Diving Deeper into Pedagogy and Educational Practices through a Collaboratively Designed Assessment Process

Assessment in the Sciences, Social
Sciences, and The Arts
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Assessment:

A systematic means of ascertaining the fit between our expectations (what we intend) and students' actual achievement of those expectations.

--Process is guided by and anchored in
   intellectual curiosity about the
   the collective efficacy of our
   educational practices.

Research on Learning that Anchors the Commitment

- Learning is a complex process of interpretation-not a linear process

- Learners create meaning as opposed to receive meaning

- Knowledge is socially constructed (importance of peer-to-peer interaction)

National Research Council. (2001). Knowing What Students Know. National Academy Press

- People learn differently—prefer certain ways of learning (for example, learning style inventories)

- Deep learning occurs over time—transference

- Meta-cognitive processes are a significant means of reinforcing learning (thinking about one's thinking)

- Learning involves creating relationships between short-term and long-term memory

- Transfer of new knowledge into different contexts is important to deepen understanding

- Practice in various contexts creates expertise

Specific Questions that Guide Assessment

- What do you expect your students to demonstrate, represent, or produce by the end of their education at Miami University?

- What do you do in your classes or in your educational experiences to promote the kinds of learning that you expect students to demonstrate?

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Questions (con'd)

- Which students benefit from various classroom teaching strategies or educational experiences?

- What educational processes are responsible for fostering your program's intended student learning outcomes ?

- What pedagogies/educational experiences develop knowledge, abilities, habits of mind, ways of knowing/problem solving, dispositions?

- How are curricula and pedagogy designed to develop knowledge, abilities, habits of mind, ways of knowing and problem solving, and dispositions?

- How do you intentionally build upon what each of you teaches or fosters to achieve these expectations—contexts for learning?

- What methods of assessment capture desired student learning--methods that align with pedagogy, content, curricular and instructional design?

Integrating Teaching, Learning, and Assessing

- Pedagogy

- Curricular design

- Instructional design

- Educational tools

- Educational experiences

- Students' Learning Histories/Styles

Integrated Learning….

Cognitive

Psycho-motor

Affective

Expressive
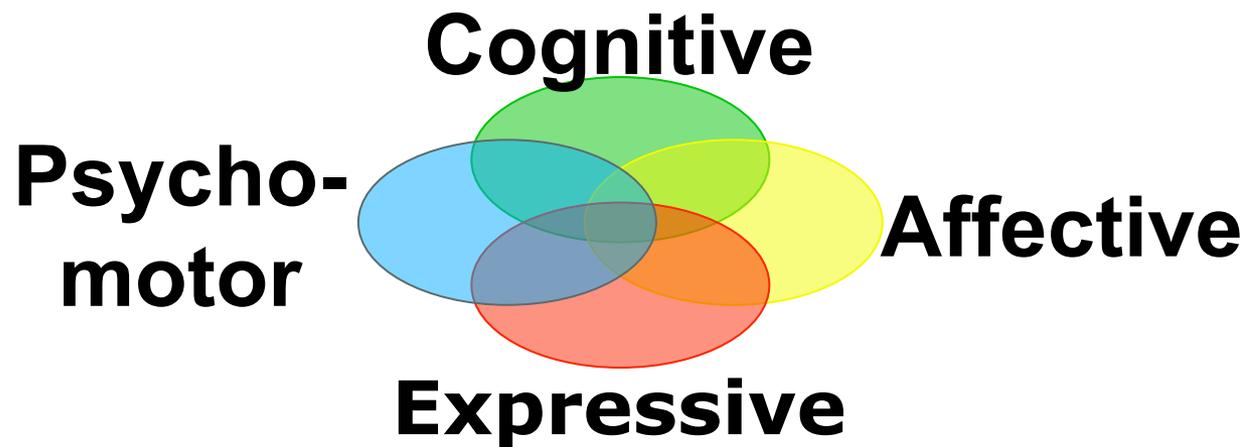
Collaboratively Articulating Program-level Learning Outcome Statements ....

Statements that…

○ Describe learning desired within a context

○ Rely on active verbs, such as create, compose, calculate. (*See Bloom's Taxonomy handout.*)

○ Emerge from your collective intentions along the continuum of students' learning

- Can be mapped to curricular-co-curricular practices (ample, multiple and varied opportunities to learn over time)

- Can be assessed quantitatively and/or qualitatively

- Are written for a course, program, and the institution itself

   (*See program-level examples in handout.*)

Levels of Learning Outcome Statements
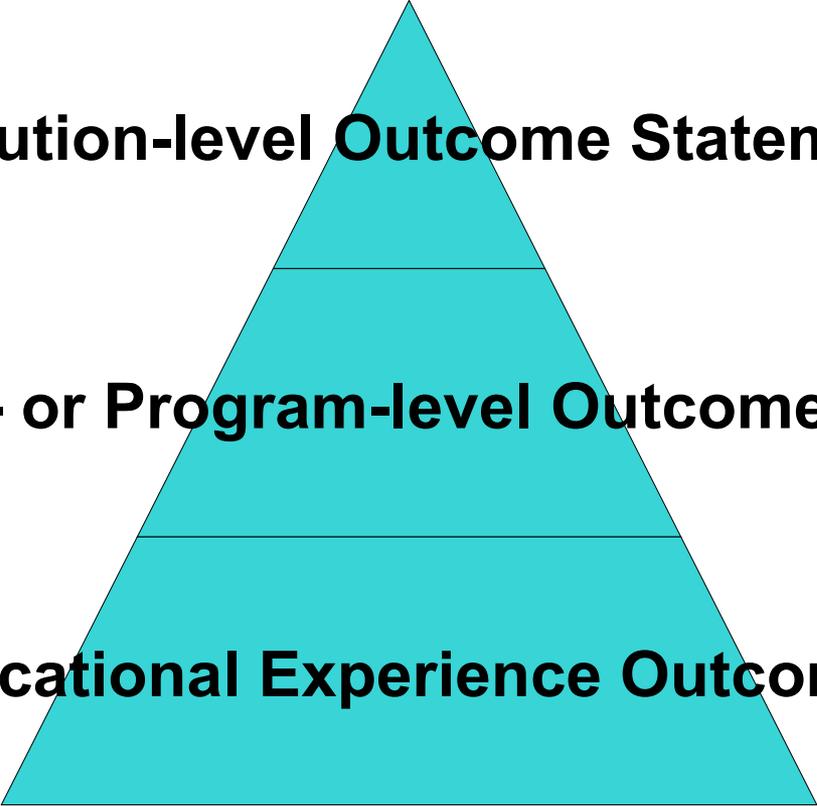
Institution-level Outcome Statements

Department- or Program-level Outcome Statements

Course or Educational Experience Outcome Statements

Revised Bloom's Taxonomy Krathwohl, et. als.

Creating

Evaluating

Analyzing

Applying

Understanding

Remembering
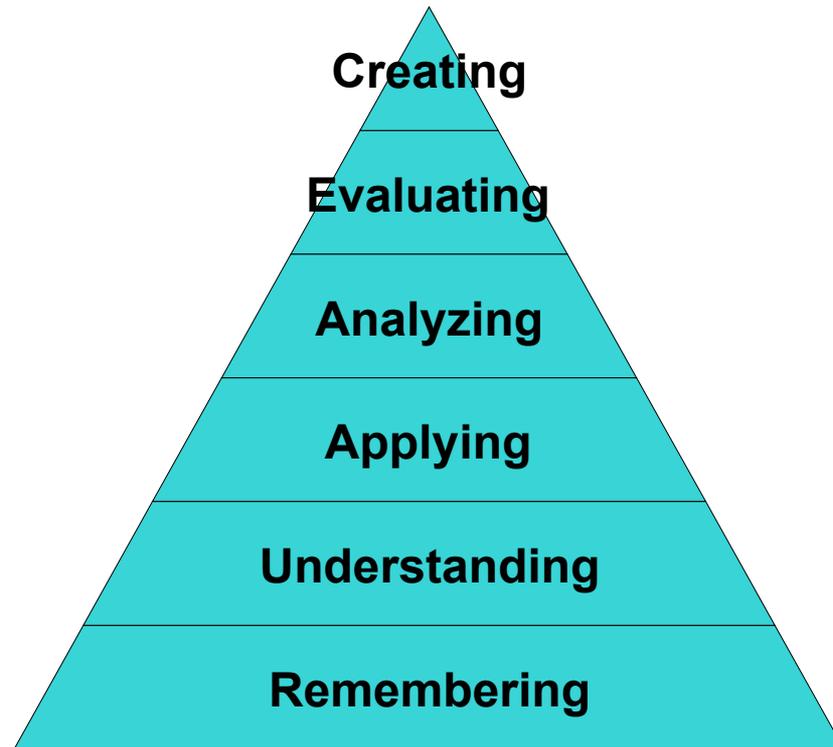
Ways to Articulate Outcomes

- Adapt from professional/scholarly organizations

- Derive from mission of the school/program/department

- Derive from students' work that demonstrates, for example, interdisciplinary thinking, ways of knowing, disciplinary logic

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Group Work

With colleagues from your program or as a representative from your program, articulate two to three learning outcomes that students should be able to achieve by the time they graduate from your program:

1.

2.

3.

Mapping Learning Outcome Statements to the Curriculum and Co-curriculum to Assure Coherence

- Reveal how we translate outcomes into educational practices, offering students multiple and diverse opportunities to learn and reflect on their learning

- Help you identify appropriate times to assess those outcomes to ascertain progress/mastery

- Identify gaps in learning or opportunities to practice desired learning

○ Help students understand your expectations for their work

○ Enable students to develop their own maps or learning chronologies. (*See examples in handouts.*)

How might you use maps and inventories?

○ Discuss how you might go about the process of developing a curricular map and inventories of educational practices.

Developing Research or Study Questions: The Seeds

- Informal observations around the water cooler

- Results of previous assessment along the chronology of learning or at the end

- Remarks shared by peers, such as librarians' insights about students' research abilities

Research or Study Questions

- Collaboratively developed
- Open-ended
- Coupled with Learning Outcome Statements
- Developed at the Beginning of the Assessment Planning Process
    - --Shape Decisions about the Kinds of Evidence/Data You Collect to Answer Your Driving Question

Some Sample Research or Study Questions

WHAT--

- approaches to learning do students take as they shift from one disciplinary course to another or from introductory courses to higher level courses in their program of study

- gaps in skill level occur as students transition into subsequent courses or learning experiences

- kinds of erroneous ideas, concepts, or misunderstandings predictably interfere with students' abilities to learn new content (recall the physics scenario)

- approaches do successful and unsuccessful learners take to solve representative disciplinary problems

- patterns of weakness continue to surface or persist in students' work, such as weak reading abilities, analytical abilities, or computational skills

- kinds of processes, problems, or tasks typically stump students (*refer to Taxonomy*)

Group Work

- Based on one or more of the outcome statements you have identified, what are some possible research or study questions that you might want to answer?

- -------------------------------------

- -------------------------------------

- -------------------------------------

Identifying or Designing Valid Assessment Methods that Align with Teaching, Learning, and Feedback Practices

"Every assessment is also based on a set of beliefs about the kinds of tasks or situations that will prompt students to say, do, or create something that demonstrates important knowledge and skills. The tasks to which students are asked to respond on an assessment are not arbitrary."

National Research Council. Knowing what students know: The science and design of educational assessment . Washington, D.C.: National Academy Press, 2001, p. 47.

Assumptions Underlying Teaching

Actual Practices

Assumptions Underlying Assessment Tasks

Actual Tasks

What Tasks Elicit Learning You Desire?

○ Tasks that require students to select among possible answers?

○ Tasks that require students to <u>construct</u> answers (students' problem-solving and thinking abilities)?

Approaches to Learning

○ Surface Learning

○ Deep Learning

Direct Methods

- Focus on how students represent or demonstrate their learning (meaning making)

- Align with students' learning experiences and assessment experiences

- Align with curricular design verified through mapping

- Invite collaboration in design (faculty and students)

Standardized Instruments

- Psychometric approach—values quantitative methods of interpretation

- History of validity and reliability

- Quick and easy adoption and efficient scoring

- One possible source of evidence of learning

May Not Provide…..

- Evidence of strategies, processes, ways of knowing and understanding that students draw upon to represent learning

- Evidence of complex and diverse ways in which humans construct and generate meaning

- Highly useful results that relate to pedagogy, curricular design, sets of educational practices

Authentic, Performance-based Methods

- Focus on integrated learning

- Directly align with students' learning and assessment experiences

- Provide opportunity for students to generate responses as opposed to selecting responses

- Provide opportunity for students to reflect on their performance

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Do Not Provide…

- Immediate reliability and validity (unless there has been a history of use)

- Usually do not provide easy scoring unless closed-ended questions are used

Some Options

- E-portfolios

- Capstone projects (mid-point and end point?)

- Performances, productions, creations

- Visual representations (mind mapping, concept mapping, charting, graphing

- Case studies with Analysis/Self-Reflection

- Disciplinary or professional practices, such as delivering a paper, having a paper jury reviewed for publication, preparing a laboratory report, writing a dissertation or thesis

- Agreed upon embedded assignments that provide evidence of students' progress or mastery

- Writing, to speaking, to visual representation

- Team-based or collaborative projects

- Internships or Practica or Service Projects

- Internally or externally juried review of projects

- Oral examinations or defenses or responses

- Simulations/virtual simulations

- Computer-generated scenarios

- Performance on a national exam or locally developed exam

- Learning logs or journals

- Data mining

- Think alouds

Indirect Methods of Assessment

- Focus group (representative of the population)

- Interviews (representative of the population

- Small Group Instructional Diagnosis (SGID)

- Student evaluation of courses such as SALG-Student Assessment of Their Learning Gains

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Other Useful Data

○ Transcript audits (course-taking patterns)

○ Grades

○ Engagement in the co-curriculum or other educational practices

Identify Methods to Assess Your Outcomes

- Identify both direct and indirect methods you do or might use to assess one or more outcome statements you articulated earlier.

- Based on each method, identify the kinds of inferences you can or will be able to make about students' achievement of those outcomes.

- How will your methods enable you to answer your research or study question?

Developing Standards and Criteria of Judgment--What's Good Enough?

Scoring rubrics--A set of criteria that identifies the:

(1) expected characteristics/traits of student work/behavior

(2) levels of achievement along those characteristics/traits

- Are criterion-referenced, providing a means to assess the multiple dimensions of student learning.

- Are collaboratively designed based on how and what students learn (based on curricular coherence)

- Are aligned with ways in which students have received feedback (students' learning histories)

○ Are useful to students, assisting them to improve their work and to understand how their work meets standards (can provide a running record of achievement).

○ Raters use them to derive patterns of student achievement to identify strengths and weaknesses and thus verify the efficacy of educational practices as well as those that need to be changed

Interpretation through Scoring Rubrics

- Criteria descriptors (ways of thinking, knowing or behaving represented in work)

  - Creativity
  - Self-reflection
  - Originality
  - Integration
  - Analysis
  - Disciplinary logic

○ Criteria descriptors (traits of the performance, work, text)

  ○ Coherence
  ○ Accuracy or precision
  ○ Clarity
  ○ Structure

Performance descriptors (describe how well students execute each criterion or trait along a continuum of score levels). Use numbers or words with descriptive elaboration, such as:

- **Exemplary—Commendable– Satisfactory-Unsatisfactory**
- **Excellent—Good—Needs Improvement—Unacceptable**
- **Expert—Practitioner—Apprentice—Novice**

Development of Scoring Rubrics

- Emerging work in professional and disciplinary organizations or in research projects

- Research on learning (from novice to expert)

- Student work itself—derive traits and levels beginning with high to low achievement

- Interviews with students or integration of them in the creation of a scoring rubric

- Observations based on previous student work

Pilot-testing Scoring Rubrics

○ Apply to student work to assure you have identified all the dimensions with no overlap

○ Schedule inter-rater reliability times:

        -independent scoring

        -comparison of scoring

        -reconciliation of responses

        -repeat cycle

- Determine assessment method and times to collect student work

- Determine who will score

- Identify and train scorers

- Determine who will analyze results (suitable for aggregation and disaggregation to answer your research or study question)

- Establish time and place for pilot testing the scoring rubric on representative samples before the formal process is established

Identifying When, Where, and Who You Will Assess along Students' Program of Study

○ **Baseline**—at the beginning?
For example, to identify what students do and do not know as a basis upon which to ascertain progress

○ **Formative**—along the way?
For example, to ascertain progress or development

○ **Summative**—at the end?
For example, to ascertain mastery level of achievement

Meaningful Use of Data: Answering the Question You Raised about Student Learning

- Collect data from different sources identify patterns of strength and weakness (for example, assessment of undergraduate student portfolios as well as results of focus group meetings or interviews or surveys).

- Collect data you believe will be useful in identifying patterns of strength and weakness.

- Organize reports around issues, not solely data.

Analyzing and Interpreting Results that Also Answer Your Research or Study Question

- Develop assessment briefs that illustrate student performance against scoring rubrics to easily identify patterns of strength and weakness

- Report results using graphics and comparative formats. (*Show trends over time, for example, or achievement based on representative populations*)

- Publish short, issue-specific reports or research briefs. *(Organize presentation of results around issues of interest, not the format of the data.)*

- Establish soft times and neutral zones to engage in interpretation across a program

- Seek **patterns** against criteria and cohorts

- Tell the story that explains the results—triangulate with other data

- Determine what you wish to change, revise, or how you want to innovate

- Interpret your data so that your interpretation informs pedagogy, practices, budgeting, planning, decision-making, or policies

**Comparison of Scores on Chronological Exams for Students Enrolled in The Traditional or Online B.S. Program in Health Sciences Beginning in 2006**
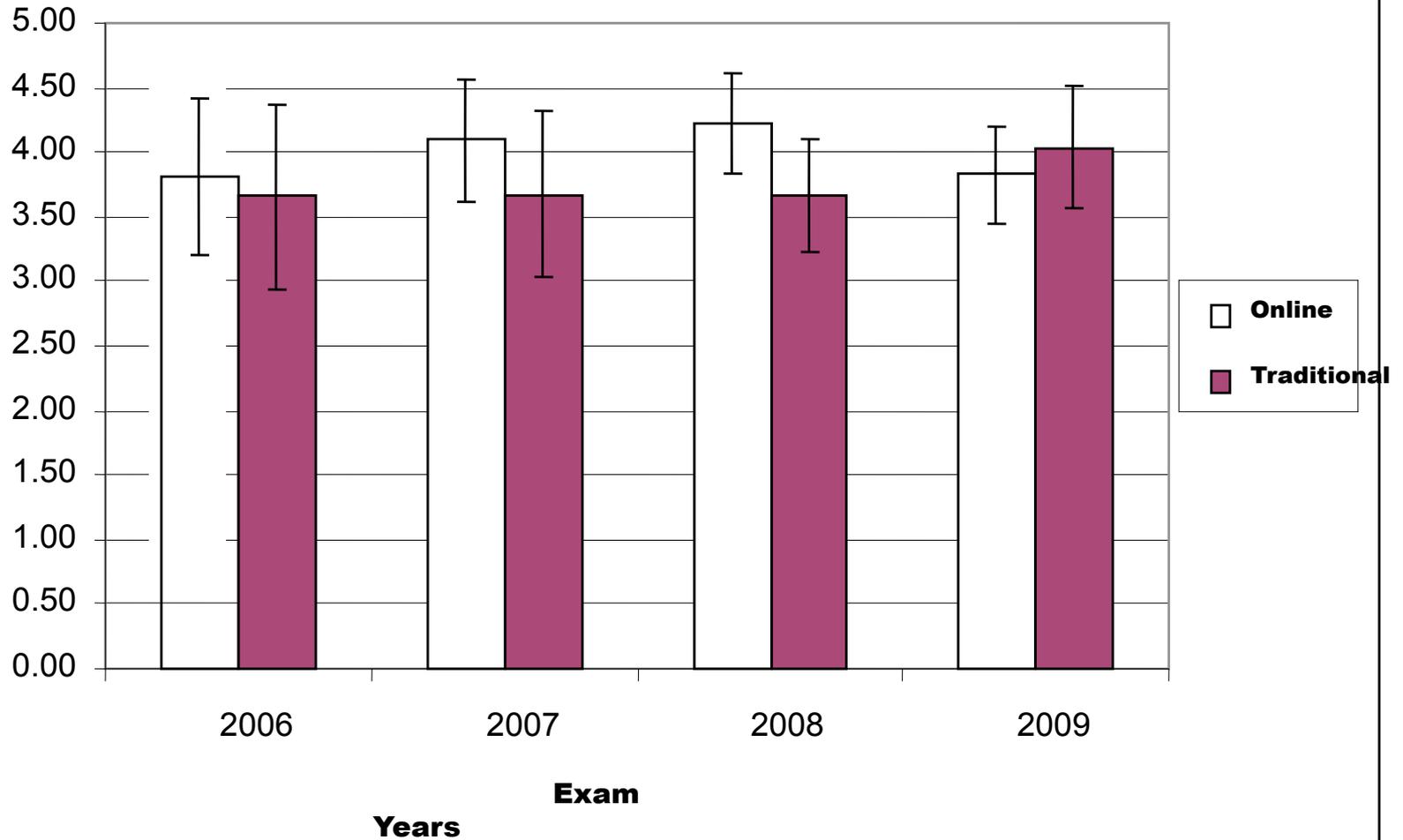
Results of Holistic Scoring of Junior Level Lab Reports in Biology
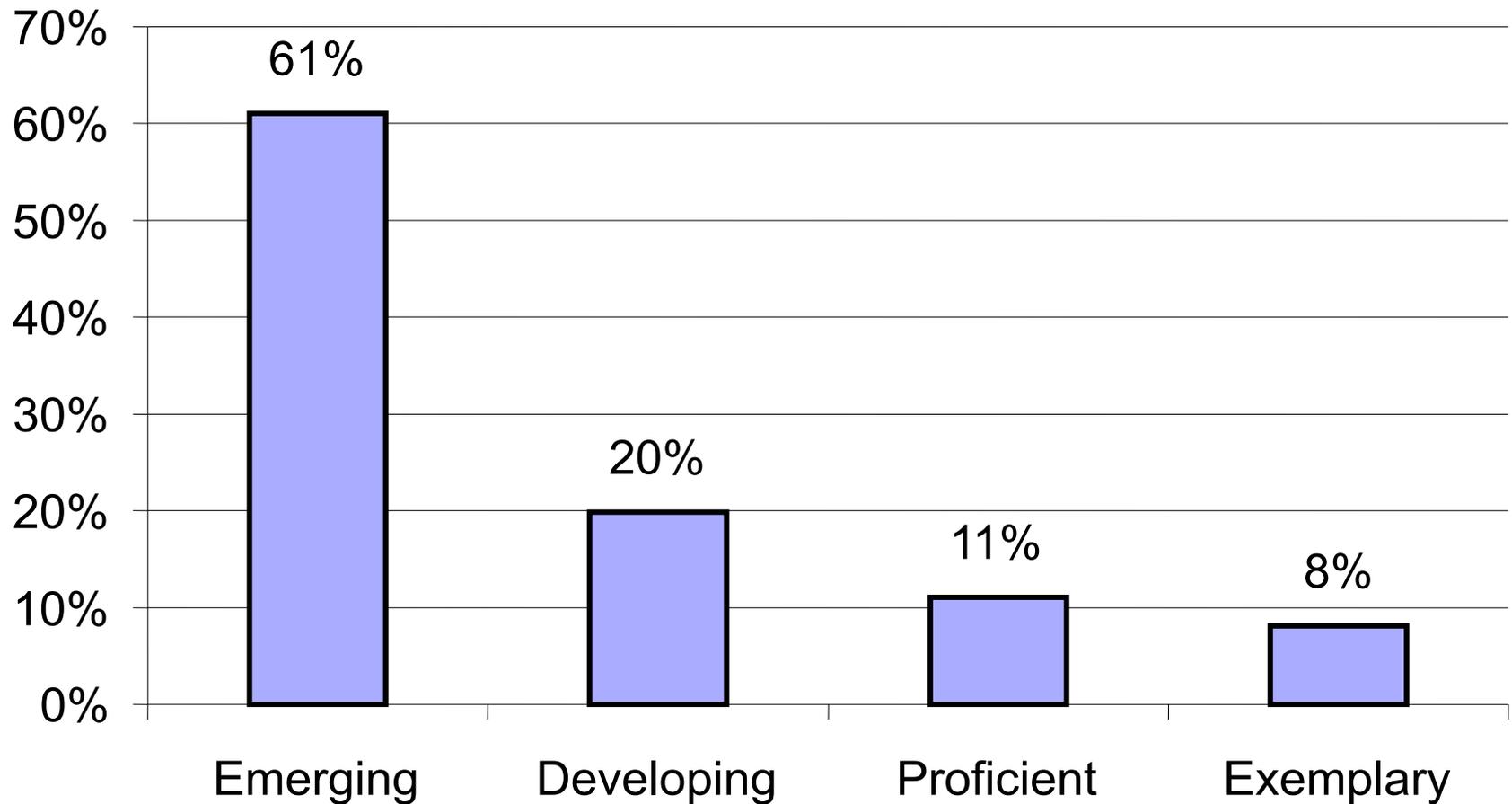
Critical Thinking Scores - 4 Classes w/ the Rubric vs. 4 Classes w/o the Rubric

	Problem	Position	Other Views	Context	Evidence	Assumptions	Implications	CT Avg Score
No rubric - four classes	2.76	2.68	2.43	2.96	2.10	1.86	2.35	2.45
Lower div Gen Ed GH & Phys 102	3.71	2.88	2.95	3.26	3.30	2.69	3.10	3.12
Upper div Entom 401 & Soils 415	4.09	2.91	3.41	3.71	3.59	2.96	3.34	3.43

Average Scores (1 to 6)

Dimensions of the CTR

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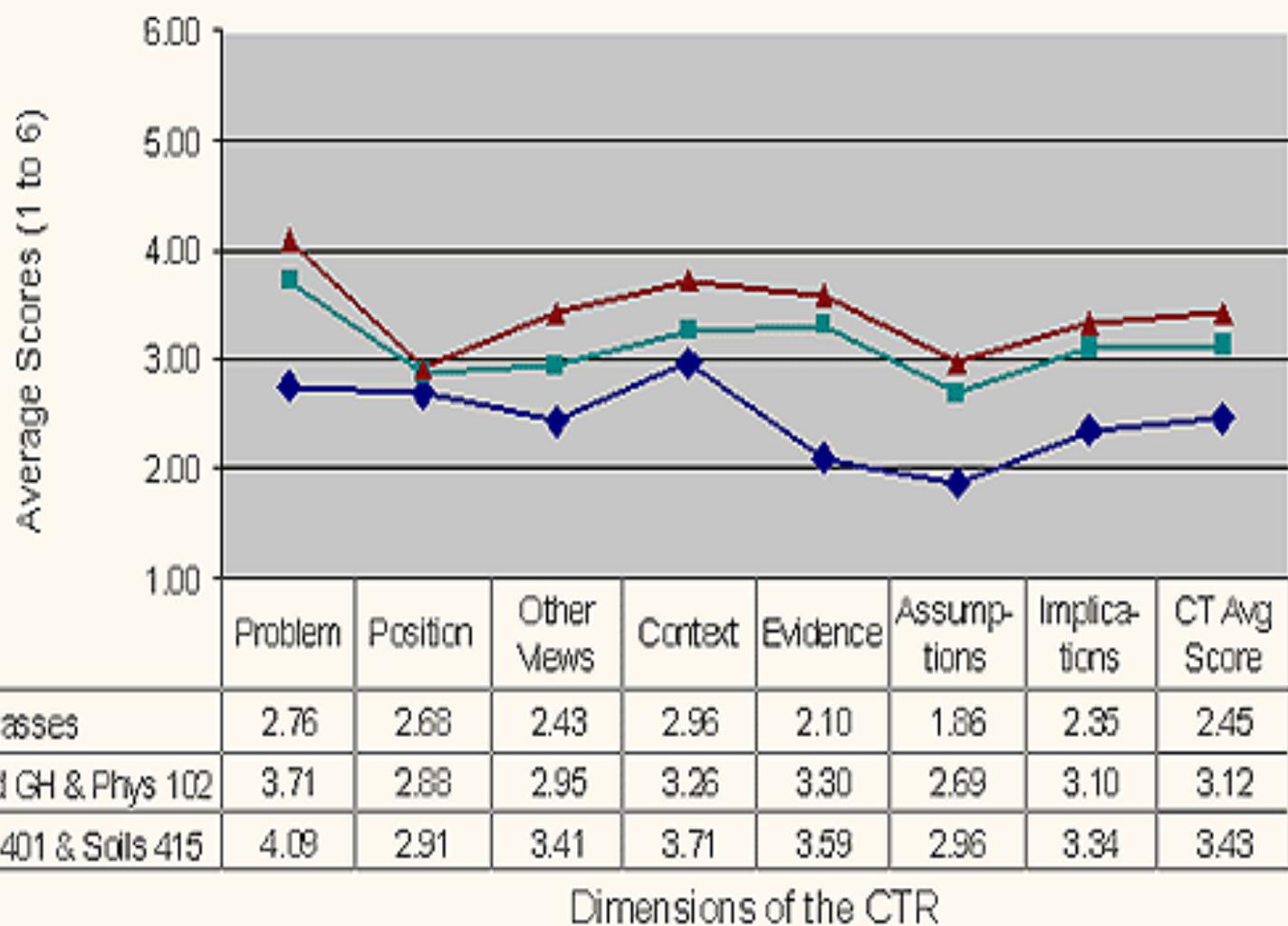
Average Gains on BME 301 Assignments over Time by Dimension

■ Gain from Time 1 to Time 2
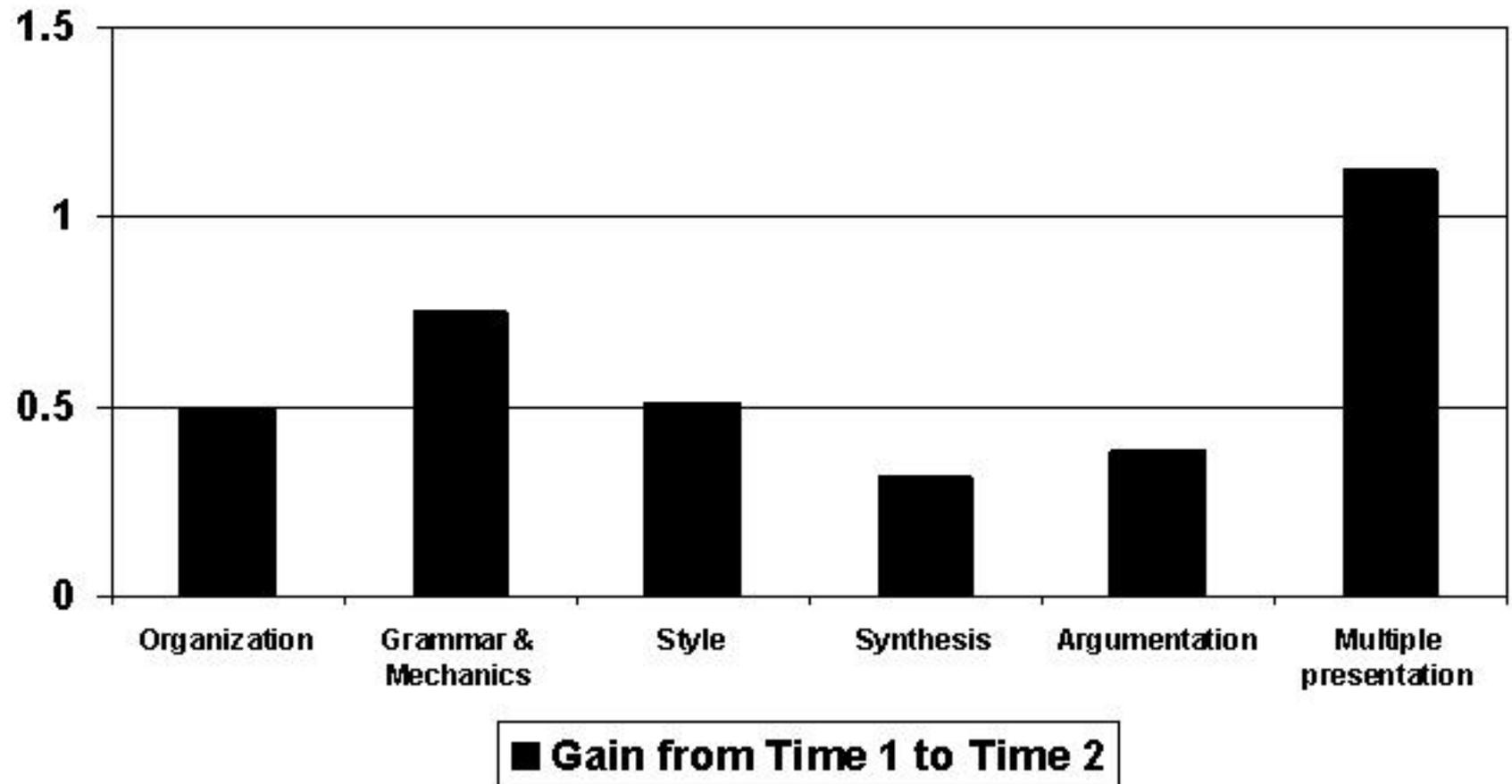
Note: Scale is 1 to 5, positive numbers represent improvement over time

Collaboratively Determining How and When You Will Improve Patterns of Weakness in Student Learning and When You Will Re-enter The Assessment Cycle

○ Implement agreed upon changes.

○ Re-assess to determine efficacy of changes.

○ Focus on collective effort—what we do and how we do it.

The Phet Design Process contributed by Wieman in Maki, P., 2010

Implement Changes and Re-Enter the Assessment Cycle

- ○ Implement agreed upon changes

- ○ Re-assess to determine efficacy of changes

- ○ Focus on collective effort—what we do and how we do it

Gather Evidence

Interpret Evidence

Mission/Purposes

Learning Outcomes

How well do students achieve our outcomes?

Enhance teaching/ learning; inform decision-making, planning, budgeting

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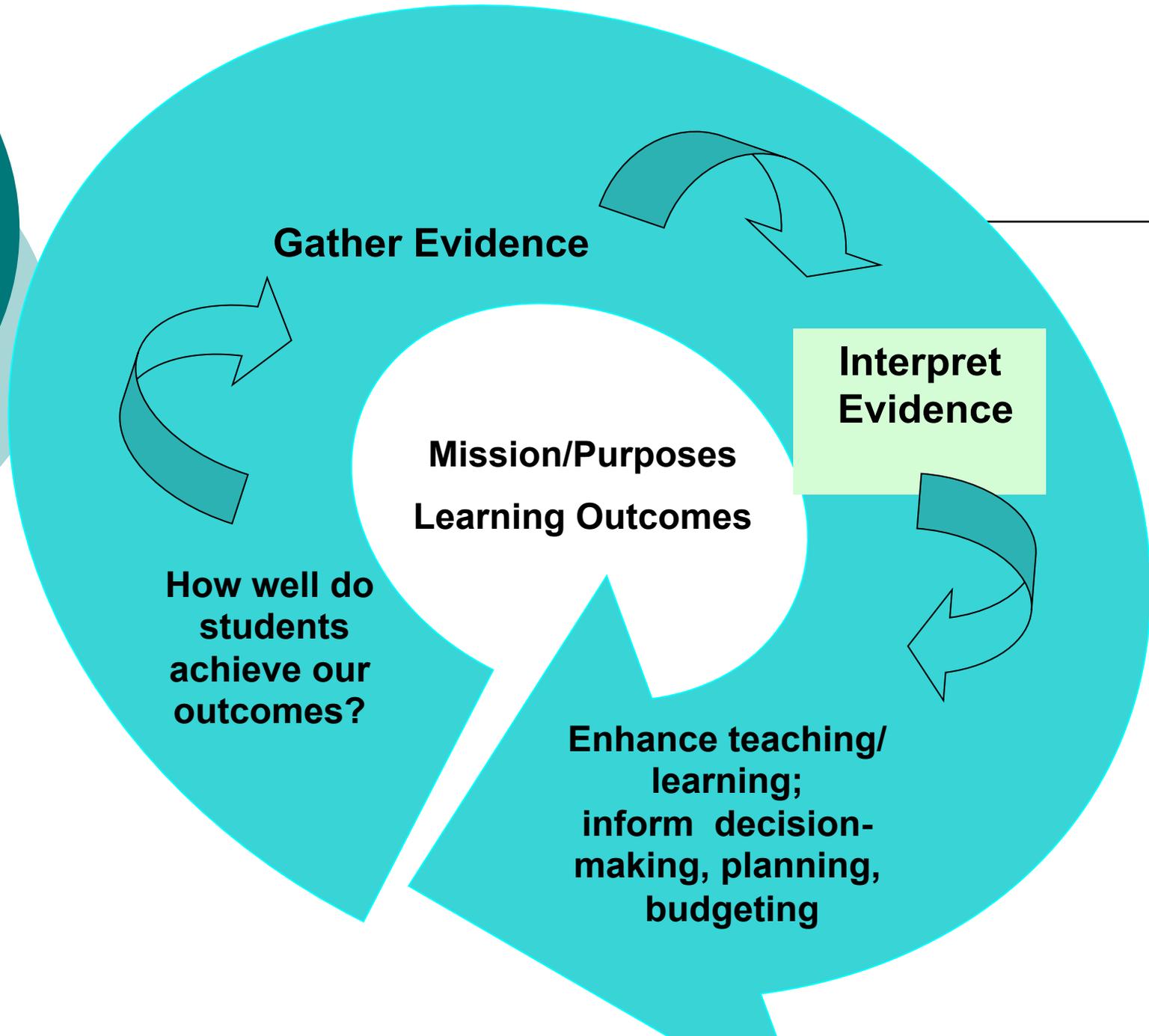
Using Structures, Processes, Channels of Communication, and Forms of Support that Sustain the Process

- Assessment Committees (institution-level, school-level, program-level)

- Development of task forces to assume responsibilities for steps in the process

- Communication within departments, across the institution, and into decision-making bodies

- Human, technological, and financial support

Communication: Collaborative Interpretation

- Disciplinary work groups

- Cross-disciplinary work groups

- Formal opportunities to share program-level findings

Communication: Decision-making Bodies

○ Planning

○ Budgeting

○ Decision-making

○ Allocation of Resources

Human, Financial, Technological Support

- Grad students or part-time support to assist with development of methods or research on methods, collection of evidence, or analysis of results to share with faculty and staff and students

- Faculty and staff development or resources to support efforts

- Development of technology to house results or to house existing data that contributes to interpretations

"What and how students learn depends to a major extent on how they think they will be assessed."

John Biggs. (1999).*Teaching for Quality Learning at University: What the Student Does*. Society for Research into Higher Education & Open University Press, 141.

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