

Dear Reader,

I hope you're having a great day. My experience with this R2 wasn't too shabby, and can be summarized in a few distinct events. Firstly, I quickly sketched an outline for the D2, scrapped most of it, then made a new outline. Then I expanded that outline into around 7 pages, had a friend read it over, and fixed transitions and ordering. This process went by pretty fast and I am overjoyed with how little time it took. I also learned a lot from outlining. It's definitely the most efficient way that I've come across to quickly pose a structurally sound argument.

Some things that went well: the outlining sped up the process a lot. Also not going to the writing center or office hours gave me fewer things to worry about so that made the editing go faster, and even if I regret not going for extra help, I feel comforted by the fact that I spent my time on more important things. And focusing on the important things is imperative, especially for writing sem, where our arguments need to all relate back to a central claim, something that I had no problem with because of my handy dandy outline.

Some things that did not go well: my draft workshop was pretty bad. It is very fortunate that Dr. Choi had us go outside that day so that not everyone fell asleep. I had some difficulties doing research on Google Scholar so I went to the psychology librarian, who showed me some neat tools for finding related articles. After expanding the outline, my friend said that the topic sentences were horrible and the paragraphs didn't transition at all, so I guess that's one potential downside of using outlines. Also, it definitely was not stuffy in the room.

For the actual paper, it was pretty satisfying when all the sources combined to make a unified argument. I did a lot of reading of research articles, and to my horror, I enjoyed a lot of it. If I'm ever feeling particularly inspired or bored, I may pick up some research articles to read. I guess I didn't do a great job of making the argument centered around the College Board. I mention it in the beginning and tried to go back to it at the end, but that was an afterthought so now it's just awkwardly sitting there.

My main takeaways from this are that outlines are useful and that research articles can be interesting to read. I guess I also dipped my feet in learning how to read and consolidate research into an argument presenting new information, which was cool. Thanks for reading, and I hope you have an amazing rest of the week.

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Self-efficacy: the Common Denominator of Success

All high school students dread taking the SAT--their future of getting into a prestigious college is determined by a single 4 hour long test. College Board claims that this is for the benefit of everyone, as the SAT is a “vehicle to showcase students’ academic strengths and readiness for college and careers” by testing all sorts of skills such as reading, analyzing, reasoning, understanding, etc. (The College Board, 2015, p.14). These skills seem to fit the definition of cognitive intelligence, which is the mental capacity and ability to reason, plan, and solve problems, think abstractly, comprehend complex ideas, learn quickly, and learn from experience. In essence, the SAT is an intelligence test, and by claiming that their test measures students’ academic readiness for higher education, the College Board is saying that intelligence measures academic readiness.

Many studies support this, but other studies provide evidence that there is a better predictor of academic success than intelligence, and that factor is self-discipline, defined by diligence in working and putting in effort into completing tasks. A study by Lounsbury found that there is a significant, positive relationship between intelligence and grades (Lounsbury et al., 2003) while another study by Rau found that intelligence has little correlation with academic success compared to self-discipline (Rau and Durand, 2000). This contradiction raises the question of whether or not there is a significant relationship between intelligence and

self-discipline, and whether or not there is a confounding variable that accounts for both traits. It turns out that self-efficacy is the key factor in motivating self-discipline, which then works in tandem with the objective thought process that self-efficacy garners to improve performance and, over a long period of time, build cognitive intelligence.

It is commonly accepted that high school grade point average (HSGPA) is unreliable in terms of predicting college success due to differences in grading standards, but HSGPA is still a better predictor of academic success than standardized tests. The College Board claims that they measure academic readiness through the SAT, which is a cognitive intelligence test. However, a study by Geiser and Santelices found that HSGPA is a better predictor for college grades than standardized test scores. Geiser and Santelices found that HSGPA had a correlation coefficient of 0.34 with four-year college GPA while the SAT I verbal section had a 0.07 coefficient, and the SAT I math even had a slight negative correlation to fourth-year cumulative GPA. The predictive weight associated with HSGPA increased after freshman year (Geiser and Santelices, 2007, p. 10), showing that contrary to popular belief, HSGPA is a better indicator of college academic success than SAT scores.

To explore the relationship between academic success and HSGPA/SAT scores, it is important to understand the underlying factors behind the two metrics. A study by Duckworth, Quinn, and Tsukayama found that standardized test scores assess competencies determined more by intelligence, while report card grades assess competencies determined more by self-control. They found that self-control predicted increases in grades better than IQ (correlation coefficient of 0.20 compared to 0.09) while IQ predicted changes in standardized achievement test scores better than self-control (0.29 compared to 0.01) (Duckworth et al., 2011). In context of the

findings from Geiser and Santelices, we know that HSGPA is a better predictor for college academic success than standardized test scores. Since self-control is significantly correlated to grades while intelligence is significantly correlated to test scores, we can conclude that self-control is a better predictor of college academic success than intelligence.

In addition, self-control is not only positively correlated with academic success, but might be the cause of it. A study by Duckworth and Seligman found that self-discipline predicted which students would improve their grades over the course of a semester (Duckworth et al., 2005). The improvement of grades shows that the correlation between self-discipline and grades is not just a coincidence, and suggests that improvement in grades is caused by self-discipline or a mutual factor, which is explained later in this paper.

Although there seems to be a clear relationship between how hard work and intelligence positively impact academic success, two contradictory studies show us that self-discipline seems to have a broader impact than intelligence. A study by Lounsbury, Sundstrom, Loveland, and Bigson confirmed the positive relationship between general intelligence and course grades with a correlation coefficient of 0.40. To measure general intelligence, they used the Otis Lennon Mental Ability Test, which has a correlation coefficient of 0.7 with the SAT (Lounsbury et al., 2003), thus establishing the positive relationship between standardized tests and grades. However, Rau and Durand found that standardized tests have little impact on grades, while academic ethic, defined in terms of certain behaviors and attitudes towards diligent studying, correlated positively with grades with a correlation coefficient of 0.237 (Rau and Durand, 2000).

Part of the reason for this contradiction is that Rau and Durand found little correlation between standardized tests and grades after accounting for academic ethic (2000), implying that

the impact that standardized tests have on grades is already accounted for by academic ethic. This finding is in accordance with Lounsbury et al.'s findings because Lounsbury et al. also found that work drive accounted for significant variance in predicting course grade beyond general intelligence (Lounsbury et al., 2003). While the contradiction is resolved, a new question emerges: why does hard work seem to account for all of the impact that standardized tests have on grades, and then some?

To answer this question about how our two variables predict grades, it might be helpful to study the relationship between the variables themselves, namely how intelligence and hard work impact each other. The reason hard work accounts for the effects of intelligence is because hard work predicts intelligence. A study by Duckworth, Quinn, Lynam, Leober, and Stouthamer-Loeber found that test motivation impacts scores on intelligence tests. They found that offering material incentives increased IQ scores by up to 0.96 SD, showing that "test motivation can deviate substantially from maximal under low-stakes research conditions." (Duckworth et al., 2011) Their findings show that motivation to work hard can increase scores on IQ tests, implying that self-discipline predicts intelligence, at least for certain intelligence tests. So on the surface, it seems like self-discipline impacts perceived intelligence, but what are the underlying causes behind how hard work encompasses intelligence?

A big factor in determining how hard an individual works and their future performance in a task is their perception of their own actions and how they interpret the results. A study conducted by Mueller and Dweck found that how a child perceives a failure or success can determine how hard they work on that task in the future, and how hard they work on a task indicates increased performance and improved intelligence. Mueller and Dweck had children

perform tasks and praised them for either their intelligence or for the effort that they put in. Children praised for their intelligence took more negatively to failures, displaying “lower levels of task persistence, task enjoyment, and performance,” while children praised for their effort saw failures as a result of not putting in enough work. The children praised for intelligence saw failure as a reflection of their abilities and were more likely to make up results while the children praised for effort saw failures as a reflection on the amount of effort and preparation put in (Mueller and Dweck, 1998). Clearly, the children praised for their efforts will be more motivated to work than the children praised for their intelligence because the former group will see that if they put in more work, they can accomplish the task, while the latter group will see failure as a big hit to their ego, making them more averse to working on the task in the future. How the children interpreted their results impacted their motivation to work on the task.

Mueller and Dweck also found that this desire to work harder, combined with an objective interpretation of results, led to improved performance and intelligence. When asked to choose between two types of additional problems to solve, the children praised for intelligence chose problems that would allow them to continue having good performance, while the children praised for hard work chose problems they could learn more from. When asked to choose between certain types of information, the children praised for intelligence preferred finding out about how their peers did on the tasks, while the children praised for effort were interested in receiving strategy-related information (1998). The children praised for intelligence valued performance while the children praised for hard work valued learning opportunities. Over time, it is easy to see how the skills and knowledge gained by the second group can be perceived as increased intelligence relative to the former group. Thus, the findings of Mueller and Dweck

support the idea that how a person perceives their actions is the underlying factor that motivates hard work, creating self-discipline that can increase intelligence over time. A limitation of this study is that it was done on children, but it implies that the source of a person's self-discipline lies in how much control a person feels they have over their future outcomes.

A study by Bandura shows that this keystone factor that predicts self-discipline and intelligence is self-efficacy, which determines how much control an individual feels they have in achieving their goals. Bandura finds that self-efficacy is significantly and positively correlated with high grades, intelligence, self-discipline, and many other factors. In context of the study by Mueller and Dweck, low-efficacy has similar effects to when children are praised for intelligence, while high-efficacy has similar effects to when children are praised for effort. People with a low sense of efficacy shy from difficult tasks, have low aspirations and weak commitment to goals, give up quicker, and dwell on personal deficiencies when faced with difficult tasks. On the other hand, people with a strong sense of efficacy approach difficult tasks as challenges to be mastered, maintain strong commitment to goals, heighten and sustain effort in the face of failure, and attribute failure to insufficient effort or knowledge and skills that are acquirable (Bandura, 1993). Just like the children who are praised for effort, people with a strong sense of self-efficacy are more motivated to work and learn, allowing them to gain more knowledge and skills, thus improving their cognitive intelligence.

Although self-efficacy is clearly linked to increased self-discipline and performance, can we say that intelligence can be improved via self-efficacy? A literature review by Deary provides some insight as to how intelligence is influenced. Deary states that the "heritability of intelligence is now well established" through previous studies and articles. An example Deary

gives is the e4 allele of the gene for apolipoprotein E and how it tends to correlate with lower cognitive ability (Deary, 2012). While genetics is clearly tied with intelligence, there are also environmental factors that influence intelligence. As defined earlier, cognitive intelligence is the ability to solve problems, think complexly, and learn quickly. According to Bandura, all of these aspects can be improved upon by having a strong sense of self-efficacy and putting in enough effort. Therefore, self-efficacy and hard work are important environmental factors that contribute to intelligence.

To summarize, both intelligence and hard work seem to predict academic success, but the impact that intelligence has on grades seems to be contained within the impact that hard work has, implying a common denominator. This confounding variable is self-efficacy, which along with hard work, contribute to increased intelligence because self-efficacy gives the individual the tools to think objectively and focus on improving, while hard work allows that individual to build the skills and knowledge necessary for increased performance. These three variables are similar to how Russian dolls work, where outer dolls recursively contain smaller dolls. The outermost doll can be equated to self-efficacy, the middle doll to hard work, and the smallest doll to intelligence. Self-efficacy, the keystone factor, dictates how hard a person works towards their goals, and this self-discipline determines how quickly they improve and learn, leading to increased intelligence.

The College Board has dramatically shifted society's views towards education since introducing the SAT. The idealized version of education used to be that a kid walks into school without knowing how to do math or write, then after studying for 12 years they walk out knowing how to do calculus and writing sonnets and haikus. However, this kid never really

learns how to learn and only gains the knowledge taught to him by his teachers. The College Board has shifted the focus to a more abstract type of learning: intelligence. But in the process of doing so, they have left out *how* students are supposed to transition from simply consuming knowledge to becoming high-functioning individuals who know how to reason, think, and learn. The indications of this paper are clear: instead of simply teaching knowledge and hoping that our students will turn out geniuses, our education system should value the underlying principles of intelligence, namely self-efficacy and hard work.

Is it imperative that we focus on improving these factors instead of intelligence due to how the research in educational psychology is currently laid out. A paper by Philips argues that “given the highly contextualized nature of educational processes, embedded in shifting complex social settings... very little education research is able to pursue predictive power” (Philips, 2014). Intelligence is a prime example of the “contextualized nature” of education that Philips mentions--it is a high level trait that depends on many environmental and genetic factors and capturing how each factor influences intelligence will be extremely difficult, if not impossible. Rather than focusing on the unclear implications of intelligence research, it would be much more efficient for our education system to incorporate findings from research on self-efficacy and self-discipline because they have a much clearer, well-defined, and positive impact on education.

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This paper represents my own work in accordance with University regulations.

/s/Hollis Ma