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Developing students' critical thinking skills

Gary R. Brown
Portland State University

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The Office of Undergraduate Education

Developing Students' Critical Thinking Skills

University of Texas, Arlington

April 2007

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The Center for Teaching, Learning & Technology

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WASHINGTON STATE UNIVERSITY

World Class. Face to Face.

Agenda

- Setting the Stage—Why Critical Thinking?
- Adventures in Critical Thinking at WSU
- How we do it—three samples
- Implications for Practice—Assignments, Facilitation, Involving Students

More degrees, less comprehension

Baltimore Sun

More Americans are getting college degrees than they were about a decade ago, but skills in reading and analyzing data among the well educated have dropped significantly, according to a national report on adult literacy released Thursday.

When adults with higher education degrees were asked to compare the viewpoints in two newspaper editorials, for example, less than half could do it successfully.

"I think these results are really unexpected," said Mark Schneider, the U.S. Commissioner of Educatio Statistics. "I think it is a wake-up cal to the research and university community."

The National Assessment of Adult Literacy interviewed 19,000 people 16 years of age and older in their homes, in much the same way the census is conducted. They were asked to read prose, do math and find facts in documents.

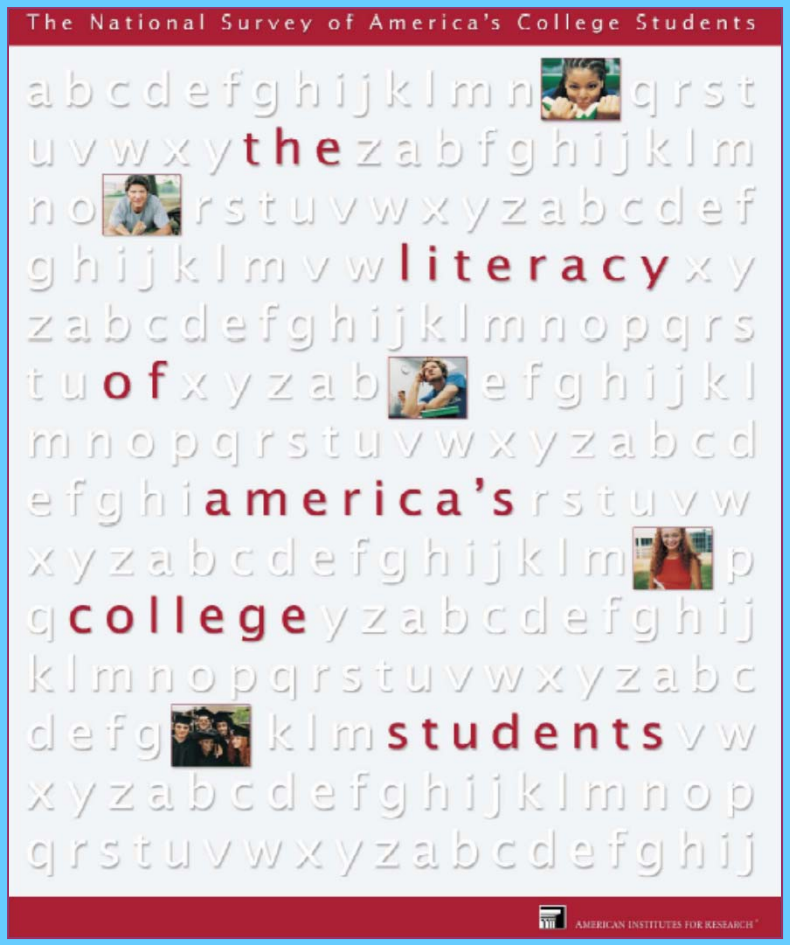
The study was designed to assess not whether people can read a novel, but whether they are competent in the skills they need to be productive citizens.

Among the most significant findings is that among adults who have taken graduate courses or have graduate degrees, only 41 percent scored as proficient, compared with 51 percent a decade ago.

“Students may not be as prepared as most of us think they are when they're graduating college,"

"Institutions of higher education should take a good look at this and ask themselves what they are teaching."

—Stéphane Baldi, for the Pew Charitable Trusts.



"Obstacles to Critical Thinking"

- ***Trosset reports:***
  - ***Students do not value discussion as a mode of intellectual exploration.***
  - ***Students' identities come from what rather than how they think.***
  - ***Students show no evidence of change over the course of their education.***

Trosset, C. (1998). Obstacles to student critical thinking. Change.

Knowing & Reasoning in College

- **Entering students will limit their roles to obtaining knowledge.**
  - **Only 16% of seniors come to understand the essential uncertainty of knowledge**
  - **The greatest gains happen only after students graduate (57%).**
  - **Even then, however, only 12% attain contextual knowledge, thinking through problems and integrating and applying information/knowledge**

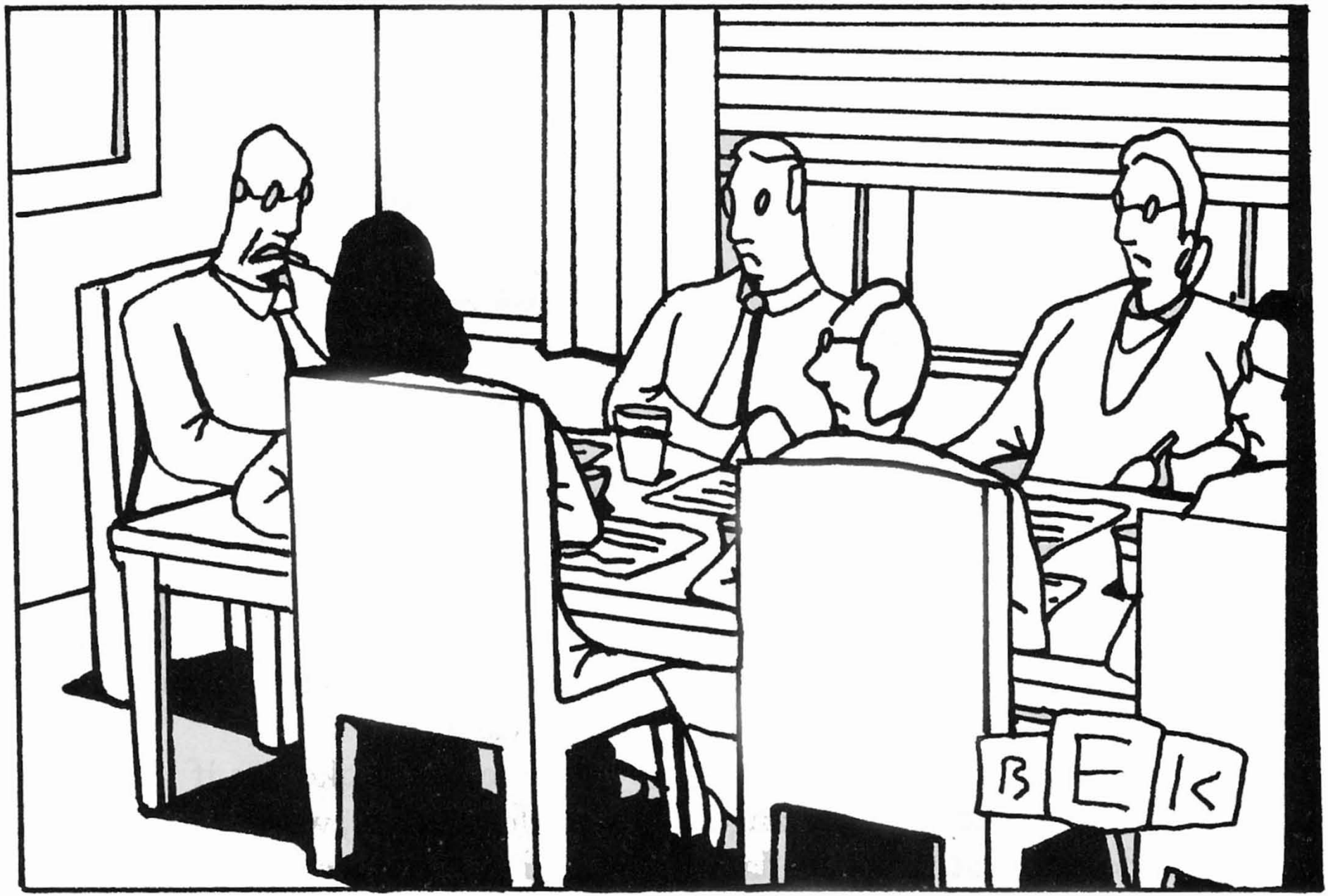
Baxter Magolda, P. (1992). Knowing and reasoning in college: Gender-related patterns in students' intellectual development. San Francisco: Jossey-Bass.

The Fast Food Culture Meets Education

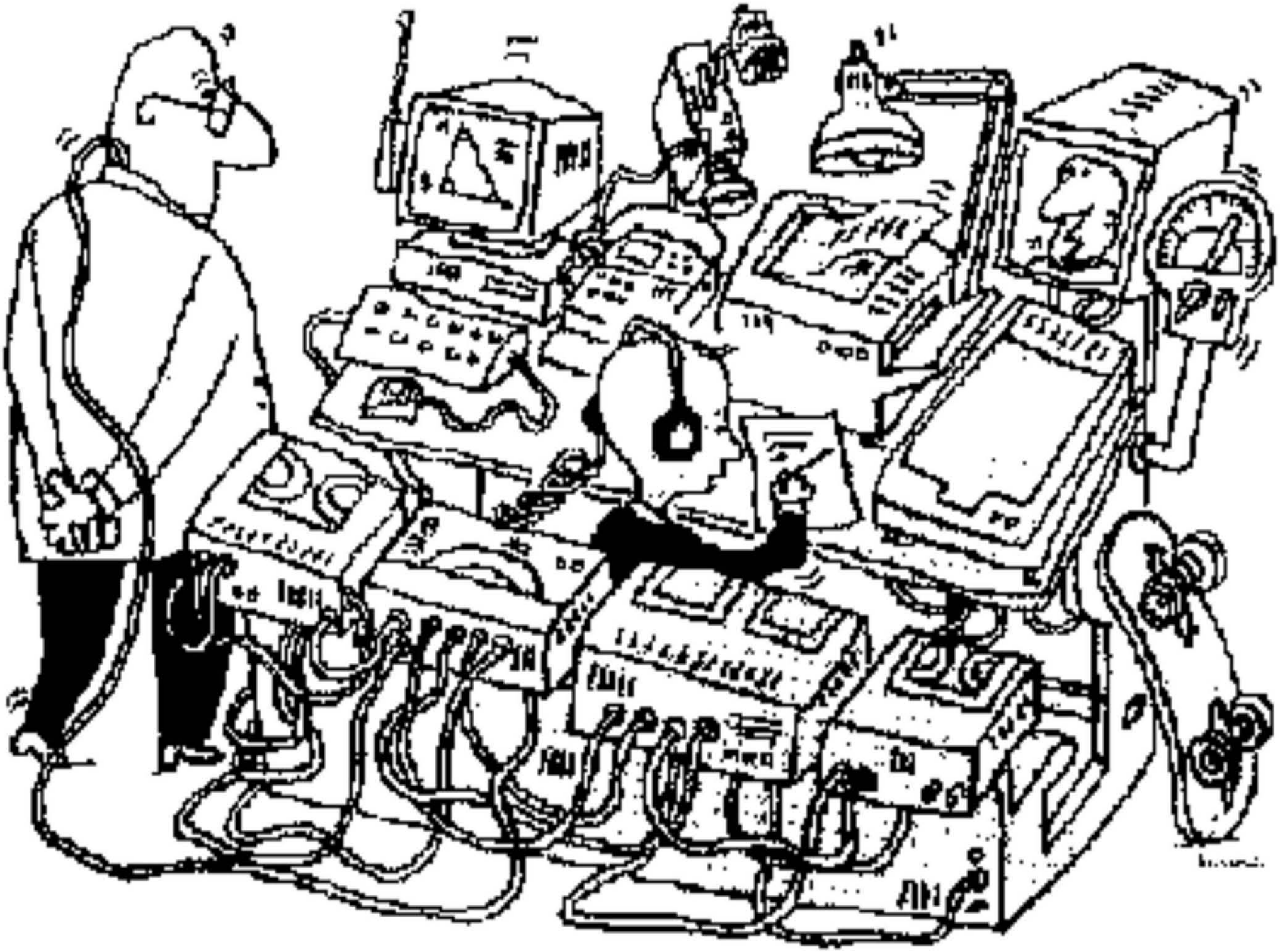
- In 1993 Colorado Springs started a nationwide trend becoming the first public school district in the US to place ads for Burger King in its hallways.
- In 1997 the same district made a 10 year deal making Coke the district's exclusive beverage supplier.
- "*We try to be more like the fast food places where these kids are hanging out*" —
  A Colorado school administrator

And "Cradle to Grave" Advertising

- Where children no longer distinguish between television programming and television advertising
- Brand loyalty begins at 2
- And recognize logos before they recognize their own names
- *Over 100 million happy meals…*



"It's time to call in other people who don't know more but are just different."

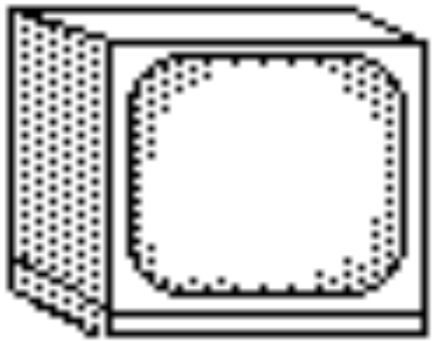


Transformation?

The Research Question

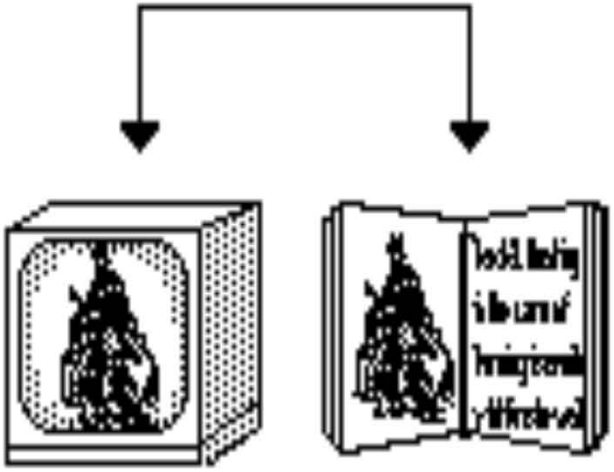
- How do different media sources shape learning?
  - Synthesis appears critical to successful learning.
  - Better learners develop more elaborated discussion of an attribute by giving more detailed information about it.
  - *A picture is worth a thousand words*
    —Confucius

Two Modes

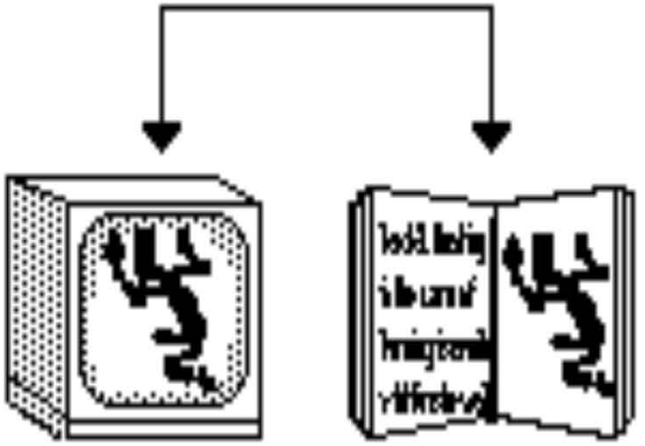


Two Messages

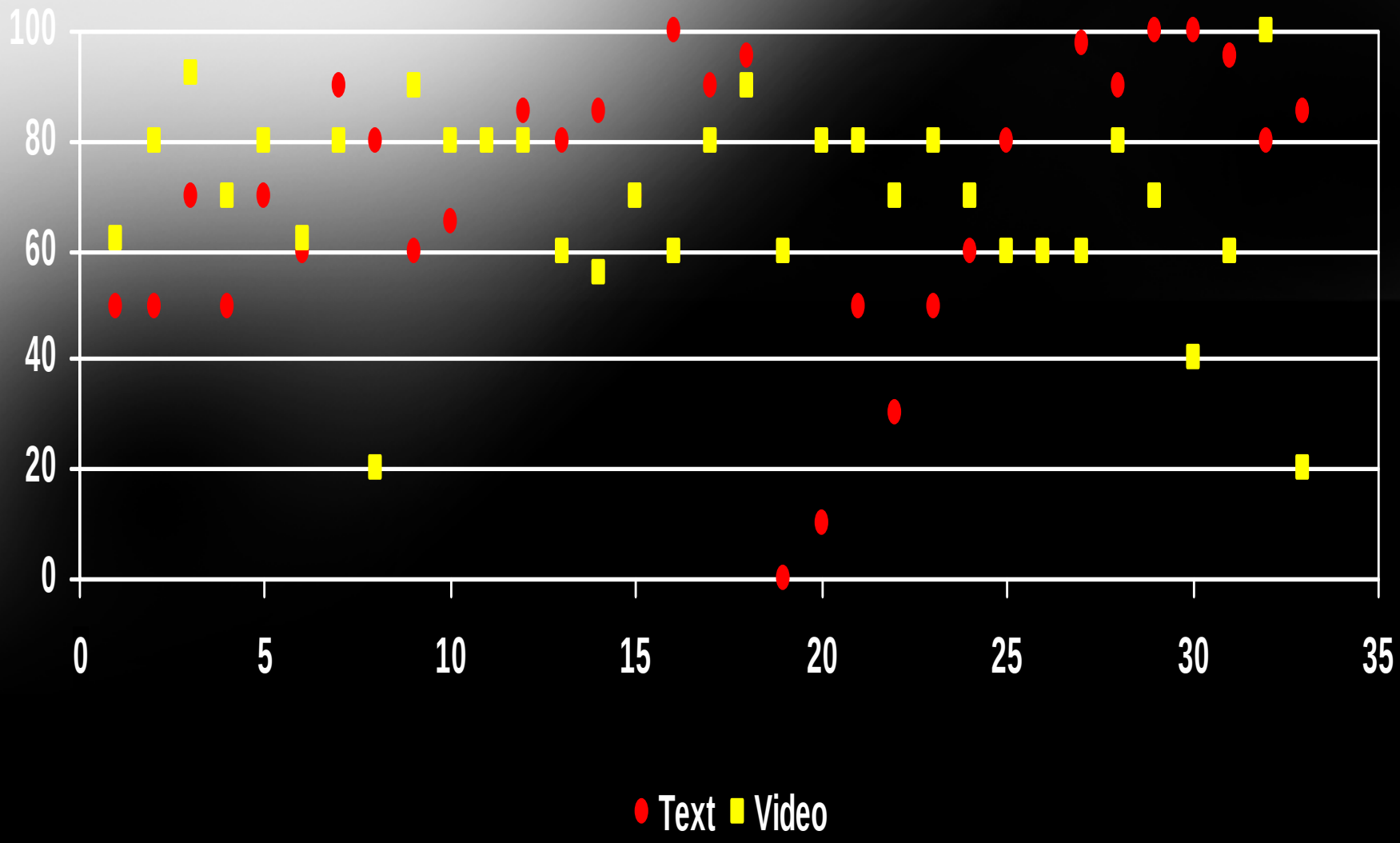
Tradition



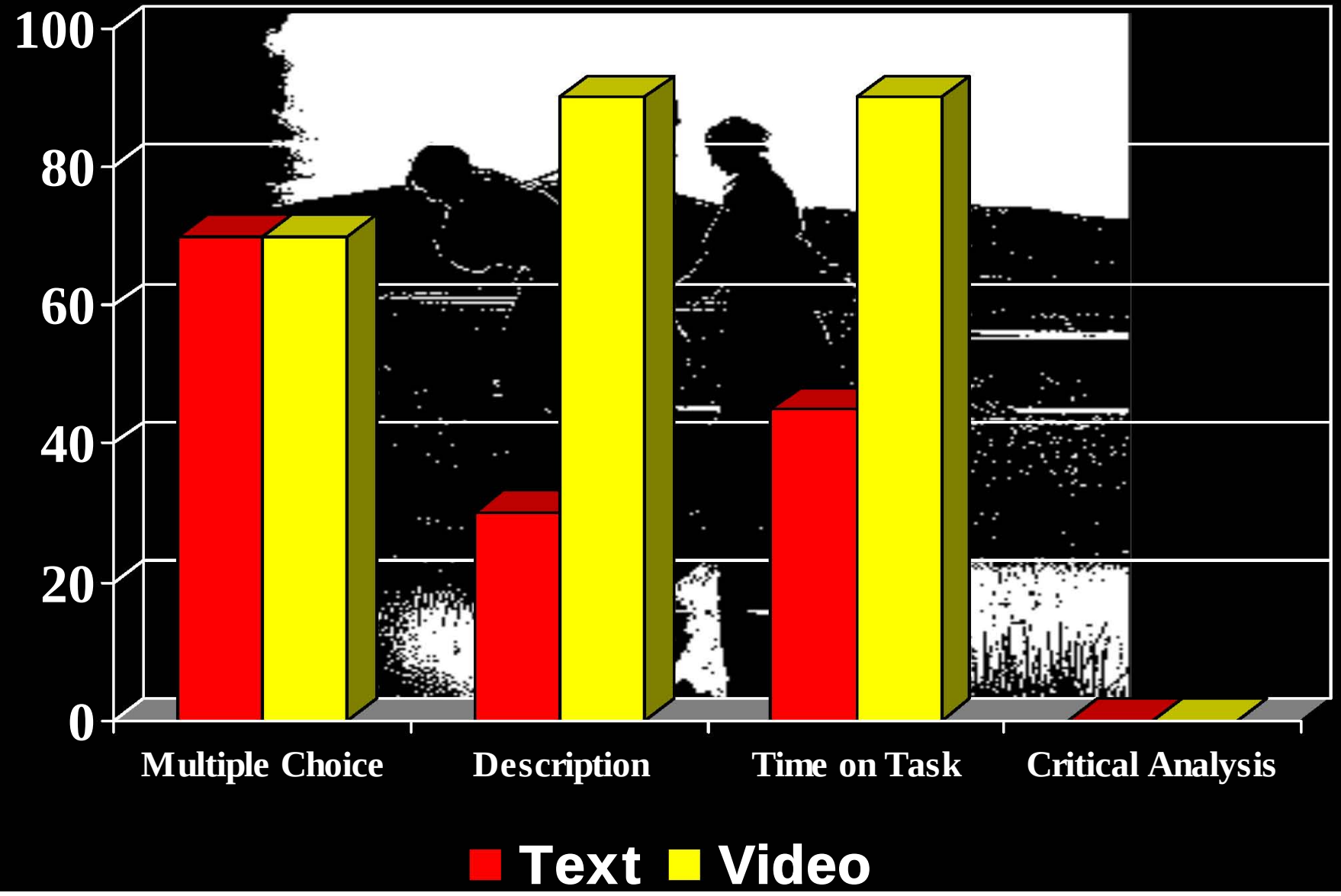
Superstition



Multiple Choice Distribution



Media Mode & Learning



What Students Said…

I did not actually decide not to use the video material, it was just more convenient to recall what I had read 1/2 hour ago. This would be somewhat typical: "whatever comes first is what is used." I admittedly spent little time in recalling anything other than what was on my mind at the time.

"People only solve the problem they give themselves to solve."

—Flower & Hayes, 1988

The WSU Critical Thinking Project

- **Provide measures of growth**
  - **Beginning of course to end of course**
  - **Beginning of program to end of program**
  - **Beginning of enrollment to graduation**
- **Help *demystify learning expectations***
- **Help grade AND show *how* students think**
- *Improve teaching and learning!*

The 3 Essential Assessment Purposes

1. Evaluate Students (grading)
2. Promote Learning (teaching)
3. Learn about Teaching (improvement)

GOAL

1. Build & Promote Faculty expertise
   - Provides opportunities for improvement
2. Embed Assessment in existing curricula and teaching practice
   - Augments current grading strategies
3. Initiate a process that exceeds accountability expectations
   - Communicates to stakeholders

Dimensions of Critical Thinking

http://wsuctproject.wsu.edu

1) Summarizes the problem, question, or issue.
2) Presents the own position or hypothesis.
3) Considers other salient perspectives and positions.
4) Considers key assumptions.
5) Assesses the quality of supporting evidence and provides additional & appropriate evidence.
6) Considers context.
7) Assesses conclusions, implications and consequences.

Focus on Quality of Thinking

—A View of One Dimension—

Identifies and summarizes the problem/question (and/or the source's position).

Emerging _____ **Mastering**

Does not identify and summarize the problem, is confused or identifies a different and inappropriate problem.	Identifies the main problem and subsidiary, embedded, or implicit aspects of the problem, and identifies them clearly, addressing their relationships to each other.
Does not identify or is confused by the issue, or represents the issue inaccurately.	Identifies not only the basics of the issue, but recognizes nuances of the issue.

Focus on Quality of Thinking

—A View of One Dimension—

Identifies and summarizes the problem/question (and/or the source's position).

Emerging _____ **Mastering**

Does not identify and summarize the problem, is confused or identifies a different and inappropriate problem.	Summary of issue is mostly accurate but some aspects are incorrect or confused	Identifies the main problem and subsidiary, embedded, or implicit aspects of the problem, and identifies them clearly, addressing their relationships to each other.
Does not identify or is confused by the issue, or represents the issue inaccurately.	Nuances and critical details are absent or glossed over.	Identifies not only the basics of the issue, but recognizes nuances of the issue.

Dimensions of Critical Thinking	Score
Problem Identification	3
Own Perspective or Hypothesis	3
Other Perspectives	4
Evidence	3
Context	4
Assumptions	2
Implications & Conclusions	2
Average	**3**

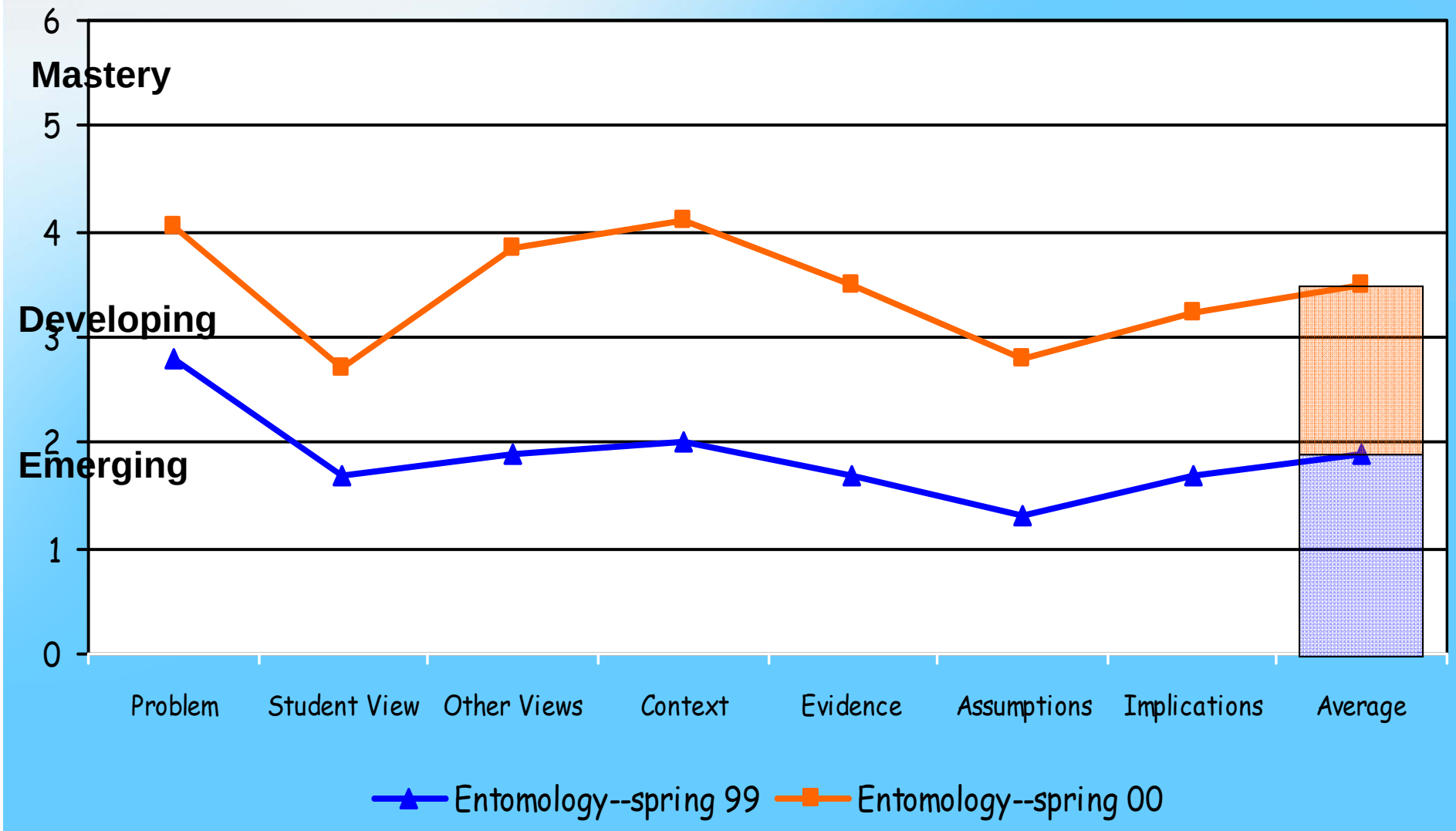
Additional comments

This student's critical thinking is middling.

Average	**2**	**3**	**4**	**5**	**6**
Emerging		Developing			Mastering

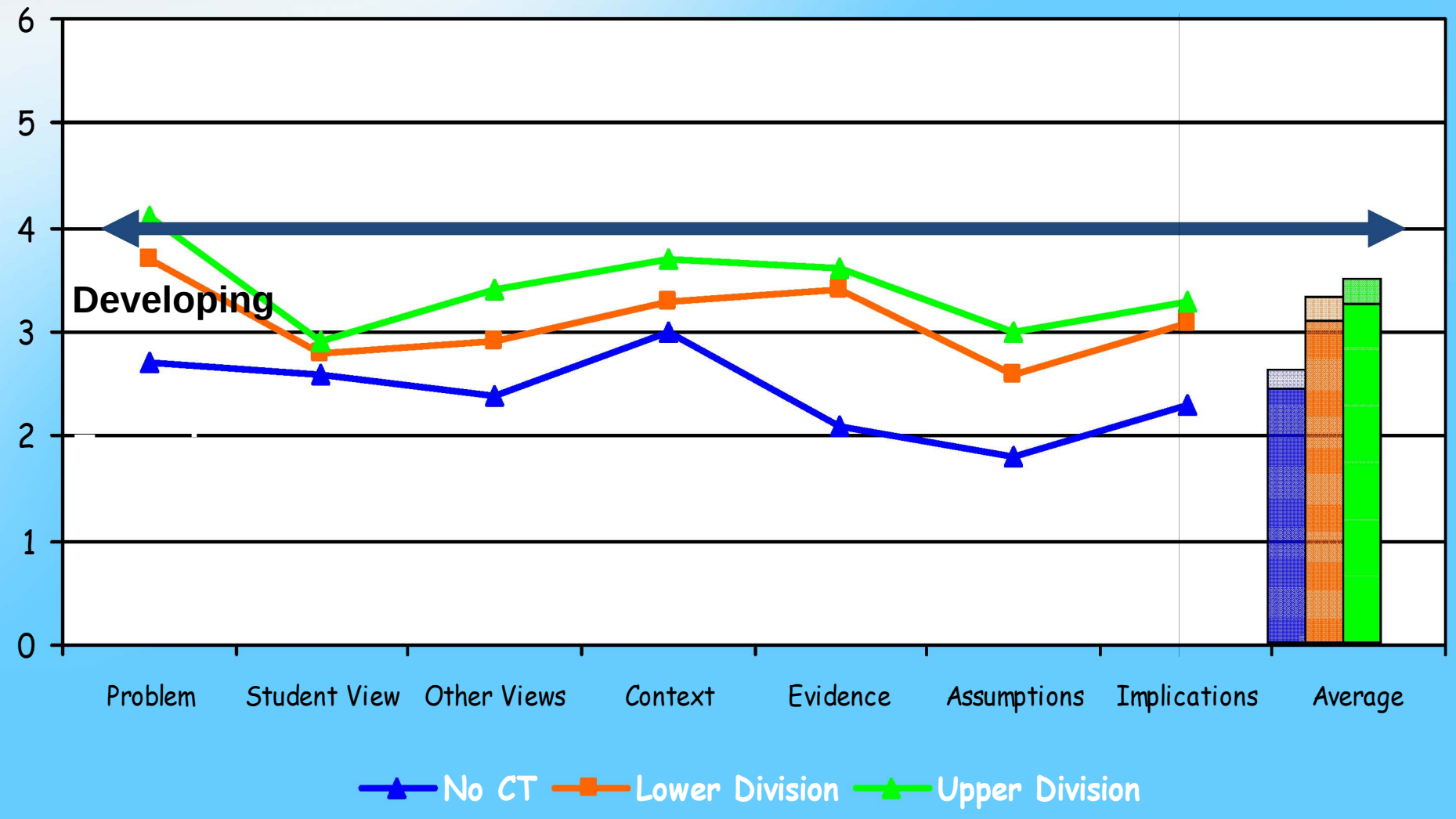
Critical Thinking

One course—two semesters



Critical Thinking

Aggregate Performance



What Students Say…

- *"Having to think and not just write took some getting used to…."*
- *"The grading rubric in this class was very demanding."*
- *"I have carried this skill on to my other classes…"*
- *"Can I get a copy of the rubric for my boss?"*

"Critical thinking is something you will need for the rest of your life. You may not be able to answer every question that is thrown at you right off the bat, but critical thinking can help you find a way to answer the question, or throw it back in a different way…"

—a student

What About Content?

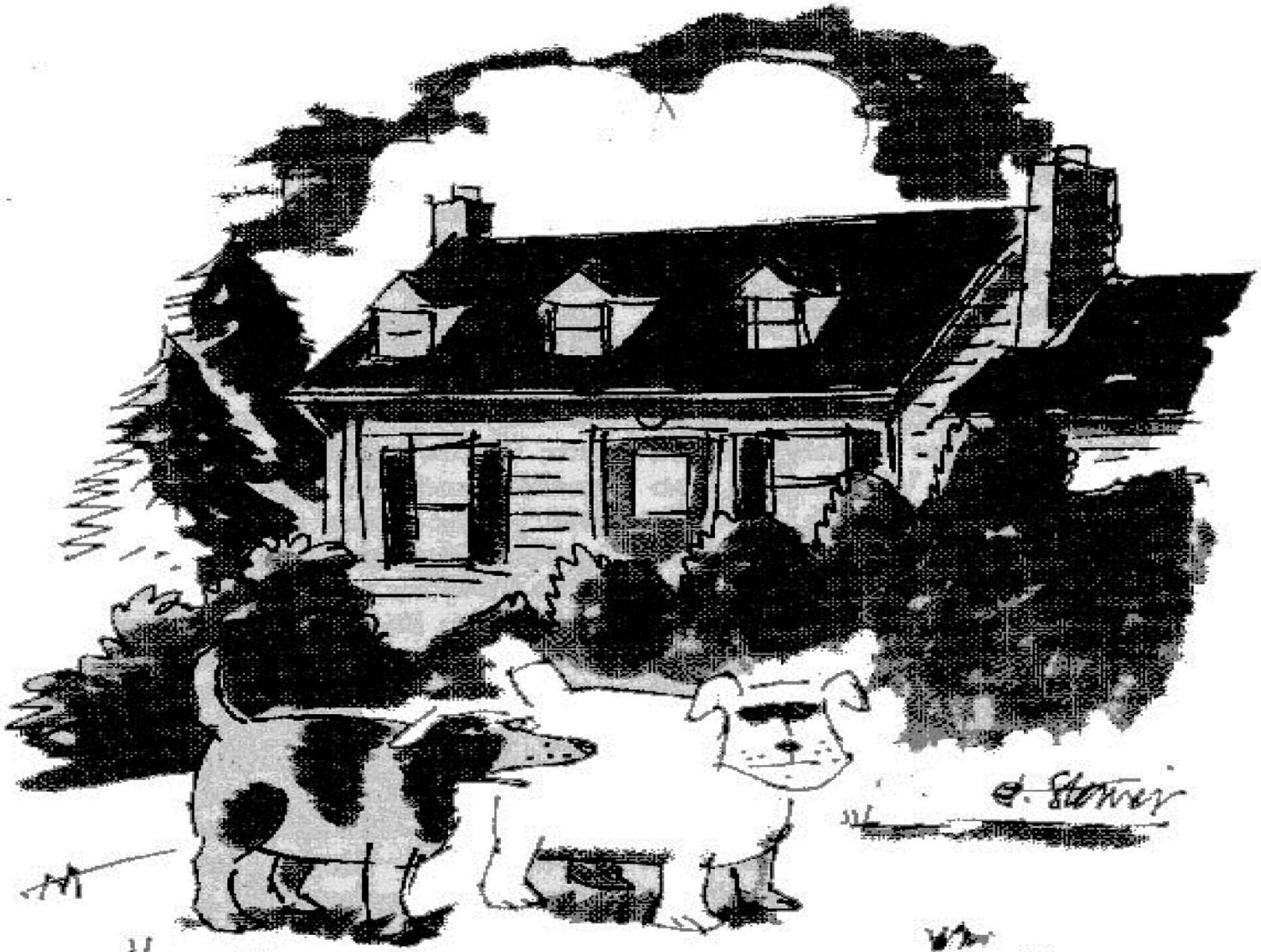
"By taking the emphasis off of learning material to answer test questions and placing it more on critical thinking and formulating new, original ideas, students are forced to really think about the material they are researching and the discussions held in class and to make their own decisions about the meaning and assumptions behind the facts."

"This is something I've been hoping would actually happen someday…It's very refreshing to see that there are teachers that like to actually encourage thought, something that goes a lot farther in the real world than knowing a plethora of historical facts that will never serve you any farther in life than maybe to be good at watching Jeopardy."

Additional Findings

- The dimension of least gain was in students' abilities to articulate their own viewpoints.
- Understanding the "assumptions" dimension remains a challenge.
- Faculty & students focus on grading….
- Comparisons to WSU's writing assessment—

  As critical thinking scores went up, writing placement scores and portfolio scores went down…



"Fetching is for Losers"

YOUR Turn!

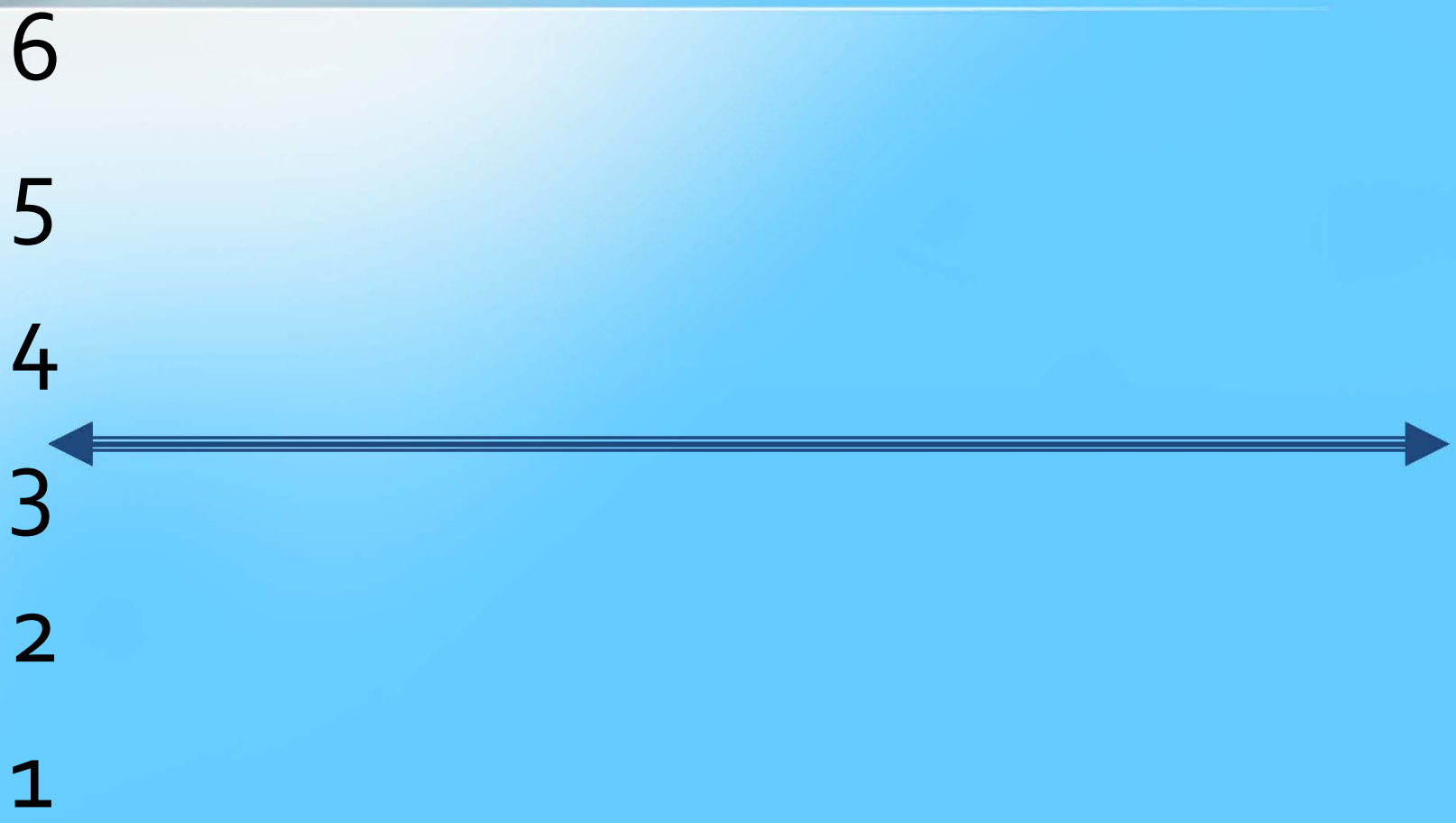
1. Read the sample paper.
2. On your own, rate it between 1 – 6 using the rubric on each of the seven dimensions
3. Use an absolute standard…
4. Be prepared to report individual scores in 10 minutes
5. Then we negotiate the score (inter-rater reliability)

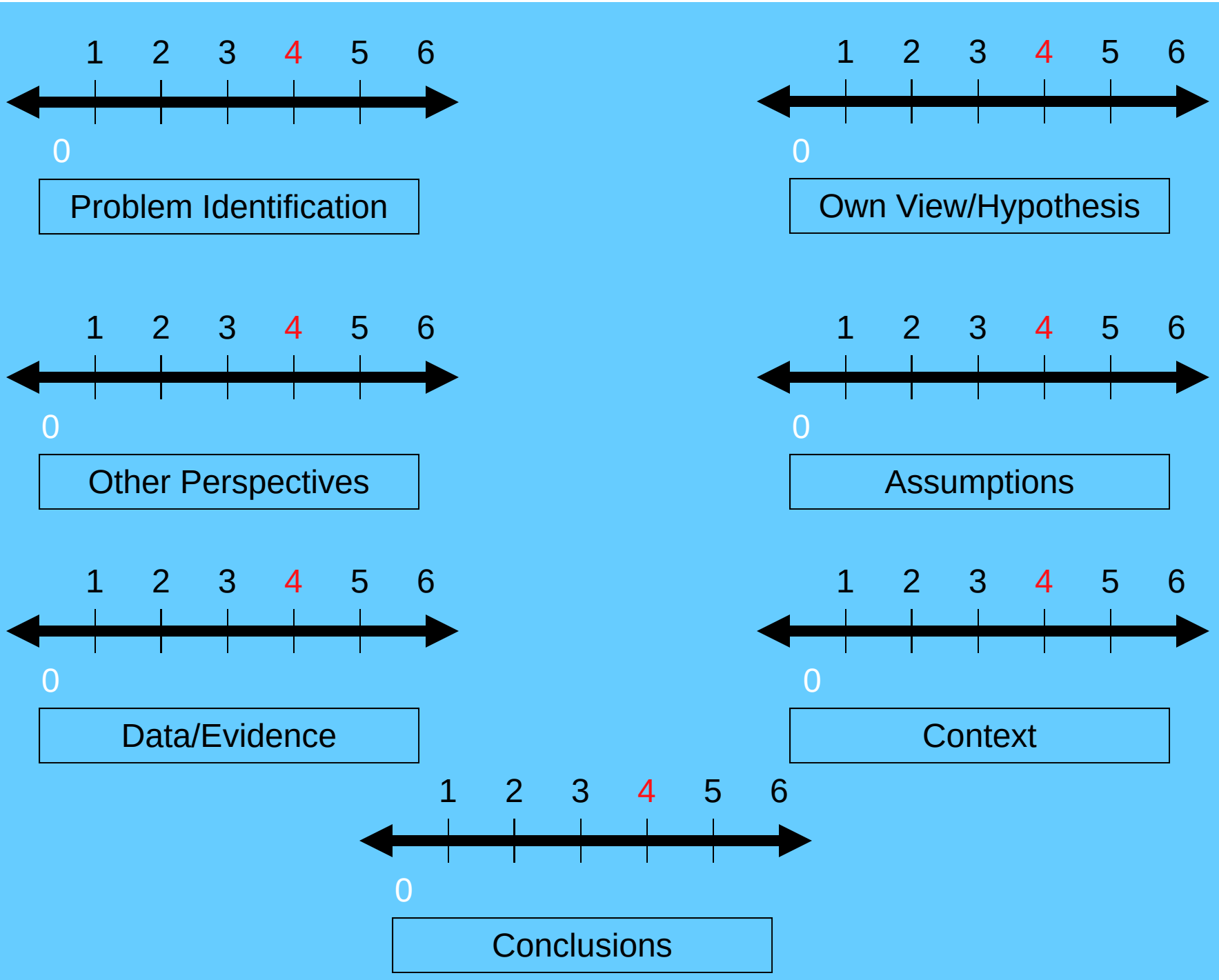
Why Worry About Consensus?

- **Legal**
  - Faculty content expertise trumps faculty exam design expertise.
- **Accreditation**
  - High standards are not the same as standardization…
- **Curricular coherence**
  - No single course will meet all of one instructor's outcome goals.
- **Community of Faculty Learners**
  - Work together to preserve autonomy

Why Worry About Consensus?

Preemies




1 2 3 4 5 6
0
Problem Identification
1 2 3 4 5 6
0
Own View/Hypothesis
1 2 3 4 5 6
0
Other Perspectives
1 2 3 4 5 6
0
Assumptions
1 2 3 4 5 6
0
Data/Evidence
1 2 3 4 5 6
0
Context
1 2 3 4 5 6
0
Conclusions

Mechanics to Cars

6

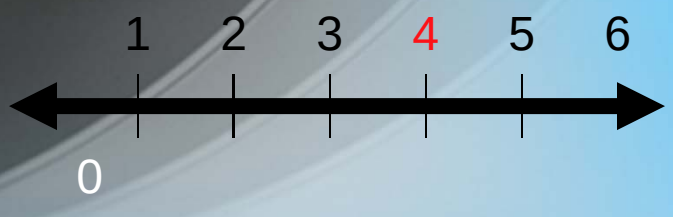
5

4

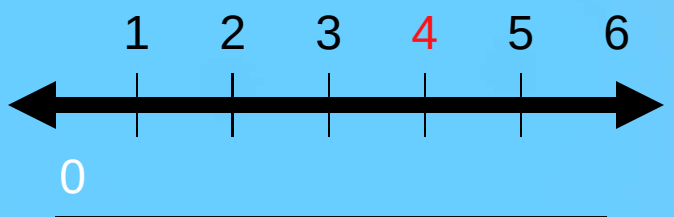
3

2

1

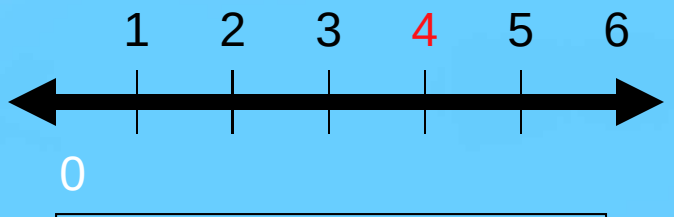


Problem Identification

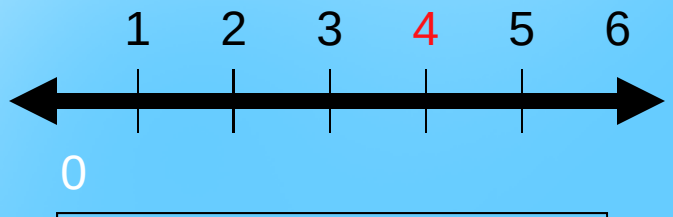


Own View/Hypothesis

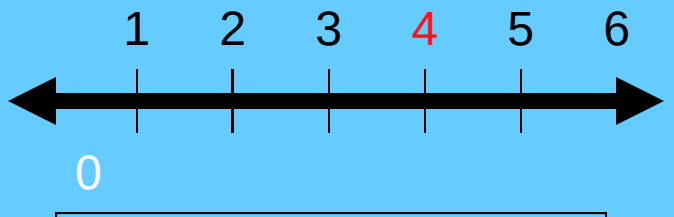
Other Perspectives



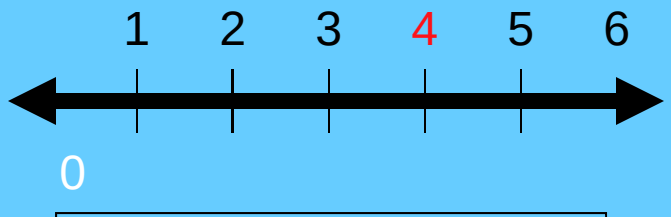
Assumptions



Data/Evidence



Context



Conclusions

General Education

6

5

4

3

2

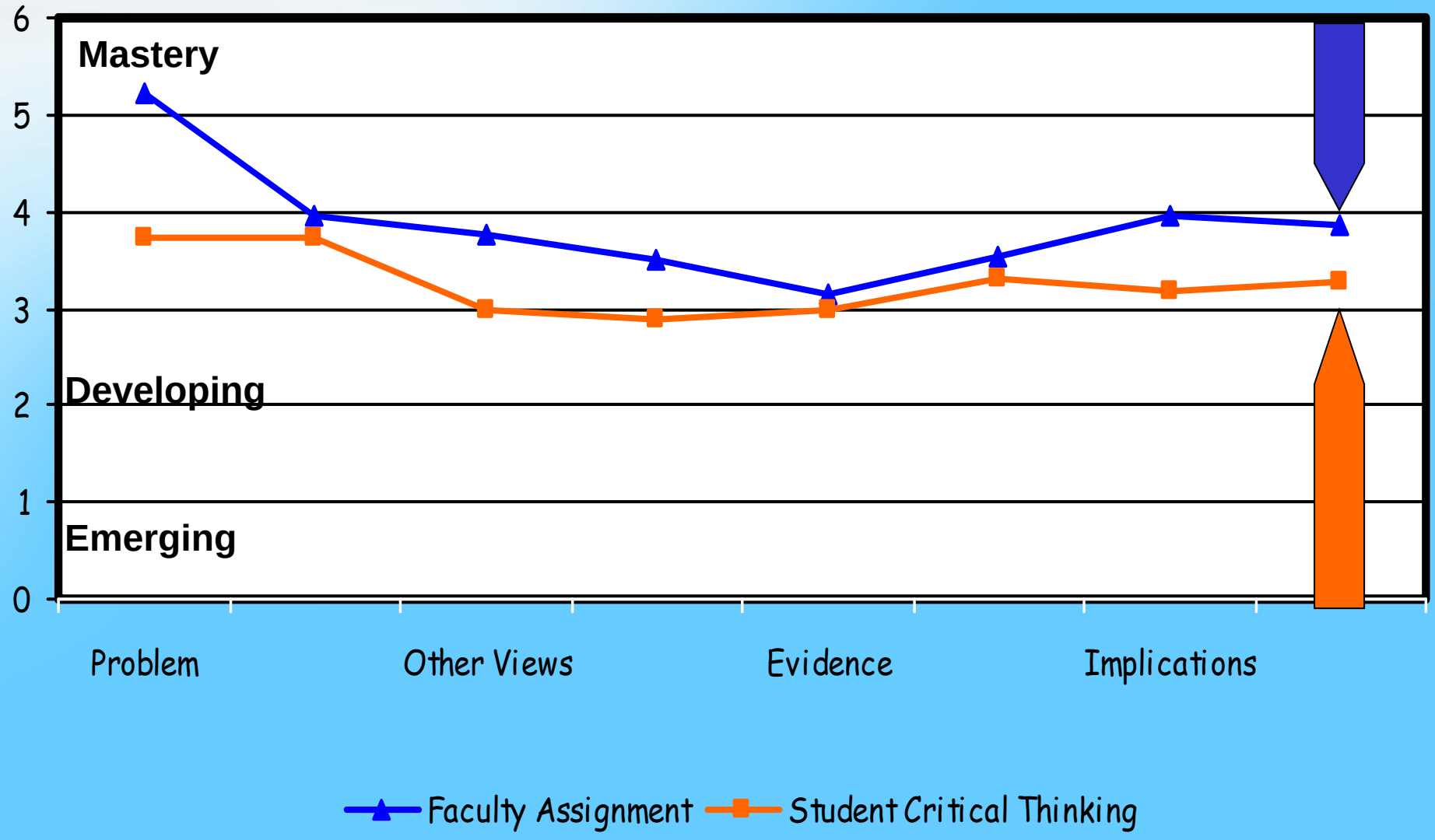
1

The Influence of Assignments?

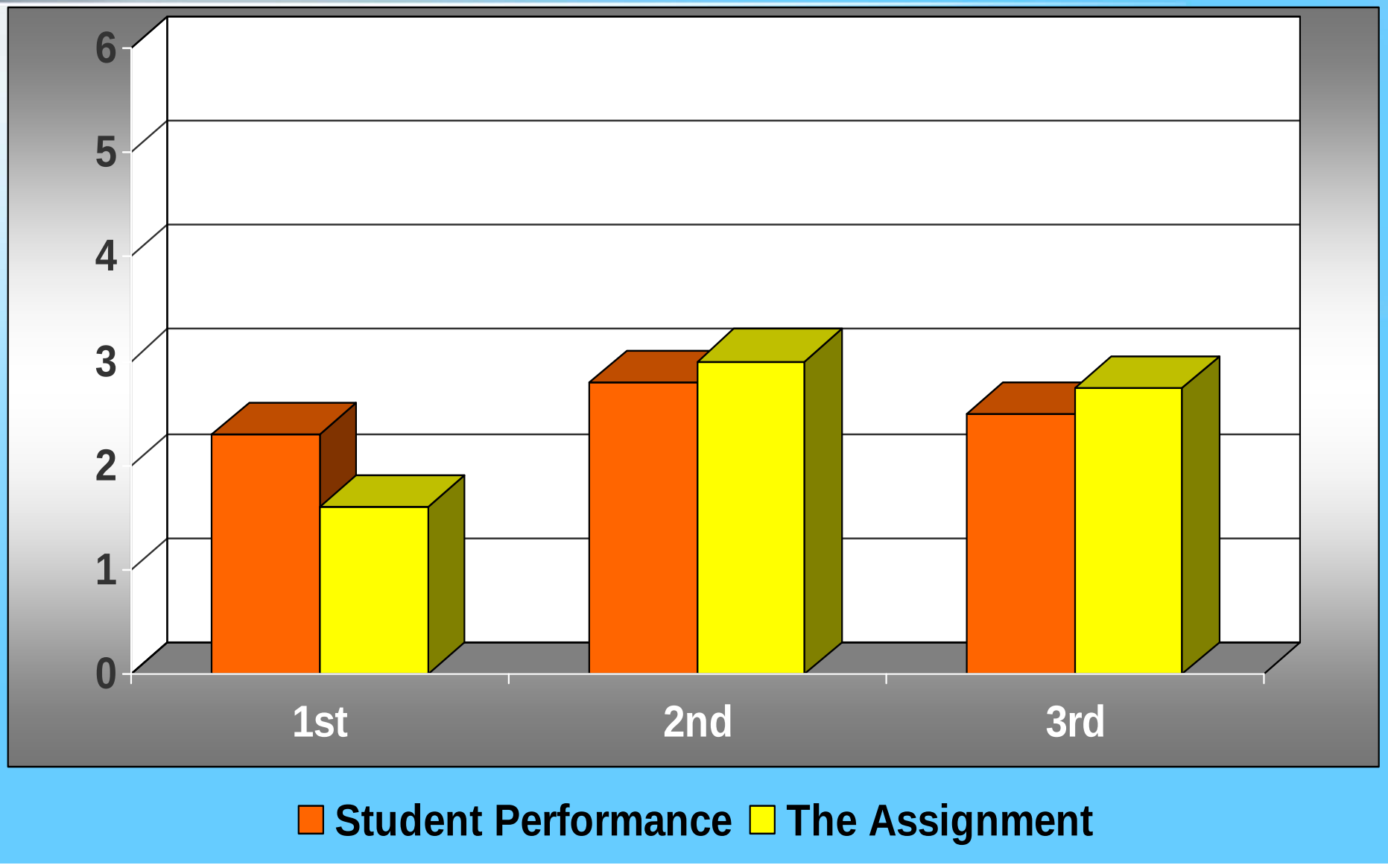
Assessing Assignments

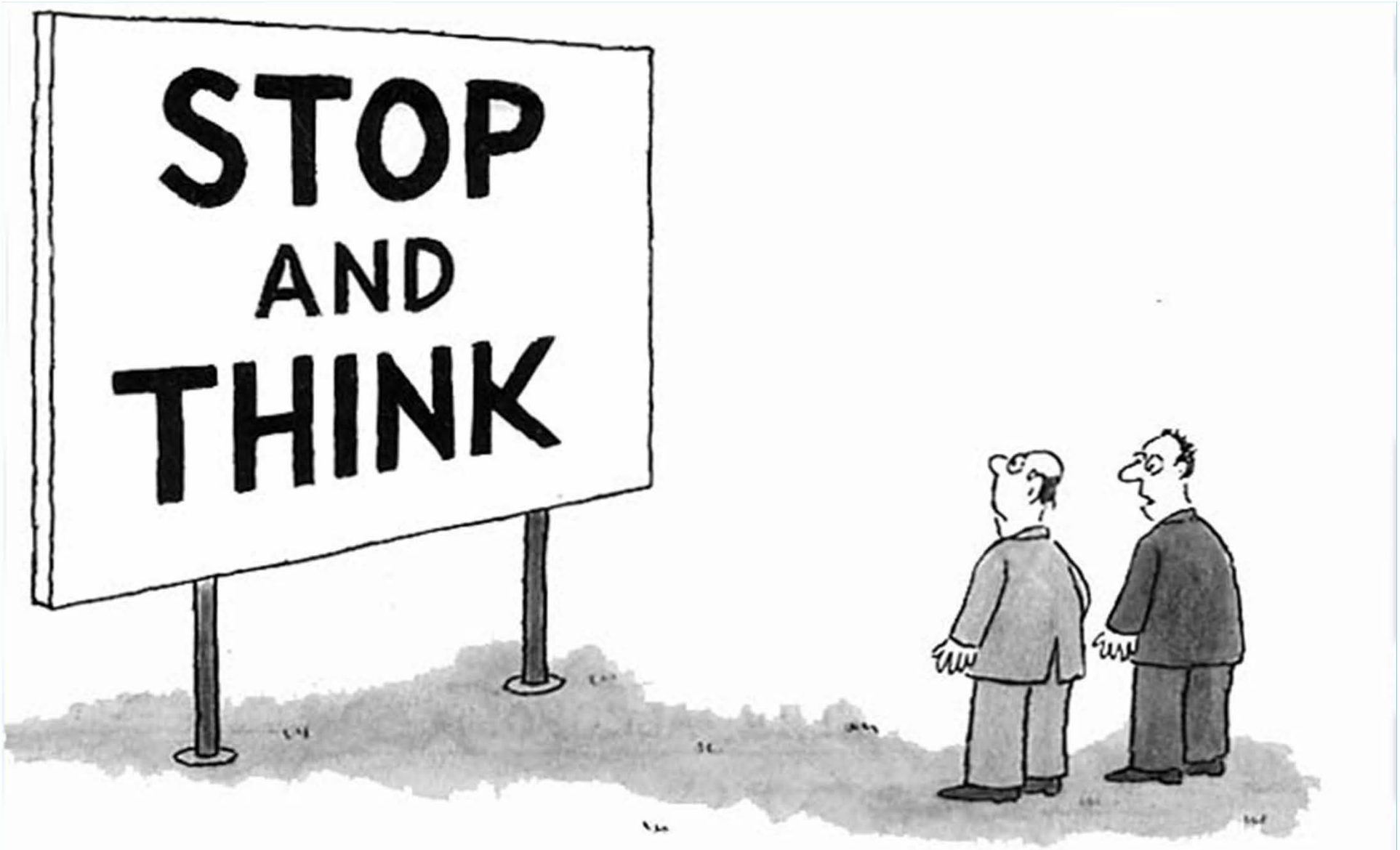
- Total CT assignments = 23
- Total Instructors = 23
- Total assignment assessments = 272
  - average Inter Rater Reliability =.81
- Total CT student papers = 240
  - average Inter Rater Reliability = .77

The Assignment Mirror Effect



Assignment Progression



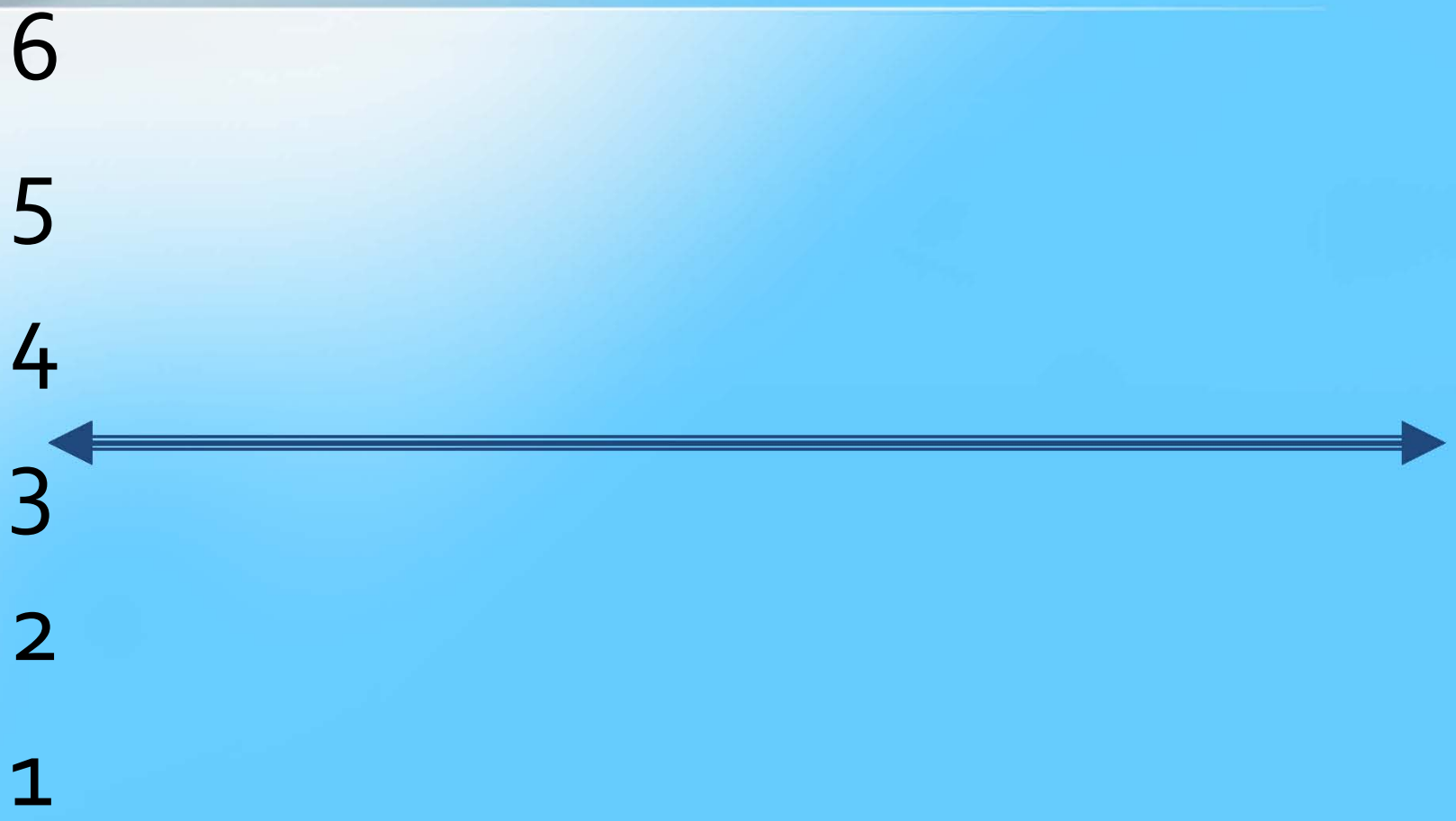


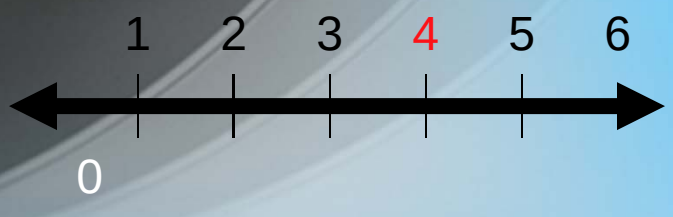
"It sort of makes you stop and think, doesn't it."

YOUR Turn!

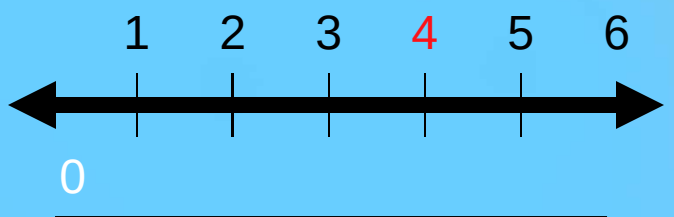
1. On your own, rate the Preemie assignment between 1 – 6 using the rubric on each of the seven dimensions
2. Use the same absolute standard we applied to student work…
3. Be prepared to report individual scores in 10 minutes
4. Then we negotiate the score (inter-rater reliability)

The Nicholls Assignment



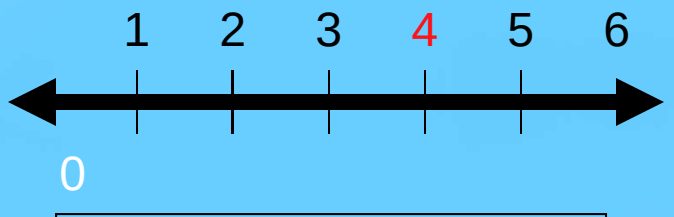


Problem Identification

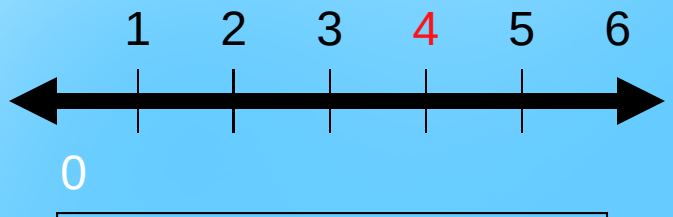


Own View/Hypothesis

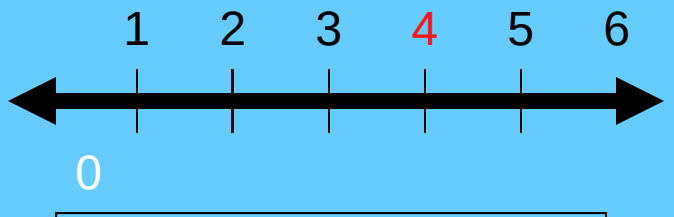
Other Perspectives



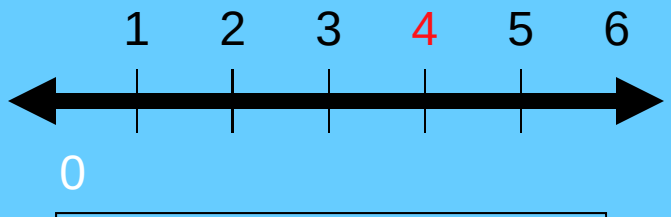
Assumptions



Data/Evidence



Context



Conclusions

Assignment One CT Assessment


Inviting Students Into Assessment

Faculty Member (before the exercise):

"I wondered if they would have enough time in one setting to absorb the expectations."

"Was it too much or too overwhelming? Is this too much for students?"

"I feel like I have to create a balance between the course assignments and goals and the critical thinking process that CTLT wants us to engage in."

Faculty Member (after the exercise):

"It was rushed and there wasn't enough time. The students wanted to spend more time with the paper and rubric."

"How do the rubric and the goals fit with the student goals for taking the class?"

"Coming from high school they may not have the cognitive ability to do this type of work; they may perform at a lower level than older students."

What Students Say

- I just completed an English course in which, "great paper" and "good work" were far too common reviews of peer work. The rubric is clear and concise and would be an excellent tool in the developing of critical thinking skills.
- What is confusing is the terminology. Some are very clear to understand and others are still a bit vague….
- I'm not confused… I guess I just don't think that I have the authority to criticize someone else's work quite yet.
- At first I did not understand the concept but after you went through it I seemed to get it.

Faculty Member (after seeing data):

"It looks like they are ready to do this!"

"It is good to see the student's exposure to the process; otherwise we would just be operating on our own assumptions."

"The majority of the students want more feedback on their work than "good job" or a grade."

Faculty Member (after seeing data):

"I feel more positive about this, but I feel I need more training to do this because I am not familiar with the rubric."

"Other classes offer feedback on student writing; I don't know if we have time to do that."

Students Respond To Each Other

- *"Didn't really incorporate others opinions or influences besides your teacher and the other photographer."*
- *"a lot of facts laid down about public relations, but not much context as to the world around us and the world according to Public Relations."*
- *"Gave good data just not much analysis as to how this helped make your decision."*
- *"Didn't really say how this effected your decision other than it made you change your mind."*
- *"Your works cited page shows that you used a lot of sources, but I didn't see any evidence of that in your paper. You showed a labor and statistics reference but you made no reference to how the job will grow, except according to the speaker you listened to."*

What Students Say About the Process

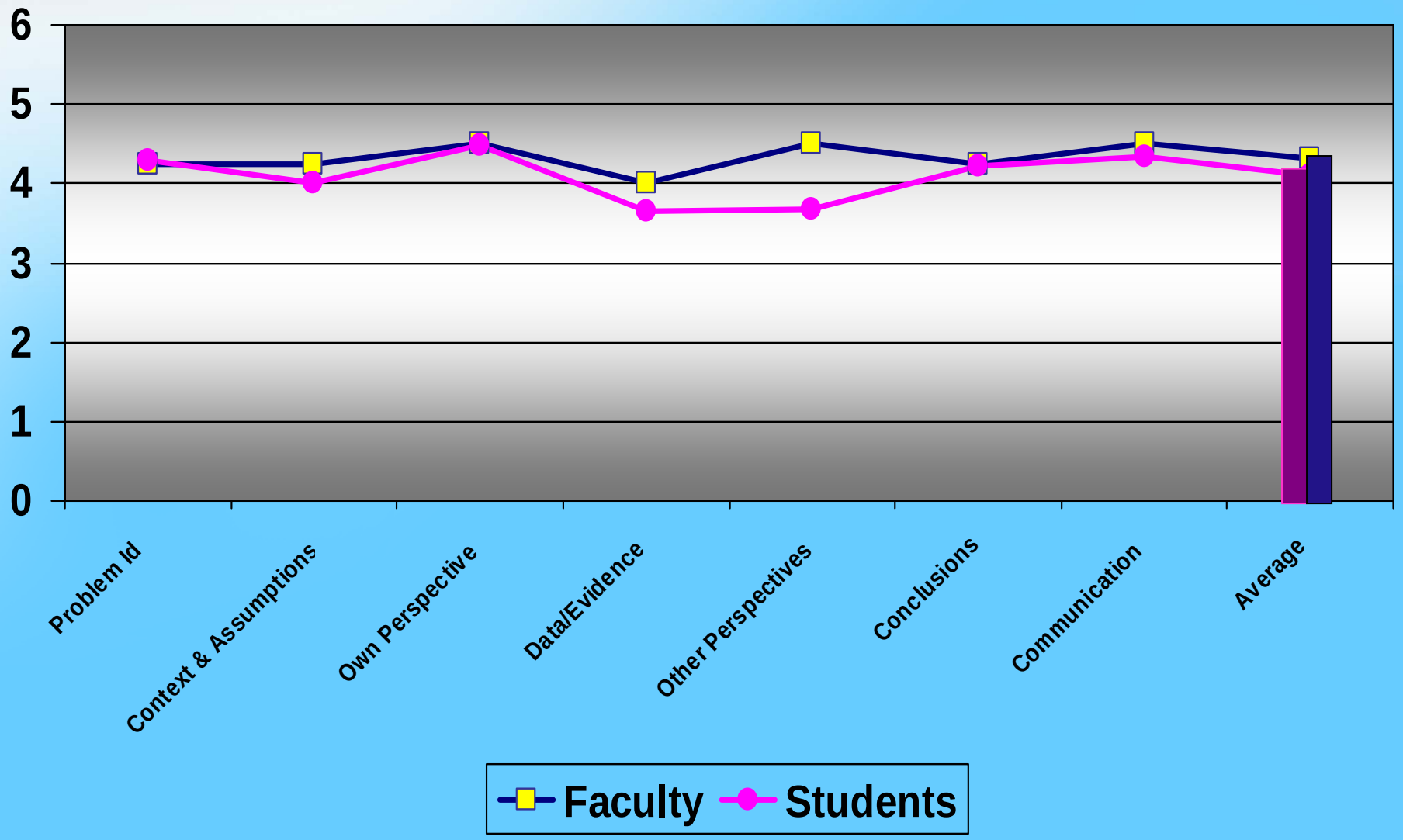
- *It's better to get personal feedback instead of numbers from a chart.*
- *Critical thinking skills are what allow you to problem solve. They can be applied to any situation unlike most classroom content.*
- *It could be used as a universal set of criteria that would significantly reduce variance in the writing standards and make a vast majority of critics come to a general consensus on the quality of the writing.*
- *It will help strengthen my writing and research, and know that I am getting a fair assessment on my paper (if the teacher used this method).*
- *None of these skills will be useful because I'm changing*

What Students Say About the Process (2)

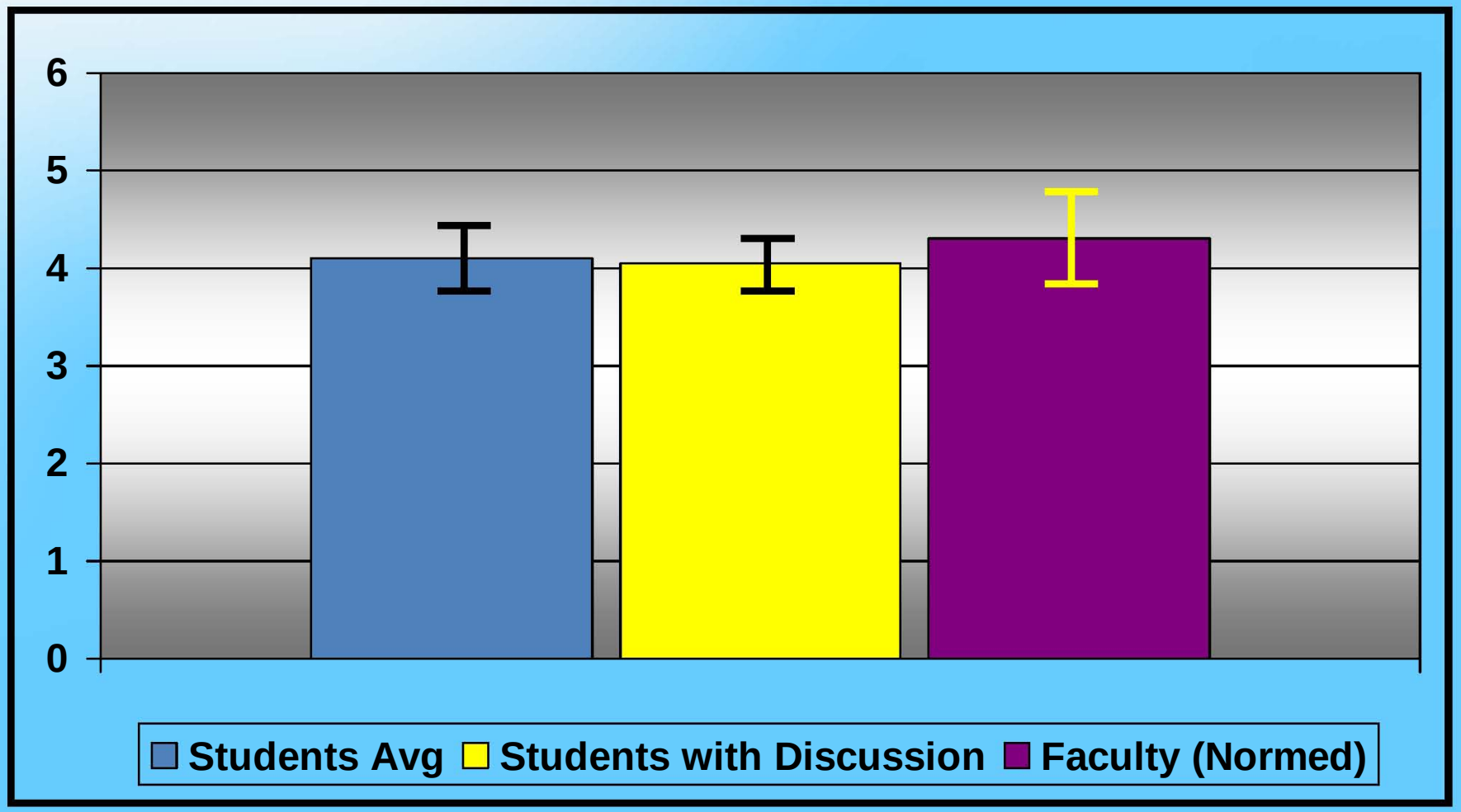
- *It could be helpful because you can actually grade yourself.*
- *It is nice to know why you got the grade you did.*
- *It helps me understand my peers ideas and elaborate on an idea I may not have thought of myself.*
- *It would be helpful to have a second opinion and some tips towards the paper. However, there can be a pretty big difference between what a teacher would want in a paper and what a fellow student would want.*

Comparison of Student & Faculty Ratings 2007

One paper; N = 2 faculty, 46 students



Students and Feedback



What We See in the National Survey of Student Engagement

Question to Faculty: [Students] Received prompt feedback (written or oral) from you on their academic performance.

- Faculty Responses: 89% said **Very Often or Often**

Question to Students: [You] Received prompt feedback (written or oral) from faculty on your academic performance

- Student Responses N=566: **39% said Very Often or Often**

Difference = -50%

Question 2: Coursework emphasizes: Memorizing facts, ideas or methods from your course readings

- Student responses (Fr. Year N=566): 78% said **very much or quite a bit**.
- Faculty responses (LD): 43% said **very much or quite a bit**

Difference = -35%

- Student responses (Sr. Year N=770): 67% said **very much or quite a bit**.
- Faculty responses (UD): 24% said **very much or quite a bit**

Difference = -43%

Accreditation

The Good Old Days

	My Class	Your Class	His Class	Her Class	Another Class
1st Year Content	✓				
2nd Year Content		✓	✓		
3rd Year Content					
4th Year Content					
Capstone Content	✓	✓	✓	✓	✓
				✓	

Accreditation

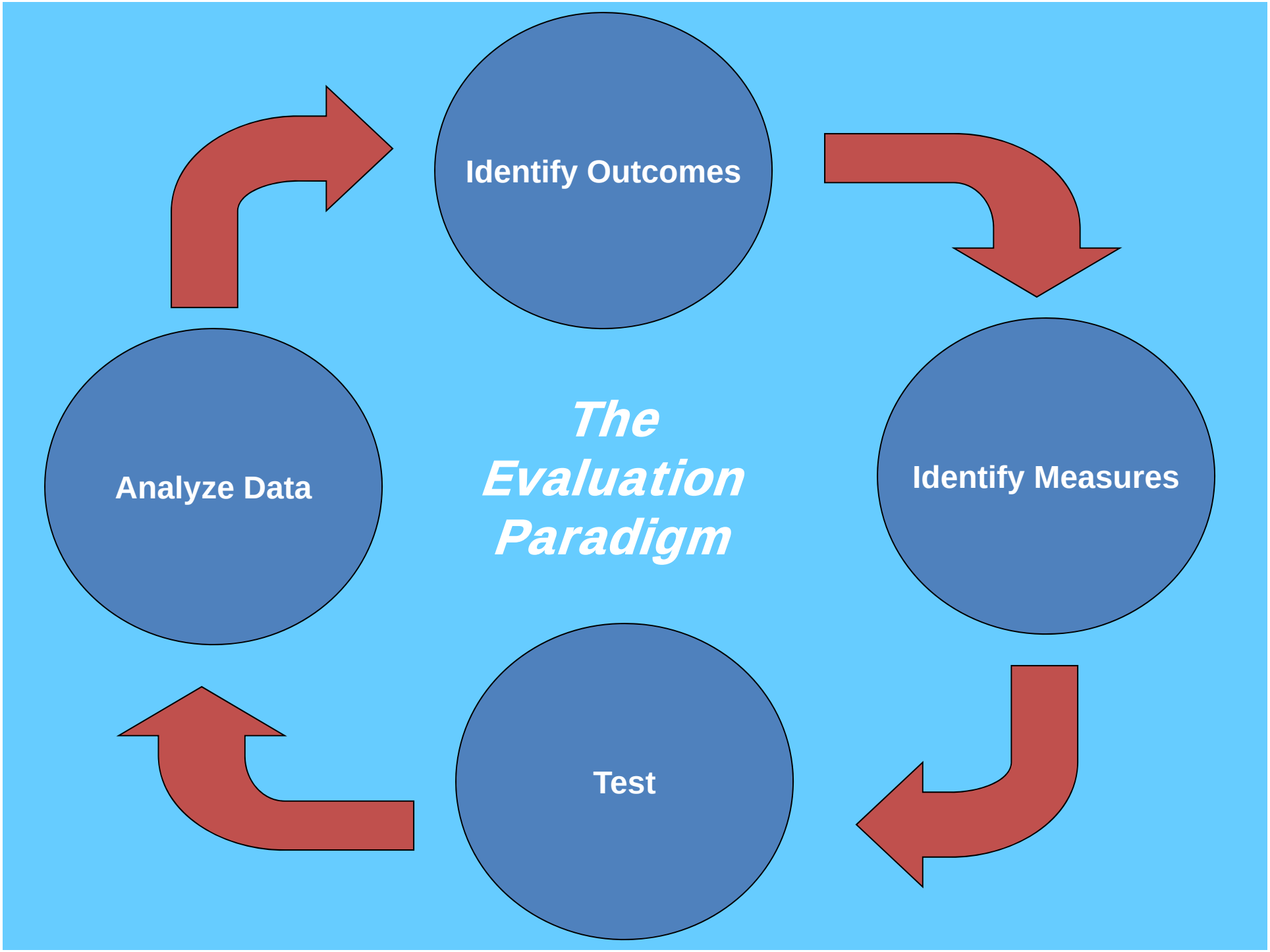
Northwest Commission on Colleges & Universities

For Each Program:

1) What are the intended educational outcomes?
2) How are these expected outcomes assessed?
3) How is this information utilized to improve the outcomes for future students?

(Commission Standards 2A-2B and Policy 2.2)

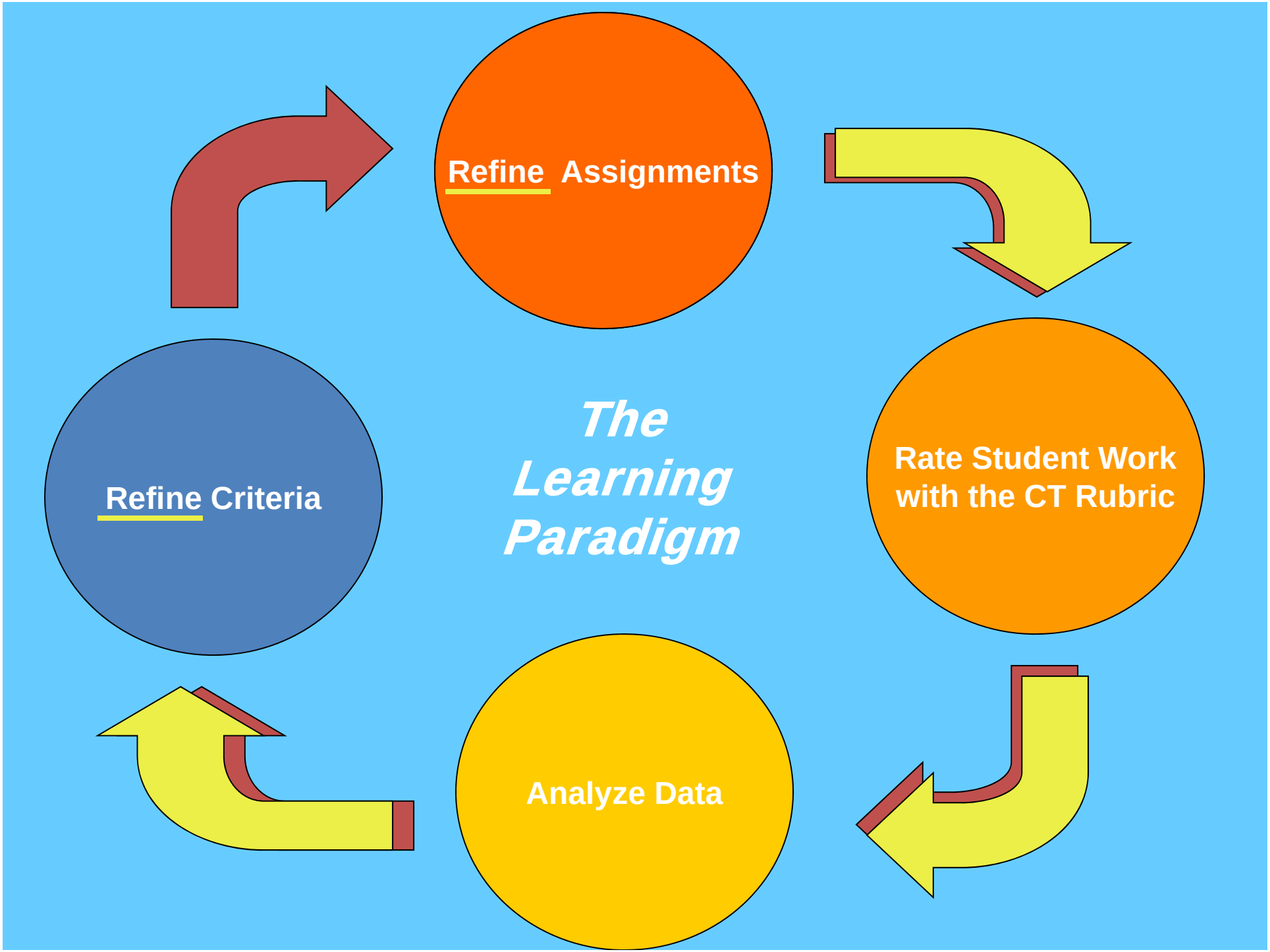
Closing the Loop


Identify Outcomes
Identify Measures
Test
Analyze Data
The Evaluation Paradigm

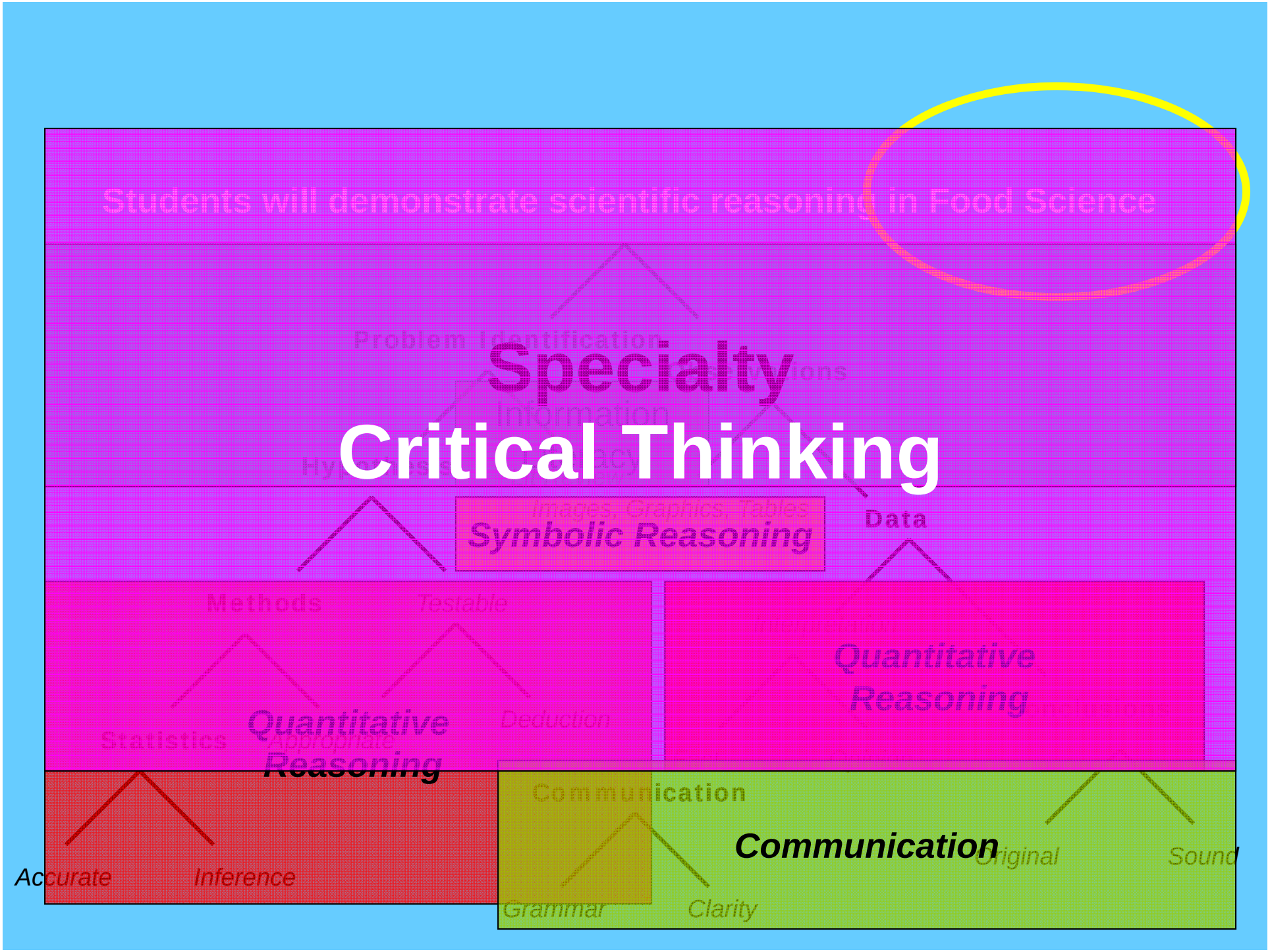
The Assessment Reform Agenda

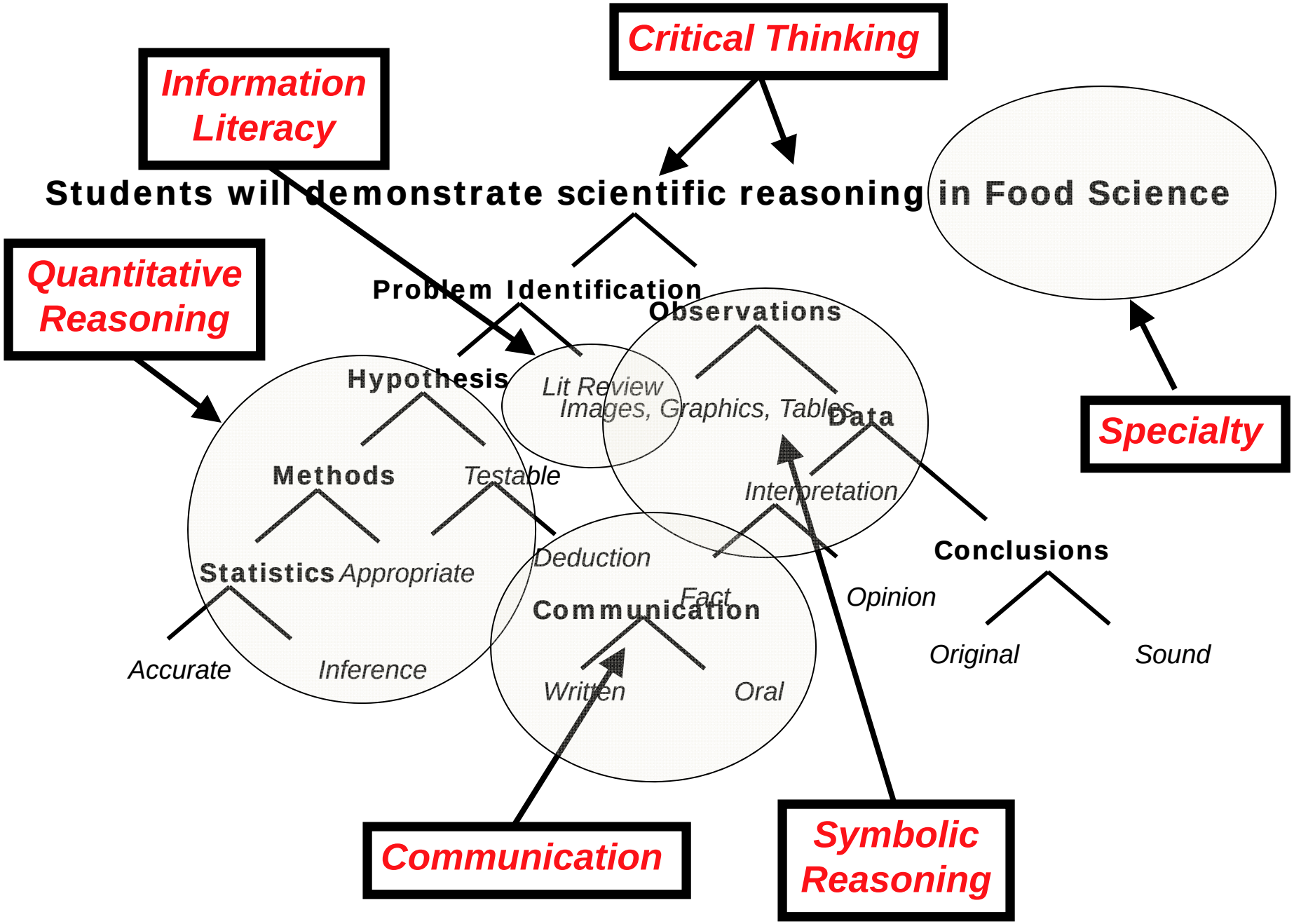
—Peter Ewell

- Unlike formal assessment design as described in the textbooks…
- "It is often more helpful to go the other way…"
- "Specify the parameters of an assignment or problem."
- "The performance that the student exhibits on the assessment is the definition of the ability itself."
- "The ability has no independent existence." (p.6)


Refine Assignments
Rate Student Work with the CT Rubric
Analyze Data
Refine Criteria
The Learning Paradigm

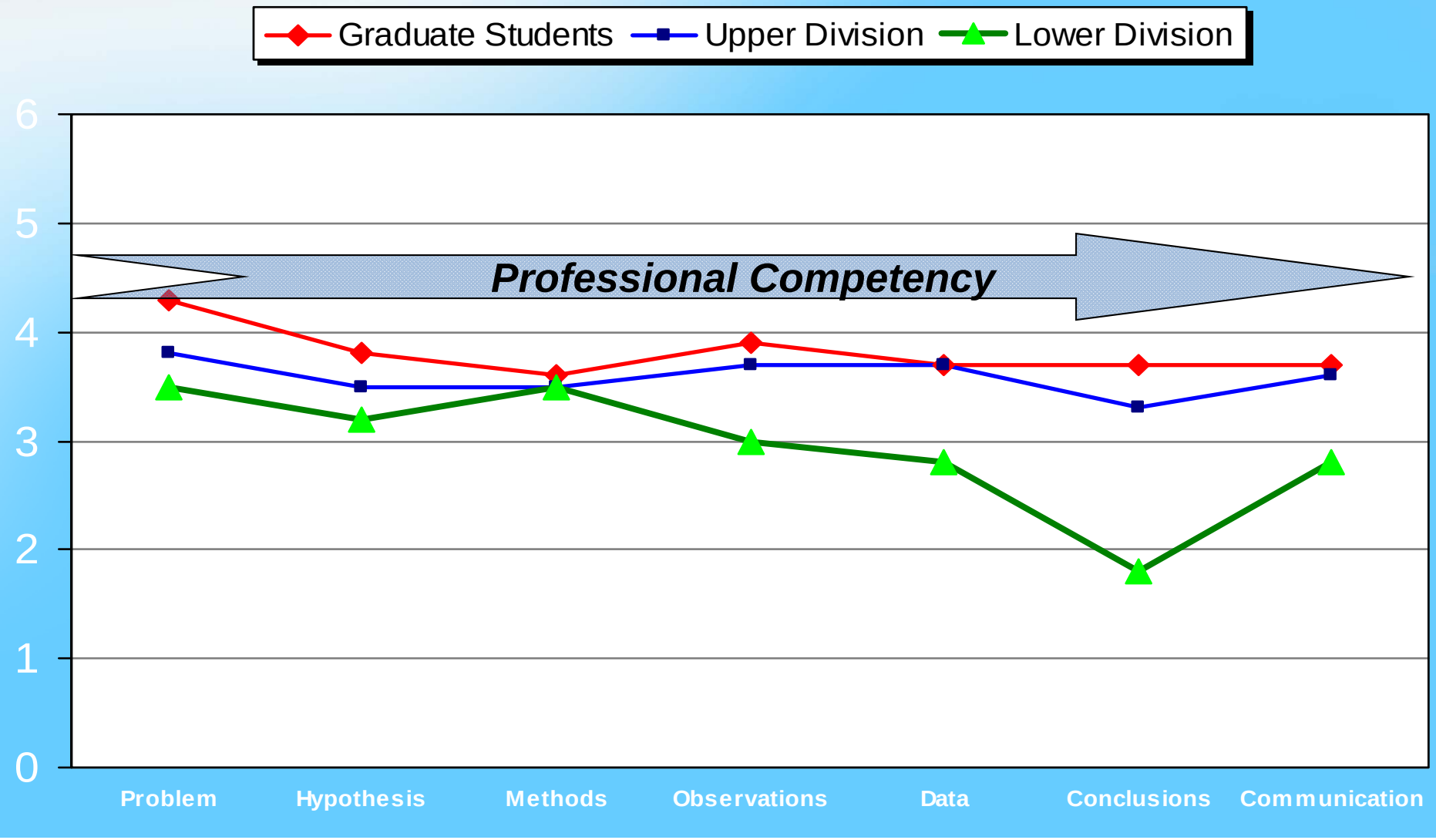

creative & critical thinking
quantitative and symbolic reasoning
information literacy
communication
self in society
specialty


Students will demonstrate scientific reasoning in Food Science
Specialty
Critical Thinking
Problem Identification
Information
Images, Graphics, Tables
Symbolic Reasoning
Data
Methods
Testable
Quantitative Reasoning
Statistics
Deduction
Quantitative Reasoning
Communication
Communication
Accurate
Inference
Grammar
Clarity
Original
Sound


Critical Thinking
Information Literacy
Students will demonstrate scientific reasoning in Food Science
Quantitative Reasoning
Problem Identification
Observations
Hypothesis
Lit Review
Images, Graphics, Tables
Data
Specialty
Methods
Testable
Interpretation
Deduction
Conclusions
Statistics
Appropriate
Fact
Opinion
Communication
Original
Sound
Accurate
Inference
Written
Oral
Communication
Symbolic Reasoning

Food Science Program Outcomes

Fall *Pilot* 2003



Closing the Loop

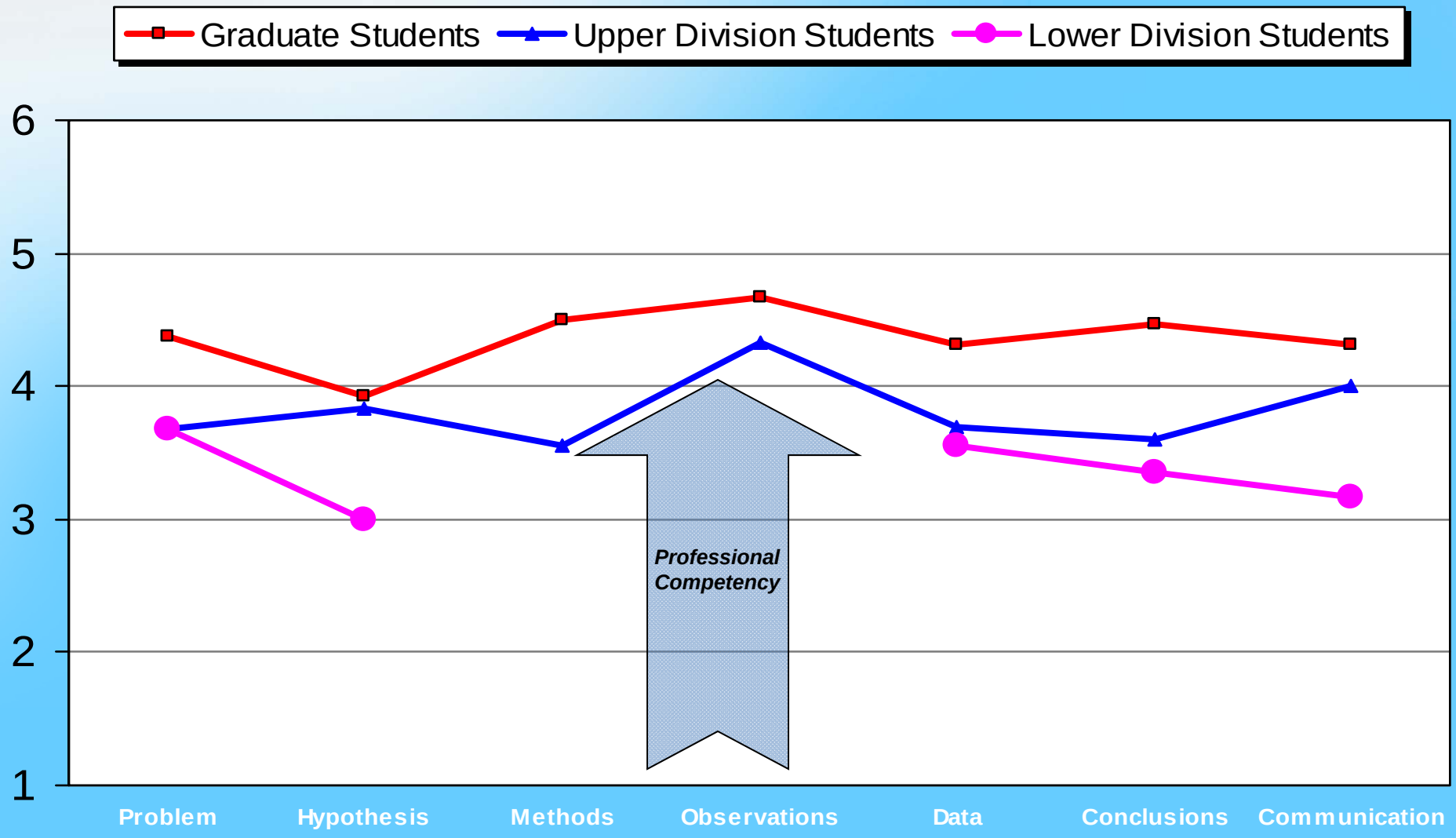
The Key

Faculty agreed:

- **Assignments need to be revised to align with assessment criteria—*the shared OUTCOMES*.**
- **Jointly create <u>assignments</u> for target points in curricula…**
  - **Early level baseline**
  - **Rising mid-program**
  - **Capstone**
  - **Integrate key concepts (content) with skills**
- **Include other professionals and upper-level students in the process**

Food Science Program Outcomes

*Spring 2005**



Benchmarks Available

- Number of faculty & TAs engaged in rating as % of program
- Number & kind of external reviewers engaged in rubric review and rating (accreditors, professionals, alumni, etc).
- Number of assignments aligned with outcomes
  - Ongoing assessment to correlate with greatest gains to determine optimal number (Not all activities need/should be measured)
- Number of content focused topics integrated with scientific reasoning outcomes

What Faculty Say…

"Working together to design assignments is unusual because faculty are accustomed to working independently. However, collaboration should enable improvement of individual assignments, thus the entire curriculum shall benefit."

—Stephanie Clark, Faculty
Food Science & Human Nutrition

What Students Say….

"I wanted to thank you for always challenging me to think critically. I have found this style of thinking very applicable to all of my other classes."

What Accreditors Say….

The USDA accreditation external review team reported that the WSU/UI joint program faculty "has critically examined the course and program outcomes. This model has been praised by the Committee on Higher Education of IFT as the model for other departments to follow. Furthermore, the faculty is committed to making any changes necessary for continuous improvement in their curriculum."

Toward Professional Development

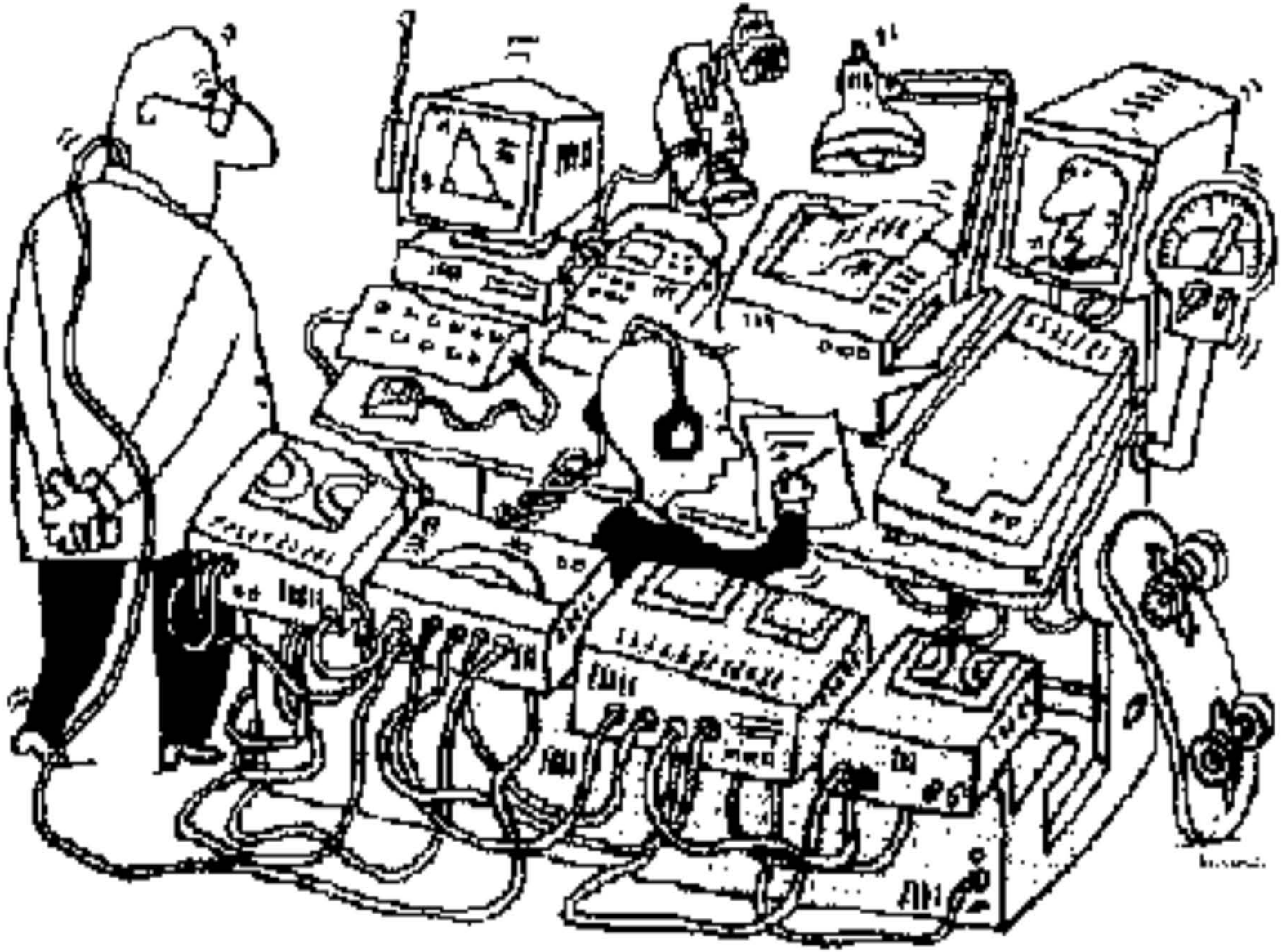
Scholarship of Teaching and Learning Framework for Faculty

Overview, Fall 2006

- **Instructional Design—**Candidate clearly articulates course goals, learning outcomes and performance criteria, and activities align with program goals when appropriate. Encourages integration of ideas and their wider application.

- **Instructional Presentation & Facilitation—**Candidate provides opportunities for active learning and student-generated content or materials, encouraging critical thinking; uses teaching methods that create a supportive learning environment and take into account various learner needs and interests; facilitates constructive interaction and collaborative learning among students, between students and faculty, between students, campus, and community; and provides prompt and useful formative feedback.

- **Assessment—**Candidate demonstrates commitment to professional growth by seeking input from others, including attention to student evaluations illustrated by a combination of consistently strong or improving results, improvements through increasingly sophisticated teaching practices, and use of innovative classroom assessment techniques that deepen understanding of student learning.



Brown, G., Smith, T., & Henderson, T. (2007)
Student perceptions of assessment efficacy in online and blended classes.
In Blended Learning, Sloan C, Dziuban & Picciano, Eds.

Cognitive & Social Orientations Toward Learning

Wildman, (2005)

Key Questions	Cognitive Orientation	Social Orientation
Where is the locus for learning	In individual minds, which must be filled and changed	**In the participation of people in social practices**
How is learning defined	Acquisition of propositional and procedural knowledge	**Acquisition of roles in cultural practices**
How is success defined?	Development of mature, well-formed cognitive structures	**Development of identity as a legitimate practitioner**
What is the time frame for use?	Future oriented; learning depends on later application	Immediate: learning is part of doing
What supports learning?	**Teachers, organized materials, and personal cognitive strategies**	Tools, contexts, other participants, stories, and participation
What provides evidence of learning?	**Tests and grades: Exchange value replaces use value**	Repertoires of skills and improved practices

Neuroscience

Caine and Caine (1997)

- *"Humans and human brains are innately social. Even as children interpersonal relationships are essential for healthy development of the brain and mind."*

- *"It is now clear that throughout our lives, our brain/minds change in response to their engagement with others—so much so that individuals must always be seen to be integral parts of larger social systems."*

- *"Indeed, part of our identity depends on establishing community and finding ways to belong."*

http://www.newhorizons.org/neuro/caine.htm

"The learner who learns best is the one who organizes, summarizes, elaborates, explains, and defends his or her ideas in the process of collaborating."

Driscoll, M. (2004, October).
"Collaborative Tools in the Learning Continuum."
Chief Learning Officer, 2(2).

Hypothesis

Students' views of activities commonly associated with "school" will be perceived with diminishing value as learners gain experience.

Construct 1—School

School

"School" tasks are characterized by the exclusive audience of the instructor who determines the student's grade.

(Johns and Swales, 2000)

Construct 2—Community

Community

Community tasks reflect a social orientation toward learning and some degree of peer participation or review of the student work or performance, regardless of the formal assessment criteria.

GAPs Overview

- Goals, Activities, and Processes
  - Designed to be formative
  - Online survey
  - All WSU faculty using web-based CMSs are invited to participate
  - Both faculty and students are surveyed

The Question

Which method of assessing your work is most likely to reflect what you are learning in this course?

Population

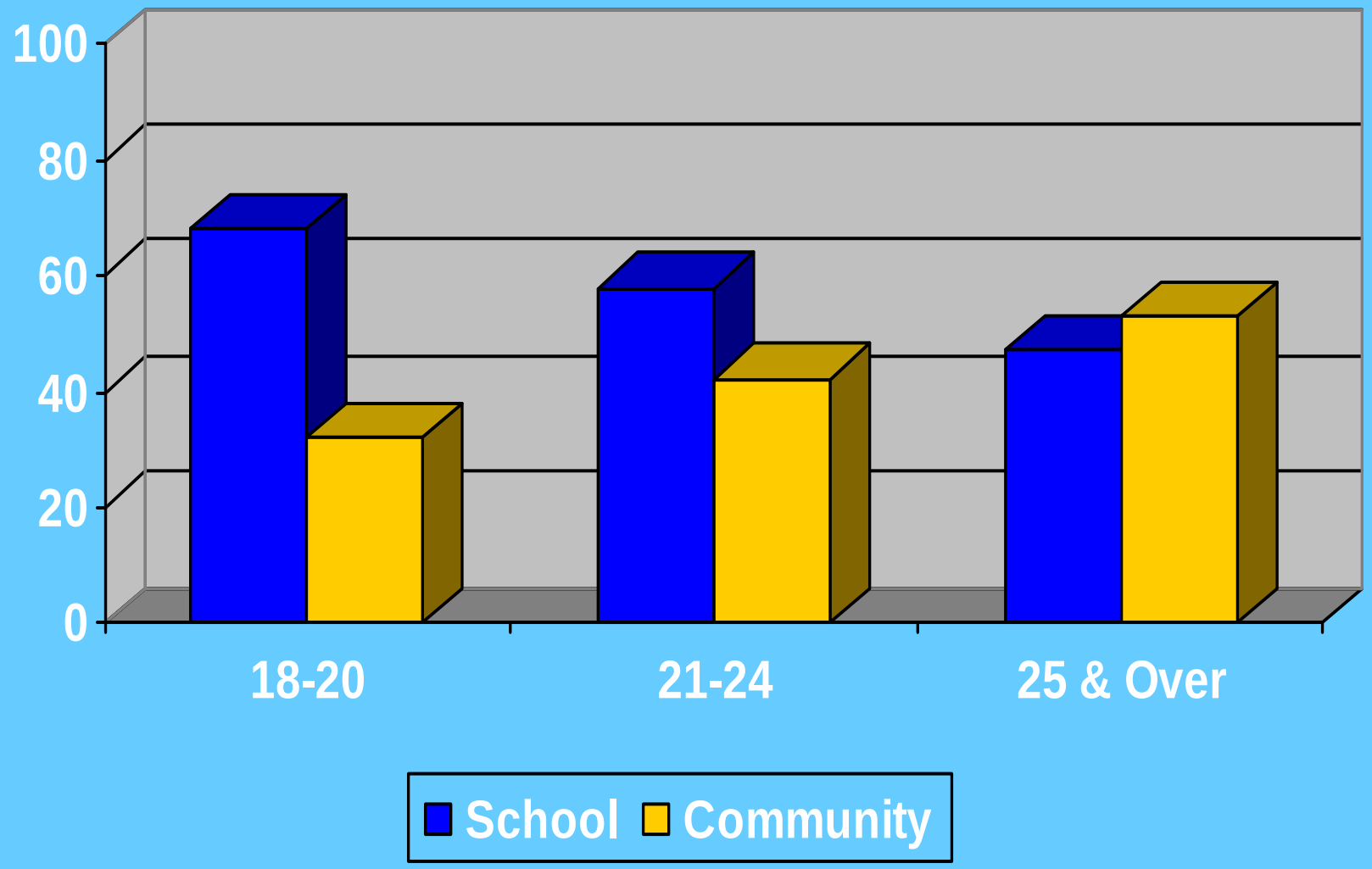
- Responses
  - 41 classes in fall 2002
  - 34 classes in fall 2003.
    - Convenience sample
      - incentives for student participation varied

Analysis

- Two raters independently coded open-ended responses to the question.
  - Inter-rater reliability was 89%.

Results

Combined 2002 & 2003
Experience or Age

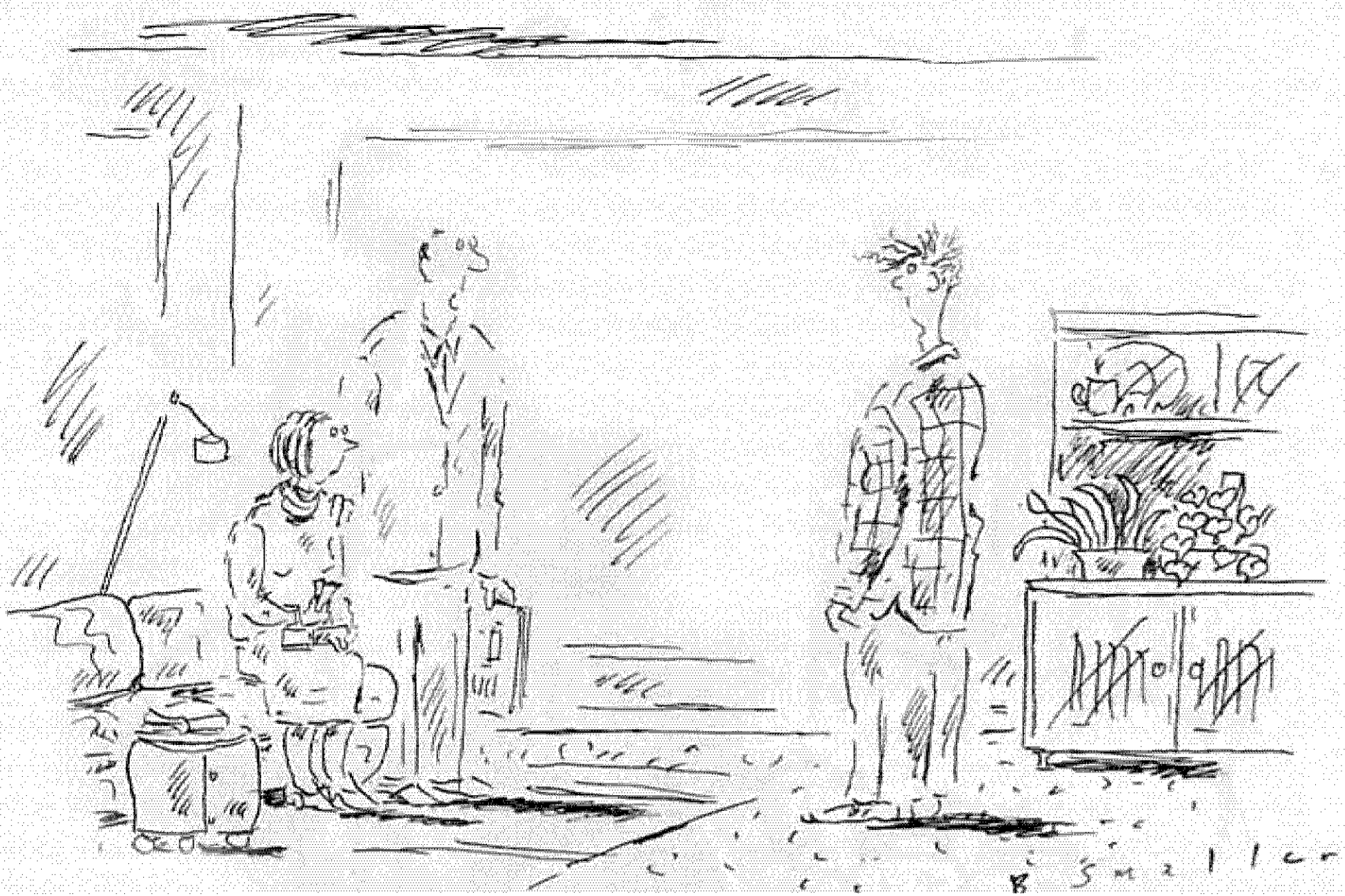


Guiding Assignment Principles

1. Promote collaboration, reflection, and discourse beyond the classroom.

2. Assessment as a series of "Drop boxes" is not compatible with P # 1.

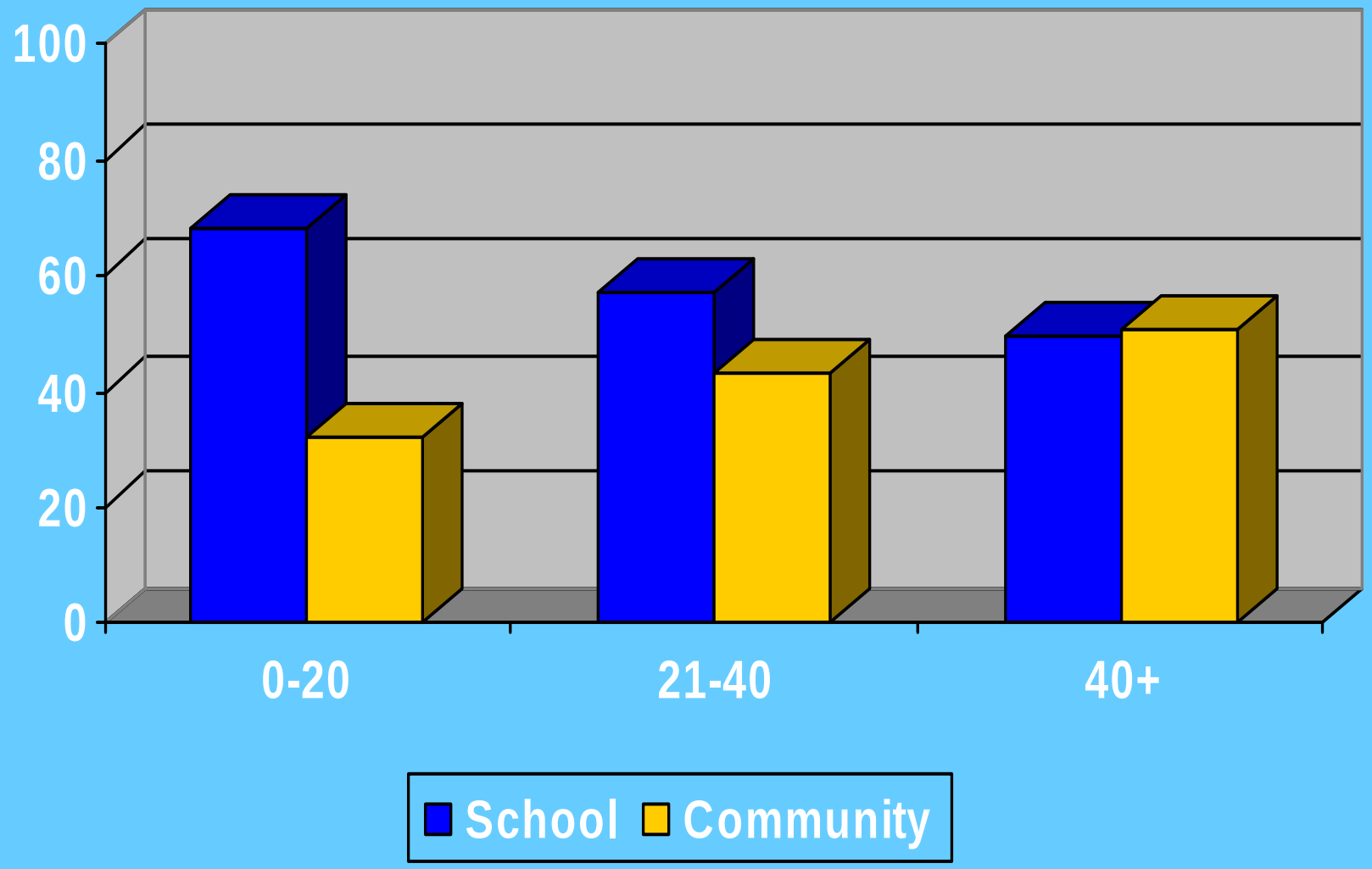
3. Exploration, collaboration, and scholarly investigation is not semester-based.
   - Promote recursive cycles of self, peer, & professional assessment/feedback, reflection, & revision.
   - Promote understanding that intellectual property extends beyond disciplinary and class silos.
4. Assessment is embedded in day-to-day work.



“Young man, go to you room and stay there until your cerebral cortex matures.”

Combined 2002 & 2003

Number of Courses



What Students Say

1. *"It would be nice to have some more objective evaluation like a multiple choice test or something."*
2. *"Every professor has their own style to a multiple choice test."*
3. *"I think essay based exams where a case study could be evaluated would be the best method of 'graded' assessment—but comments to threaded discussions are by far the best way to see if we have grasped the course work's objective."*
4. *"I am very upset that my time was so taken up trying to pass the quizzes rather than enjoying the learning that could have taken place."*

Confirming

- Tasks that are assessed solely by a teacher are "pseudocommunicative."

  (Johns and Swales, 2002)

- "The quality of academic production emerges significantly from purposeful social interaction."

  (Labaron and Santos, 2005)

- "Social interaction—especially in online environments—is not just an add-on but an essential prerequisite for effective online learning"

  (Meyer, 2003; Swan, 2002)

Conclusions & Implications

Mature learners recognize a difference between grading and learning.

Making the distinction reflects the progression of the novice to the mature learner.

But to what extent do these findings reflect our diminished expectations of novice learners?

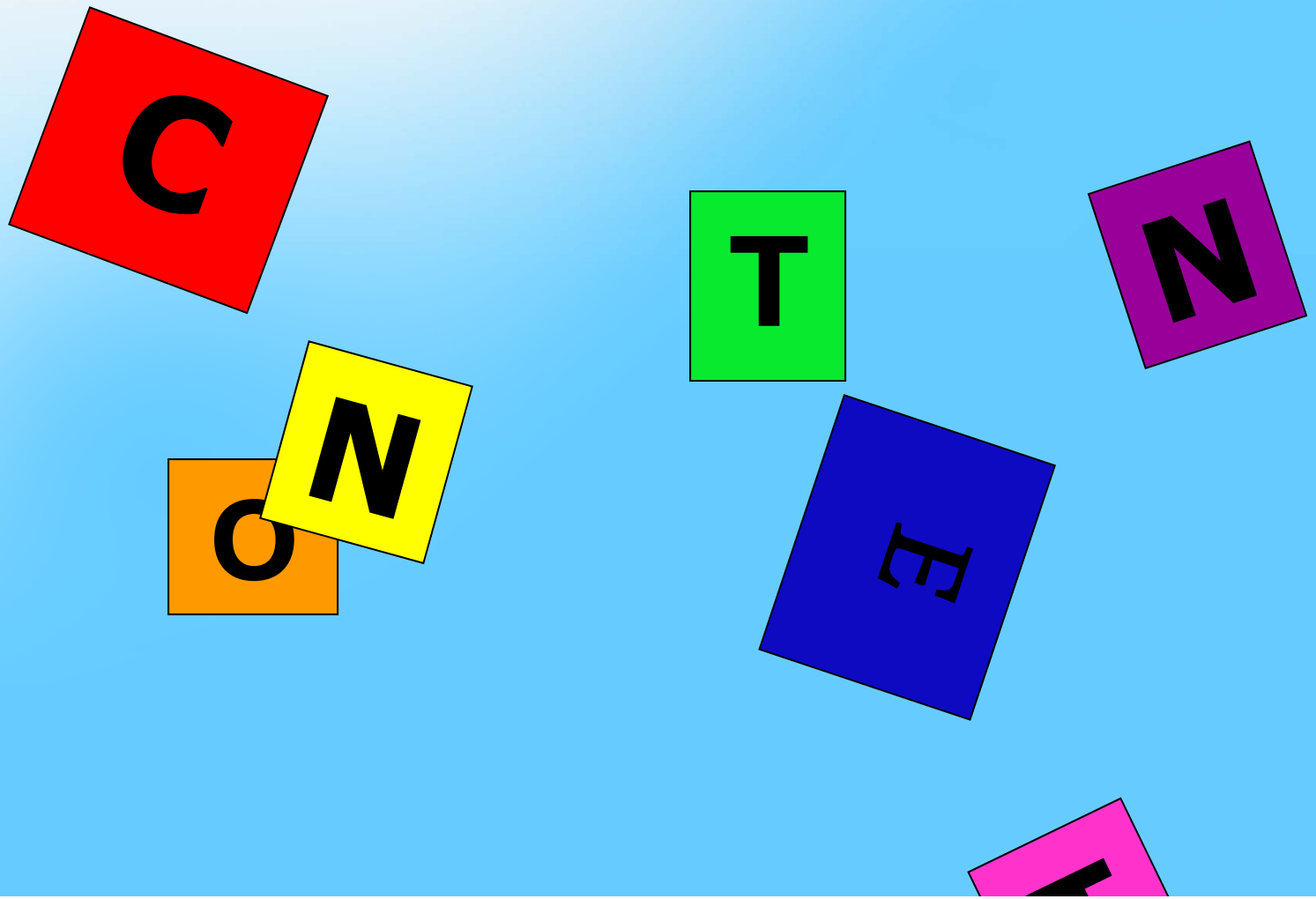
Finally

- Students who value critical thinking are significantly more likely to value:
  - Peer critiques
  - Community
  - Self Assessment
- Students who do not value critical thinking are significantly more likely to value:
  - *School*

Designing for Critical Thinking

Common Approach to Curriculum Design

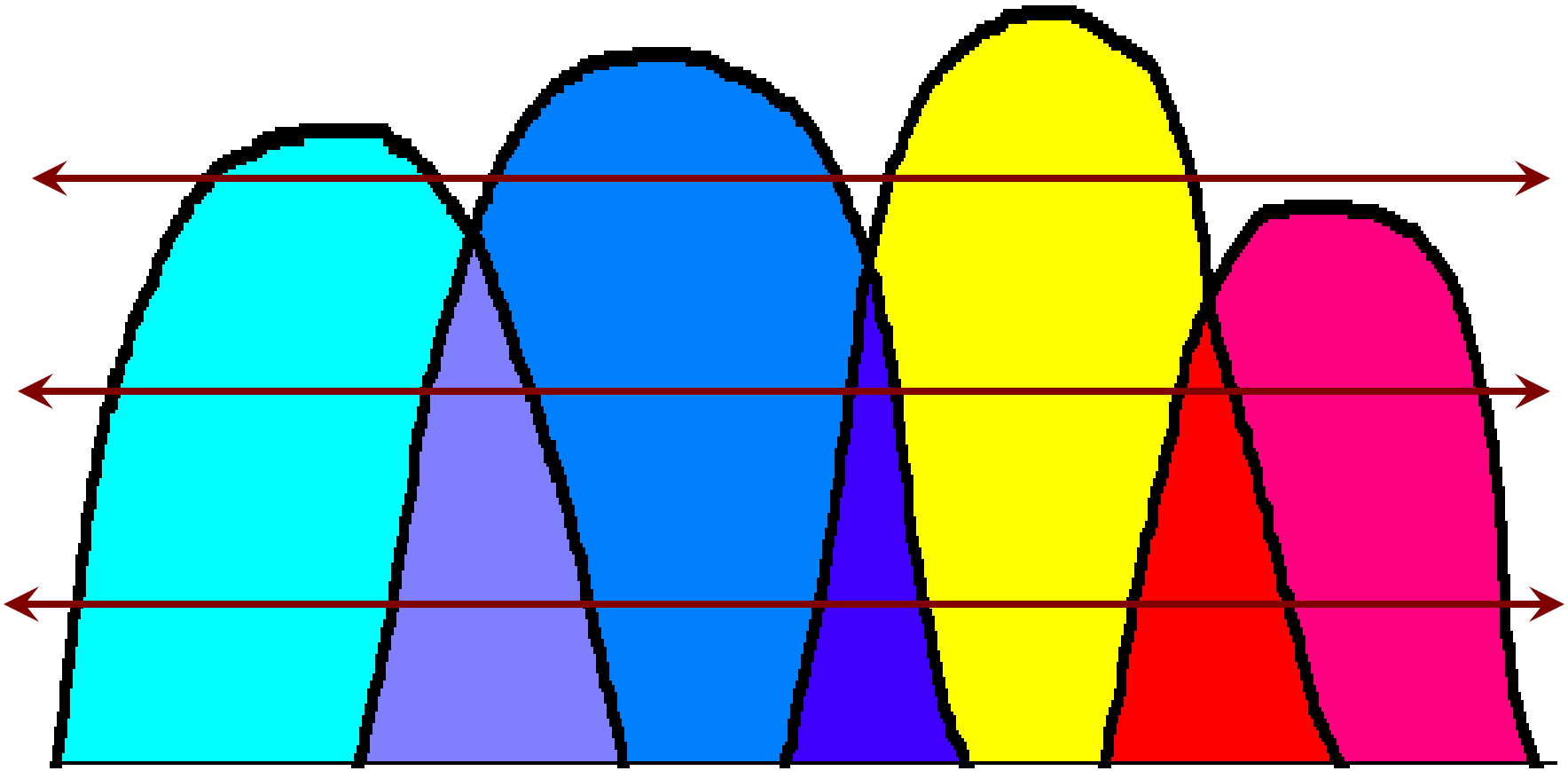
Students' Experience



The Recursive **Curriculum**

The Comprehensive Course Question

Benefits Gained by Answering Question



The Course Question

Program Evaluation—an Example

- *The Question*
- *What outcomes[1] are useful for determining the value[2] and for improving[3] a program[4]?"*
- ***Which raises the subordinate questions:***
- **What are outcomes?**
- **How do you determine value?**
- **What does improving mean?**
- **What makes up a program?**
- **What is the difference between the summative "determining" and the formative "improving"?**
- **How do you assess the program and for whom?**
- **How do you communicate or report the results?**

Content is a RESOURCE for answering the Question!