# From Facilitators to Transformers: Developing Essential Non-Cognitive Skills to Promote Student Success

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# About Me . . .

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- My research involves the study of metacognition, motivation, and self-regulation in classroom-based and computer-based settings

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**How have Non-Cognitive Skills been described:**

Noncognitive Skills in the Classroom: New Perspectives on Educational Research

This book provides an overview of recent research on the relationship between noncognitive attributes (such as *effort or self-regulated learning*) and academic outcomes (such as grades or test scores). Noncognitive attributes are those academically and occupationally relevant skills and traits that *are not specifically intellectual or analytical in nature.* They include a range of personality and motivational habits and attitudes that facilitate functioning well in school. Noncognitive traits, skills, and characteristics include perseverance, motivation, self-control, and other aspects of conscientiousness (see Borghans et al., 2008).

Jeffrey A. Rosen, Elizabeth J. Glennie, Ben W. Dalton, Jean M. Lennon, Robert N. Bozick
Research Triangle Institute (RTI) 2010

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# *Self-Regulated Learning*

*The effective regulation of one's own learning in the pursuit of personal goals*

## 3 Core Components

- Strategy use
  - Selectively choosing then evaluating strategies

- Metacognitive awareness
  - Knowledge about cognition/Regulation of cognition

- Motivational control
  - Goals, self-efficacy, effort

# Effective Learners . . .

- **Motivational Research**
  - "are intrinsically motivated to learn"
  - "maintain confidence when challenged"
  - "are goal oriented"

- **Metacognition**
  - "accurately monitor and control their learning"
  - "flexibly apply strategies"

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**SOME CURRENT MOTIVATION CONSTRUCTS**

- 
  - 
- 
- vs EXTRINSIC MOTIVATION
- EXPECTANCY BELIEFS
- SELF-EFFICACY
- SELF-CONCEPT (Self-Esteem)
- OUTCOME EXPECTATIONS
- ATTRIBUTIONS of success and of failure
- LOCUS OF CONTROL (origins and pawns)
- ANXIETY
- SELF-REGULATION
- FLOW
- GRIT

## Slide 1

More likely to be . . . ..

**Situational interest:**

### Spanish town tosses world's biggest salad

MADRID (AFP) - A town in southern Spain on Saturday tossed what local officials said was the world's largest salad, involving 6,700 kilograms (14,740 pounds) of lettuce, tomato, onion, pepper and olives.  It took 20 cooks over three hours to mix all the ingredients needed to make the salad in the town of Pulpi in the province of Almeria, one of Spain's main fruit and vegetable growing areas.  "Excellent coordination since the beginning made it possible to meet this challenge," said Lorenzo Navarro, the head of the Association of Businessmen and Storekeepers of Pulpi which organized the event with the town hall.  The salad will be distributed to restaurants in Pulpi who will provide it for free to their clients, he told reporters.  A Guinness World Records judge was on hand to confirm that the salad had set a new record, Spanish media reported.

**Personal interest:**

### Haile Gebrselassie, In Berlin, Mentions The Major Number 2:03:00

He ran 2:05:56 to win in Berlin in 2006 and then a 2:06:52 for a Fukuoka victory in December - the shortest interval ever between sub-2:07 marathons. His acknowledged goal is to break Paul Tergat's Gebrselassie_hailepcsberlin07 world record of 2:04:55 on Sunday, but at a press conference, ask to mock up an ad campaign, Gebrselassie did a line drawing of himself and wrote underneath it '2:03:00 – I will show you.' Then he commented: "Well, 2:04 would be okay as well. You always have to aim high." Gebrselassie explains, "to become stronger in the last part of the marathon I increased my speed in the final part of my training runs." For the Ethiopian hero, Berlin "is the best course and there are incredible spectators." World Championship Sports Network (WCSN.com) is providing live coverage of the Berlin Marathon starting at 2:45 a.m. on Sunday.

## Slide 2

# Interest . . .

- ⚙ **Personal interest - relatively stable, enduring disposition**

- ⚙ **Situational interest - an interest in the task or activity because of the context**

- ⚙ **Both types are typically positively related to memory, attention, comprehension, deeper cognitive engagement, thinking, and achievement**

# Interest . . .

- ☸ Situational interest may be a introductory pathway to personal interest

- ☸ Certain instructional factors have been show to activate interest (e.g., puzzles, group work, use of technology) while others maintain interest (meaningful work and active involvement of learners)

- ☸ Key factors include students seeing the *relevance* of the material and/or *connections* to their personal lives

# Example of Constructivist Teaching:

Robin Williams character in Dead Poet's Society is a prime example of constructivist teaching. He encourages:

Personal interest

Background knowledge

Active learning

An emphasis on personal meaning

Critical thinking

## Things I try do in my courses:

- Provide many applied examples

- Connect material to students' lives

- Toggle presentation style

- Instill curiosity and engagement by presenting challenging problems, debates, or alternative ways to assess

- Be goofy (throw candy) and get personal (share stories, travels, etc.)

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*"Your future endeavors may be influenced more by your BELIEFS about your abilities than your actual abilities themselves."*

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*"You are not doing learners a service by building them up with a false sense of accomplishment."*

**How sure are you that you could solve a problem from the following subjects?**

- Geography

- Math Reasoning

- General Knowledge

| 1 | 2 | 3 | 4 | 5 |

Not at all Confident

Totally Confident
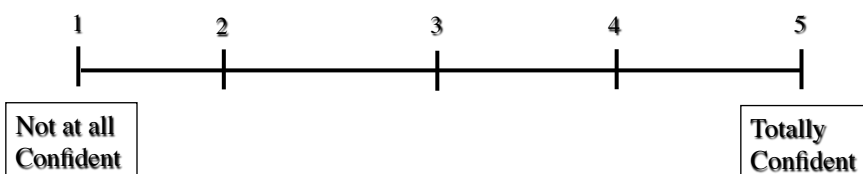
# *Self-Efficacy*

**Judgment of one's ability to perform a task within a specific domain**

"People's level of motivation, affective states, and actions are based more on what they *believe* than on what is objectively the case."

**Albert Bandura**

## How are *self-efficacy* and *self-concept different?*

### Self-Efficacy

➢ Context specific

➢ Competence for performing specific tasks

➢ Reference points for judgments tend to be inherent within the task requirements (e.g. How confident are you that you can successfully write a good essay on the information processing model?)

### Self-Concept

➢ Judgment of competence at a broad level

➢ Evaluates feelings of self worth

➢ Reference points for judgments tend to be social and self-comparisons (e.g. I am a better reader than most of my classmates/ I am better at science than I am at math)

# High Efficacy Learners

⚙ **Engage in challenging tasks**

⚙ **Persist when goals are not initially reached**

They also . . .

⚙ Expend **high effort** when faced with challenging tasks

⚙ **Believe** they will succeed

⚙ **Control stress** and **anxiety** when goals are not met

⚙ Believe they are in **control** of their **environment**

⚙ Discard unproductive **strategies**

⚙ **Perform higher** than low-efficacy students of equal ability

# SELF-EFFICACY

WHERE DOES IT COME FROM?

PAST PERFORMANCE

MODELING

VERBAL PERSUASION

PSYCHOLOGICAL STATES
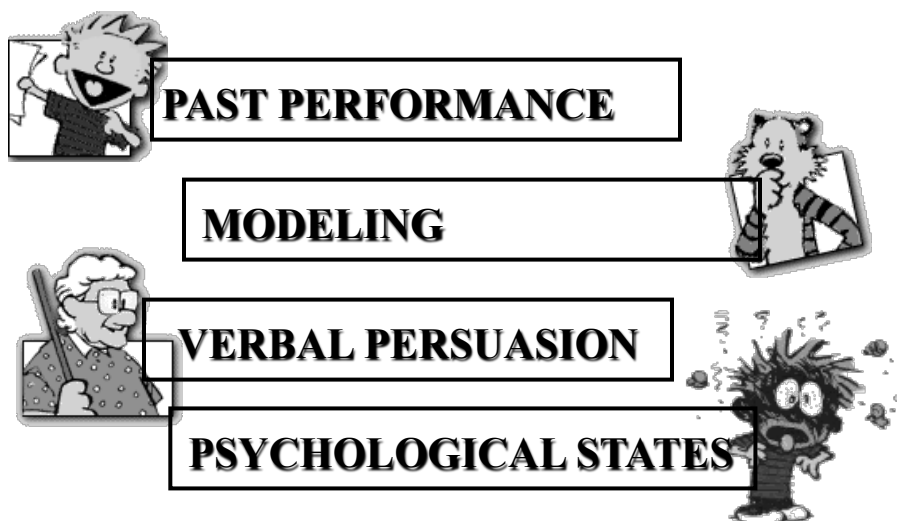
# Improving Self Efficacy

➢ **Present challenging yet doable activities that are mastery oriented**

➢ **Arm with numerous cognitive and metacognitive strategies**

➢ **Encourage with specific feedback related to performance**

➢ **Avoid verbal persuasion, even subtle persuasion, which may diminish engagement**

➢ **Gain awareness not only of ability but also perceptions of ability**

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### *Higher Self-efficacy can Lead to Lower Performance on Exams*

Vancouver (2006) found within-person negative correlations between self-efficacy and performance, planned and reported study time on exams during a psychology course. Between-person correlations between self-efficacy and performance were still positive. So, students with higher levels of self-efficacy overall tend to perform at higher levels. However, high self-efficacy during the course can lead individuals to study less and thus perform at lower levels. Higher study preparation was exhibited with lower levels of self-efficacy. Higher self-efficacy led to higher goal setting for the exams.

## Implications for Effective Learners:

◉ **Encourage learners to engage in challenging tasks where scaffolded support is offered at critical junctures**

◉ **Increased self-efficacy could lead to increased cognitive engagement that can translate into improved cognitive and metacognitive skills and an increase in background knowledge**

# *Attribution Theory*

➢ **The study of the causal explanations for success and failure**

➢ **Efficacy focuses on confidence for future performance whereas attributional judgments relate to past events**

➢ **3 primary dimensions of attributional responses:** *Locus of Control, Stability, and Controllability*

➢ **Student attributions are derived not only from themselves but also are influenced through interactions with teachers, parents, and peers**

| Attribution | Locus | Stability | Controllability | Examples |
|---|---|---|---|---|
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

| Attribution | Locus | Stability | Controllability | Examples |
|---|---|---|---|---|
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

A teacher is circulating around the class while the students are involved in a homework activity. The teacher stops near Jerome, who appears to be having a bit of difficulty with a problem, but she says nothing. She stops near Leroy and comments, "Let me give you a hint," and makes a suggestion, even though Leroy had not asked for help and seems to be making progress, although the progress is somewhat slow.

The teacher stops near Anthony, who has made a mistake, and smiles, "Now, that's a very good try. Here, let me show you how to solve the problem."

**What message is the teacher sending each student about their ability? What attributions is she subtly and unconsciously encouraging?**

Graham (1991) suggests that when teachers praise students for a "good try," express pity, or offer unsolicited help, they *subtly communicate that the students have low ability*, and it increases the likelihood that the students will attribute failure to lack of ability. Even young students perceive students who are offered unsolicited help as being lower in ability than those not offered help (Graham & Barker, 1990)

## *Encouraging Adaptive Attributions*

➢ Above all, emphasize **EFFORT and STRATEGY USE** for achieving goals

➢ Learner attributions are affected by explicit feedback from the teacher (e.g. "maybe you just don't have talent in math") and through more subtle feedback ("offering unsolicited help)

➢ More successful learners tend to attribute their success and failure to internal and controllable factors such as effort and strategy use

➢ Assist learners by explicitly discussing different types of attributions

➢ Consider alternative attributions such as prior knowledge, strategies, monitoring skills, & automaticity

## Implications for Effective Learners:

❂ The most beneficial attribution may be contextual, however you generally want to avoid learners attributing failure to lack of ability

❂ As an instructor your task is to assist in identifying the point where improvement is needed (e.g., better strategies) and target that as an attribution – thus specific feedback is important

❂ Successful learners likely know that they have high ability but it is important to also emphasize the importance of effort. An overemphasis on ability could lead to overconfidence and failure on a task

# Things I try do in my courses:

- Have students engage in 'self-testing' activities in class

- Present challenging puzzles, questions, dilemmas, examples in class

- Have explicit conversations about strategy use and effort

- Discourage negative attributions (e.g., "I am just not good with statistics")

# Carol Dweck

**Implicit Beliefs about Intelligence, Goal Orientation, & Growth Mindset**

# Goal Orientations

## Entity Theorists → Performance Goals

Normative

Prove competence

Grades

Comparison

Others' perceptions

Gaining Recognition

# Goal Orientations

## Incremental Theorists → Learning or Mastery Goals

Knowledge acquisition

Progress

Competency

Self-improvement

# Dweck on self-esteem . . .

"Self-esteem, we will see, is something completely different in the incremental system. It is not an internal quantity that is fed by easy successes and diminished by failures. It is a positive way of experiencing yourself when you are fully engaged and are using your abilities to the utmost in pursuit of something you value.

It is not something we *give* to people by telling them about their high intelligence. It is something we equip them to get for themselves -- by teaching them to value learning over the appearance of smartness, to relish challenge and effort, and to use errors as routes to mastery" pg. 4; *Self Theories* 2000

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## *Implicit Beliefs about Intelligence*

- **Growth Mindset** leads to greater persistence, more varied strategy use, appropriate help-seeking and are more likely to have high self-efficacy and attribute success to controllable factors such as effort and strategy use

- **Fixed Mindset** leads to attempting easy rather than challenging problems, a defensive attitude regarding ability, and a greater frequency of developing learned helplessness because of fear of failure

# *Fostering Adaptive Goals*

- Promote the view that intellectual development is controllable

- Reward effort and improvement while de-emphasizing native ability

- Emphasize the process, rather than the products, of learning

- Stress that mistakes are a normal (and healthy) part of learning

- Encourage individual, rather than group, evaluative standards

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"Perhaps the most appropriate view represents an integration of both entity and incremental theories, that is, a recognition of present differences in relative ability but an emphasis on individual growth in ability."

*Dweck & Leggett, 1988*

# Current Approaches . . .
# Multiple Goal Theory

- **Mastery Approach -** for attaining task-based or intrapersonal competence

- **Mastery Avoid -** for avoiding task-based or intrapersonal incompetence

- **Performance Approach -** for attaining normative competence

- **Performance Avoid -** for avoiding normative incompetence

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## Achievement Goals Questionnaire

_____ 1. It is important for me to do better than other students.

_____ 2. It is important for me to do well compared to others in my courses.

_____ 3. My goal in class is to get a better grade than most of the other students.

_____ 4. I worry that I may not learn all that I possibly could in class.

_____ 5. Sometimes I'm afraid that I may not understand the content of class as thoroughly as I'd like.

_____ 6. I am often concerned that I may not learn all that there is to learn in class.

_____ 7. I want to learn as much as possible from class.

_____ 8. It is important for me to understand the content of my courses as thoroughly as possible.

_____ 9. I desire to completely master the material presented in my courses.

_____ 10. I just want to avoid doing poorly in class.

_____ 11. My goal in class is to avoid performing poorly.

_____ 12. My fear of performing poorly in class is often what motivates me.

# Test Anxiety

Arises from

1) A lack of confidence in the particular domain

2) The adoption of avoidance goal orientations
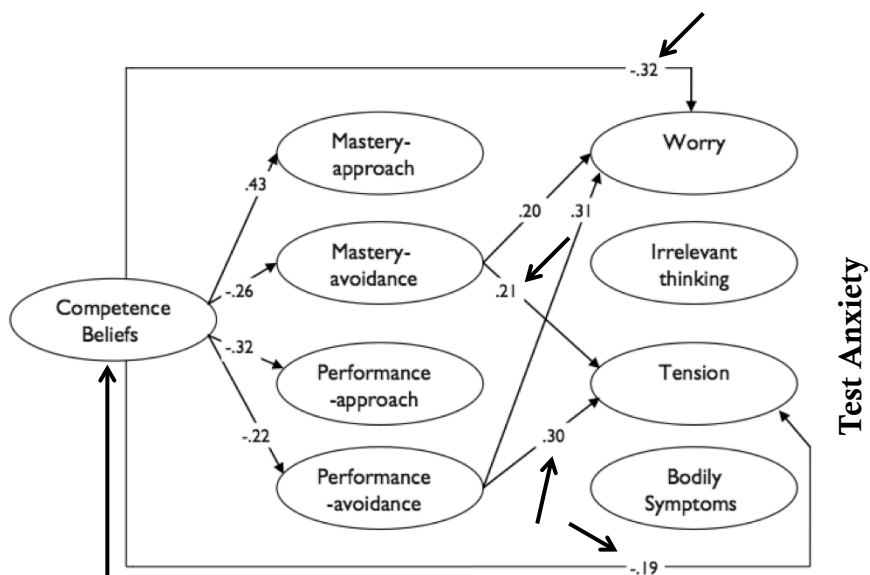


"I learn things quickly in psychology"

Putwain & Symes (2012)

## What is this measuring?

Consistency of Interest
1. *I often set a goal but later choose to pursue a different one.*
5. *I have been obsessed with a certain idea or project for a short time but later lost interest.*
6. *I have difficulty maintaining my focus on projects that take more than a few months to complete.*
2. *New ideas and projects sometimes distract me from previous ones.*

Perseverance of Effort
9. *I finish whatever I begin.*
10. *Setbacks don't discourage me.*
12. *I am diligent.*
11. *I am a hard worker.*

# Grit

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### What *No Child Left Behind* Leaves Behind: The Roles of IQ and Self-Control in Predicting Standardized Achievement Test Scores and Report Card Grades

Angela L. Duckworth
University of Pennsylvania

Patrick D. Quinn
University of Texas at Austin

Eli Tsukayama
University of Pennsylvania

The increasing prominence of standardized testing to assess student learning motivated the current investigation. We propose that standardized achievement test scores assess competencies determined more by intelligence than by self-control, whereas report card grades assess competencies determined more by self-control than by intelligence. In particular, we suggest that intelligence helps students learn and solve problems independent of formal instruction, whereas self-control helps students study, complete homework, and behave positively in the classroom. Two longitudinal, prospective studies of middle school students support predictions from this model. In both samples, IQ predicted changes in standardized achievement test scores over time better than did self-control, whereas self-control predicted changes in report card grades over time better than did IQ. As expected, the effect of self-control on changes in report card grades was mediated in Study 2 by teacher ratings of homework completion and classroom conduct. In a third study, ratings of middle school teachers about the content and purpose of standardized achievement tests and report card grades were consistent with the proposed model. Implications for pedagogy and public policy are discussed.
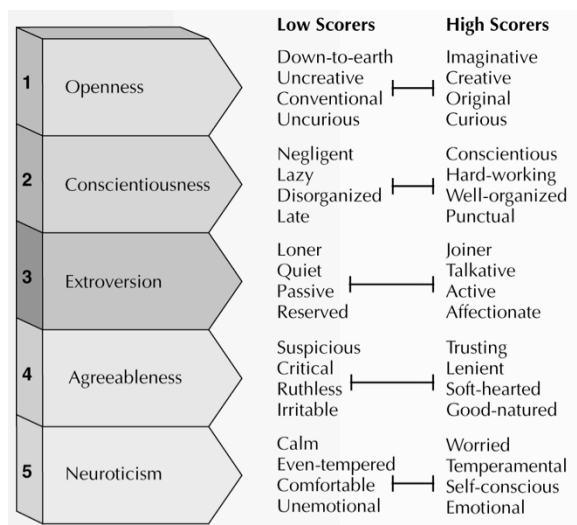
*Keywords:* impulsivity, self-control, achievement, success, personality

# The "Big 5"

**Modern personality research argues for 5 basic personality traits (OCEAN)**

- **Openness**: whether a person is open to new experiences
- **Conscientiousness**: whether a person is disciplined and responsible

  **"socially prescribed impulse control that facilitates task- and goal-related behavior" (John et al., 2008)**
- **Extroversion**: whether a person is sociable, outgoing and affectionate
- **Agreeableness**: whether a person is cooperative, trusting, and helpful
- **Neuroticism**: whether a person is unstable and prone to insecurity

# Overview of the Big "5"

| | | Low Scorers | High Scorers |
|---|---|---|---|
| 1 | Openness | Down-to-earth Uncreative Conventional Uncurious | Imaginative Creative Original Curious |
| 2 | Conscientiousness | Negligent Lazy Disorganized Late | Conscientious Hard-working Well-organized Punctual |
| 3 | Extroversion | Loner Quiet Passive Reserved | Joiner Talkative Active Affectionate |
| 4 | Agreeableness | Suspicious Critical Ruthless Irritable | Trusting Lenient Soft-hearted Good-natured |
| 5 | Neuroticism | Calm Even-tempered Comfortable Unemotional | Worried Temperamental Self-conscious Emotional |

## Journal of Research in Personality

### Predicting school success: Comparing Conscientiousness, Grit, and Emotion Regulation Ability

CrossMark

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ARTICLE INFO

ABSTRACT

The present paper examines validity of three proposed self-regulation predictors of school outcomes – Conscientiousness, Grit and Emotion Regulation Ability (ERA). In a sample of private high school students ($N = 213$) we measured these constructs along with indices of school success obtained from records (rule violating behavior, academic recognitions, honors, and GPA) and self-reported satisfaction with school. Regression analyses showed that after controlling for other Big Five traits, all school outcomes were significantly predicted by Conscientiousness and ERA, but not Grit. The discussion focuses on the importance of broad personality traits (Conscientiousness; measure of typical performance) and self-regulation abilities (ERA; measure of maximal performance) in predicting school success.

Our results did not support the incremental validity of Grit over Conscientiousness. The concept of Grit has captured popular imagination through bestselling books such as How Children Succeed: Grit, Curiosity and the Hidden Power of Character (Tough, 2013) and articles like True Grit: The Best Measure of Success and How to Teach It (Davis, 2014) that are read and shared by thousands of people on education-related websites. Here, we do not settle the

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## EDUCATION WEEK

### 'Grit' May Not Spur Creative Success, Scholars Say

By Sarah D. Sparks

But Magdalena G. Grohman, the associate director of the Center for Values in Medicine, Science, and Technology at the University of Texas at Dallas, argues that grittiness is not the end-all, be-all for student success. "When you look at it, these [areas studied by Ms. Duckworth] are well-defined areas and the rules for achievement are well-defined in those areas," she said. "We know what to do to get good grades, what to do to stay in military school, and what to do to win in contests such as spelling bees. The rules are pretty clear on what the achievement is and what success is in these domains. But what about creative achievement?"

## Implications for Effective Learners:

⚙ **Learners with only performance goals are shallow learners**

⚙ **Promote the idea that becoming an effective learner takes time and effort, failure is likely part of the process of attaining skill**

⚙ **Assist learners to be more self-regulated by helping them learn when to emphasize certain goals or toggle between goal orientations**

## Things I try do in my courses:

⚙ Verbally emphasize the importance of mastery and understanding over grades

⚙ Maintain course activities that allow for both individual and team competition (e.g., clicker reviews)

⚙ Emphasize the importance of the 'incremental mindset' for graduate students and for pre-service teachers . . . the idea of consistency and small growth each day (e.g., writing skills)

⚙ Have students set and revise goals during courses and during their program

# Effective Learners . . .

- **Metacognition**
  - "accurately monitor their learning"
  - "control and flexibly apply their strategies"

# Metacognition

- Executive processes; oversees the memory system

- Is rather late developing

- Can be improved through direct instruction & modeling

- Is largely independent of general ability

- Can facilitate critical thinking, creativity, and transfer

# Metacognition

## Knowledge of Cognition

| Declarative | Procedural | Conditional |
|---|---|---|
| Knowledge of memory limitations | Knowledge about Strategies | Knowledge about When and Why to use Strategies |

## Regulation of Cognition

| Planning | Monitoring | Evaluation |
|---|---|---|
| Setting goals, Activating Background Knowledge, Budgeting Time | Observation of Performance | Reevaluating Goals, Revising Predictions |

# Examples of Metacognition

- **Knowing how well you are doing on your psychology test**

- **Predicting how difficult a chemistry project will be**

- **Understanding how much you know about makes and models of cars**

- **Knowing what information is important to take away from class lecture**

- **Knowing how well you can ski**

# Dunning-Kruger Effect

### "Unskilled and Unaware"

Do you have students like this??

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*"Having knowledge is only part of effective learning.  It also is important to use one's knowledge strategically and to understand the strengths and limitations of one's knowledge."*

(Bruning, Schraw, Ronning, 1999; p. 102)

**This is the key distinction between metacognition and cognition.**

**What is the most populated city in South America?**

**A. Buenos Aires**
**B. Santiago**
**C. Lima**
**D. Sao Paulo**

**0%_____100%**
**Accurate                                        Accurate**

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# Monitoring and Calibration

**Calibration is the degree to which one can match their *perception* of their performance with their *actual* level of performance.**

**Calibration is one measure of metacognitive monitoring accuracy**

> **Is calibration related to performance?**
> **Does prior knowledge improve calibration?**
> **Can training and/or feedback improve calibration?**

## Is calibration related to performance?

TABLE 2. Correlations Among Grade Point Average (GPA), Test Score, and Local Monitoring Accuracy

| Test | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 1 GPA | — | .59** | .76** | .67** | −.68** | .50** | −.44* | .64** | −.63** |
| 2 Test 1 score | | — | −.79** | .59** | −.62** | .63** | −.36* | .64** | −.58** |
| 3 Test 1 accuracy | | | −.63** | .77** | −.60** | .46* | −.69** | .61** |
| 4 Test 2 score | | | | — | −.80** | .40* | −.32 | .69** | −.52** |
| 5 Test 2 accuracy | | | | | | −.54** | .48* | −.74** | .69** |
| 6 Test 3 score | | | | | | — | −.64** | .70** | −.53** |
| 7 Test 3 accuracy | | | | | | | | −.36 | .69** |
| 8 Test 4 score | | | | | | | | — | −.63** |
| 9 Final exam accuracy | | | | | | | | | |

*$p < .05.$ **$p < .01.$

Nietfeld, J. L., Cao, L., & Osborne, J. W. (2005). Metacognitive monitoring accuracy and student performance in the classroom. , 7-28.

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## How many ways can a jury of 4 women and 3 men be chosen from 5 women and 5 men?

A. 20
B. 30
C. 40
D. 50

0%_____100%
Accurate                    Accurate

## Does prior knowledge improve calibration?

**Design:**

- **3 Groups with varied math background**
    **Low Knowledge N=31**
    **Mid Knowledge N=34**
    **High Knowledge N=28**

- **Completed a test of math probability and general intelligence**

- **Provided monitoring judgments for each item**

- **The High Knowledge group significantly outperformed the other two groups *and* made significantly more accurate monitoring judgments**

- **No differences were found in general ability between the 3 groups**

Nietfeld, J. L., & Schraw, G. (2002). The role of knowledge and strategy training on metacognitive monitoring. *Educational Research, 95*, 131-142.

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## Can training and/or feedback improve calibration?

Monitoring accuracy on math probability problems by college students –
Session 1=pretest, Session 2=after training (for Training group only),
Session 3=after one week.  Lower numbers equal higher accuracy.

**Table 3.—Means and Standard Deviations for Experiment 2**

| Group | Raven test performance | | Probability performance | | Probability confidence | | Probability bias | | Probability accuracy | | Self-efficacy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | SD | M | SD | M | SD | M | SD | M | SD | M | SD |
| **Training** | | | | | | | | | | | | |
| Session 1 | .64 | .23 | .58 | .12 | .70 | .13 | .14 | .15 | .37 | .09 | 35.02 | 8.79 |
| Session 2 | | | .68 | .13 | .79 | .12 | .10 | .15 | .29 | .08 | 33.88 | 9.01 |
| Session 3 | | | .62 | .10 | .78 | .13 | .16 | .15 | .35 | .08 | 34.07 | 8.82 |
| **Control** | | | | | | | | | | | | |
| Session 1 | .69 | .23 | .59 | .15 | .66 | .17 | .10 | .14 | .32 | .10 | 36.61 | 8.93 |
| Session 2 | | | .58 | .15 | .69 | .16 | .11 | .14 | .34 | .08 | 35.79 | 8.63 |
| Session 3 | | | .60 | .09 | .69 | .16 | .09 | .16 | .36 | .08 | 36.81 | 9.96 |

*Note.* Performance, confidence, and accuracy ranged from 0 to 1. Bias ranged from −1 to 1.

Nietfeld, J. L., & Schraw, G. (2002). The role of knowledge and strategy training on metacognitive monitoring. *The Journal of Educational Research, 95*, 131-142.

## Can training and/or feedback improve calibration?

No change in monitoring accuracy (calibration) in the absence of training or feedback.

**TABLE 1. Means and Standard Deviations of Monitoring Accuracy, Bias, and Confidence, by Test**

|  | Score | | Monitoring accuracy | | | | Bias | | Confidence | | |
|  | | | Local | | Global | | | | | | |
| Item | M | SD | M | SD | M | SD | M | SD | M | SD | n |
| Test 1 | .78 | .13 | .29 | .11 | .13 | .10 | −.03 | .11 | .75 | .13 | 27 |
| Test 2 | .81 | .09 | .29 | .10 | .13 | .12 | −.05 | .12 | .76 | .13 | 27 |
| Test 3 | .76 | .13 | .35 | .12 | .26 | .18 | −.07 | .19 | .68 | .18 | 27 |
| Final | .81 | .12 | .28 | .11 | .11 | .11 | −.02 | .17 | .78 | .16 | 26 |
| GPA | 3.35 | .41 | | | | | | | | | 27 |

*Note.* GPA = grade point average.

Nietfeld, J. L., Cao, L., & Osborne, J. W. (2005). Metacognitive monitoring accuracy and student performance in the classroom. *Journal of Experimental Education, 74*(1), 7-28.

## Give metacognitive strategy instruction a chance to "sink in" . . .

Study in how 5th graders comprehend expository science text

In 4 conditions:
1) Graphic organizer + Metacognitive instruction
2) Metacognitive instruction
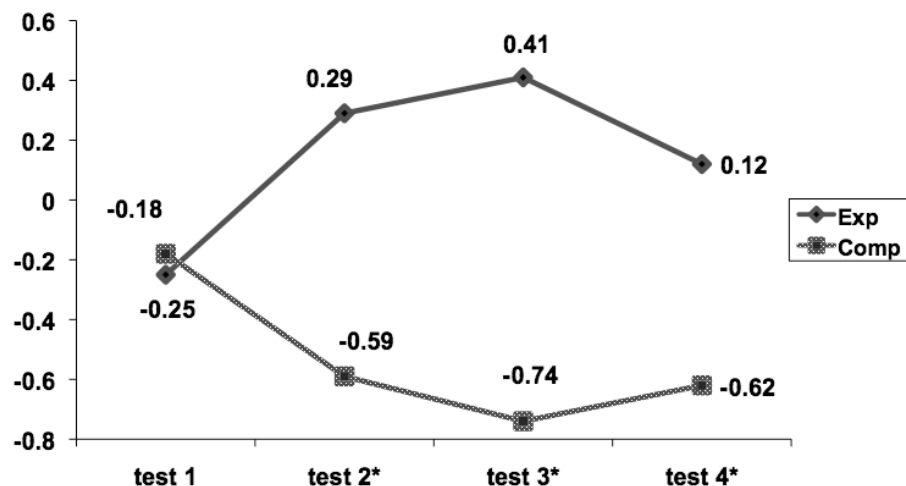3) Graphic Organizer instruction
4) Traditional instruction

Comprehension Score Change over Time, Controlling for Prior Knowledge

After 6 weeks an effect is found
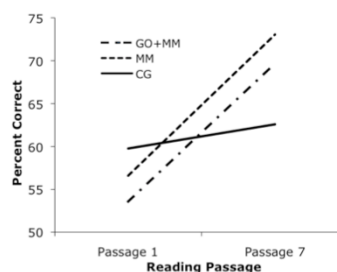


Hoffmann, K. F. (2010, dissertation)

## Can training and/or feedback improve calibration?



Nietfeld, J. L., Cao, L., & Osborne, J. W. (2006). The effect of distributed monitoring exercises and feedback on performance and monitoring accuracy. *Metacognition and Learning, 2,* 159-179.

# Metacog Checks

**EDP304 Metacogcheck - Motivation**

Name _____

1. Which one of these students clearly has a mastery goal rather than a performance goal?

A. Amanda wants to keep her 4.0 GPA so she can get an academic scholarship

B. Barney knows his parents will be proud if he is accepted into the National Honor Society.

C. Candace loves violins and spends hours trying to perfect her playing technique.

D. Dave hopes to play well in tonight's game to get the admiration of a girl.

0% _____ 100%
Confident                                                        Confident

Please predict how many of the questions (0-5) have you answered correctly:

What concept(s) from this material do you find difficult to understand?

Specifically, what will you do to improve your understanding of the concept(s) you listed above?

## Some Conclusions:

✓ It appears that monitoring accuracy (calibration) is not strongly related to general ability, perhaps not related at all

✓ Background knowledge (at least within the domain of probability) appears to be an essential component in the development of accurate monitoring skills

✓ Strategy training appears to be an effective means by which to increase skill *and* monitoring accuracy

✓ Distributed strategy training over time appears to be necessary to ensure the maintenance of gains in monitoring accuracy

# The "Knowing" and "Adjusting" Processes:
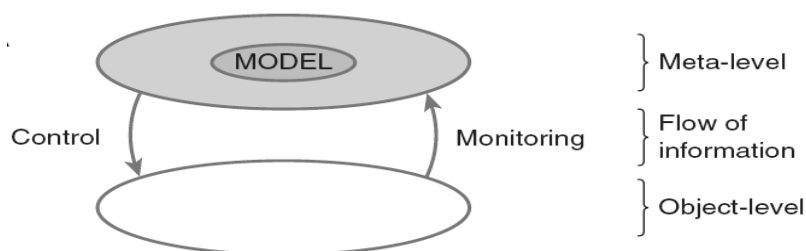


Adapted from Nelson & Narens (1990)

**Description of Written Response Categories.**

Category    Definition    Example

| Externally-focused thoughts | Thoughts not directly related to the task | "Is there spit on my face?"; "My mind wonders,"; "I may think about school or a friend." |
| Planning | Thoughts related to pre-race preparations | "First I start warming up, usually to fast music, for it gets me pumped up to run." |
| Information Management Strategy (IMS) | Thoughts that reflect strategies that the runner employs during the competition | "Usually, I am thinking about dividing the race up into smaller parts, for instance, four 200s because it's easier to get through." |
| Monitoring | Thoughts runners have about their energy level, pain tolerance, or form | "I am thinking about how much I have left." |
| Debugging | Thoughts that reflect changes in strategies or adjustments during the race | "If it is not going well I am trying trying to fight negative feedback from my body and mind." |
| Evaluation | Thoughts that reflect back on a race | "I sometimes think that I am running hard and then when I finish I know that I could have gone harder." |

Nietfeld, J. L. (2003). An examination of metacognitive strategy use and monitoring skills by competitive middle distance runners. *The Journal of Applied Sport Psychology, 15*, 307-320.

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External thoughts represented only 12% of the total recorded. In contrast, 41% of the responses were information management strategies, 42% of the responses involved monitoring, and more broadly, *88% of the responses were internally-focused and metacognitive in nature.*

Runners missed their target mile time by an average of 9 seconds

The relationship between the Racing the Mile Questionnaire and the mile performance task (*r = –.44)*. This correlation indicates that *participants who report being more strategic when preparing for and racing a mile also show a tendency to be more accurate at monitoring their pace on a performance task* (low scores on the performance task represent more accurate monitoring).

4. Do you make adjustments in your running during the race?
5. Do you visualize and/or meditate about the race after you run?
6. If you are not racing well after a half-mile do you just finish without changing anything about your performance?
7. Do you make changes in your racing after watching highly successful runners?
8. Do you have a race plan when you are on the starting line?
9. Does the type and amount of training you do affect the way you race?
10. Do you adjust your pace to fit the race and the other runners?

Nietfeld, J. L. (2003). An examination of metacognitive strategy use and monitoring skills by competitive middle distance runners. *The Journal of Applied Sport Psychology, 15*, 307-320.

2/2/16

## 3 Levels of Cognitive Study Strategies

- **Basic Study Strategies**
  - Highlighting/Underlining/Note Taking
  - Don't take for granted that students know these!

- **Comprehension Monitoring Strategies**
  - Self-questioning/Summarizing
  - These are things you do "on-line" while learning

- **Critical Thinking**
  - Most important level--this is your goal!
  - What is critical thinking?

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# Ten Essential Critical Thinking Skills

- **Distinguishing between verifiable facts and value claims**

- **Distinguishing between relevant and irrelevant information, claims, or reasons**

- **Determining the factual accuracy of a statement**

- **Determining the credibility of a source**

- **Identifying ambiguous claims or arguments**

# Ten Essential Critical Thinking Skills cont.

⊚ **Identifying unstated assumptions**

⊚ **Detecting bias**

⊚ **Identifying logical fallacies**

⊚ **Recognizing logical inconsistencies in a line of reasoning**

⊚ **Determining the strength of an argument or claim**

Taken from Beyer (1988)

# Teaching Metacognitive Strategy Regulation

✏➤ **Model strategies that cut across domains**

✏➤ **Encourage students to transfer strategies (eliminate inert knowledge)**

✏➤ **Demonstrate why some strategies are better than others**

✏➤ **Explain when and where a strategy will be used**

✏➤ **Use checklists to help monitor**

## Teaching Metacognitive Strategy Regulation *cont.*

☞ Ask students to look back on their performance and determine what they did well and not so well on

☞ Strategies are most effective when integrated within the curriculum as opposed to being taught as a stand-alone unit

# What is Creativity?

*"Ability to produce work that is both novel and appropriate"*
(Sternberg & Lubart, 1996)

*"The capacity to perform mental work that leads to an outcome both novel and applicable."*    (Pereira, 1999)
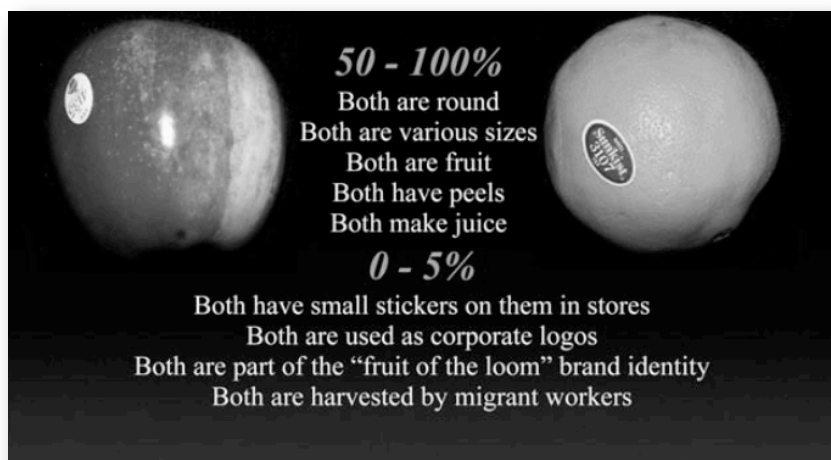
NOVEL -> original, unexpected
   ⚙ => Associative thinking – recombine existing knowledge with divergent approaches

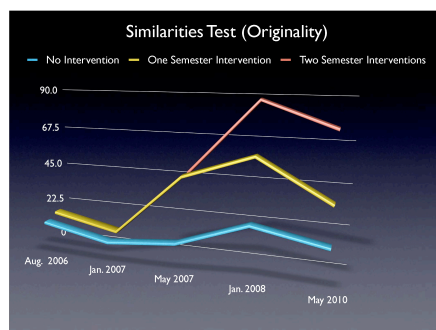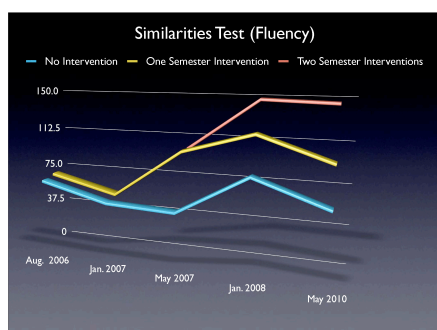PRODUCTIVE -> appropriate, applicable, useful, meets task constraints, has a contribution
   ⚙ => Critical thinking – What you select out, focus on

# Creativity & Metacognition



# Creativity & Metacognition



Hargrove, R. A., & Nietfeld, J. L. (2014). The impact of metacognitive instruction on creative problem solving. *Journal of Experimental Education*. DOI: 10.1080/00220973.2013.876604

# Transfer of Learning

- Occurs when something learned at one time and place is applied in another setting
  - Transferring to another university
    - Schedule time with advisor
    - Knowing how to register for classes
    - Where to find information--library

- Most difficult challenge for teachers!

- People often don't realize the relevance of their prior knowledge in new situations

- Important to instill a "disposition for transfer" in your learners

- Need to reduce inert knowledge

# Factors Affecting Transfer

- Structured practice that promotes automated problem solving increases transfer

- Meaningful learning leads to greater transfer than rote learning

- Relate problem-solving skills in one domain to another by the use of analogy. Students should see material as context-free rather than context-bound

- Give numerous worked-out examples

- Similarity between two situations increases transfer

- Transfer is more likely when only a short amount of time has elapsed after students have studied a topic
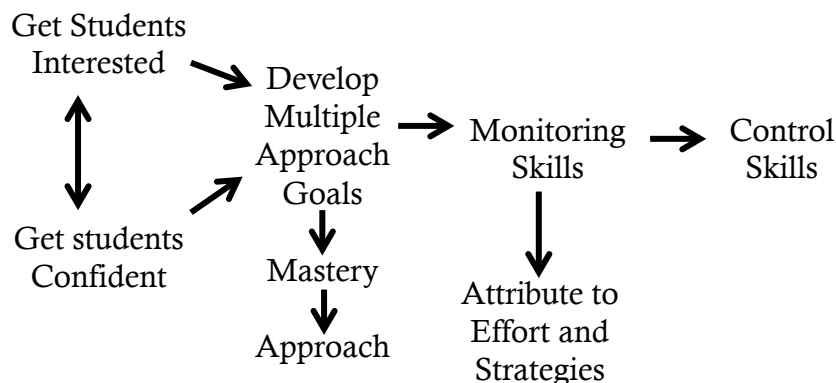
## Implications for Effective Learners:

* **Above all, help learners to learn to be strategic. This includes helping them to learn many strategies and be flexible in using them**

* **Also, strategies are only effective when learners know when, where, and why they should apply them**

* **Teach learners to make a habit of actively reflecting on their learning**

* **Metacognition can facilitate critical thinking, creativity, and transfer if you teach students appropriate self-prompts**

## Things I try do in my courses:

* Weekly Metacog Checks

* Confidence judgments on exams

* Study guides without the answers directly under the questions – this leads to overconfidence

* Asking students to justify their answers – providing evidence can lead to re-evaluation

* Talk to students about study methods – can they explain the material to someone not in the course?

* Model effective study strategies through in-class exercises

## A Model for Impacting Classroom SRL Skills

Get Students Interested → Develop Multiple Approach Goals → Monitoring Skills → Control Skills

Get students Confident → Develop Multiple Approach Goals

Develop Multiple Approach Goals → Mastery → Approach

Monitoring Skills → Attribute to Effort and Strategies

# Safe Sally

Sally is a "straight A" student. In fact, she made that clear on your course student information page the first day of class. In many respects, Sally is a perfect student – dependable, and highly motivated. A superficial look at her would reveal no motivation problems.

But despite Sally's high academic performance, she is an underachiever. She is motivated, but only to achieve high grades and the accompanying respect of her teachers. She perceives a "B+" as a disastrous blemish on her record. Working methodically within the guidelines and structure given to her, she makes no effort to be creative.

A careful look at Sally's perfect record reveals a series of courses that offered little challenge. She took only the required science courses, and she enrolled in the calculus course but dropped it after getting a "C+" on the first weekly quiz. Learning has no intrinsic value to her and she always chooses the easiest assignment in class. She lacks self-confidence in her academic skills and prefers not to risk failure.

Adapted from Stipek (1998)

# Anxious Alma

Alma is an average student in most subjects but she is doing poorly in your class on statistics – saying that stats just aren't her thing. Tests often are turned in with many unanswered problems. Sometimes correct answers had been written but were erased. For the first few weeks of the semester, you asked Alma questions to elicit her participation. But she usually refused to participate, and you have stopped after sensing her level of discomfort.

In contrast to her class performance, assignments that Alma can take home are often returned completed and mostly correct. Alma lacks self-confidence and apparently finds that refusing to answer a question is less threatening than risking a wrong answer. She is very concerned about failure. However prepared Alma may be for a test, as soon as it is in front of her, she panics. She cannot remember the simplest procedures that she knew well the evening before. For the rest of her life she will claim that she has no aptitude for statistics.

Adapted from Stipek (1998)

# Overconfident Ollie

Ollie is never afraid to put forth his opinion on issues and questions in your psychology course. He speaks up more than any other students in class. At first other students assumed he had more background on the subject than themselves but now, in the middle of the semester, they are annoyed by his talkativeness. When others share an opinion different from his own Ollie begins shaking his head almost immediately.

When offering to provide personal feedback on upcoming projects Ollie is one of the few who didn't take advantage. After returning tests in class he looks rather offended that you would have given him such a marginal grade. Ollie is not the lowest performing student in the class but he is in the bottom third.

Nietfeld (2016)

# Helping Safe Sally

* Self worth is dependent upon external recognition and awards

* Limit the amount of recognition for achieving the highest grade

* Challenge her to adopt independent standards. Make grades partly contingent upon working on challenging tasks.

* Praise her for her efforts on challenging tasks even for less than perfect work

* Encourage her efforts outside of class requirements

* Don't eliminate her concern for performance just make sure it is not more salient than her concern for learning and challenge

# Helping Anxious Alma

* Talk with her about her anxiety and a personal program for overcoming it

* Learn about relaxation techniques

* Agreement for her to volunteer to contribute but not be called upon when she doesn't volunteer

* Sample problems, saturate her in testing environments – getting used to being 'on the clock'

# Helping Overconfident Ollie

⚙ Ask for justification in answers – ask the 'why' questions

⚙ Have him make predictions and postdictions (after performance) and then have him compare with actual performance – he will need explicit feedback over time

⚙ Do not reinforce behaviors that lead to overconfident responses (e.g., quick replies)

⚙ Talk with him and explain that his overconfidence is likely leading to poorer academic performance