Welcome!

National Standards Day

Creating The Optimal Learning Environment

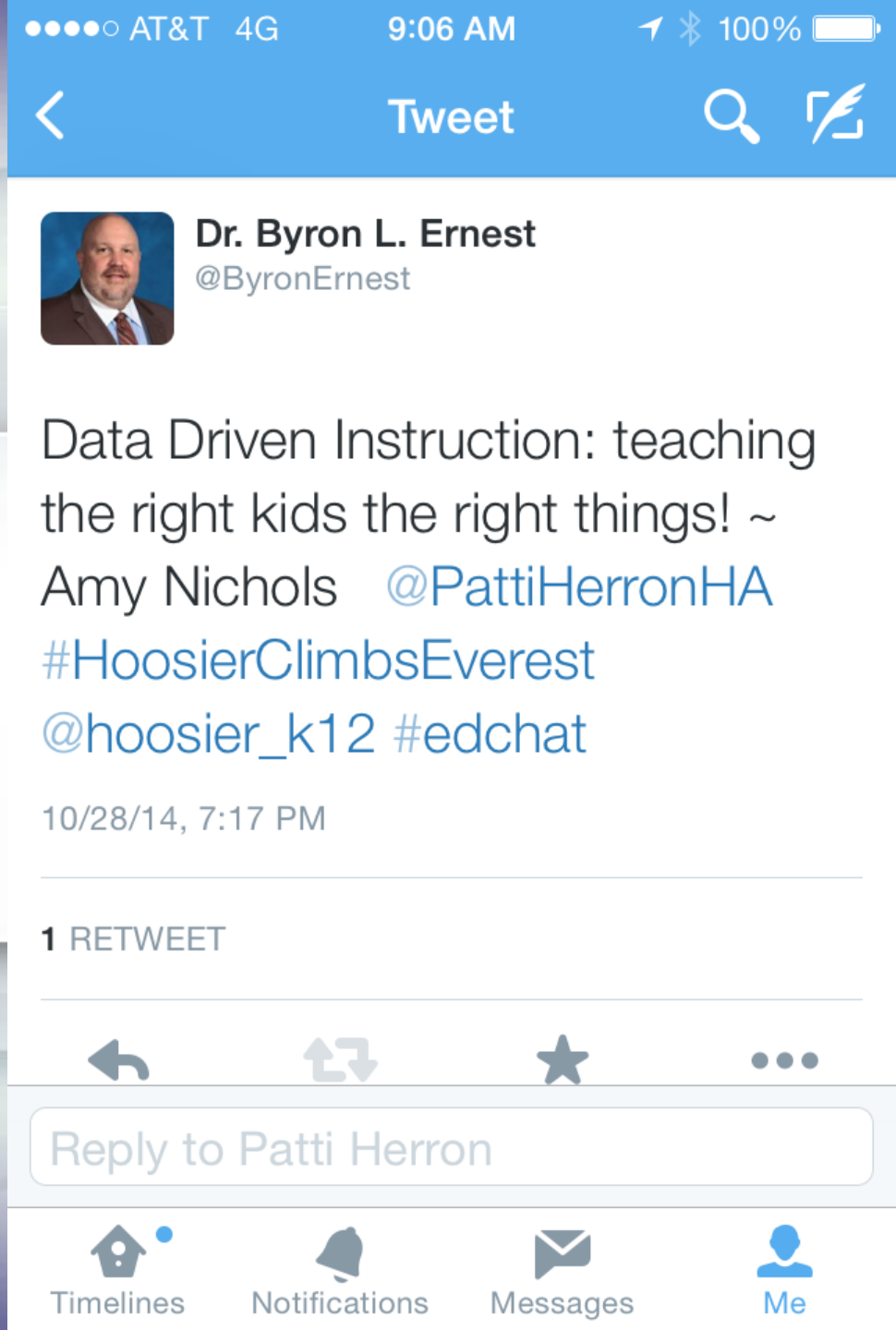
Dr. Byron L. Ernest
@ByronErnest

Follow Me On Twitter:@ByronErnest

We can become a PLC by using the hashtag: #HoosierNSD

@ByronErnest
#HoosierNSD

Shout Out!


AT&T 4G
9:06 AM
100%
Tweet
Dr. Byron L. Ernest
@ByronErnest
Data Driven Instruction: teaching the right kids the right things! ~ Amy Nichols @PattiHerronHA #HoosierClimbsEverest @hoosier_k12 #edchat
10/28/14, 7:17 PM
1 RETWEET
Reply to Patti Herron
Timelines
Notifications
Messages
Me

The Hand In The Back of the Room

Education exists in the larger context of society.

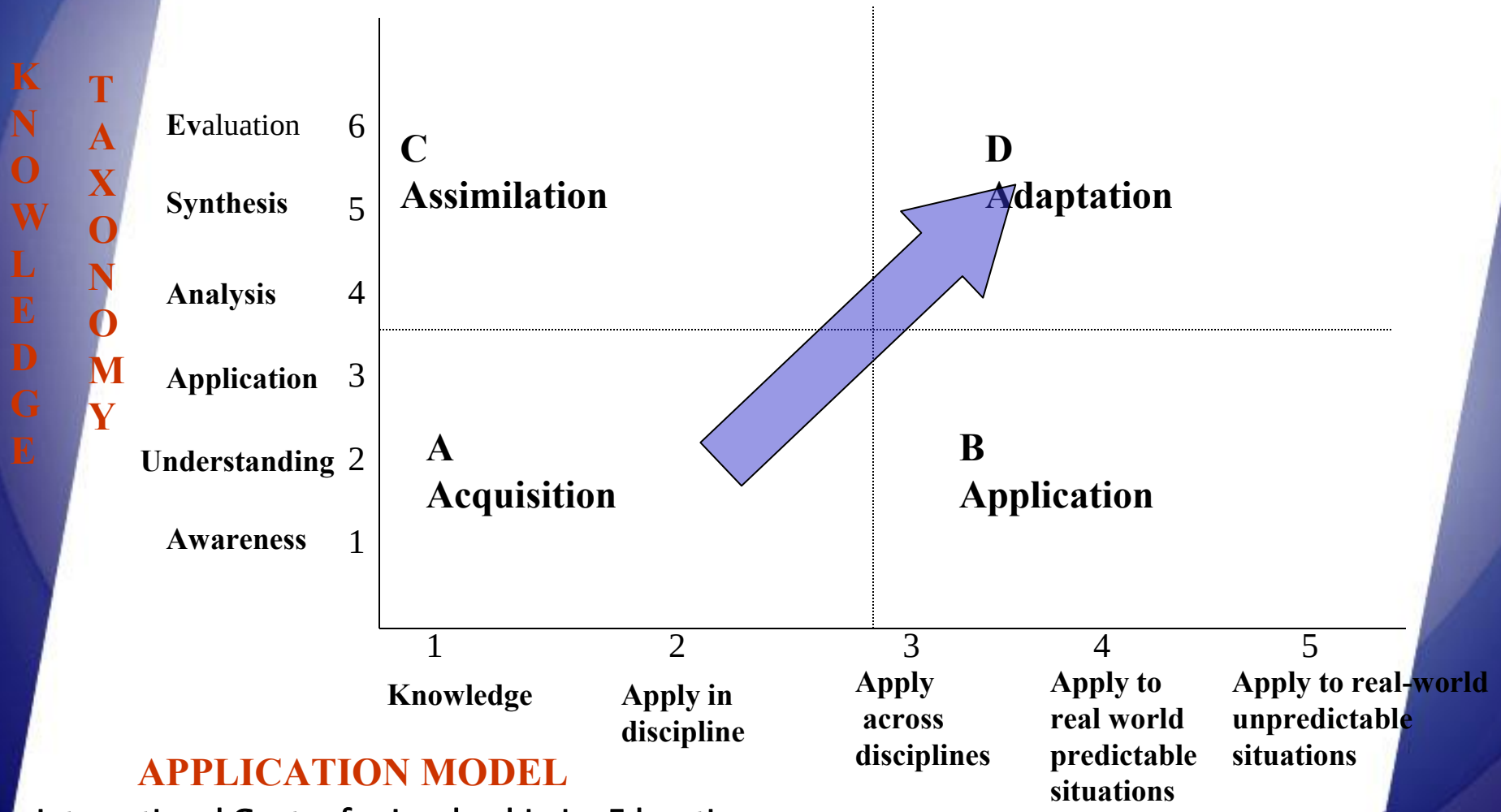
When society changes – so too must education if it is to remain viable.

Problem

The problem addressed in this study was the lack of student achievement in science as measured by high school level exams and Biology course grade.

@ByronErnest
#HoosierNSD

The Rigor/Relevance Framework

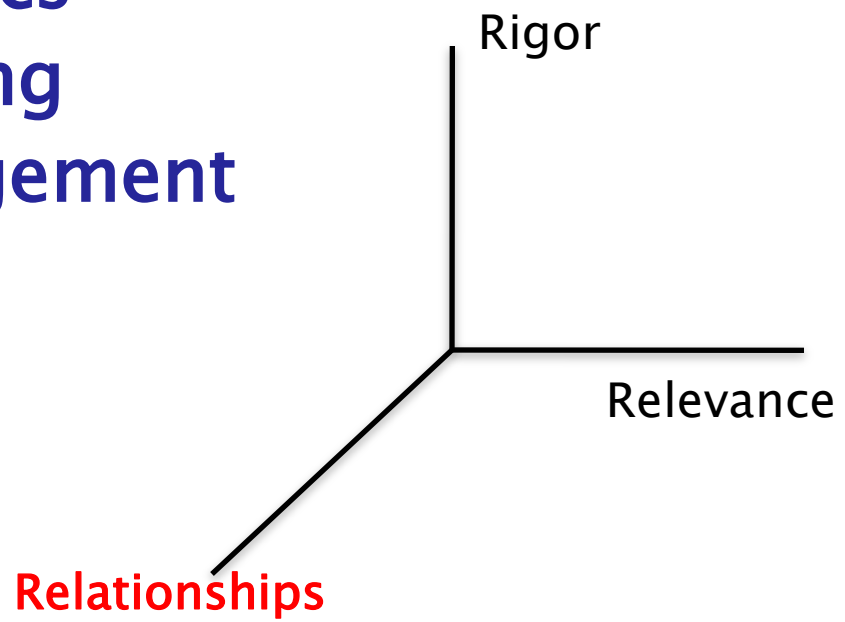


APPLICATION MODEL

International Center for Leadership in Education

Success Beyond the Test

- Core Academics
- Stretch learning
- Learner Engagement
- Personal Skill Development



@ByronErnest
#HoosierNSD

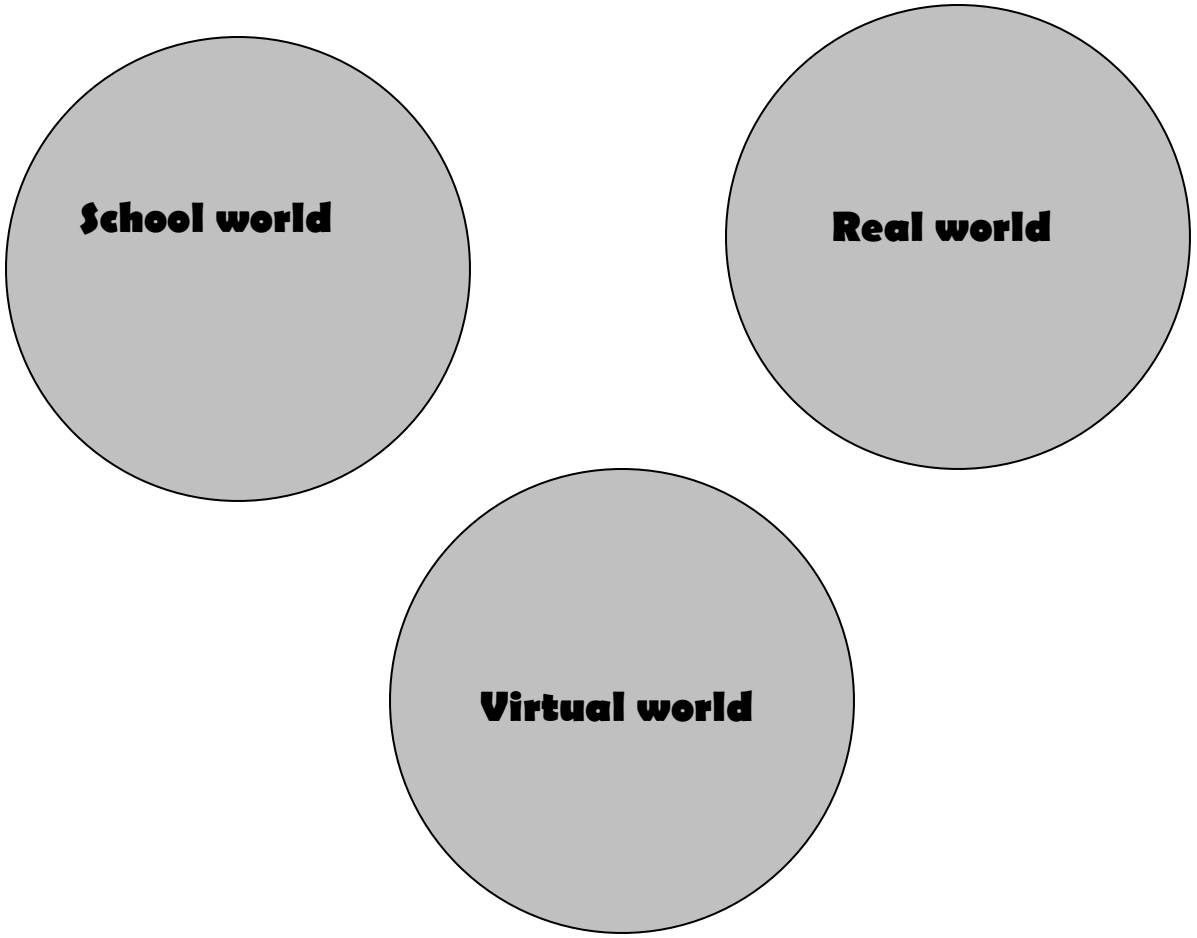
Relationships

It is virtually impossible to make things relevant for, or expect personal excellence from, a student you don't know.

~Carol Ann Tomlinson

@ByronErnest
#HoosierNSD

Three Worlds of the Student



@ByronErnest
#HoosierNSD

What Zone Am I In?

Too Easy

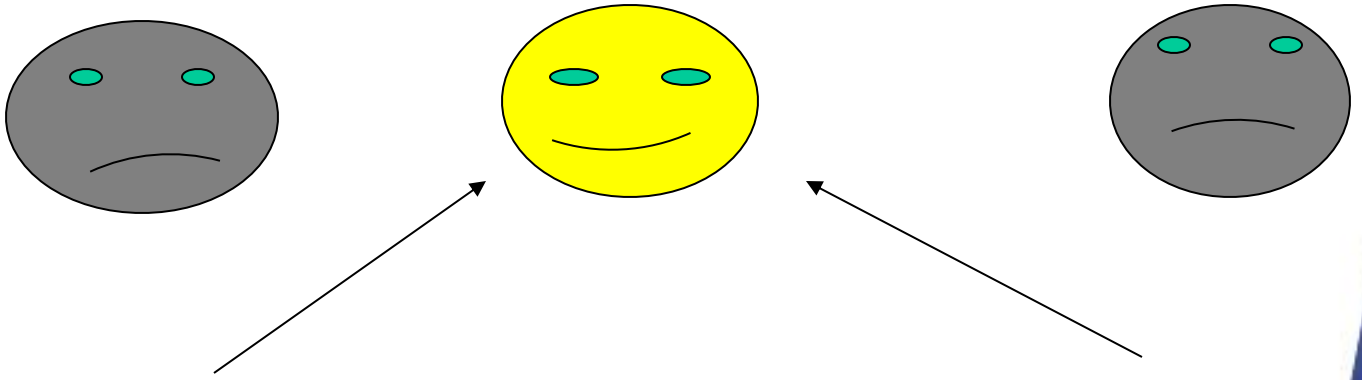
- I get it right away…
- I already know how…
- This is a cinch…
- I'm sure to make an A..,
- I'm coasting…
- I feel relaxed,,,
- I'm bored…
- No big effort necessary.

On Target

- I know some things…
- I have to think…
- I have to work…
- I have to persist…
- I hit some walls…
- I'm on my toes…
- I have to regroup…
- I feel challenged…
- Effort leads to success..

Too Hard

- I don't know where to start…
- I can't figure it out…
- I'm spinning my wheels…
- I'm missing key skills…
- I feel frustrated…
- I feel angry…
- This makes no sense…
- Effort doesn't pay off…



THIS is the place to be.

THIS is the achievement zone.

Setting & Sample

- The population used in this study were Biology I students (n=486) in an Indiana high school taking the State Biology I End of Course Assessment (ECA).
- The population for the qualitative sequence included all science and agriculture teachers (n=10) in the study school.

Instruments & Data Analysis

- The source for student achievement data was the Indiana Biology I ECA scores Biology I student grades.
- A convenience sample of all science and agriculture teachers (n=10) were interviewed as the data source for the qualitative sequence.

Theoretical Framework

- The theories that provided the framework for this study were:
  - Vygotsky's (1978) constructivist theory
  - Gardner's (1993) multiple intelligences.

Learning Organization

- Scott and Dixon's (2009) evaluative research showed that when teachers had the opportunity to reflect with each other on pedagogical knowledge, share resources, collaboratively develop ideas, and observe alternative teaching strategies the impact was significant.

Teacher Interview Questions

1. Tell me about your experiences teaching a science lesson in the context of agriculture.
2. How was planning for teaching a science lesson in the context of agriculture different from other lessons?
3. What teaching strategies have you used when teaching science lessons in the context of agriculture?
4. Describe the impact of science taught in the context of agriculture on student learning of science concepts.
5. How has science taught in the context of agriculture impacted your students' ability to solve problems and think critically?
6. What has been your experience related to student motivation when learning science in the context of agriculture?
7. Are there any additional points you would like to discuss or comments you would like to add?

Quantitative Findings – RQ 1

Table 1 – Point-Biserial Correlations For End of Course Assessment

		Fund of Ag Science	ECA Score
Fund of Ag Science	Point-Biserial Correlation	1	.364**
	Sig. (2-tailed)		.000
	N	486	486
ECA Score	Point Biserial Correlation	.364**	1
	Sig. (2-tailed)	.000	
	N	486	486

Using the sample of 486 students there was a statistically significant correlation of .364 for students taking Fundamentals of Agriculture Science and Business and the same students' achievement on the Indiana Biology I End of Course Assessment (see Table 1).

Quantitative Findings – RQ 2

Table 2 – Point-Biserial Correlations For Biology I Grade Percentage

		Fund of Ag Science	Biology I Grade
Fund of Ag Science	Point-Biserial Correlation	1	.351**
	Sig. (2-tailed)		.000
	N	486	486
Biology I Grade	Point-Biserial Correlation	.351**	1
	Sig. (2-tailed)	.000	
	N	486	486

A .351 point-biserial correlation was found and the correlation was significant at the 0.01 level (2-tailed) as seen in Table 2.

Quantitative Findings – RQ 3

Table 3 – Biology I End of Course Assessment Chi-Squared Observed/Expected Data

	Observed N	Expected N	Residual
0 Not Passing ECA	208	243.0	-35.0
1 Passing ECA	278	243.0	35.0
Total	486		

Agriculture Science and Business, as seen in Table 5. The percentage of participants that passed the Indiana Biology I End of Course Assessment was higher for those who had successfully completed the Fundamentals of Agriculture Science and Business course, $c^2(1, N=486) = 10.08, p=.001$.

Quantitative Findings – RQ 3

Table 4 – Biology I End of Course Assessment Chi-Squared Test Statistics

	Biology I ECA
Chi-Square	10.082[a]
df	1
P - value	.001

0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 243.0.

Agriculture Science and Business, as seen in Table 4. The percentage of participants that passed the Indiana Biology I End of Course Assessment was higher for those who had successfully completed the Fundamentals of Agriculture Science and Business course, $c^2(1, N=486) = 10.08, p=.001$.

Qualitative Findings

Two themes emerged during data analysis:

- Student Impact
  - Student Motivation
  - Interested & Inquisitive
  - Real World Activities
  - Relevance of Agriculture Context
  - Agriculture is Made up of Science
  - Application to Other Courses

- Teacher Experience
  - Positive Experience
  - More Training Needed

@ByronErnest
#HoosierNSD

Interpretation of Results

The results for this mixed methods explanatory study were as follows:

- There was a statistically significant correlation for students taking Fundamentals of Agriculture Science and Business and student achievement on the Indiana Biology I End of Course Assessment;
- Students who took Fundamentals of Agriculture Science and Business were significantly more likely to score higher on the Biology I course grade percentage;
- Teachers reported a positive experience and perceived positive student impact from teaching science concepts in the context of agriculture

Interpretation of Findings

Science should be taught in a relevant & rigorous context, which enables the student to think critically, explore phenomena, and solve meaningful everyday problems.

@ByronErnest
#HoosierNSD

Interpretation of Findings

Inquiry-based science methods taught in the relevant context of agriculture support many national and state core standards in science.

@ByronErnest
#HoosierNSD

Interpretation of Findings

Facilitating learning should use contexts where the student plays an active role.

Student-centered practices improve rigor, student engagement and motivation.

@ByronErnest
#HoosierNSD

Interpretation of Findings

The understanding of science concepts expressed by the teacher participants was that higher quality learning occurs when connections between classroom and a real life context are made.

@ByronErnest
#HoosierNSD

Learning Criteria

- **Core Academics** – Achievement in the core subjects of English language arts, math, science, social studies and others identified by the school or district using Indiana Academic Standards

- **Stretch Learning** – Demonstration of rigorous and relevant learning beyond the minimum requirements

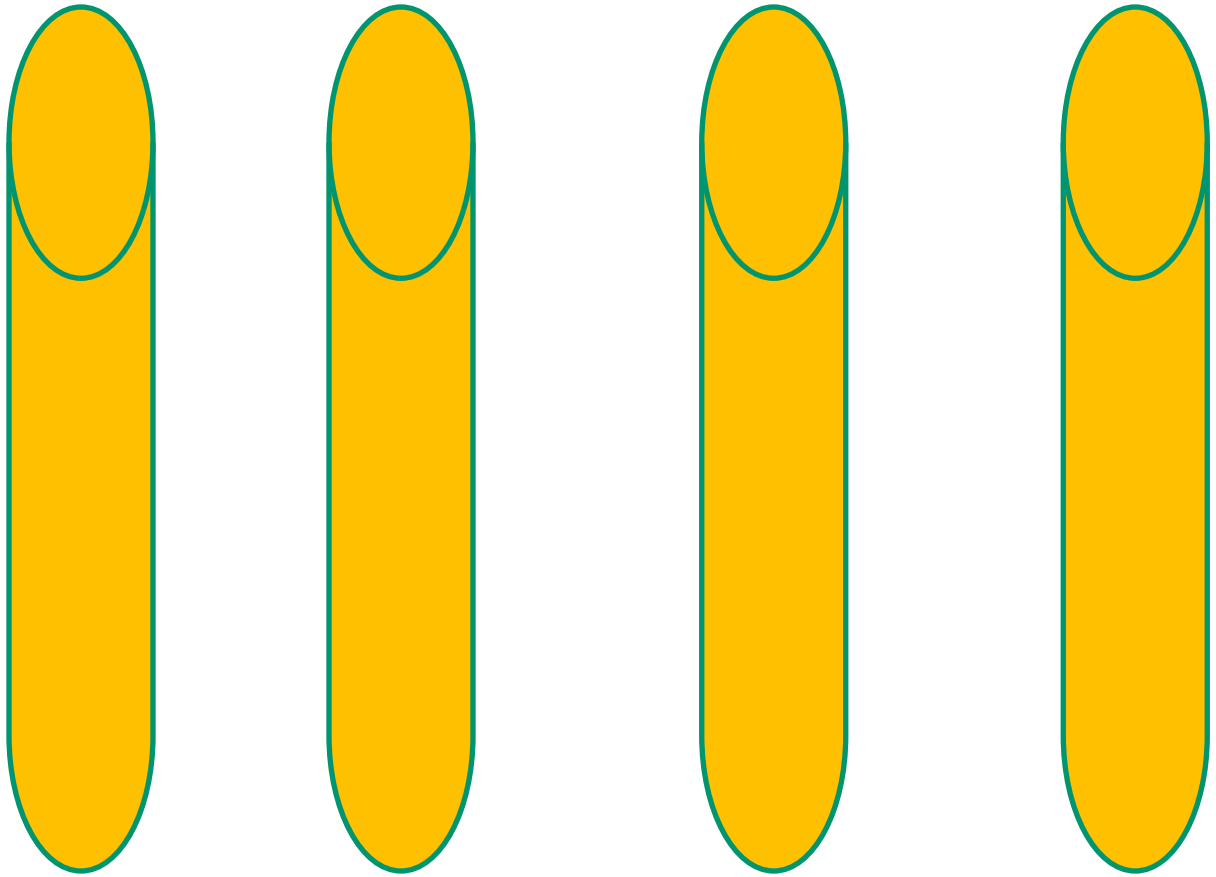
@ByronErnest
#HoosierNSD

Learning Criteria

- **Learner Engagement –** The extent to which students are motivated and committed to learning; have a sense of belonging and accomplishment; and have relationships with adults, peers and parents that support learning

- **Personal Skill Development –** Measures of personal, social, service, and leadership skills and demonstrations of positive behaviors and attitudes

Learning Criteria



Core

Stretch

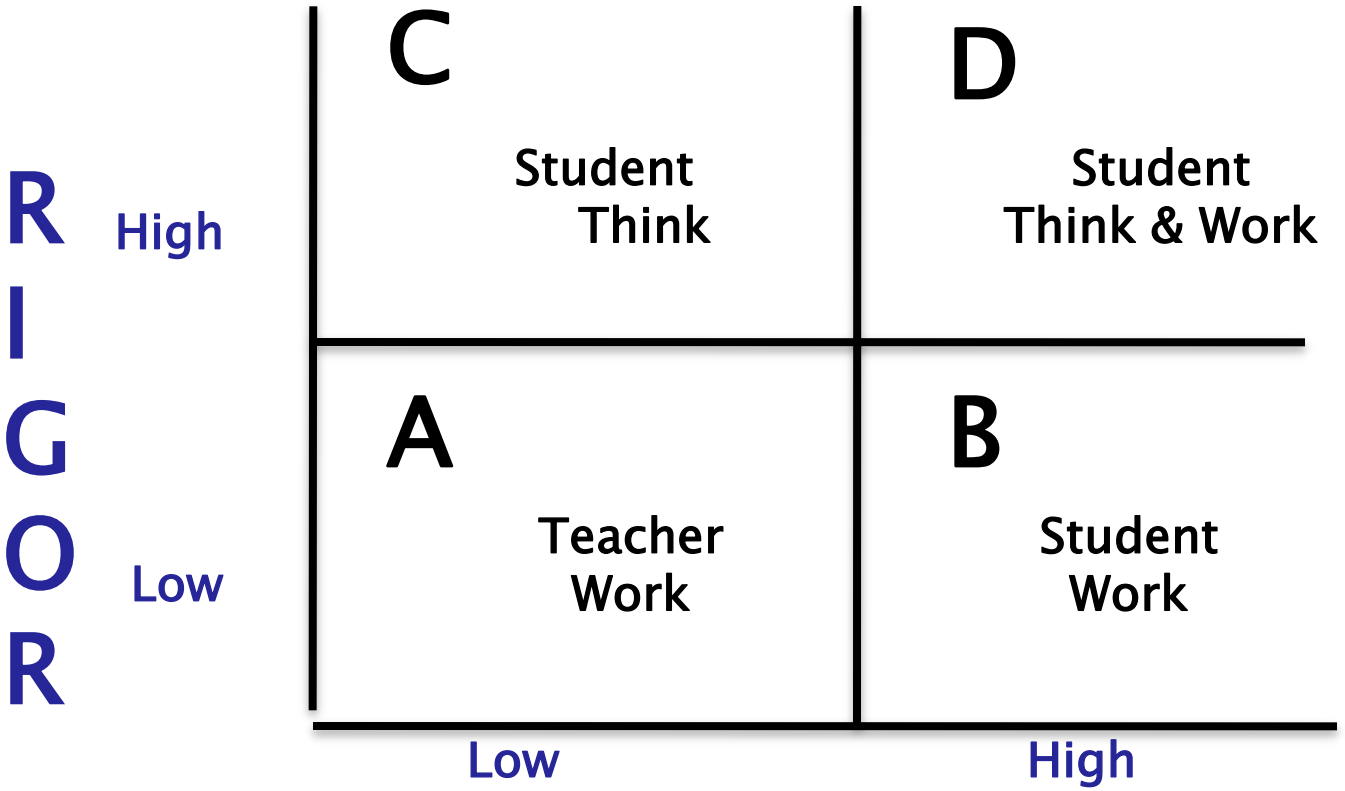
Learner Engagement

Personal Skill Development

Learning Criteria

@ByronErnest
#HoosierNSD

Rigor/Relevance Framework: Teacher/Student Roles



@ByronErnest
#HoosierNSD

Creating a Learning Environment for 21st & 1/2 Century Skills

Students working in teams to experience and explore relevant, real-world problems, questions, issues, and challenges; then creating presentations and products to share what they have learned.

@ByronErnest
#HoosierNSD

Relevant & Engaging Skills

To learn collaboration –

work in teams

To learn critical thinking –

take on complex problems

To learn oral communication –

present

To learn written communications –

write

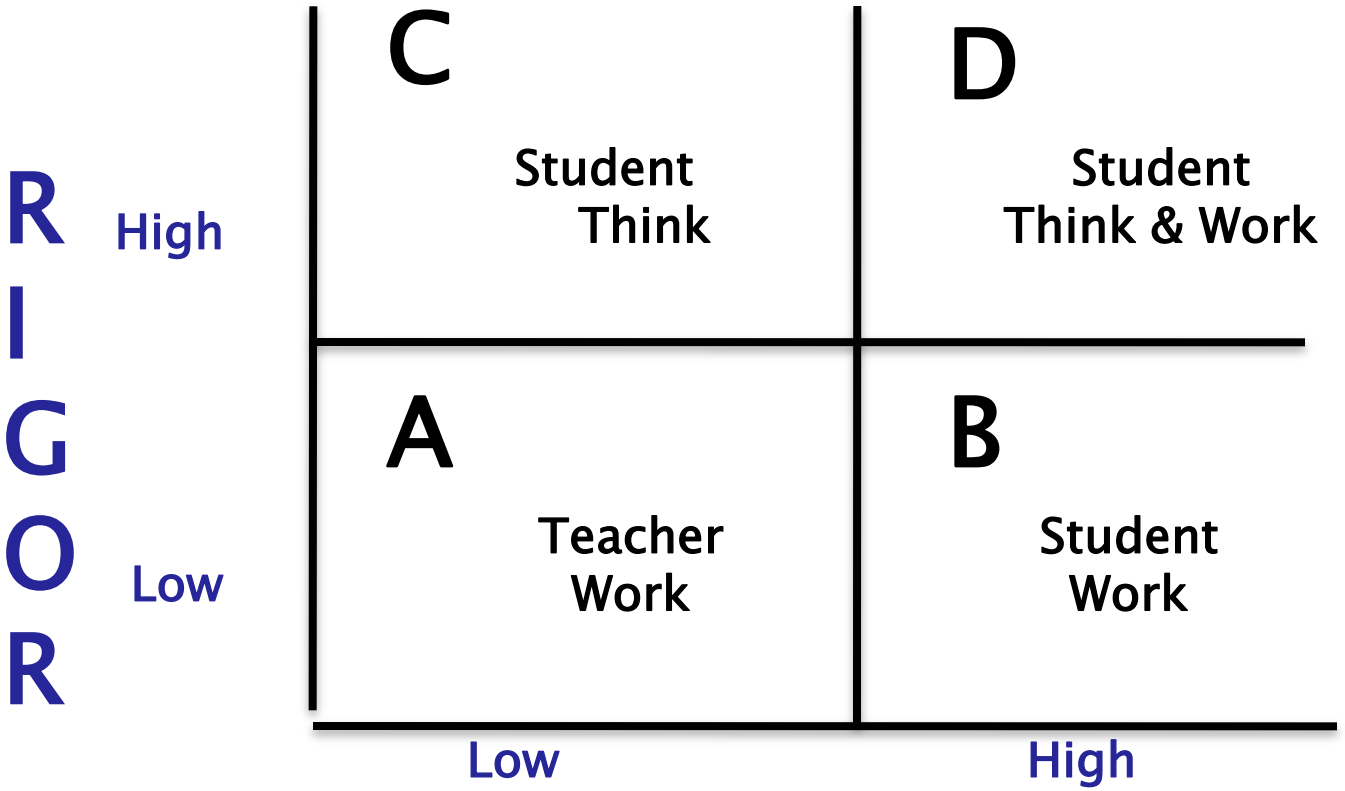
@ByronErnest
#HoosierNSD

Students Develop Needed Skills in

- Information Searching & Researching
- Critical Analysis
- Summarizing and Synthesizing
- Inquiry, Questioning and Exploratory Investigations
- Design and Problem-solving

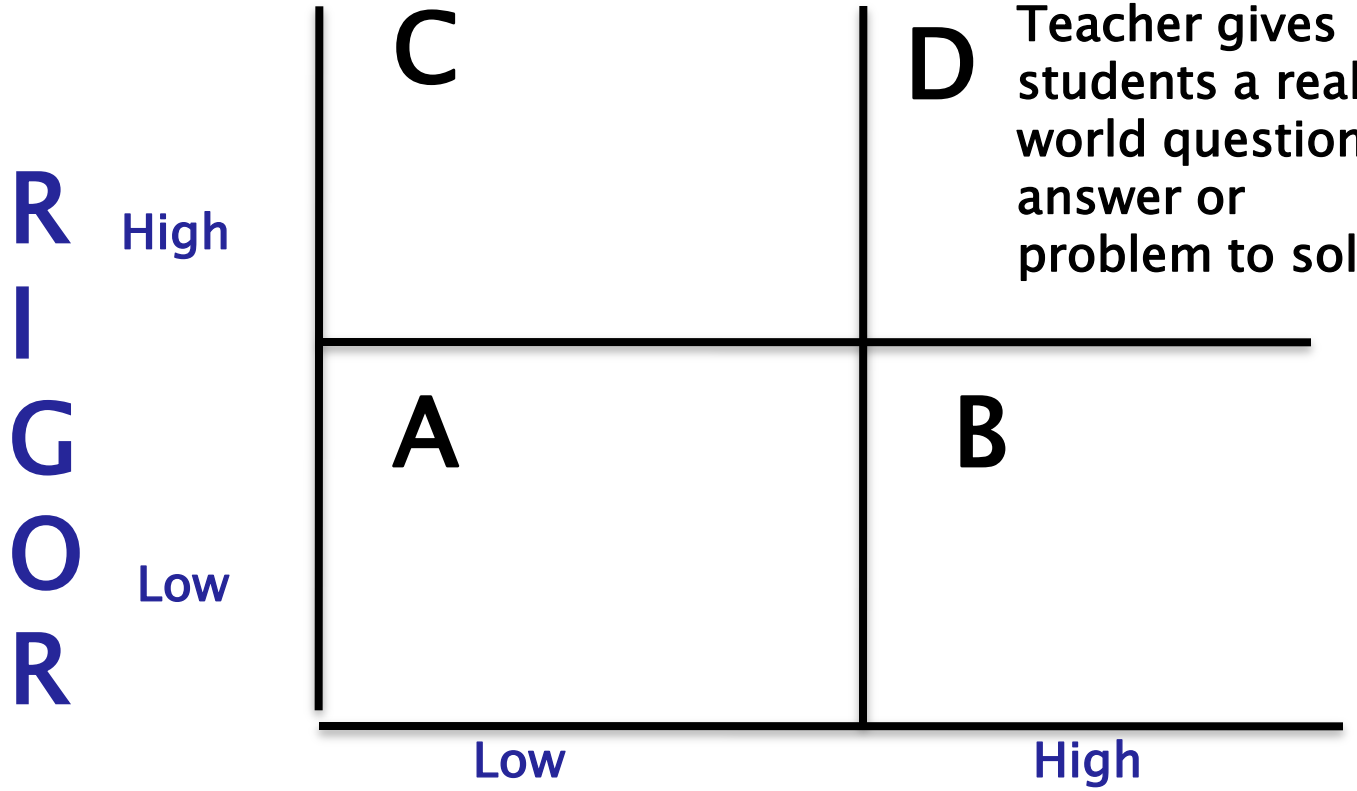
@ByronErnest
#HoosierNSD

Rigor/Relevance Framework Teacher Student Roles



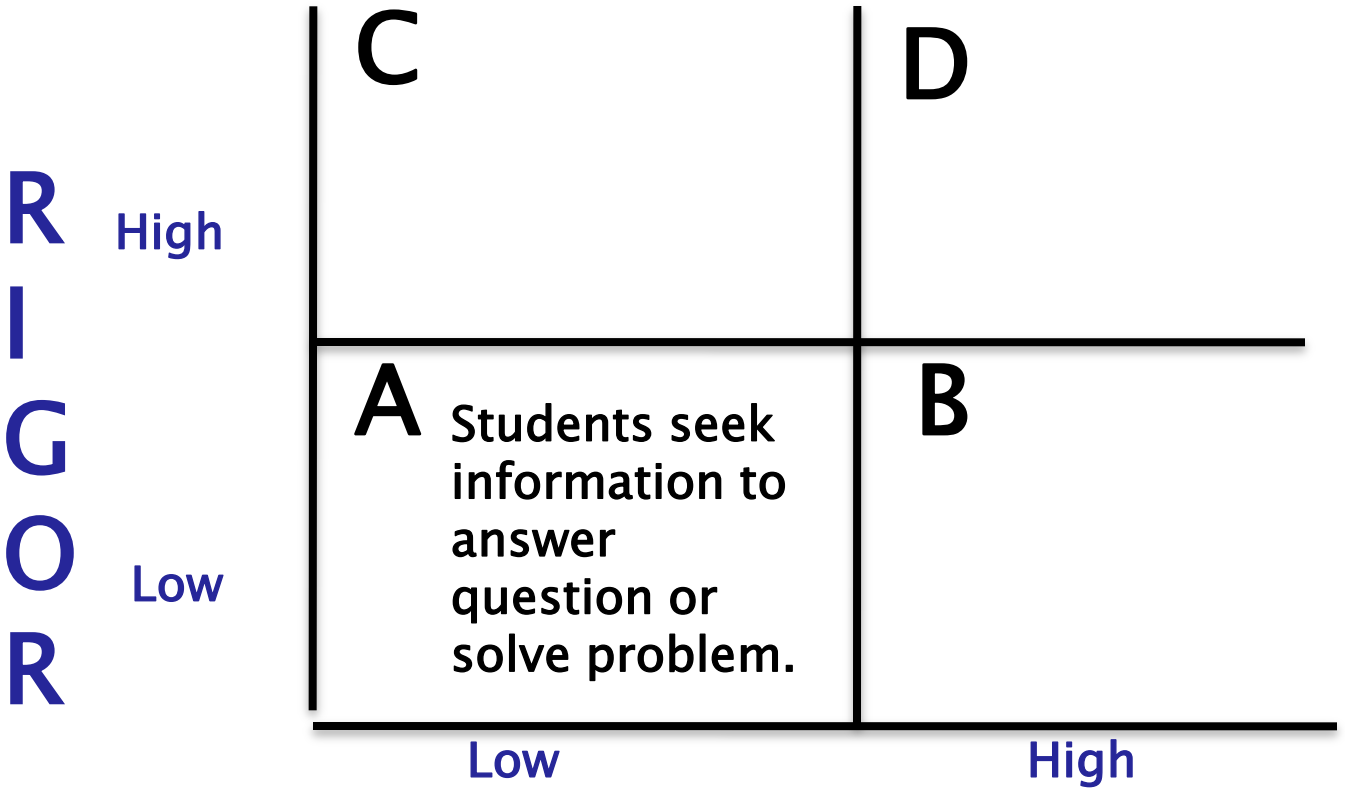
@ByronErnest
#HoosierNSD

Rigor/Relevance Framework – Step 1



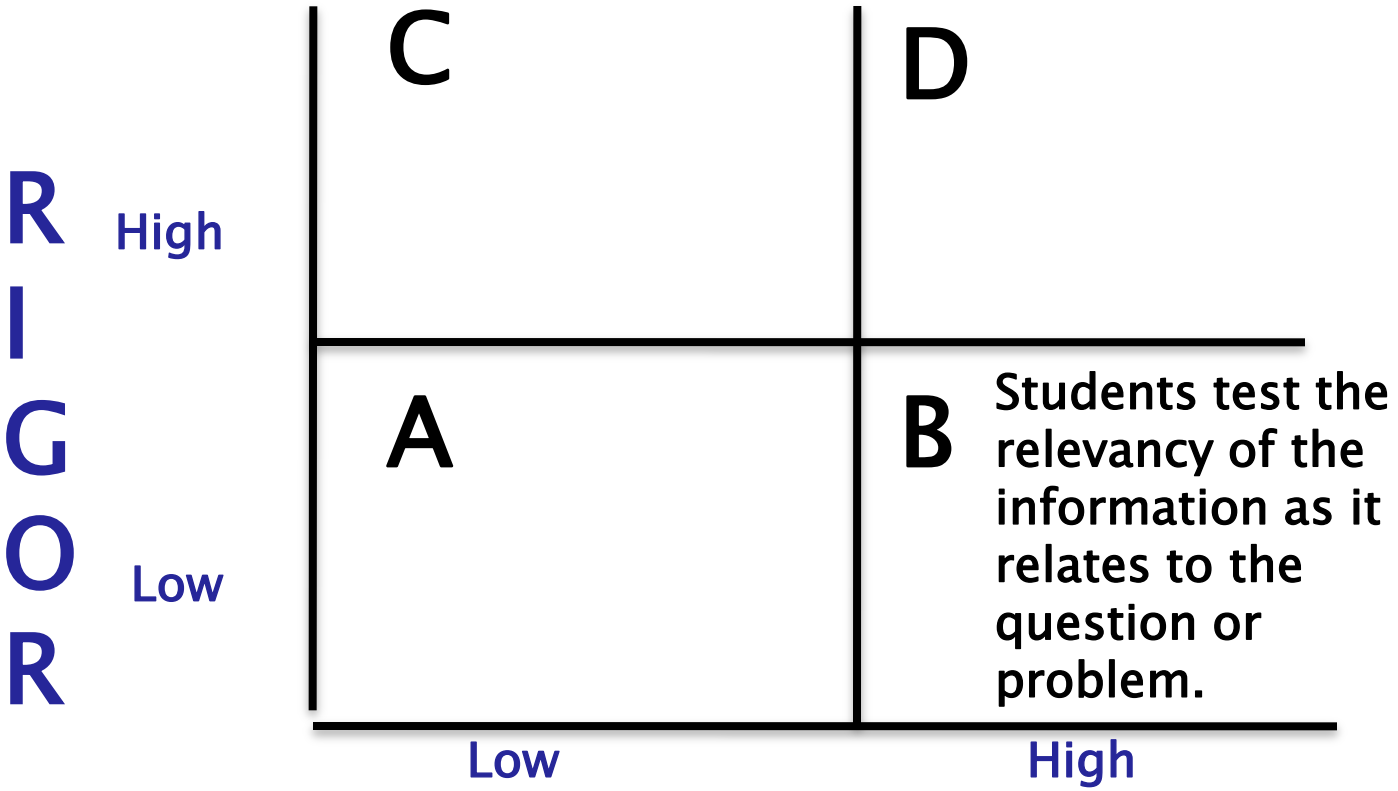
@ByronErnest
#HoosierNSD

Rigor/Relevance Framework – Step 2



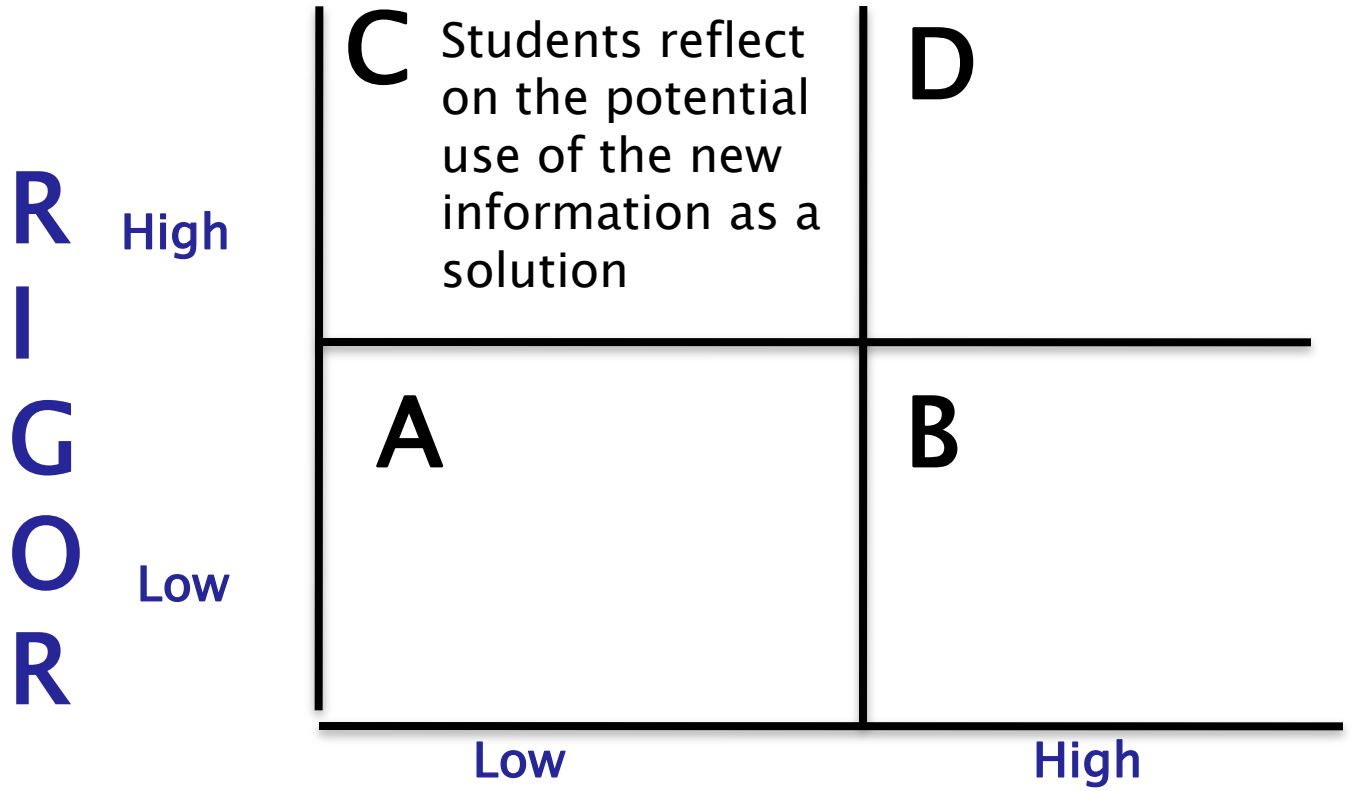
@ByronErnest
#HoosierNSD

Rigor/Relevance Framework – Step3



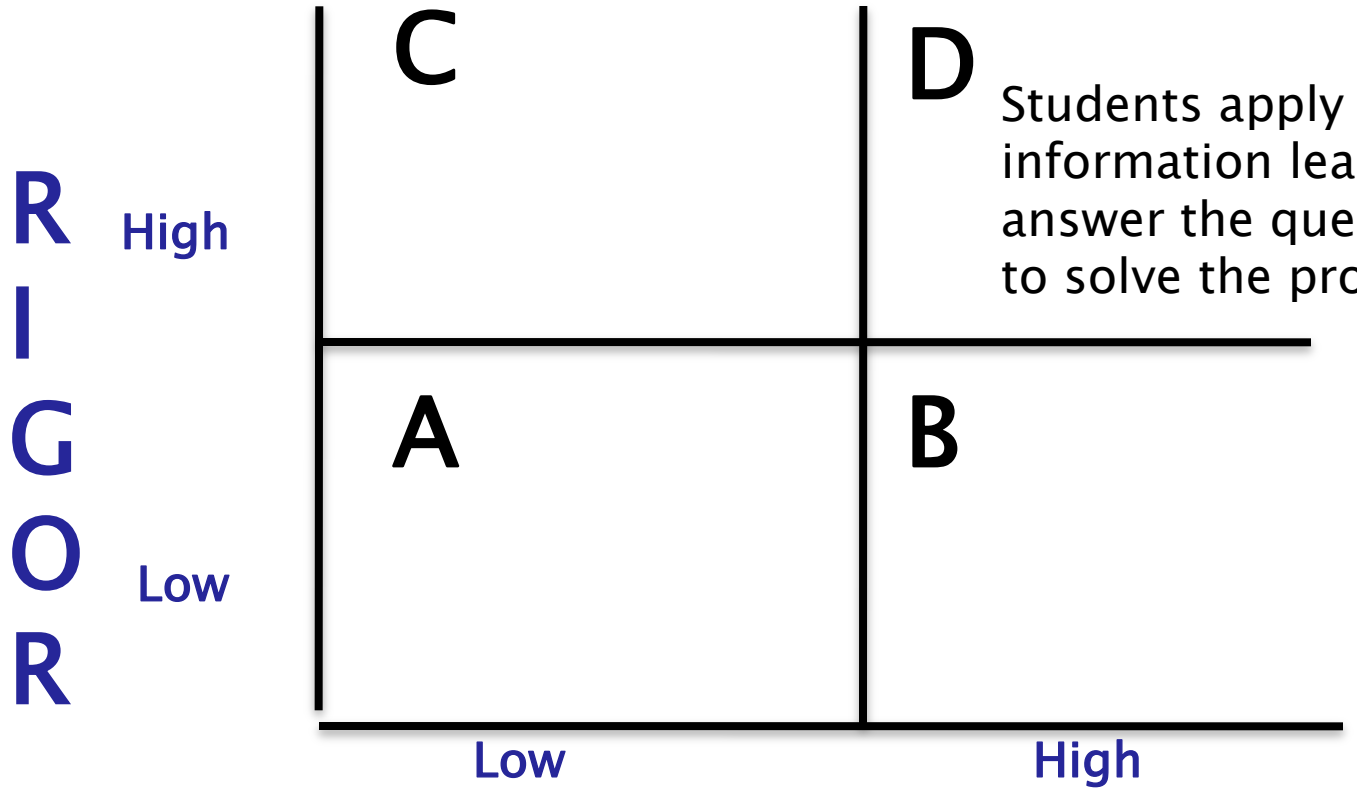
@ByronErnest
#HoosierNSD

Rigor/Relevance Framework – Step 4



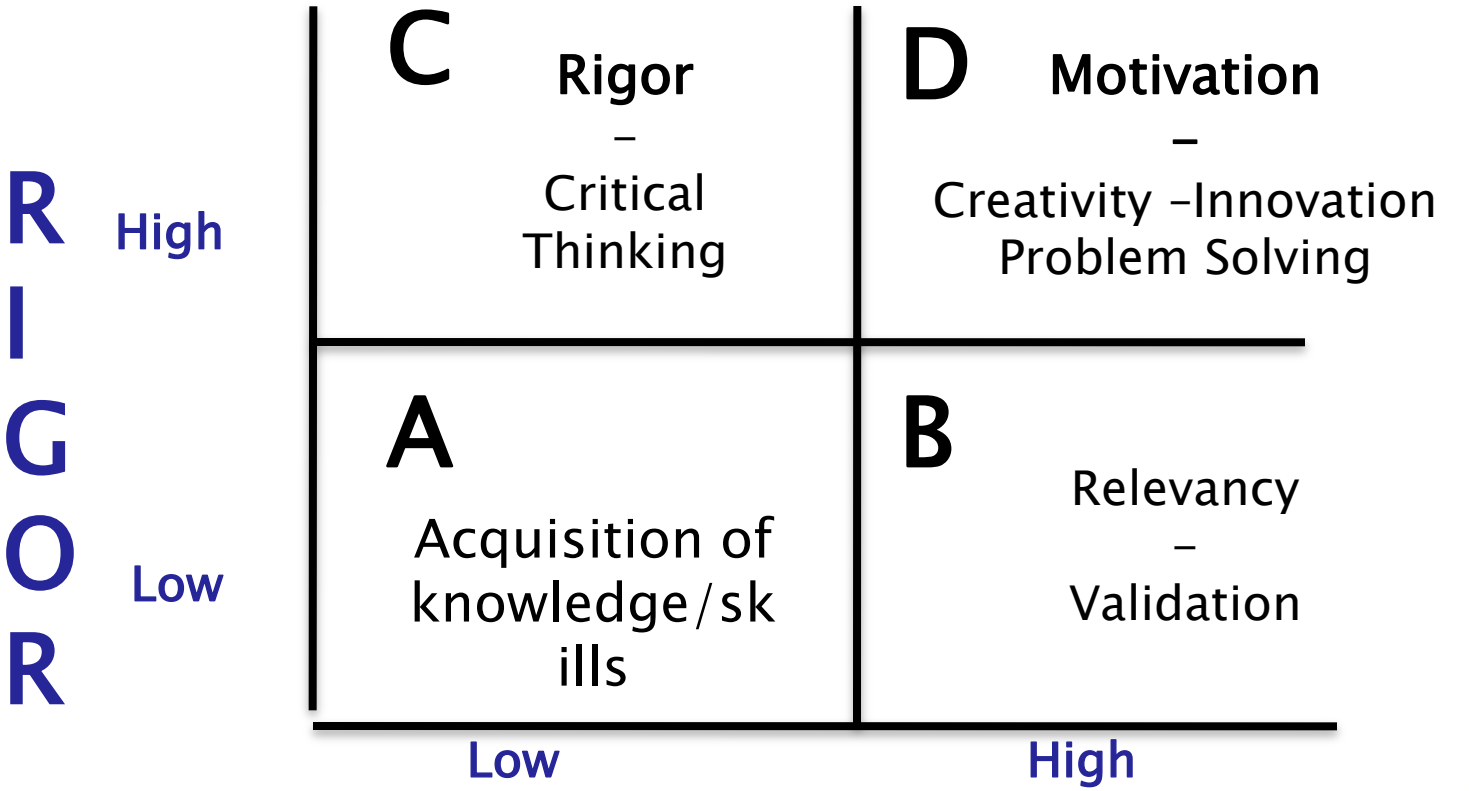
@ByronErnest
#HoosierNSD

Rigor/Relevance Framework – Step 5



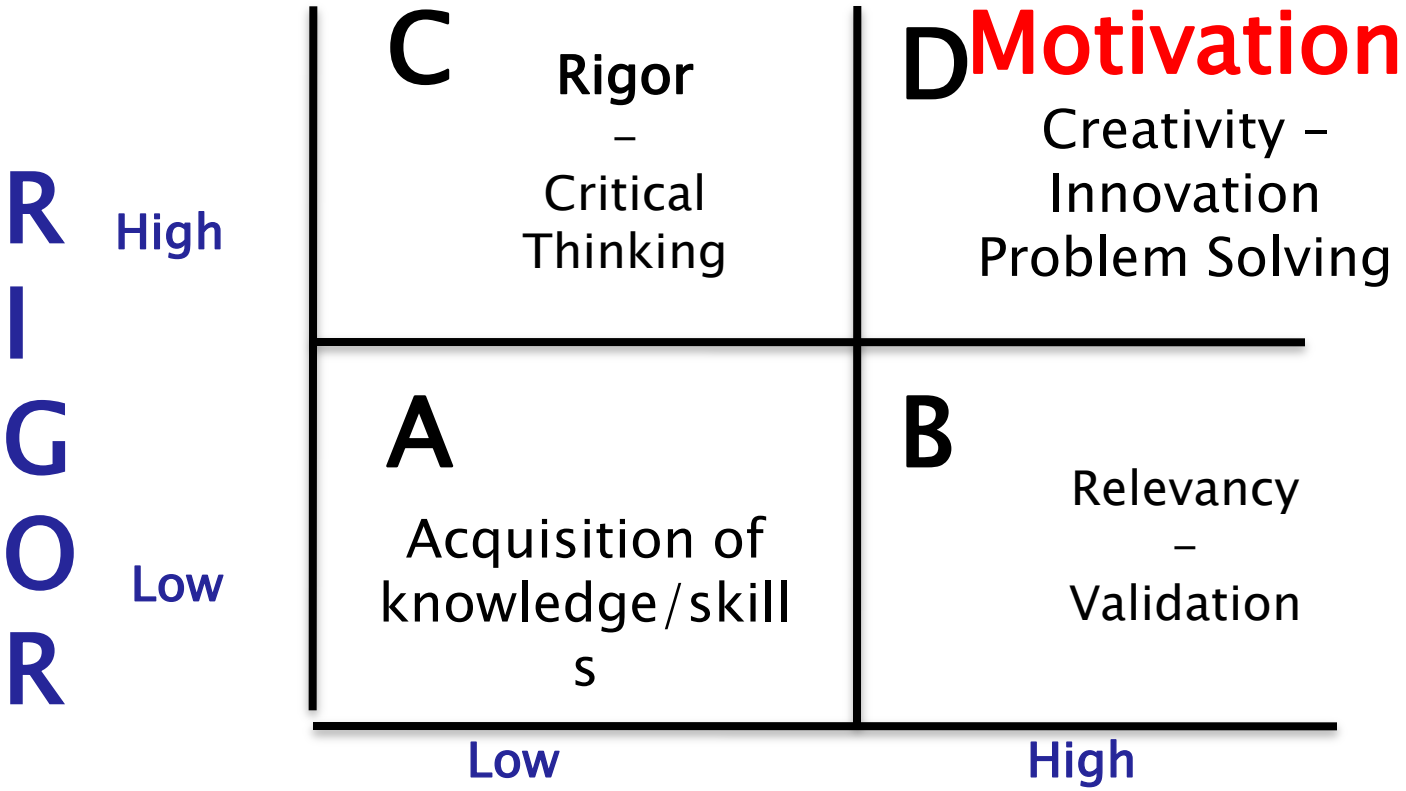
@ByronErnest
#HoosierNSD

Rigor/Relevance Framework



@ByronErnest
#HoosierNSD

Rigor/Relevance Framework & Motivation



@ByronErnest
#HoosierNSD

Optimal Learning Environment

Six Ideas for improving learning:

- See the whole before practicing the parts.
- Study content and apply it to authentic problems.
- Applied Learning
- Active Exploration
- Adult Connections
- Make schoolwork more like real work.

@ByronErnest
#HoosierNSD

Command Intention:

Hoosier Academies will determine our pillars of rigor by spring break 2015.

References

- Brophy, S., Klein, S., Portsmore, M., & Rogers, C. (2008). Advancing engineering education in p-12 classrooms. *Journal of Engineering Education, 97*(3), 369-387.
- Chow, C. M. (2011). *Learning from our global competitors: A comparative analysis of science, technology, engineering, and mathematics (STEM) education pipelines in the United States, Mainland China, and Taiwan*. (Doctoral dissertation). Retrieved from Dissertations and Theses Database. (UMI No. 3477870)
- Crawford, K. (1996) Vygotskian approaches to human development in the information era. *Educational Studies in Mathematics (31)* 43-62.
- Duschl, R. A., Schweingruber, H. A., & Shouse, A.W. (2009). Taking science to school: learning and teaching science in grades k – 8. Washington, D.C.: National Academies Press.

References

- Emo, K. (2007). How rules shape children's use of science as they raise market animals in 4-H. *Journal of Experiential Education. (29)*3, 401-406.
- Fensham, P. J. (2008). *Science education policy-making.* Paris: UNESCO.
- Gardner, H. (2008). *5 minds for the future.* Boston, MA: Harvard Business School Publishing.
- Gardner, H. (1993). *Frames of mind:The theory of multiple intelligences* (10th anniv. Ed.). New York, NY: BasicBooks.

References

- Hatch, J. A. (2002). *Doing qualitative research in education settings*. Albany, NY: State University of New York.
- Hoban, S. and Severson, J.R. (2011). Challenging a "why should I care" attitude by incorporating societal issues in the classroom. *The American Biology Teacher, (73)*1, 39-41.
- Holbrook, J. (2010). Education through science as a motivational innovation for science education for all. *Science Education International. 21*(2), 80-91.

References

- Phipps, L.J., Osborne, E.W., Dyer, J.D., & Ball, A.L. (2008). *Handbook on agricultural education in public schools* (6th ed.). New York, NY: Thomson Delmar Learning.
- Robertson, W. H. (2008). *Developing problem-based curriculum: Unlocking student success utilizing critical thinking and inquiry*. Des Moines, Iowa: Kendall Hunt Publishing.
- Scales, J. A. (2007). *Assessment of teacher's ability to integrate science concepts into secondary agriculture programs* (Doctoral dissertation). Retrieved from Dissertations and Theses Database. (UMI No. 3349060)

References

- Scott, S. & Dixon, K. (2009). Partners in a learning organization: A student-focused model of professional development. *The Educational Forum, 73,* 240-255.
- Tolbert, S. E. (2011). *Teaching the content in context: Preparing "highly qualified" and "high quality" teachers for instruction in underserved secondary science classrooms* (Doctoral dissertation). Retrieved from Dissertations and Theses Database. (UMI No. 3471776)
- Vygotsky, L.S. (1978). Mind and society: The development of higher mental processes. Cambridge, MA: Harvard University Press.

References

- Warner, A.J. & Myers, B.E. (2008). *What is inquiry-based instruction.* Gainsville, FL:Department of Agricultural Education and Communication, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida.
- Wong, S. L., & Hodson, D., Kwan, J., & Yung, B. H. W. (2009b). Turning crisis into opportunity: Nature of science and scientific inquiry as illustrated in the scientific research on severe acute respiratory syndrome. *Science & Education, 18*(1), 95-118.
- Wong, S. L., & Hodson, D. (2010). From the horse's mouth: What scientists say about science as a social practice. *International Journal of Science Education, 32*(11), 1431-1463.

Contact Me!

Twitter: @ByronErnest

Blog: byronernest.wordpress.com

Dr. Byron L. Ernest
Head of Schools
Hoosier Academies2855 N. Franklin Rd.
Indianapolis, Indiana 46219

Office 317.495.6494 X1201
Cell 317.379.8533
Email bernest@k12.com