Study of Inquiry & Analysis and Critical Thinking

TRUMAN COLLEGE ASSESSMENT COMMITTEE

GENERAL EDUCATION ASSESSMENT

SPRING / FALL 2017

Gen.Ed. Goals & Outcomes: Inquiry & Analysis

1. Communication - Written & Oral *(Last assessed 2015 and 2016)*

2. Inquiry & Analysis *(Last assessed 2010-11, 2017)*

Goal: The student gathers, interprets and analyzes information.

Student Learning Outcomes:

- 1. Use appropriate research methodologies
- 2. Collect, organize, and analyze information
- 3. Identify patterns and relationships of social and physical phenomena
- 4. Draw appropriate conclusions from the data
- 5. Design and execute discipline-specific research projects

3. Critical Thinking *(Last assessed 2010-11, 2017)*

4. Civic Engagement and Human Diversity *(Last assessed 2010 and 2013)*

5. Quantitative Skills *(New for 2017-18)*

Gen.Ed. Goals & Outcomes: Critical Thinking

1. Communication - Written & Oral *(Last assessed 2015 and 2016)*

2. Inquiry & Analysis *(Last assessed 2010-11, 2017)*

3. Critical Thinking *(Last assessed 2010-11, 2017)*

Goal: The student considers mathematical models within real-world contexts to make good predictions, judgments, and decisions.

Student Learning Outcomes:

- 1. Formulate a hypothesis/thesis
- 2. Establish criteria for evaluation AND select or construct a method for testing the hypothesis
- 3. Reason from sound premises to a valid conclusion
- 4. Apply knowledge to new situations
- 5. Synthesize knowledge

4. Civic Engagement and Human Diversity *(Last assessed 2010 and 2013)*

5. Quantitative Skills *(New for 2017-18)*

Assessing skills of Inquiry & Analysis and Critical Thinking

- Research Goal: During Spring and Fall 2017, the Assessment Committee sought to evaluate students' skills in inquiry & analysis and critical thinking, and to gather faculty perspectives on the challenges and opportunities of assessing these skills.

Study Process & Timeline (2017):

- **(Jan 11)** Study launch during all-faculty Pro.Dev. day
- **(Feb-Mar)** Course sampling: 10 classes in 8 different disciplines
- **(Apr-May)** Collection of student artifacts, anonymizing, and printing
- **(Aug 18, 2017) Assessment Day**
  - **Evaluators**: All full-time faculty gathered for a morning of artifact evaluation within their departments
  - **Quantitative Data**: Evaluators scored each artifact from 1-3 (3 – Exceeds expectations, 2 – Meets Expectations, 1 – Does not meet expectations)
  - **Qualitative Data**: 5-question evaluator survey to collect feedback, concerns, and suggestions

Subject	Course Num.	# of Artifacts
Biology	121	16
Microbio	233	12
Chemistry	121	10
English	101	10
English	102	4
Speech	101	6
History	112	12
Psych	213	5
Math	125	5
Math	207	5
Total		**85 artifacts**

Notes on Study Parameters and Challenges

- This Gen.Ed. Study seeks to gain a better understanding of **broad trends in students' ability to perform inquiry & analysis and to demonstrate critical thinking skills** (student strengths / weaknesses & faculty perspectives)
- **Student IDs *not* collected** due to small sample size (1 section) for several disciplines. (This limited any student demographic analysis.)
- **Conducting two studies simultaneously proved challenging**
  - Locating assignments that produce student work samples demonstrating both sets of skills **restricted courses eligible for sampling**
  - Inconsistencies during collection of student work samples led to **fewer usable artifacts**
- Definitions of "inquiry & analysis" and "critical thinking" **vary widely across disciplines**
  - Challenge of using a **common Gen.Ed. rubric** for student work samples with different assignment expectations
  - Challenge of **forgoing a group norming session** with all faculty, due to departmentally-specific student work samples

- This study ***does not*** offer comment on individual student's abilities
- This study ***does not*** offer comment on individual faculty members

As a result of this study, the Assessment Committee will take the following actions for future studies:

- **Provide** a draft rubric to faculty participants to ensure quality student work samples
- **Collect** assignment instructions, plus answer key(s), when necessary.

Quantitative data: Rubric scoring

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Gen.Ed. Rubric for Inquiry & Analysis

Inquiry & Analysis (Definition from VALUE Rubric: Inquiry is a systematic process of exploring issues, objects or works through the collection and analysis of evidence that results in informed conclusions or judgments. Analysis is the process of breaking complex topics or issues into parts to gain a better understanding of them.				
	Exceeds 3	Meets 2	Does not meet 1	Not Applicable
1. Use appropriate research methodologies	All elements of the methodology or theoretical framework are skillfully developed. Appropriate methodology or theoretical frameworks may be synthesized from across disciplines or from relevant sub-disciplines.	Critical elements of the methodology or theoretical framework are appropriately developed, however, more subtle elements are missing, incorrectly developed, or unfocused.	Research methodology demonstrates a misunderstanding of the methodology or theoretical framework, is nonexistent. or incomplete.	
2. Collect, record, and organize data	Professionally collects, records, and organizes data.	Adequately collects, records, and organizes data.	Attempts to collect, record, and organize data, but is incomplete or unorganized.	
3. Identify patterns and relationships	Organizes and synthesizes evidence to reveal insightful patterns, differences, or similarities related to focus.	Organizes evidence to reveal important patterns, differences, or similarities related to focus.	Lists evidence, but it is incomplete, unorganized, and/or unrelated to focus.	
4. Draw conclusions from the data	States a conclusion that is a logical extrapolation from the inquiry findings.	States a conclusion focused solely on the inquiry findings. The conclusion arises specifically from and responds specifically to the inquiry findings.	Does not state or include a conclusion, or states an ambiguous, illogical, or unsupportable conclusion from inquiry findings.	
5. Design and execute discipline-specific research projects or studies using scientific reasoning	Synthesizes in-depth information from relevant sources representing various points of view/approaches.	Presents in-depth information from relevant sources representing various points of view/approaches.	Presents information from sources representing limited points of view/approaches, or does not present discipline-specific research or reasoning.	

Gen.Ed. Rubric for Critical Thinking

Critical Thinking: (Definition from VALUE Rubric: Critical thinking is a habit of mind characterized by the comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating an opinion or conclusion.)				
	Exceeds 3	Meets 2	Does not meet 1	Not Applicable
1. Formulate a hypothesis/thesis	Specific position (perspective, thesis/hypothesis) is creative, taking into account complexities of an issue.	Specific position (perspective, thesis/hypothesis) acknowledges and/or accounts for different sides of an issue.	Position (perspective, thesis/hypothesis) is simplistic, unclear, or incomplete.	
2. Establish criteria for evaluation and select or construct a method for testing the hypothesis	Establishes thorough and detailed criteria for evaluation, and excellently accounts for complexities, exceptions, counter-arguments, and/or possible errors.	Establishes appropriate criteria for evaluation, and adequately accounts for complexities, exceptions, and/or possible errors.	Does not establish appropriate criteria for evaluation, and/or fails to account for possible errors.	
3. Reason from sound premises to a valid conclusion	Conclusions and related outcomes (consequences and implications) are logical and reflect student's informed evaluation and ability to place evidence and perspectives discussed in priority order.	Conclusion is logically tied to a range of Information; some related outcomes (consequences and implications) are identified clearly.	Conclusion is nonexistent, incomplete, or inconsistently tied to some of the information discussed; related outcomes (consequences and implications) are oversimplified.	
4. Apply knowledge to new situations	Proficiently uses course learning or prior knowledge to perform discipline-specific tasks.	Competently uses course learning or prior knowledge to perform discipline-specific tasks.	Does not use course learning or prior knowledge to perform discipline-specific tasks.	
5. Synthesize knowledge	Others' points of view or sources of information are exceptionally synthesized within position (perspective, thesis/hypothesis).	Others' points of view or sources of information are acknowledged within position (perspective, thesis/hypothesis).	Others' points of view or sources of information are minimally or not at all acknowledged.	

Rubric Data: Inquiry & Analysis

Criterion	Bio 121	Micro 233	Chem 121	Math 125	Math 207	Eng 101	Eng 102	Speech 101	History 112	Psych 213	Mean with zeros (NA) eliminated
1. Use appropriate research methodologies	2.6	2.39	1.79	0	1.3	0.95	1.75	1.43	1.37	1.91	2.04
2. Collect, record, and organize data	2.52	2.33	1.9	0	1.25	1.86	1.94	1.79	1.71	2.27	2.01
3. Identify patterns and relationships	2.44	2.28	1.4	0	1.2	1.76	1.94	1.86	1.71	2.27	1.89
4. Draw conclusions from the data	2.17	2.31	1.5	1.45	1.5	1.71	1.94	1.5	1.66	2.18	1.81
5. Design and execute discipline-specific research projects or studies using scientific reasoning	0	0	0.1	0	1.25	0	1	0.36	0.66	1.09	1.5

Mean scores

Evaluator scores for criteria #1 and #2 indicate **students meet expectations with introductory skills.**

Scores are slightly below meeting expectations with intermediate skills (criteria #3 and #4). See slide 11 for analysis of criteria #5.

Bio 121 and Microbio 233

Faculty evaluators indicated that **Biology students meet or exceed expectations** for all criteria.

One observation is that these Gen.Ed. outcomes, especially the processes of inquiry and analysis, align with learning outcomes in Biology courses.

Rubric Data: Inquiry & Analysis

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1. Use appropriate research methodologies	2.6	2.39	1.79	0	1.3	0.95	1.75	1.43	1.37	1.91	2.04
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4. Draw conclusions from the data	2.17	2.31	1.5	1.45	1.5	1.71	1.94	1.5	1.66	2.18	1.81
5. Design and execute discipline-specific research projects or studies using scientific reasoning	0	0	0.1	0	1.25	0	1	0.36	0.66	1.09	1.5

Criterion 5: Zeroes and ones

As a result of this Gen.Ed. study, the Committee **voted to remove "design"** from criterion 5.

Students in 100- and 200-level courses are expected to "execute discipline-specific research," but not to design the projects themselves.

Math 125

Due to problems with the artifacts collected (poor photocopy quality / unclear instructions), the Math department was **unable to evaluate artifacts from Math 125** in a meaningful way. For the next Gen.Ed. study, Math faculty will vet the artifacts submitted for evaluation.

Rubric Data: Critical Thinking

Criterion	Bio 121	Micro 233	Chem 121	Math 125	Math 207	Eng 101	Eng 102	Speech 101	History 112	Psych 213	Mean with zeros (NA) eliminated
1. Formulate a hypothesis/ thesis	2.13	2.17	0.39	1.7	1.2	2	1.81	2	1.86	1.45	1.95
2. Establish criteria for evaluation and select or construct a method for testing the hypothesis	2.29	2.22	1.77	1.8	1	0.29	0.44	1.36	1	1.55	1.88
3. Reason from sound premises to a valid conclusion	2.27	2.24	1.46	1.4	1.3	1.81	1.69	1.79	1.69	2.09	1.8
4. Apply knowledge to new situations	2.17	2.31	1.58	1.45	1.2	1.86	1.5	1.79	1.06	1.91	1.83
5. Synthesize knowledge	0	0	0.76	0.05	1.25	1.38	1.94	1	1.54	2	1.56

Bio 121 and Microbio 233
Scores in Biology 121 and Microbio 233 indicate that students **exceed expectations in every criteria**, except "Synthesize knowledge." This indicates close alignment between Biology course outcomes and Gen.Ed. outcome #3 (CT).

English 101 > English 102 ?
Scores seem to indicate lower performance for students in English 102, than in English 101.

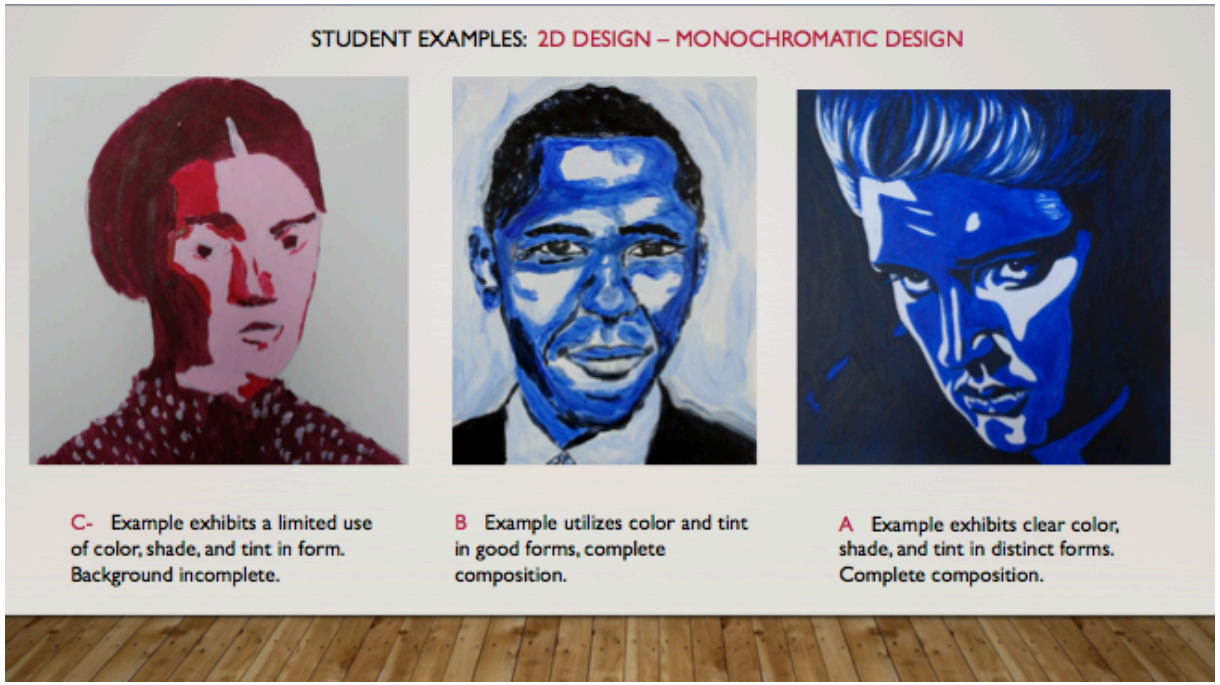
Prof. Farrell helpfully explained that **lower 102 scores are not statistically significant**, and perhaps not cause for alarm. (IGNITE! #12)

Assessment in the Humanities

Challenge during evaluation day (FDW17)

- Written samples of student work **did not fully represent** achievement of learning outcomes in Humanities
  - student work is often **performative** and not easily documented
  - student work is **creative**, often intuitive, and does not always adhere to strictly logical progression
  - it is also often **interpretive**, cultivating informed preferences and opinions

In Humanities courses, students learn to work collaboratively and individually to perform, create, and interpret, some of **the most advanced skills in Bloom's taxonomy**. Course offerings that introduce, refine, and master these skills through practice are **key assets to Truman College.**



Student work in visual arts courses is evaluated on variety, proficiency, and extent of techniques demonstrated (slide courtesy Prof. Stephanie Roberts)

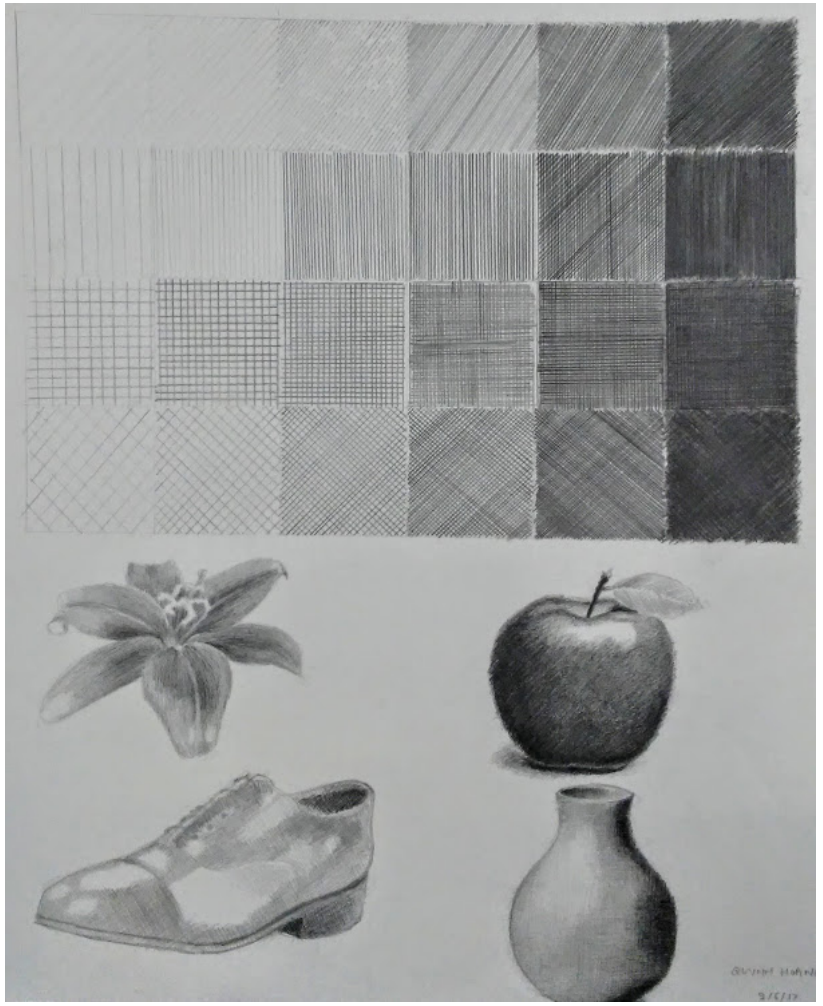
Assessment in the Humanities

Assessment Showcase and Workshop

- **Nov. 16 2017:** Humanities faculty convened to discuss assessment methods
- Numerous disciplines represented, including **Spanish, French, Music, Visual Arts, Religion, and Philosophy**
- Assessment methods emphasize **multimodal practice**, **feedback processing**, and **qualitative evaluation**
- Opportunity to assess skills and knowledge endemic to Humanities across other departments

Potential Gen.Ed. outcomes centered in Humanities coursework

- Critical and creative thinking
- Self-authorship and storytelling
- Metaphorical reasoning
- Embodiment and sensory exploration
- Artistic production
- Interpretive listening



Qualitative data: Evaluator survey

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Evaluator Survey: Question 1

1. What impresses or surprises you, in general, about students' inquiry & analysis and critical thinking skills?

Positive	Negative
• Surprised by the range of student work, at both ends of the spectrum of expectations (Exceeds, Meets, Does not meet) • In general, student work samples demonstrated greater acuity in critical thinking than inquiry & analysis	• Inappropriate or lack of sources, concerns about potential plagiarism • Some rubric criteria descriptors do not adequately capture discipline-specific factors • Concerns over whether student work samples demonstrated both skillsets (IA + CT)

Further insight
• "Many students who demonstrate poor critical thinking skills in their schoolwork may have better critical thinking skills **outside the classroom.**"

Evaluator Survey: Question 2

2. What concerns do you have about students' inquiry & analysis and critical thinking skills based on the artifacts you have been evaluating?

Concerns	Opportunities
• **Lack of appropriate sources**, lack of citation, plagiarism • Inability to connect data to larger concepts, to explain and interpret data • Misunderstanding questions (Students need clear instructions) • GenEd rubrics may not capture comprehensive snapshot of IA + CT across disciplines	• Students need **more time** and **more opportunities** • "I think there's a lot of work to be done toward teaching students analytical reasoning, questioning assumptions, and drawing conclusions. • "[I]t may be that our assignments do not mirror very well the way critical thinking skills are used in the world outside of school.

Evaluator Survey: Question 3

3. How might faculty across the disciplines improve their assignments to further improve students' inquiry & analysis and critical thinking skills?

Evaluator Recommendations

More opportunities to refine skills in IA + CT

- More practice, examples, feedback, in-class modeling

Better communication across disciplines

- Useful to see examples of artifacts from other disciplines
- We should be talking and sharing more about our course materials

Student agency in undergraduate research

- **Allow students to take more creative control** over the selection of topics and research design, more exploratory and discovery-based learning

Evaluator Survey: Question 4

4. How might your own approaches to teaching and assignment–creation in your classes change/improve because of this Gen.Ed. study?

Evaluator Recommendations

Majority of respondents

- **Add a project**, address outcomes intentionally, include or **use Gen.Ed. rubric** when designing coursework

Other major comments from multiple respondents

- Ensure students are clear about rigor required in final projects
- "I will definitely work to be very clear about the expectations of each assignment."
- "I will hold students to a higher standard of critical thinking."

Additional noteworthy comments

- Those items which were not applicable will probably remain so

Evaluator Survey: Question 5

5. What thoughts or concerns do you have about Truman's Gen.Ed. Outcomes for Inquiry & Analysis and Critical Thinking or the rubrics used for this assessment?

Feedback

Rubric concerns

- Don't fit every discipline; need to be modified and adapted by disciplines for future studies
- Need more resolution (1-5), to capture more nuanced evaluation of student work samples
- Ambiguous criteria

Process concerns

- Lack of randomization: Need to sample from multiple sections of courses identified for inclusion in study
- Purpose of norming: Some departments conducted useful norming, but this process must be adopted across disciplines to ensure consistent scoring on Evaluation Day

Key Takeaways

- **Inquiry & Analysis**: Students are meeting expectations when using research methodologies (Criterion 1, I&A) and organizing data (Criterion 2, I&A), but fall short when analyzing data (Criteria 3 and 4, I&A).
- **Critical Thinking**: Students nearly meet expectations in formulating hypotheses (Criterion 1, CT), but miss the mark with more sophisticated CT skills, most noticeably the ability to synthesize knowledge (Criterion 5, CT).
- Most Truman undergraduates will "execute discipline-specific research" (Criterion 5, I&A), but will not "design" these projects themselves**. Criterion 5 for Inquiry & Analysis has been revised** to reflect this expectation.
- Conducting both studies simultaneously required student work samples that demonstrate both sets of skills, and so restricted assignments eligible for inclusion. In the future, the Assessment **Committee will conduct each study separately**.
- Past studies have been done with small groups (12-15) of evaluators, whereas this study involved all full-time faculty. One trade-off for greater faculty participation was less supervisory oversight of norming sessions. For future studies, the **Committee will facilitate a norming process on evaluation day**.

Next Steps & Proposals

- **Distribute** this Gen.Ed. Study of Inquiry & Analysis and Critical Thinking report to Truman faculty, administration, staff, and students
- **Conduct** January 2018 Assessment Workshop that includes discussion of key findings and efforts at improvement
- **Present**: The Assessment Committee will present this study's findings at the 2018 Illinois Assessment Fair, to be held Friday, Feb. 23 at Joliet Junior College.
- Institutional Resources:
  - **Request Pro.Dev. workshops** around critical thinking skills development, implementation, and evaluation
  - **Create opportunities for faculty to share** assignments and expectations across disciplines

SP/FA 2017 Committee Members

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A Note of Thanks:
The Assessment Committee would like to thank, most of all, the unnamed faculty of this study's sampled courses for helping us gather "artifacts," and to the faculty evaluators who participated in the study. Special thanks to the Humanities department for pushing against assessment norms in a productive way, leading to important findings about ongoing assessment needs at the college. Finally, thank you to our administration for providing funding to support our assessment studies, which seek to better understand--and to improve-- student learning at Truman.