

# **Essential Steps in Problem-Based Inquiry into Student Learning**

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**Workshop Presented at DePaul University  
October 25, 2013**

# Workshop Foci

- A Problem-Based Framework for SOTL
- Essential Steps Before, During, and After You Enter This Framework
  - A. Identifying: (1) Your Student Learning Outcome Statement(s) and (2) Your Criteria and Standards of Judgment
  - B. Stating Your Research or Study Question
  - C. Researching Current Literature or Practices
  - D. Identifying or Designing Assessment Methods

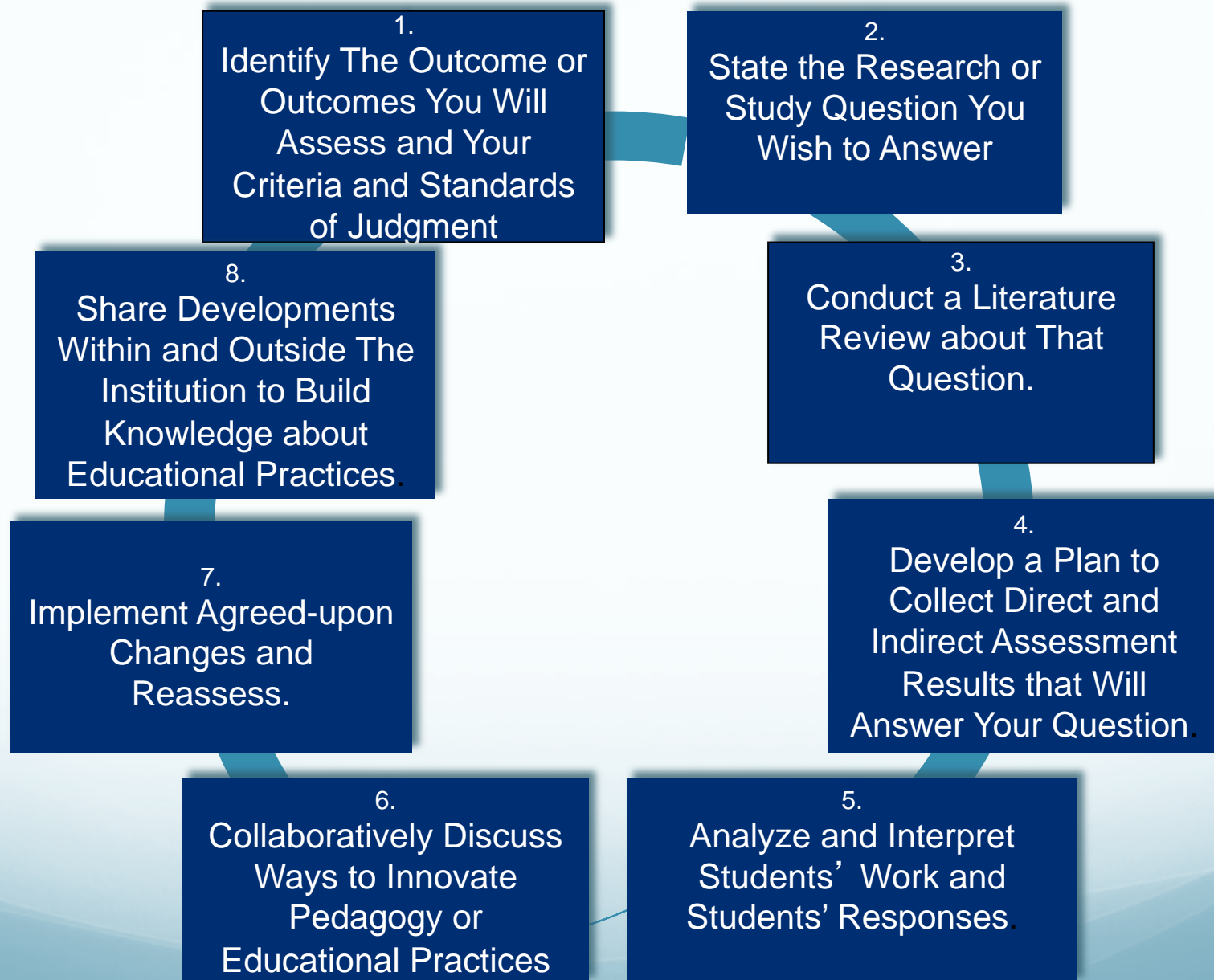
E. Seeking Student Consent and IRB Approval for Human Subject

F. Collecting and Assessing Evidence of Student Learning: Product and Process Evidence

G. Reporting and Analyzing Results of Scoring Evidence of Student Learning

H. Sharing Your Work to Advance Practices that Improve Student Learning

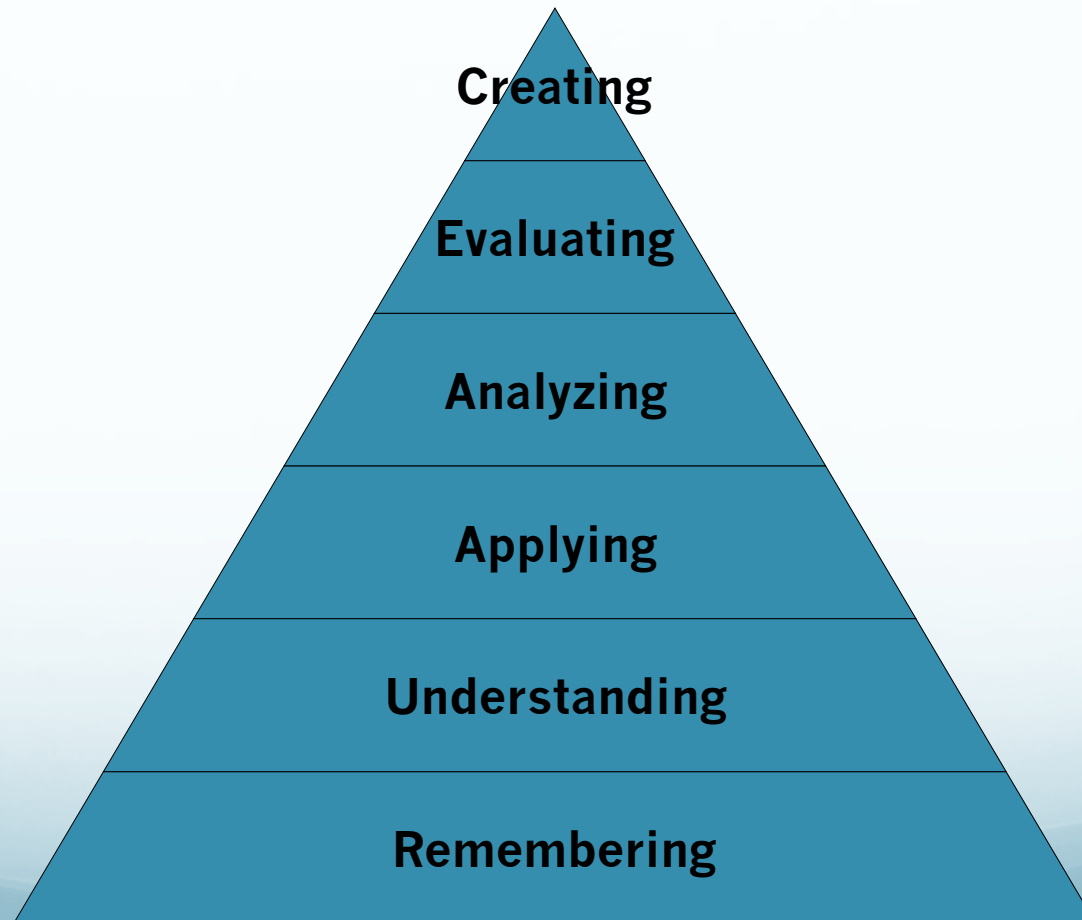
# A Problem-based Framework



## A.1. Identifying Your Learning Outcome Statement(s)

What do you expect your students to demonstrate, represent, or produce by the end of your course, educational experience, or at the end of students' program of study? (See Revised Bloom's Taxonomy: Handout 1.)

# Cognitive Levels of Learning: Revised Bloom's Taxonomy (Lorin, et. als., 2000)



## A.2. Identifying Your Standards and Criteria of Judgment

On what basis will you be able to determine patterns of strength and weakness or patterns of improvement in students' learning processes or products?

For example:

- results of adaptive technology reports
- results of applying scoring rubrics to student work
- test results that align with your outcomes
- students' assessment of their learning gains (SALG.site)

## B. Stating Your Research or Study Question



Open-ended—often collaboratively agreed upon



Coupled with learning outcome statement(s)



Developed at the beginning of the inquiry process



# The Seeds of Research or Study Questions

Informal observations around the water cooler

Results of previous assessment along the chronology of learning or at the end of students' studies

Use of a Taxonomy of Weaknesses, Errors, or Fuzzy Thinking (see Handout 2.)

# Some Examples of Research/Study Questions

What kinds of erroneous ideas, concepts, or misunderstandings predictably interfere with students' abilities to learn or may account for difficulties they encounter later on?

What unsuccessful approaches do students take to solve representative disciplinary, interdisciplinary, or professional problems? Counter that with learning about how successful students solve problems.

What conceptual or computational obstacles inhibit students from shifting from one form of reasoning to another form, such as from arithmetic reasoning to algebraic reasoning?

What kinds of cognitive difficulties do students experience across the curriculum as they are increasingly asked to build layers of complexity?

(See Handout 3.)

# Group Work


Keeping in mind a desired student learning outcome statement—what you expect your students to demonstrate or represent—refer to Handout 3 as a way to draft your research or study question. Share and discuss that draft with colleagues as a way to refine it.

## C. Researching Current Literature or Practices

How Does Research on Learning Shape How and What You Explore or How You Redesign Your Practice(s)? What Does Current Research Assert about Student Learning? Establish the research on learning context. (See Handout 4.)

What Have Others Done Already That Shapes or Informs Your Research or Study Question or A Particular Practice You Will Use? What Have Others Not Done that you might do? Establish Your Context.

## D. Identifying or Designing Assessment Methods That Provide Evidence of Product and Process



Direct Methods, Including Some That Provide Descriptive Data about Students' Meaning-making Processes, Such as "Think Alouds"

Indirect Methods, Including Some That Provide Descriptive Data, such as Small Group Instructional Design or SALG Survey

Institutional data (course taking patterns, for example)

# Some Direct Methods to Assess Students' Learning Processes

- Think Alouds: Pasadena City College, “How Jay Got His Groove Back and Made Math Meaningful”(Cho and Davis)
- Word edit bubbles
- Observations in flipped classrooms
- Students' deconstruction of a problem or issue (PLEs in eportfolios can reveal this—tagging, for example)

- Student recorder's list of trouble spots in small group work or students' identification of trouble spots they encountered in an assignment
- Results of conferencing with students
- Results of asking open-ended questions about how students approach a problem or address challenges
- Use of reported results from adaptive or intelligent technology



- Use of reported results from adaptive or intelligent technology
- Focus on *hearing about* or *seeing* the processes and approaches of successful and not so successful students
- Analysis of “chunks of work” as part of an assignment because you know what will challenge or stump students in those chunks

# Some Direct Assessment Methods To Assess Students' Products

- ◆ Scenarios—such as online simulations
- ◆ Critical incidents
- ◆ Mind mapping
- ◆ Questions, problems, prompts

- Problem with solution: Any other solutions?
- Chronological use of case studies
- Chronological use of muddy problems
- Analysis of video
- Debates
- Data analysis or data conversion

# Some Indirect Methods that Probe Students' Learning Experiences and Processes

- SALG ([salgsite.org](http://salgsite.org)): Student Assessment of Their Learning Gains
- Small Group Instructional Design
- Interviews with students about their learning experiences-- about how those experiences did or did not foster desired learning, about the challenges they faced and continue to face. (See Handout 5.)

# Group Work

- Based on your research or study question, identify and discuss with colleagues the direct and indirect assessment methods you plan to use to assess student work or changes in behavior.

# E. Seeking Student Consent and IRB Approval

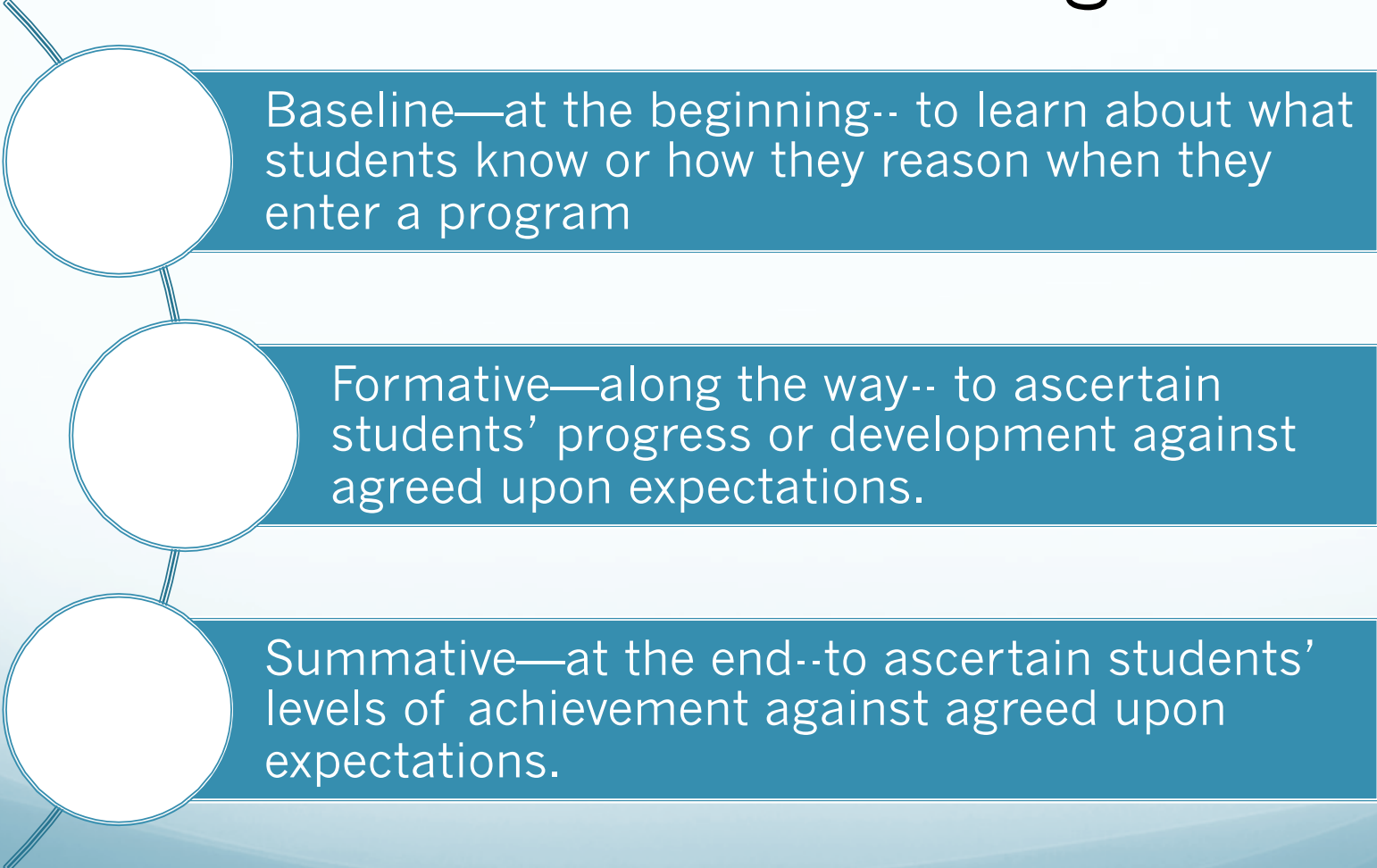
## **Student Consent**

- Values and Acknowledges Students' Work
- Informs Students of What You Aim to Do and the Parameters of How You Will Use Their Work and Report on It (See Handout 6.)

# IRB Approval

- Documents How You Will Conduct, Use, and Report on Your Research
- Documents How You Conform to De Paul's Policies on Privacy and Dissemination of Results of Your Work

# F. Collecting and Assessing Evidence of Student Learning



Baseline—at the beginning-- to learn about what students know or how they reason when they enter a program

Formative—along the way-- to ascertain students' progress or development against agreed upon expectations.

Summative—at the end--to ascertain students' levels of achievement against agreed upon expectations.



# Your Method of Sampling

Ask yourself what you want to learn about your students and when you want to learn:

- All students
- Random sampling of students
- Stratified random sampling based on your demographics—informative about patterns of performance that can be addressed for specific populations, such as non-native speakers

# Scoring

## Faculty:

- Determine when work will be sampled.
- Identify who will score student work (faculty, emeritus faculty, advisory board members, others?).
- Establish time and place to norm scorers for inter-rater reliability on agreed upon scoring rubric. (See Handout 7.)

## G. Reporting and Analyzing Results of Scoring Evidence of Student Learning

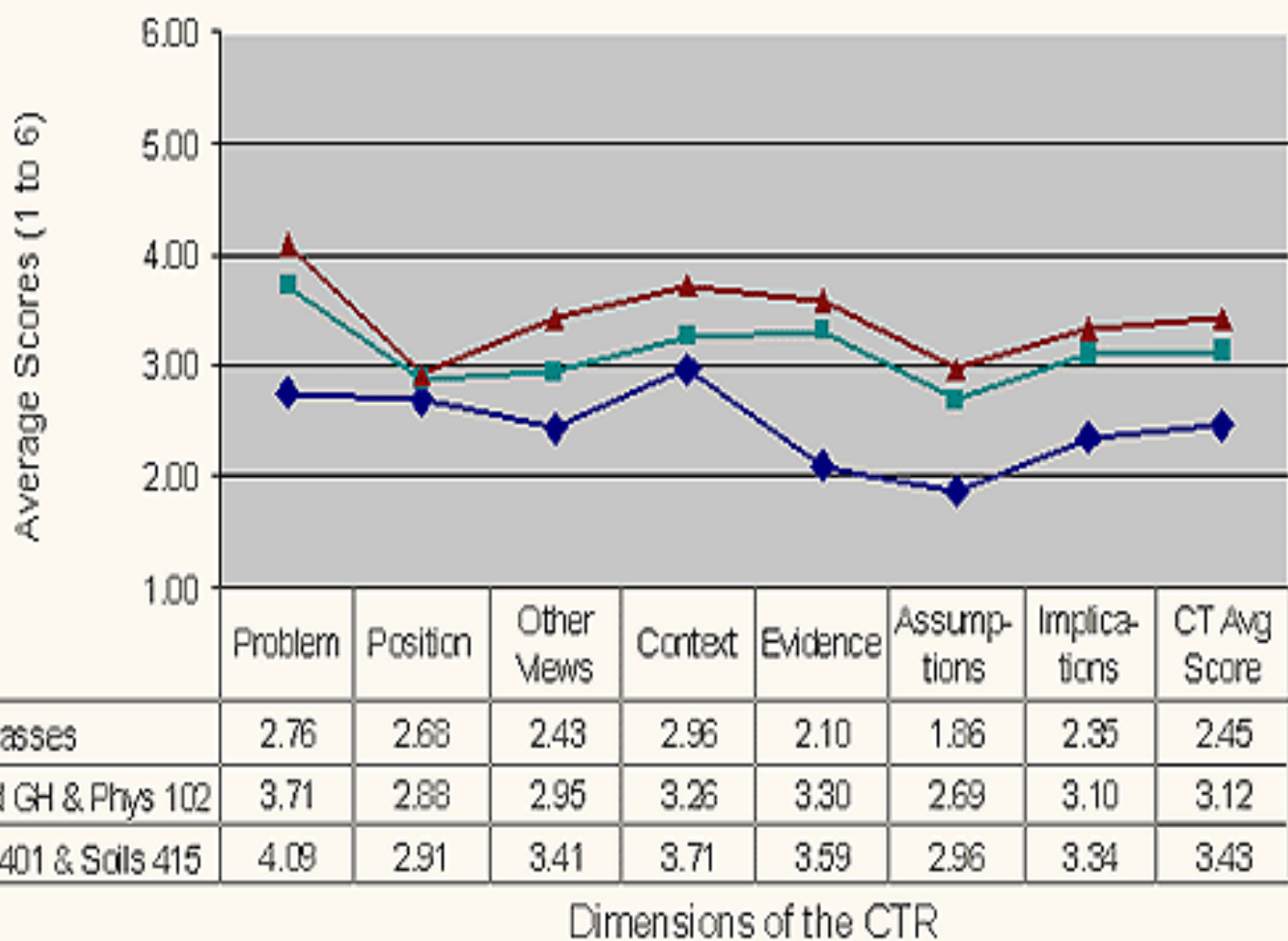
- Analyze and represent scoring or testing results that can be aggregated and disaggregated to represent patterns of achievement and to answer the guiding research or study question(s)
- Develop a one-page Assessment Brief to share internally and to serve as the basis of a possible publication or conference presentation

# The Assessment Brief

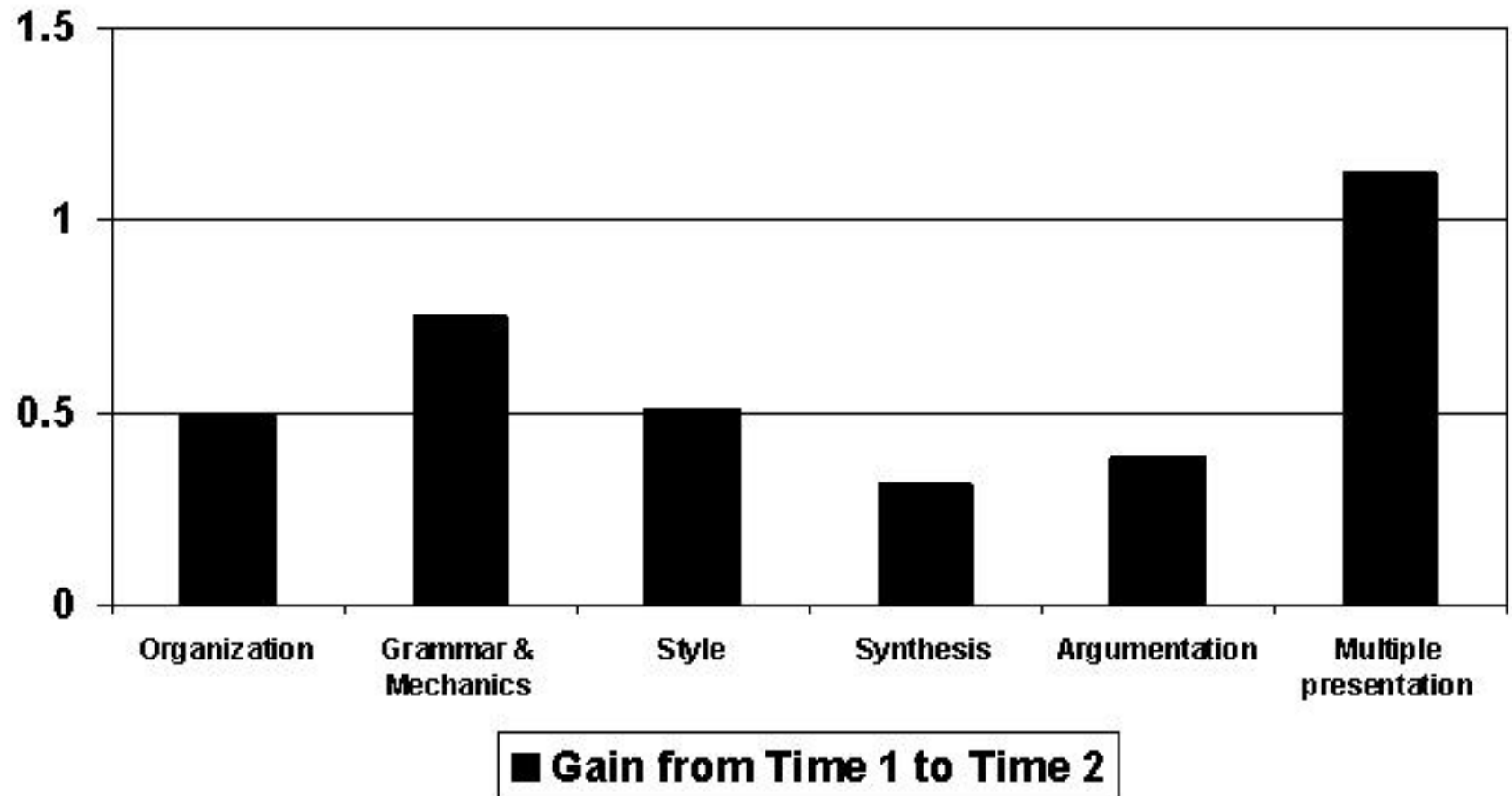
Is organized around issues of interest, not the format of the data (narrative or verbal part of the brief).

Reports results using graphics and comparative formats (visual part of the brief, such as *trends over time, for example, or achievement based on representative populations*).

Critical Thinking Scores - 4 Classes w/ the Rubric vs. 4 Classes w/o the Rubric



# Average Gains on BME 301 Assignments over Time by Dimension



Note: Scale is 1 to 5, positive numbers represent improvement over time

# H. Sharing Your SOTL Work to Advance Practices that Improve Student Learning

- To inform educational practices at the University or in your program of study
- To inform educational practices nationally at conferences and through publications
  - Your research or study question
  - Your approach to answer that question
  - Your evidence against standards and criteria of judgment
  - Your findings, any limitations, and next steps



# Works Cited

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