DEVELOPING GRIT

Multiple quantitative and qualitative metrics agree that in just four months, students have significantly increased their GRIT™. This study details the characteristics of the GRITLab program.

GRITLab
A 9th Grade Physics & Engineering Curriculum
High Tech High
San Diego, CA

A 9% INCREASE IN GRIT IN JUST 4 MONTHS

GRITLab is a San Diego based high school program currently being incubated at High Tech High. GRITLab uses STEAM (Science, Technology, Engineering, Art, and Mathematics) and an Adversity by Design project curriculum to challenge students and help them to develop their GRIT.

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THE INQUIRY

In January of 2014, I challenged myself with a reflective inquiry. Do explicit discussions about GRIT™ in the classroom help students to develop GRIT and improve their performance on rigorous course content and projects?

THE CONTEXT

High Tech High is a San Diego based charter high school that bases its curriculum around project based learning and other constructivist practices. Its 599 students are admitted through a zip-code-based lottery system to maintain a student body that mirrors the ethnic and socioeconomic diversity of the local community. All High Tech High classrooms are full-inclusion meaning that students of all ability levels learn together — including high performing students and students with disabilities. Ninth grade students attend three year-long courses: Mathematics, Humanities, and Physics & Engineering. The Humanities and Physics & Engineering courses are integrated into a cohesive interdisciplinary teaching team and are the core of the ninth grade experience. My teaching team is composed of sixty-two students, each half of which I see for two periods per day.

My students are of varying race, including: Hispanic (37%), Caucasian (35%), African-American (9%), and Other Minorities (19%). My team is relatively balanced by gender with 53% male and 47% female students, and also by experience with the High Tech High system with 45% from our system and 55% from other middle schools. 32% of my students are eligible for free and reduced lunch and we have no official English Language Learners.

My classroom is intensely project-based and students are given adult-level technical projects. Students encounter adversity by design and are supported through building a positive track record in the face of adversity as part of a larger engineering and social curriculum. In my program, GRIT™ is defined as the culmination and development of Growth Mindset, Resilience, Intensity, and Tenacity, each of which was discussed at length.

DATA SELECTION

Grades: Using first semester grades as a baseline, I looked at current second semester grades, including: overall grade, ‘projects’ sub-grade, number of missing assignments, number of make-up opportunities taken, number of days between quizzes and make-up completion, and also their completion of an optional programming assignment. Grade data was selected as a proxy for their ability to meet requirements in a difficult setting.

Adversity Quotient®: In order to more accurately assess the levels of GRIT in each student, I used the Adversity Quotient Profile® – an online test that examines a student’s ability to respond to adversity. My students were assessed by this instrument in early January, 2014 and again in early May, 2014. This instrument was selected because it has been in distribution for twenty-four years and has
an existing pool of data on which to compare.

**GRIT Gauge™**: During my action research an additional assessment became available. Made by the same organization as the Adversity Quotient Profile, GRIT Gauge™ was designed explicitly for children and contains more relevant and more easily understood questions. However, due to the late release of this assessment, students were only assessed once in early May, 2014.

Notes on quantitative data: For grade, GRIT Gauge, and Adversity Quotient data, I looked at overall raw score, their comparative performance relative to the class (as standard deviations above the mean), and their change in comparative performance from one semester to another.

**Parent Survey**: In late April, 2014, I distributed an online survey to parents that asked them to assess the growth of their students. The survey covered four components of GRIT: Growth Mindset, Resilience, Intensity, and Tenacity, and asked parents to rank their students growth this year as getting worse, no change, some positive development, or significant positive development. This survey was distributed anonymously, thus reporting an overall trend and not the specific performance of an individual student. Twenty-five responses were recorded (a 40% response rate). This survey was developed because GRIT extends beyond the classroom and parents have a larger perspective of a student’s overall growth.

**THE RESULTS**

Quantitative and qualitative analysis agree that students have significantly increased their GRIT in this course. There were, however, significant dif-

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**Adversity Quotient & GRIT Gauge**

#1 Bestselling author and noted scholar, Dr. Paul G. Stoltz, whose grit-related assessments and methods are featured as global best practices at Harvard, MIT, Carnegie Mellon, and Cornell universities (among others), has substantively evolved Angela Duckworth’s basic grit model, creating GRIT™, also known as, “GRIT 2.0.” This advanced construct has strong predictive validity on a variety of success factors, and adds Growth, Resilience, and Instinct, to Tenacity. It also assesses “Robustness,” one’s capacity to maintain one’s ideal, best state despite the onslaught of unexpected perturbations, or adversities.
After beginning a class dialogue around GRIT, students on average began their make-up procedures 1.5 days sooner with some students beginning their make-up procedures as much as 11 days sooner. While students could not be evaluated for their individual grade change between semesters (the semesters are fundamentally different and thus incomparable), they could be assessed based on their comparative performance relative to the class (as standard deviations from the mean). This data, however, was best used to delineate performance between race and gender groups (see separate publication).

The Adversity Quotient Profile yielded significant results for my research. The results from the initial assessment were very low when compared to the global mean. I attribute this to the fact that my students are in 9th grade and the global mean is made-up almost entirely of adults. In the four months between assessments, 71% of students increased their Adversity Quotient (AQ) by an average of 16% with an overall average increase of 8.6%. Even more significantly, our minimum score went up by 17% and our maximum score went up by 22%. This clearly shows that students increased their GRIT. Furthermore, the quality of the assessment is supported by the fact that it correlates strongly with grades (r = 0.38).

Since the GRIT Gauge assessment was only given once, it cannot be used to show a change in GRIT. However, it correlates strongly with AQ (r = 0.53) and grades (r = 0.43) and thus further validates the other metrics.

Written student reflections were also an interesting lens into how students interpret my language around GRIT and how they synthesize it in their everyday lives. While the depth of reflections varied from student to student, this quote stood out to me as excellent synthesis of Intensity:

“...I feel like I am more of a consistently working person, and that I have “spurts” of intensity: I’ll be working then I get really immersed and focused on one specific thing, then when that piece is done I’ll just go back to the level of work I was doing beforehand.”

This reflection is not only an example of a student’s Intensity but also serves as a testament to the self-reflectivity encouraged by the explicit GRIT dialogue.

It must be noted that the quantitative analysis above lacks a control group, consistent grading structures, and a larger sample to defend its statistical significance. However, all considerations were taken to avoid making claims that were not clearly demonstrated by the data.

The Parent Survey was evaluated by giving each answer a point value. Answers were scored as such: getting worse(-1), no change(0), some positive development(1), or significant positive development(2). Across each aspect of GRIT, the average score was 1.18 signifying that parents have noticed at in excess of “some positive development” in each of their students with only 4% of parents noticing “no change” or “getting worse”. Interestingly, Growth Mindset was rated as having the most
growth, followed by Resilience, Tenacity, then Intensity, suggesting the serial nature of this scale. Specifically, as students
develop GRIT, they tend to first develop a Growth Mindset, followed by Resilience, and then Intensity and Tenacity.

Due to the lack of control group, this analysis must be generalized to the course as a whole. While the class dialogue about
GRIT is surely instrumental in these findings, we must also consider the effect of the multitude of other structures and
experiences that are part of the program.

SUMMARY & NEXT STEPS
Of all the skills and knowledge one acquires in life, GRIT is the most accurate predictor of life success. Whether a student’s
goals be in the arena of art, engineering, friendship, writing, or parenting, the one constant requirement is the student’s
willingness and ability to overcome adversity. Assuming that as a universal truth — how do we teach GRIT? Additionally,
as a parallel to the discussion above, how do we craft student performance and synthesis expectations such that they can
demonstrate GRIT in an academic or project setting? In an information age, where information is no longer the gatekeeper
of equity, how do we then ensure that the process of developing GRIT works across all racial, gender, and economic divides?
Angela Duckworth, a pioneer in researching GRIT through the lens of education, has provided evidence of GRIT being a
predictor of success but has not been able to prescribe methods to increase it in students. My work here is evidence that
GRIT can be developed in a classroom environment. Next year I would like to repeat this study but make some key changes.
First, I would like to weave together my Adversity by Design curriculum and the explicit discussions of GRIT while refining
both to their bare essentials. Secondly, I would like to assess students at the very beginning of their experience in my class
thus revealing more about the experience as a whole. Lastly, I would like to implement a control group to more scientifically
validate these methods. Should this next round of the study prove equally or increasingly successful in developing GRIT, I
would like to document it more thoroughly for wider use.

Bio: Scott Swaaley (P.E., LEED AP) teaches physics and engineering principles through complex interdisciplinary projects
with a focus on developing GRIT in students as they propose, design, and fabricate complex engineering systems. Scott has
been recognized for his outstanding work with students by the Paul G. Allen Foundation, San Diego Foundation, Aerospace
Physiology Society, McGraw Hill, MIT InvenTeams, the Teaching Channel, and two post-production documentaries. Scott cur-
rently teaches ninth grade physics and engineering at High Tech High and is developing a program he calls GRITLab.

GRITLab: For more information about GRITLab, please visit pbl.scottswaaley.com. Featured projects include:

Apocalypto - Human history is punctuated by the prolific rise and inevitable collapse of civilization after civilization. In this project, students formulated hypothesizes for these fluctuations, compared their hypotheses with historical evidence, mapped quantitative changes throughout history, and then created a narrative and mechanical representation of their findings. Their work was then exhibited on the eve of the Mayan Apocalypse.

Cacophony - As part of the Freshman music and art festival, our team built an interactive sound exhibit. Students designed and creating a variety of sound generating equipment, signal processors, amplifiers, and visualizers that could be mix-and-matched to create a near infinite user experience. The image below shows the overall configuration as well as the different options students could pick from.