purpose

In this literature review, we will understand the underlying motivations of students and professors, through the characterizations of the two mindsets as addressed in Dweck's 2006 Mindset book, so that an experimental procedure could follow.

Terminology

Fixed Mindset

- The belief that intelligence and/or a skill is something static that remains constant for an individual

Growth Mindset

- The belief that intelligence and/or a skill is malleable and changes (or grows) with focus and practice

Research Approach

- The research is interpretive, where the data collected is dependent on the reactions of the participants.

Phase 1: Literature and discussion

Began by reading Mindset by Carol S. Dweck

Thoroughly recorded and summarized major points

Assembled a group of 3 people and discussed reading

Recorded topics discussed

Phase 2: Data collection and interpretation

Interview students on success perspectives

Turning interpretive data into quantitative data

Literature research of current coding methods for the data type change

Results

- The first phase of our research is under way.
- Using the research assistants as participants of the Mindset intervention, the following results are evident.
 - Associating past experiences in the Mindset lens (fixed and growth)
 - Preparing for future experiences in the growth mindset perspective.
- When past experiences are shaped by the fixed mindset, the following characteristics are evident:
 - Associating academic failure to diminish self worth
 - Avoiding challenges, due to identity being vulnerable to success
 - Afraid of judgment
- When past experiences are shaped by the growth mindset, the following characteristics are evident:
 - Associating success with effort and hard-working
 - Accepting challenges, due to identity not being vulnerable to success.
 - Not as susceptible to judgment

Conclusion and Future Work

As research assistants used as participants, there is still a growth mindset intervention that was instilled, which shows that exposing students to these ideologies can impact them in the same way as well.

Future literature includes Switch by Chip and Dan Heath, in addition to The Righteous Mind by Jonathan Haidt. In the meantime, interviews will be held with students to understand what mindset they fall on from an academic standpoint. The students selected will then have a similar small group discussion of Dweck's book, and tabulate results of how they will approach their academics.

Reference

- [1] C. S. Dweck, "Mindset: The New Psychology of Success," Random House, Chicago, 2006.
- [2] A. S. P. A. R. B. Dr. Emily Dringenberg, "Reactions from First-year Engineering Students to an In-depth Growth Mindset Intervention," American Society for Engineering Education, Oklahoma City, 2018.

Acknowledgements

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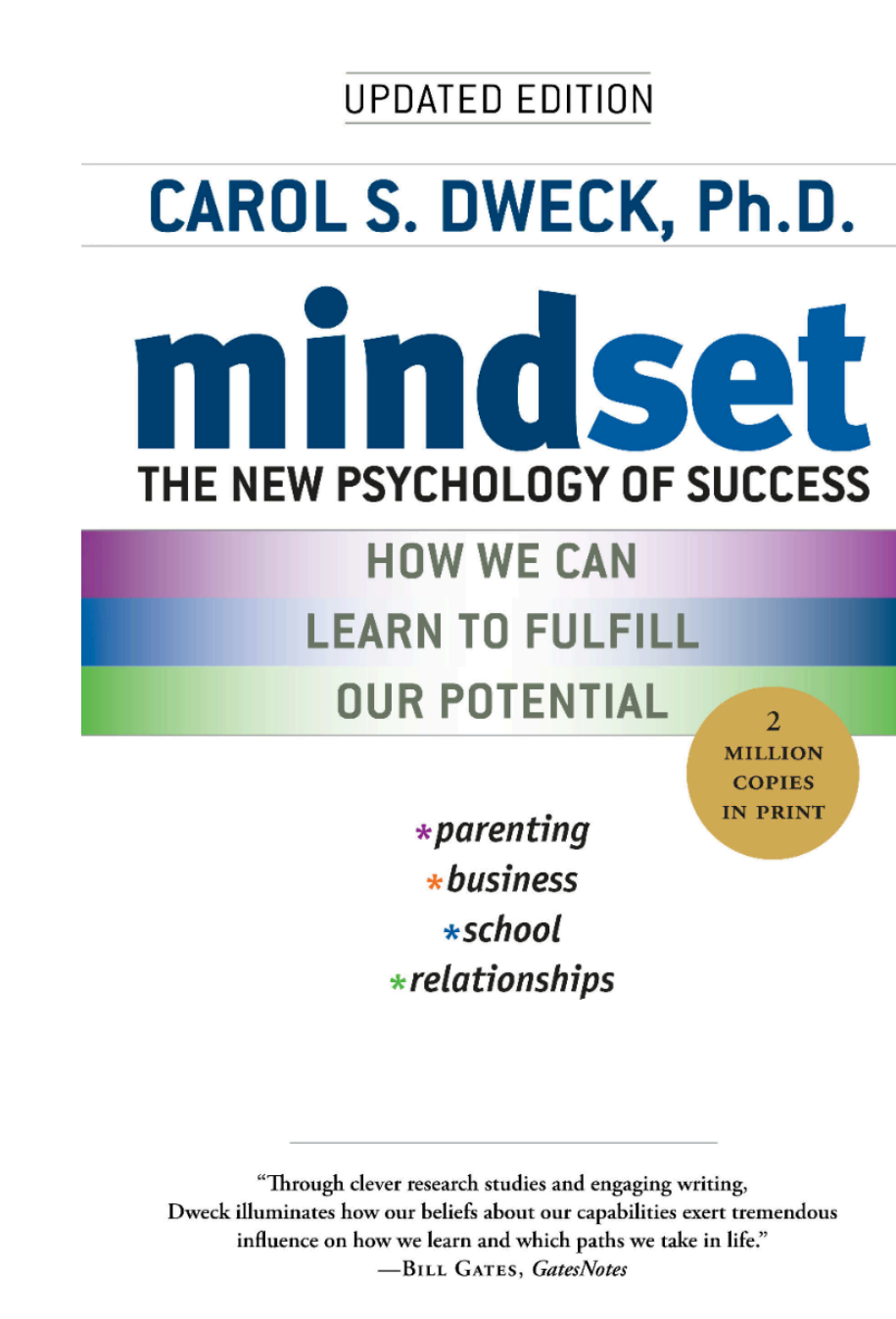


Figure 1: Primary literature Mindset by Carol S. Dweck

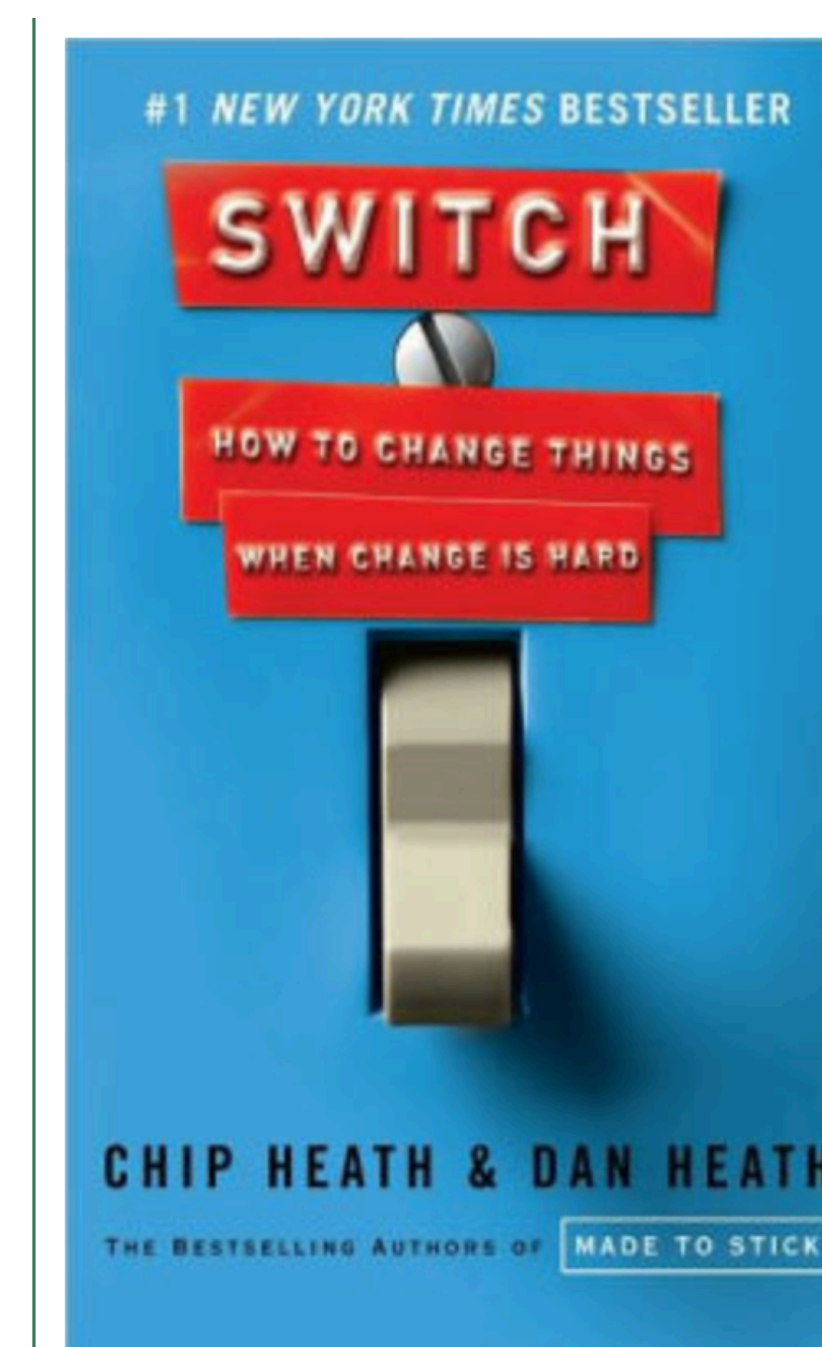


Figure 2: Alternative Literature Switch by the Heath brothers

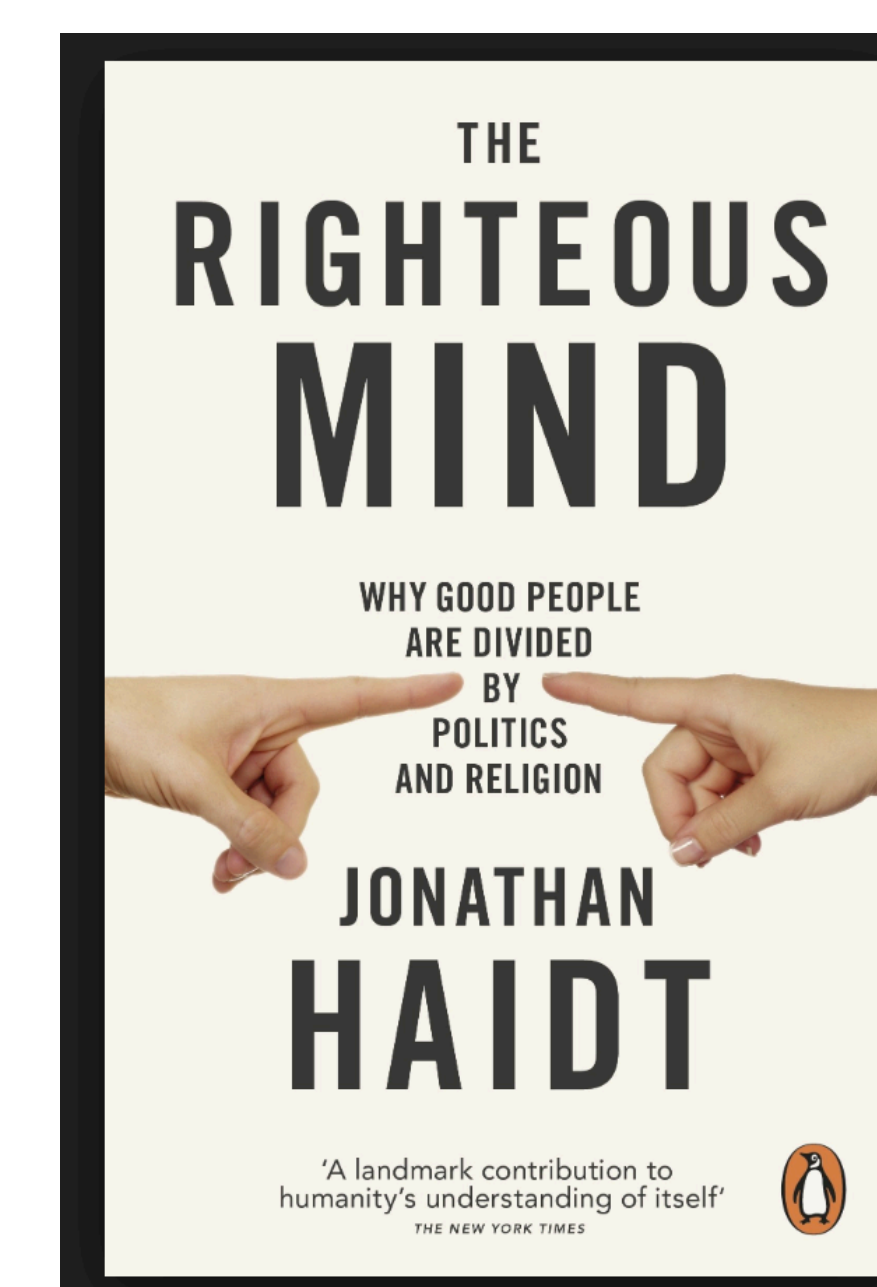


Figure 3: Alternative literature The Righteous Mind by Jonathan Haidt