JOHN W. GARDNER CENTER
for Youth and Their Communities

Academic Motivation and School Engagement and Their Links to Academic Achievement: A follow up report

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Introduction

The Hewlett Foundation's Education Program recently added ***Deeper Learning*** practices and policies to its strategic plan. . Deeper Learning refers to the content students learn as well as the strategies they use to synthesize and apply new knowledge (see Table 1). In this paper, I review evidence from key studies documenting the extent to which students' beliefs and attitudes serve as the requisite building blocks for Deeper Learning.

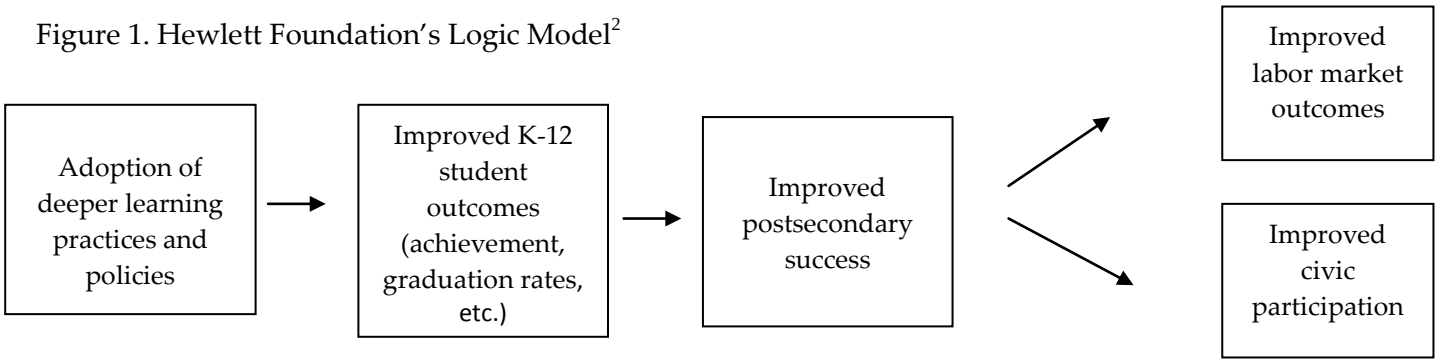
Table 1. Deeper Learning Components[1]

Category	Skills
A. Content Knowledge	1. Master core academic content
	2. Acquire, apply and expand knowledge
B. Cognitive Strategies	3. Think critically and solve complex problems
	4. Communicate effectively
C. Learning Behaviors	5. Work collaboratively
	6. Learn how to learn

Background

The Hewlett Foundation's logic model positions Deeper Learning as the catalyst that launches students on a pathway toward productive citizenship (see Figure 1). More specifically, Deeper Learning equips students with the knowledge, strategies and behaviors necessary to succeed from kindergarten through 12th grade. Success in high school, in turn, prepares students for post-secondary education and training opportunities. With engaged learning throughout these educational years and contexts, students are expected to be sufficiently prepared to succeed in the labor force, earn money and contribute to their communities.

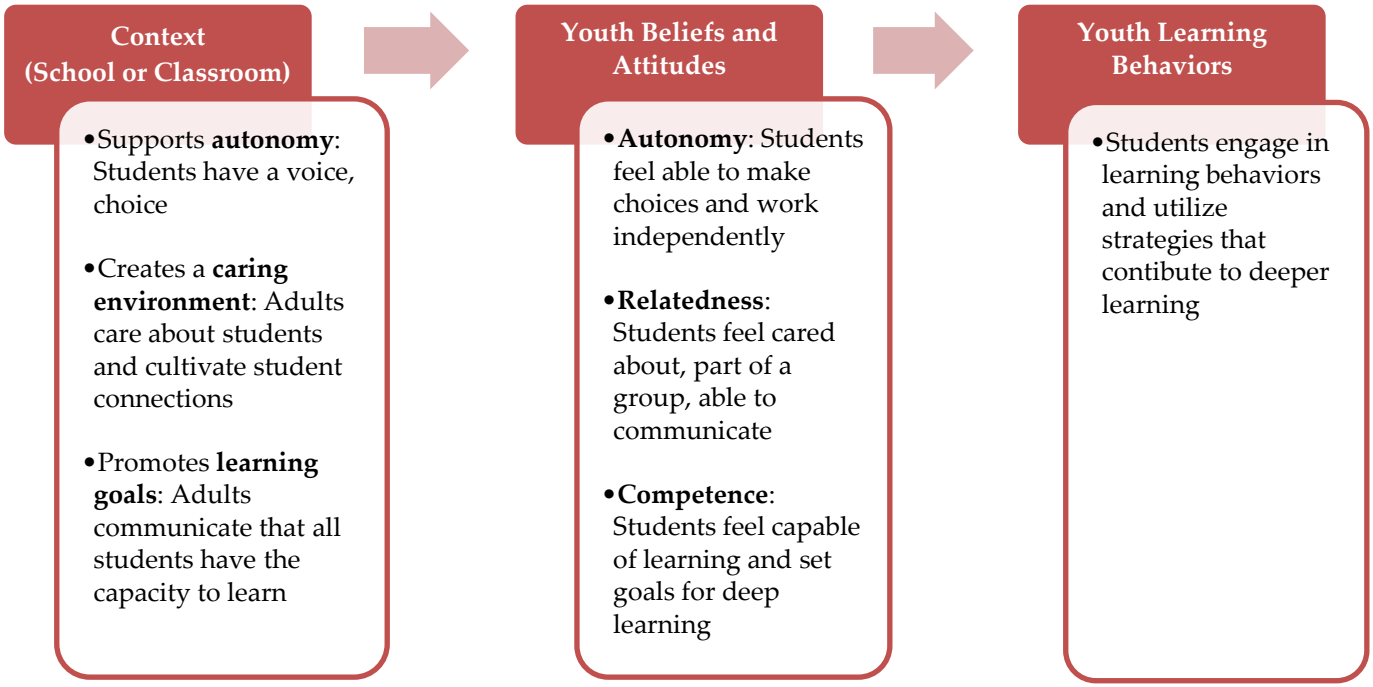
Figure 1. Hewlett Foundation's Logic Model[2]



[1] Hewlett Foundation Document— http://www.hewlett.org/library/grantee-publication/deeper-learning-defined
[2] Hewlett Foundation Logic Model

In January 2012, the John W. Gardner Center for Youth and Their Communities (JGC) at Stanford University prepared a short paper for the Hewlett Foundation reviewing research linking non-cognitive factors to students' achievement outcomes. Specifically, the paper focused on three sets of beliefs: 1) autonomy 2) relatedness and 3) competence, and discussed how each of these beliefs is associated with students' engagement in learning as well as their grades and achievement test scores. This initial review of the literature directed attention to the role that non-cognitive factors play as precursors to student engagement in Deeper Learning strategies and behaviors. Moreover, each of these beliefs was described as dynamic and responsive to specific classroom practices. The relationship between learning context, beliefs and engagement in Deeper Learning was summarized in a chart (See Figure 2).

Figure 2. Context, Beliefs and Attitudes as Precursors to Deeper Learning Behaviors



In this paper, I provide detailed evidence of the ways in which autonomy, relatedness and competence promote specific components of Hewlett's Deeper Learning framework. A review of literature that maps these beliefs onto each subcomponent of each deeper learning skill is beyond the scope of this paper. However, looking across the three categories of deeper learning (content knowledge, cognitive strategies and learning behaviors) there are some conceptually similar skills that I selected to illustrate the critical role that students' non-cognitive factors play. According to Hewlett's

document "Deeper Learning Defined[3]," in pursuit of Deeper Learning goals, students are expected to:

- master academic content
- put forth effort and persist in the face of challenge
- value and enjoy the learning content and process
- monitor and direct their learning
- think critically and problem solve.

Autonomy, relatedness and competence are each associated with many of the skills outlined in the Deeper Learning framework. In the next section, I describe studies, drawing on a range of research designs and analytic techniques, which exemplify the strength of the evidence linking motivational beliefs to learning processes and outcomes. The studies included in this next section were selected as representatives of an extensive literature and were referenced in the original memo that the JGC prepared for Hewlett in January of 2012.

Autonomy

Students who feel autonomous believe they have a degree of control over and responsibility for their learning. In many ways, autonomy is synonymous with the Deeper Learning behavioral goal for "students to direct their learning." Studies documenting the effects of autonomy in the classroom tend to focus on choices offered to students.

In a meta-analysis of 41 studies, Patall, Cooper and Robinson (2008) looked at the effects of choice on multiple learning behaviors and outcomes. Reviewing only experimental studies conducted between 1974 and 2004, the authors reported consistent evidence of effects of choice on intrinsic motivation (d=.30), effort (d=.22) and task performance (d=.32). As an example, one experimental study included 4th and 5th grade students who were offered choice over instructionally irrelevant aspects of a math activity. During the pretest session students were tested on their knowledge of math concepts and also answered questions about their motivational beliefs including their enjoyment of and perceived competence in math and other academic subjects. One week later, students in the choice conditions scored higher on the math post test compared to students in the no-choice conditions (controlling for their performance on the math pretest) $t(65)=2.02$ $p<.05$. In addition, students in the choice conditions reported significantly higher levels of sense of competence than those in the no-choice conditions, $F(1, 65) = 7.79$, $p < .01$, as well as more enjoyment $F(1, 65) = 12.89$, $p < .001$. When selecting a follow-up activity, students in the choice condition expressed a preference for more challenging levels of

[3] Deeper Learning Defined- http://www.hewlett.org/library/grantee-publication/deeper-learning-defined

difficulty while those in the no-choice condition requested easier levels., F(l, 65) = 12.47, $p < .001$.

In a study of high school students in grades 9-12, Patall, Cooper and Wynn (2010) experimentally manipulated the use of choice in homework assignments. In the choice condition students were able to choose between one of two homework assignments for every homework assignment in that unit. There were no differences in baseline measures of autonomy, competence and GPA based on experimental condition. Using Hierarchical Linear Modeling nesting students by condition and classrooms, researchers found that students in the choice condition reported significantly higher interest and value ($t(350)=2.83$, $p< .01$) , perceived competence, ($t(350)=2.16$ $p < .05$)and scores on the unit test ($t(374)=2.12$ $p<.05$).

These studies highlight the link between students' sense of autonomy and their mastery of academic content, value of learning and challenge, as well as their competence beliefs.

Relatedness

Students' sense of relatedness is most often studied with a focus on emotionally supportive dyadic teacher-student interactions. Klem and Connell (2004) used a threshold method for demonstrating the effects of perceived teacher support on student engagement and achievement. They created an index that combined test scores in math or reading with attendance records to represent both optimal and risk thresholds for predictors of high school graduation and labor market participation. For example, among middle school students, an optimal threshold includes an attendance rate of 93% or higher and a reading percentile score of 70% or higher or a math percentile score of 65% or higher. A risk threshold is marked by an attendance rate of 79% or below and a reading percentile score below 25%. Their analyses then focused on how students' engagement predicted their achievement threshold. Students who exerted more effort on their school work, paid attention in class and valued school were more likely to do well on the index. In contrast, students who were less engaged were more likely to be at risk (based on both students' self reports and teacher reports of engagement).

Once Klem and Connell (2004) established the strong association between engagement and achievement, they focused their threshold method on the effects of teacher support (relatedness) on student engagement. They defined teacher support in terms of students' perceptions of the extent to which the teacher is involved, cares and is fair. Elementary students experiencing high levels of teacher support were 89% more likely to feel engaged and 69% less likely to feel disaffected. Middle school students with high

levels of teacher support were almost three times more likely to have high levels of engagement, and 74% less likely to feel disengaged.

Roorda, Koomen, Slit and Oort (2011) conducted a meta-analysis of 92 articles on relatedness describing 99 studies between 1990 and 2011. In their analysis, relatedness was defined in terms of dyadic relationships with teachers described positively as warm, involved, responsive, supportive or caring, and described negatively as neglectful, rejecting, angry, or full of conflict. Engagement was measured in terms of task behavior, effort, persistence, participation, work habits. Achievement included grades and standardized test scores. Overall, effect sizes for the associations between positive relationships and engagement ($r = .39$, $p < .01$) and negative relationships and engagement ($r = –.32$, $p < .01$) were considered medium to large. Effect sizes for both positive relationships and achievement ($r = .16$, $p < .01$) and negative relationships and achievement ($r = –.15$, $p < .01$) were considered small to medium. Effect sizes for positive relationships were larger in studies conducted with middle school and high school students – whereas effects of negative relationship were stronger in studies of elementary school students. In addition, Roorda and her colleagues' meta-analysis indicated that positive relationships with teachers were more beneficial for students who were academically at risk because of their low SES, whereas negative relationships with teachers were more detrimental for students academically at risk.

In the studies reviewed, students' sense of relatedness was significantly related to their engagement in school. By defining engagement in terms of students' effort on tasks and value of learning, the studies directly link the concept of relatedness to two components of the Hewlett Foundation's Deeper Learning competencies.

Competence

Students' sense of competence refers to their beliefs that they have the ability to succeed and master academic tasks. Research based on experimental designs, path analyses and longitudinal models including upper elementary, middle school, high school and college students, consistently document the predictive power of students' competence beliefs. Competence beliefs are not global and are not static traits. Rather, students' competence beliefs are situation and content specific. A student may believe she is a competent reader but feels less confident in her math abilities. This same student may feel more competent in one math teacher's classroom in comparison to another math teacher's classroom. As a result, high quality studies linking competence beliefs to learning processes and outcomes make sure students are asked very specific questions about their capacity to master a skill in a particular subject area as well as in a particular learning context.

Students who feel competent in their capacity to learn are more likely to master the academic content that they are studying. Zimmerman, Bandura and Martinez-Pons (1992) captured the causal path between high school students' competence beliefs and their final grades in social studies. This study included 102 9th and 10th grade students from lower-middle class neighborhoods and included nearly equal representations of black, Hispanic and white students. Using path analysis, they reported that students' competence beliefs accounted for 31% of the variance in their course grades (*P*=.37 p<.05). In a similar study including college students, Pajares and Miller (1994) reported that competence beliefs in math had stronger direct effects on mathematics problem solving (ß = .545, p<.0001) than did prior math experience and other demographic characteristics. In one seminal experimental study, elementary students with different levels of math ability were given challenging math problems to solve. Regardless of their actual ability-level, students who were confident in their math abilities performed best (Collins, 1982).

Competence beliefs are also associated with students' willingness to exert effort and monitor their learning. In Collins' (1982) experimental study, students with high sense of competence in math demonstrated more effort and persistence in reworking incorrect problems in comparison to their less confident peers. In a survey study of 173 seventh and eighth grade students in their science and math classrooms, Pintrich and De Groot (1990) found that, controlling for prior achievement levels, students with higher competence belief were more likely to manage their effort and persistence when faced with a difficult of boring task. In addition, students with high competence beliefs were more likely to monitor their learning (M=5.31, F(1, 164)=8.16, p<.005, *MSt* = 0.38, than students with low competence beliefs (*M* = 4.74).

Few studies document long term effects of students' competence beliefs, mainly because these beliefs tend to be so situation specific. However, in a longitudinal study of students from 5th to 12th grade, Simpkins, Davis-Kean, & Eccles (2006) tracked the effects of 6th grade students' confidence in their math and science abilities on their 10th grade competence beliefs as well as their course choices. Using structural equation modeling, Simpkins and her colleagues reported that students who believed they were skilled in a particular subject area when they were in 6th grade were more likely to pursue this subject area in high school compared to their peers. Competence beliefs were more predictive than past achievement, parents' education or family income. As was the case with the research on both autonomy and relatedness, studies of students' competence beliefs consistently predict components of Hewlett's Deeper Learning Competencies including: content mastery, strategy selection, problem solving, effort and persistence, monitoring, course selection and achievement.

Summary

The details of this review highlight the ways in which non-cognitive factors map onto specific components of the Hewlett Foundation's Deeper Learning competencies (see Figure 3). When students feel autonomous, they are more likely to find their work meaningful, interesting and relevant. Moreover they are more likely to direct their own learning, apply their new knowledge and seek challenges. Similarly, when students feel a sense of relatedness or a positive connection with their teachers, they are more likely to stay on task, participate in class, persist and put forth effort. Students' competence beliefs are consistent and powerful predictors of all of the Deeper Learning Competencies listed in Figure 3.

Figure 3. Non-cognitive factors mapped onto Deeper Learning Competencies[4]

Examples of Specific Deeper Learning Competencies	Autonomy	Relatedness	Competence
Students perceive the inherent value of content knowledge.	☑	☑	☑
Students are motivated to put in the time and effort needed to build a solid knowledge base.		☑	☑
Students enjoy and are able to rise to challenges requiring them to apply knowledge in non-routine ways.	☑	☑	☑
Students persist to solve complex problems.		☑	☑
Students identify and work towards lifelong learning and academic goals.			☑
Students monitor their progress towards a goal, and adapt their approach as needed to successfully complete a task or solve a problem.	☑	☑	☑
Students enjoy and seek out learning on their own.	☑	☑	☑

[4] This list of competencies is taken from: Deeper Learning Defined
http://www.hewlett.org/library/grantee-publication/deeper-learning-defined

Recommendations

Autonomy, relatedness and competence are critical precursors to the Hewlett Foundation's Deeper Learning competencies. Classroom practices that promote these beliefs will create the conditions necessary for students to pursue the content knowledge, cognitive strategies and learning behaviors that comprise Deeper Learning. At the same time, overly controlling classrooms, negative relationships with teachers and low expectations are worrisome risk factors that can thwart students' efforts to develop Deeper Learning competencies. Training teachers to create opportunities for choice in the classroom, develop supportive relationships with their students, or emphasize learning goals and individual competencies, has the potential to launch students on a successful pathway toward Deeper Learning. Starting with just one set of practices that offers students choice, supportive relationships or an emphasis on individual effort and improvement could lead to significant improvements in students' motivation and learning outcomes.

The JGC review of the literature, in conjunction with the Consortium on Chicago School Research (CCSR) 2012 literature review on non-cognitive factors[5], supports a strong recommendation that the Hewlett Foundation add an additional category to the Deeper Learning Framework. Specifically, students' attitudes and beliefs warrant their own category (see revised framework in Table 2).

Table 2. Deeper Learning Components Revised

Category	Skills
A. Content Knowledge	1. Master core academic content
	2. Acquire, apply and expand knowledge
B. Cognitive Strategies	3. Think critically and solve complex problems
	4. Communicate effectively
C. Learning Behaviors	5. Work collaboratively
	6. Learn how to learn
D. Attitudes and Beliefs	*7. Feel responsible for own learning* *8. Feel supported in school or classroom* *9. Believe in learning potential*

[5] According to the CCSR report, academic mindsets are precursors to academic tenacity and academic behaviors which, in turn, are related to academic performance outcomes. CCSR authors define academic mindsets as a sense of belonging in a school or classroom, a belief that ability can grow, confidence that success is personally attainable and that the work is valuable and relevant. These examples of mindset are identical to the attitudes and beliefs described in this paper. In fact, the CCSR authors site the same theories and researchers in their description of belonging (relatedness) and competence.

Given the evidence presented in this paper, the Deeper Learning Framework needs to include an additional category that captures the critical role of students' attitudes and beliefs. Without this additional category, the Deeper Learning Framework is missing a critical feature of the learning process. Content Knowledge, Cognitive Strategies and Learning Behaviors do not sufficiently represent deep engagement in learning. Moreover, researchers are documenting a range of ways in which teachers can foster adaptive attitudes and beliefs in the classroom. Theoretically and empirically the link between classroom practices, students' attitudes and beliefs and learning has been established. However both researchers and practitioners are still searching for ways to translate these findings into concrete suggestions and professional development for teachers. The Hewlett Foundations has an opportunity to play a significant role in this much needed area of research and practice.

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