Critical Thinking and Problem-Solving Degree Learning Outcome (CRT DLO)
Assessment Task Force Report

2012-2013 Academic Year

Part I – Process

Critical Thinking and Problem-Solving (CRT DLO) is the third degree learning outcome of six outcomes that Tacoma Community College has set as standards of achievement for its students to meet before graduation.

> **Critical Thinking & Problem-Solving (CRT):** Compare, analyze, and evaluate information and ideas, and use sound thinking skills to solve problems.

This task force formed to measure achievement of Tacoma Community College students in Critical Thinking and Problem-Solving before earning degrees or certificates from the college. The committee designed a process for sampling and measuring CRT campus-wide, then carried out the process during the 2012-13 academic year.

Committee members included:

Pam Costa —Psychology
Robert Larsen —Business Transfer
Kristina Young—English
Jim Wiek—Business
David Straayer—Math
Kendall Reid—Library
Don Ramage—English for Academic Purposes
Pattie Green—Biology
Kim Rzeszewicz -- Facilitator

Action Summary

August 8-9, 2012

The task force met to clarify definitions and means of assessing Critical Thinking and Problem-Solving across campus. The task force found that while Critical Thinking and Problem-Solving are part of the same intellectual levels, the disciplines, concepts, and assignments would need differentiated assessment criteria. Assignments, for these purposes are referred to as artifacts, as not all assignments were actual papers or essays; a number of the submissions took the form of test questions and project summaries.

The research questions we hoped to address or answer were:

1. What percentage of students is competent at a minimum level (2 on the rubric) in Critical Thinking? Problem-Solving?
2. Does completion of college-level math courses improve Problem-Solving skills?
3. Does completion of English/ 95 and/or English& 101 improve Critical Thinking skills?

Scoring Rubrics and Scales

Two different rubrics were developed and adopted: One rubric for Critical Thinking and another for Problem-Solving. Both rubrics were adapted from the AAC&U rubrics; however, only minor changes were made to the Critical Thinking rubric, whereas more substantial changes were made to the Problem-Solving rubric. Slight changes in wording from the original rubric reflect our desire to use more active and measureable terms.

The task force modified the original 1-4 scales on the two rubrics, which were developed by the AAC&U for BA/BS and beyond courses. Meeting Expectations according to the original rubric scale was a 3 on the four-point scale on the AAC&U rubric. Recognizing that our two-year college students should be midway in their pursuit of a four-year degree, and that mastery of Critical Thinking and Problem-Solving takes several years, Meeting Expectations standard was set at 2 for an intermediate level. (See Appendix A for full rubrics)

Planned Course of Action:

- The committee decided to gather embedded assignments and assessments (artifacts) from courses which identified Critical Thinking / Problem-Solving in their course objectives. Embedded in this case means normally assigned coursework with only slight modifications for needed student reflection on critical thinking.

- Students from selected courses would be requested to include a reflection at the end of the submission, as an aid to readers in understanding the learning process behind the submissions and also in viewing student metacognition in the learning process.
- Graded artifacts would be collected for use with the Problem-Solving rubric. Instructors would be asked to submit graded artifacts because of the added challenges of reading artifacts from the technical subject areas from which many of the Problem-Solving artifacts were collected.
- Ungraded artifacts would be collected for use with the Critical Thinking rubric. Instructor's instructions and grading criteria should be included for artifacts in both areas.

During the 2012-13 Academic Year:

The entire faculty was invited to engage in professional development activities around Critical Thinking and Problem-Solving, beginning with the professional development days at the start of the Fall Quarter. Task Force members introduced and explained the two rubrics and the project for the year.

Working definitions of our key terms were developed and disseminated (see Appendix C).

During the academic year, particularly Winter Quarter, faculty in the selected courses collected the student artifacts for assessment from their regular coursework, digitized them, and submitted them to the DLO Drive or sent them to the Program Coordinator for Curriculum & Learning Outcomes with the corresponding rubrics and instructions.

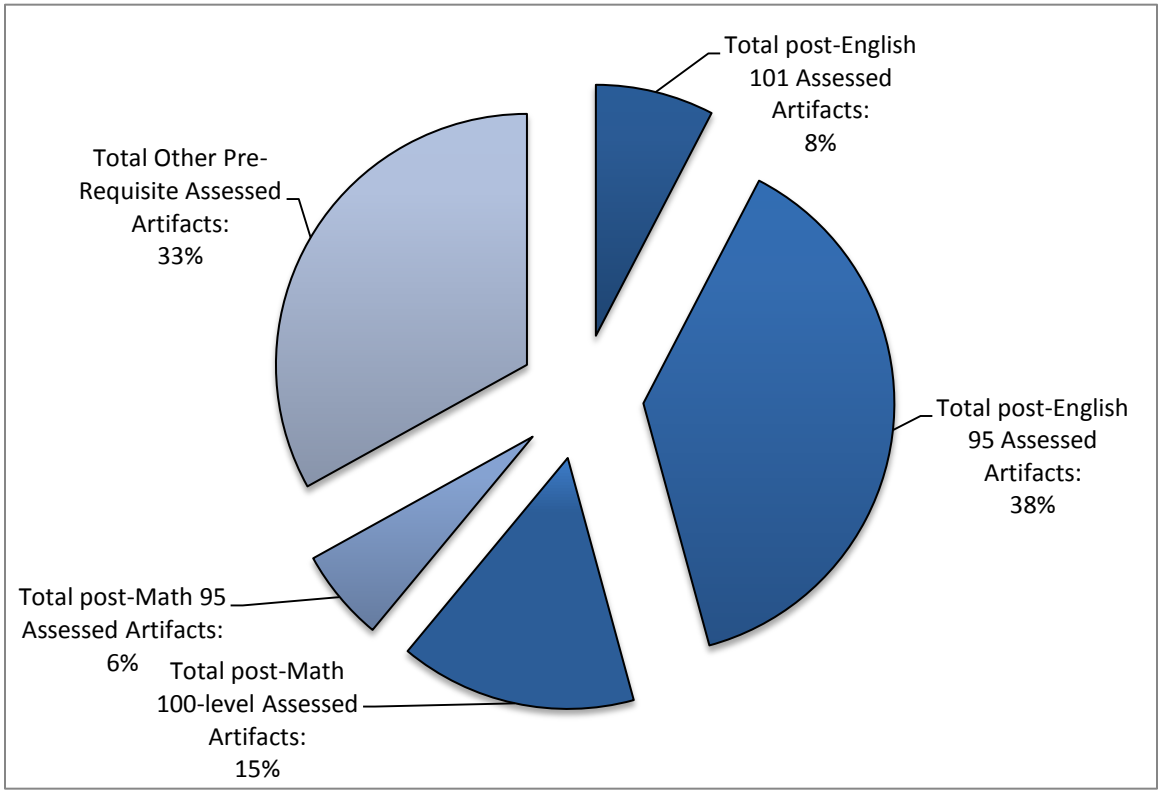

Figure 1 Breakdown of artifacts by course prerequisite

- Seventeen departments were represented in the assessed artifacts.
- Approximately 8 of the Professional-Technical degree departments were represented in the assessed artifacts; approximately 9 of the Direct Transfer departments were represented.

End of Spring Quarter/Summer Quarter 2013

- The eLearning department created a shell course for uploading the artifacts and outcomes for assessment.
- Each criteria/outcome from the rubrics was entered in the shell course as outcomes and reconstituted as the two rubrics with the measures of achievement detailed and points assigned.
- After some trial and error with the creation of Canvas Assignments, separate Assignments for each of the reviewers/ "instructors" were created within the separate Modules created for each instructor. These Modules and Assignments were apportioned based on the expertise and field of the reviewers: Patti Green, David Straayer, and Robert Larson to assess the Problem-Solving artifacts (total 24); Don Ramage, Pam Costa,

Kendall Reid, Jim Wiek, Robert Larson, and Kristina Young to assess the Critical Thinking artifacts (total 72).

- The master list of courses selected was reviewed and the artifact submissions were randomized to select the student artifacts for assessment.
- Ninety six (96) student artifacts were randomly selected from the 294 courses. This represents approximately 50% of the courses that were requested to submit artifacts.
- With the help of the eLearning department, the selected artifacts were uploaded as "Fake Students" in the Canvas course shell.
- Readers conducted a norming session in which real, sample artifacts from both rubric types were reviewed by all members and discrepancies and issues were discussed. Scores needed to be within one criteria level for validity.

Part II – Results

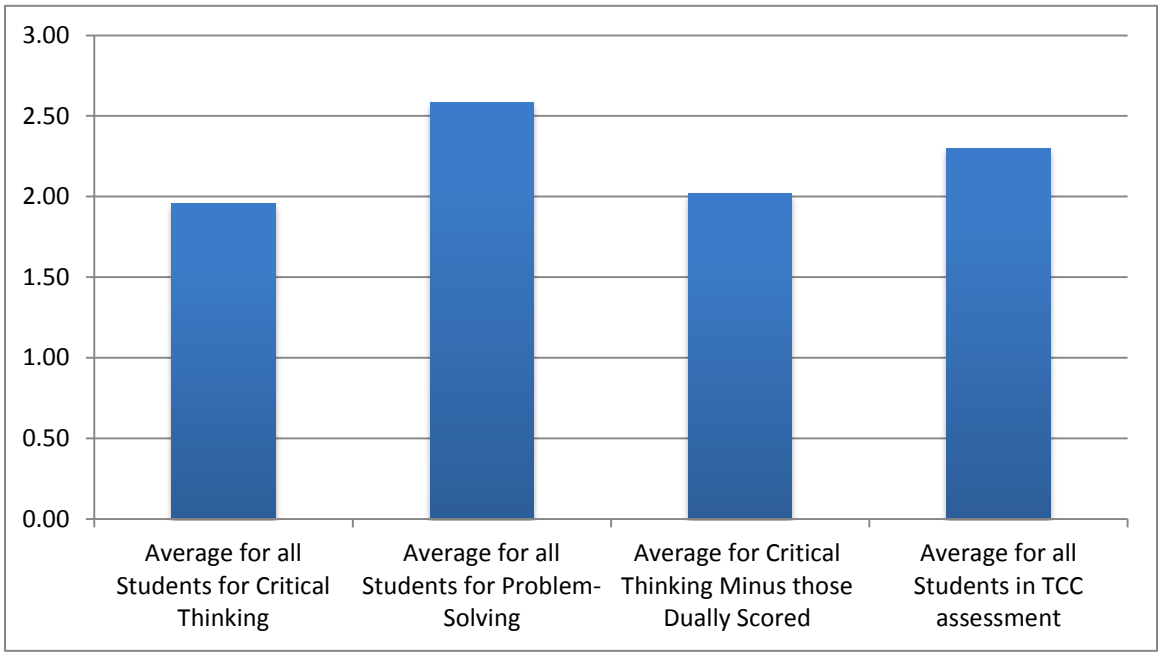

Figure 2. Total Scores for Critical Thinking and Problem-Solving, with adjustment for artifacts "dually scored", i.e. using both the Critical Thinking and Problem-Solving rubrics.

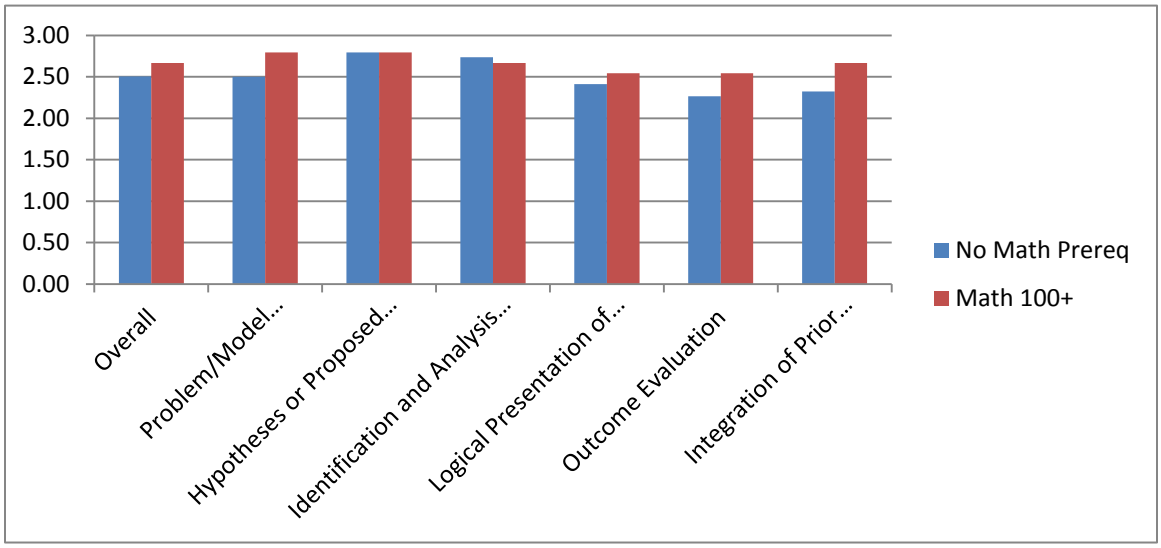

Figure 3. Problem-Solving Scores comparing no pre-requisite to Math 100+ pre-requisite scores, broken down by criteria

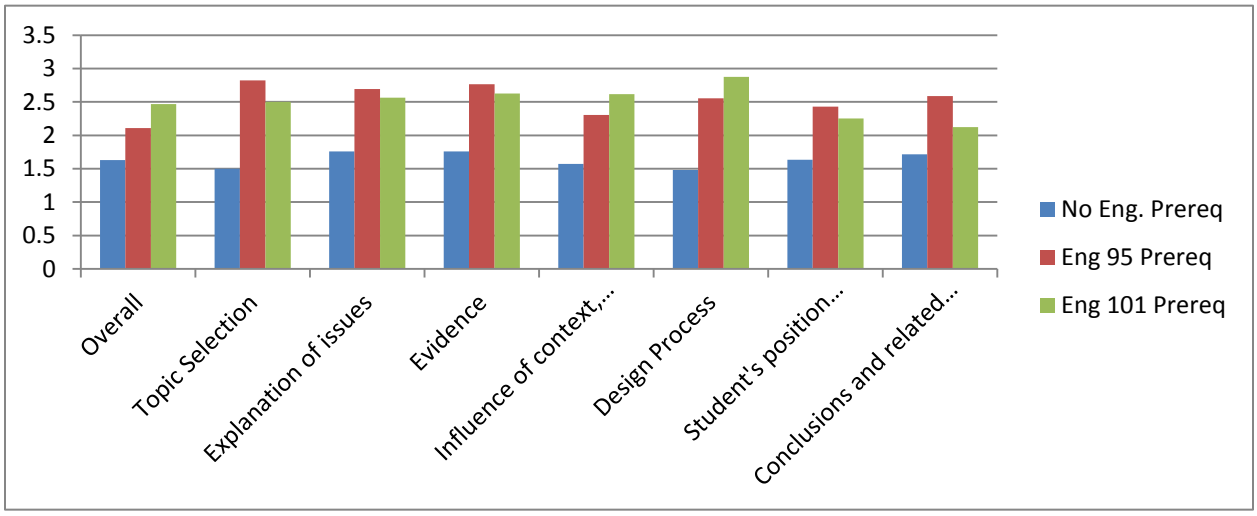

Figure 4. Critical Thinking scores comparing No English pre-requisite, English 95 pre-requisite, and English 101 pre-requisite, broken down by criteria

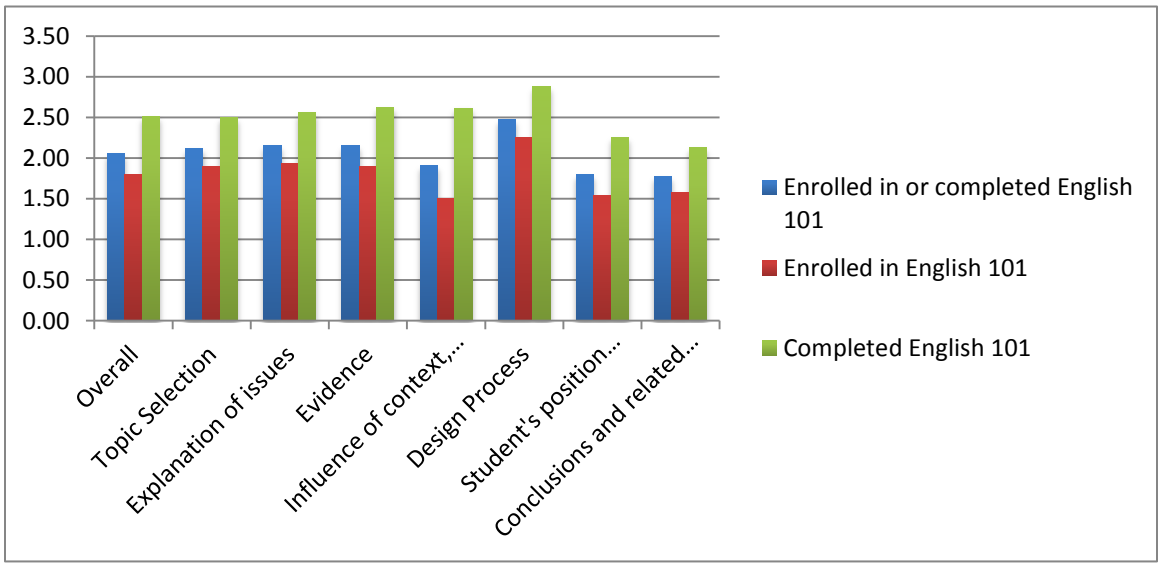

Figure 5. Critical Thinking comparing all those who have completed English 101 to those enrolled in English 101 at the time of submission, broken down by criteria.

Findings and Recommendations

Research Question 1(a): What percentage of students is competent at a minimum level (2 on the rubric) in Critical Thinking?

- Students tended to perform better in the initial or preparatory Critical Thinking tasks than in more complex and contextual tasks. (Initial tasks correspond to items on the left end of the rubric and more complex tasks correspond to items on the right end of the rubric. For example, students selected better topics than they expressed their own perspectives.) This performance would be expected of students in initial stages of critical analysis.
- Roughly 3/5 of students met or exceeded standard for topic selection. However, this means that 2/5—nearly half—did not meet minimum standard for this fundamental benchmark.

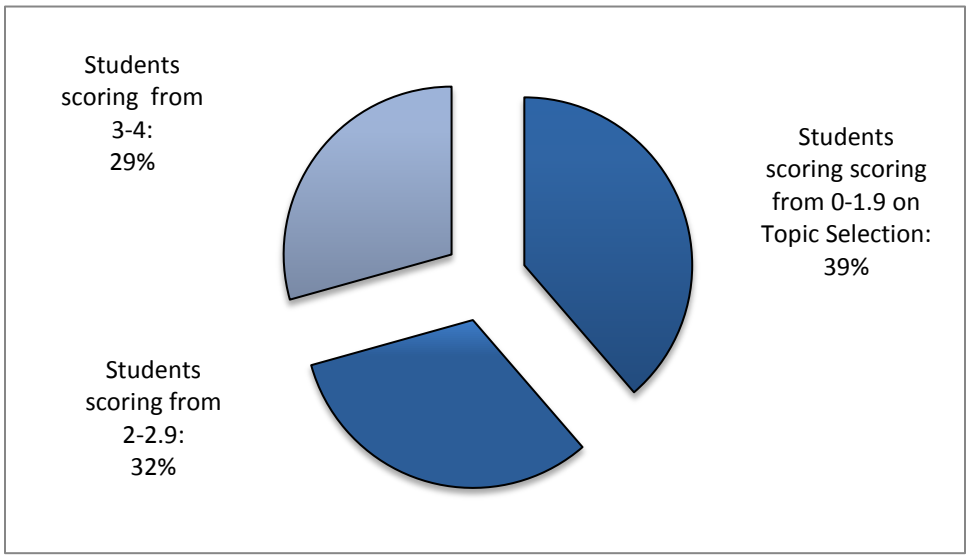

Figure 6. Critical Thinking: Topic Selection

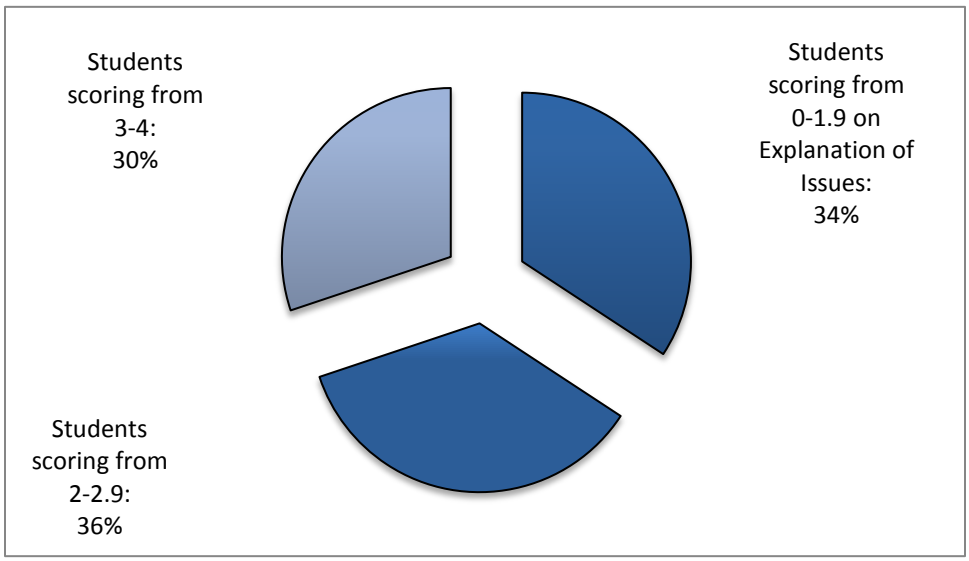

Figure 7. Critical Thinking: Explanation of Issues

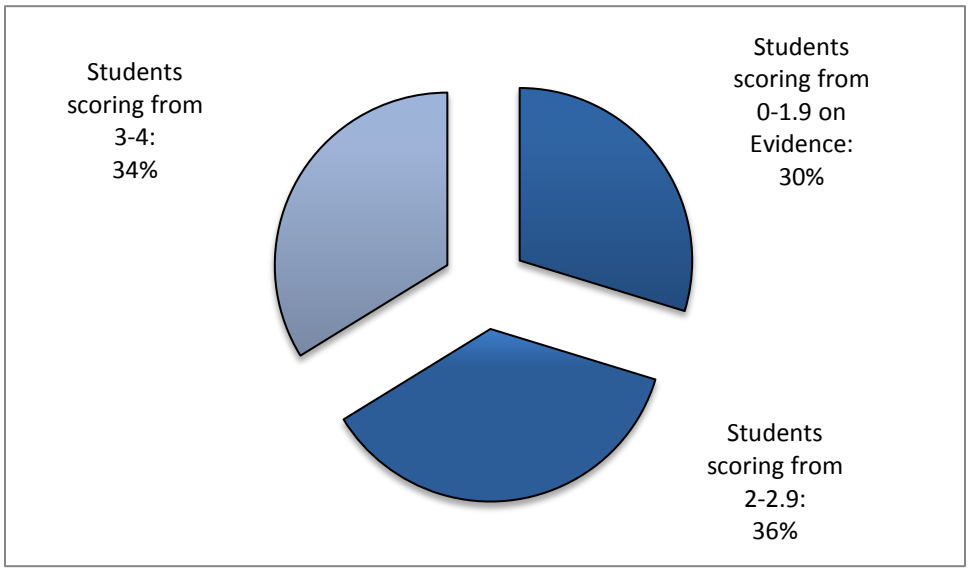

Figure 8. Critical Thinking: Evidence

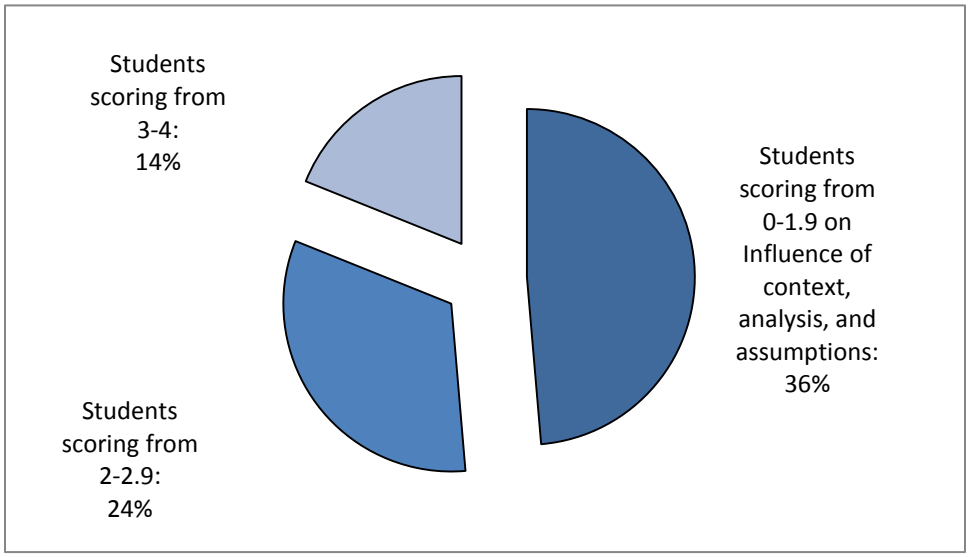

Figure 9. Critical Thinking: Influence of context, analysis, and assumptions

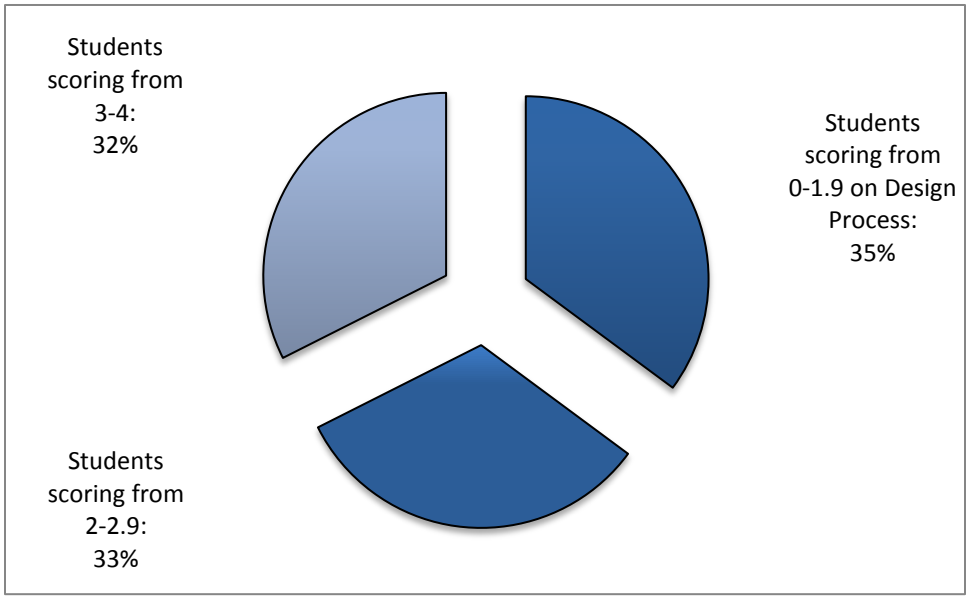

Figure 10. Critical Thinking: Design Process

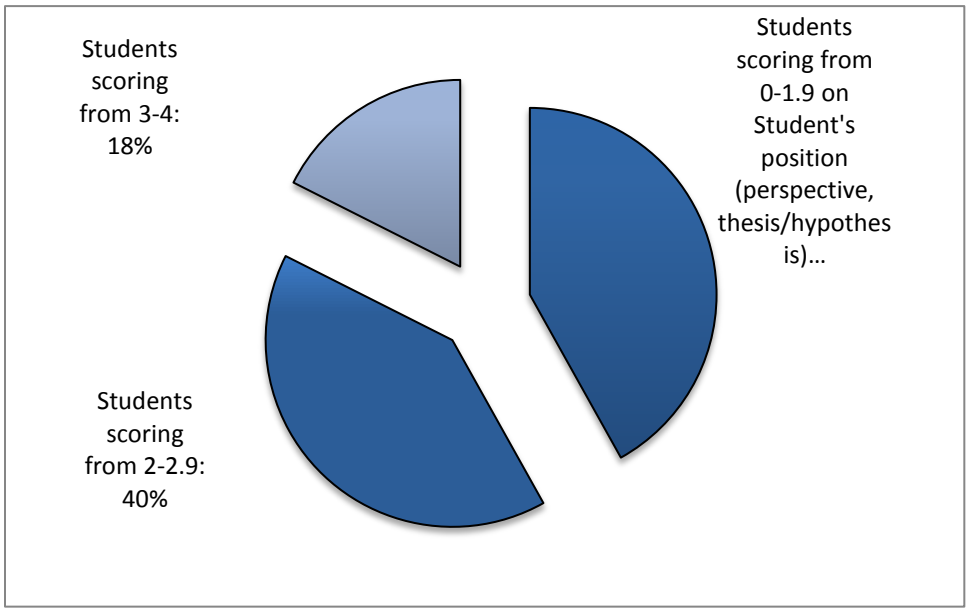

Figure 11. Critical Thinking: Student's Position (perspective, thesis/hypothesis)

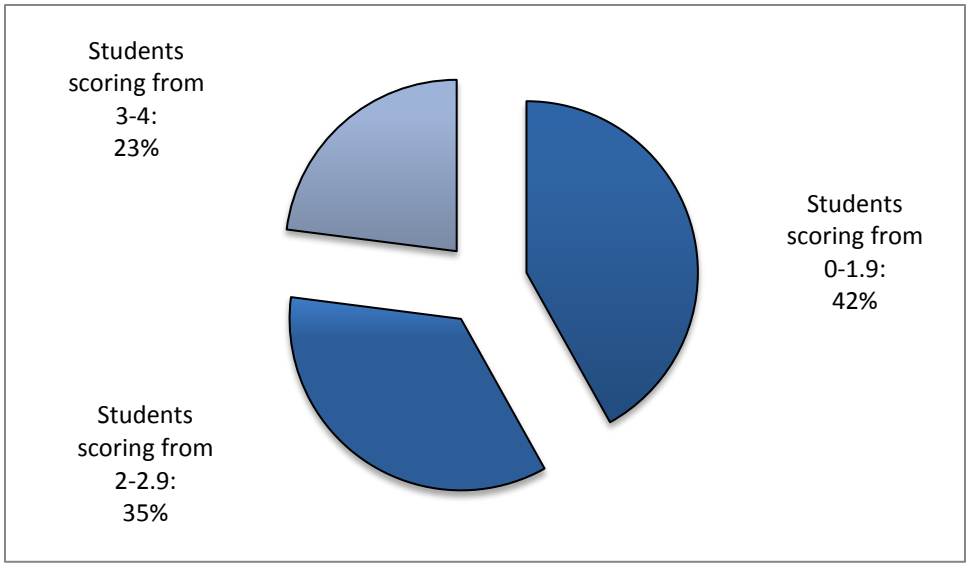

Figure 12. Critical Thinking: Conclusions and Related Outcomes (Implications, Limitations, and Consequences

Problem-Solving

Research questions 1(b): What percentage of students is competent at a minimum level (2 on the rubric) in Problem-Solving?

- A majority of students not only met, but exceeded, minimum standards in Problem / Model Identification.
- Similar results were found in Hypotheses or Proposed Strategies.
- Just over 50% of students exceeded expectation for Identification and Analysis of Variables.
- Less than a quarter of students did not meet minimum standards for Logical Presentation of Solution / Process, Outcome Evaluation, and Integration of Prior Learning.

Overall, students performed best at identification tasks, but were most challenged by tasks of conclusion and integration of prior learning. (**See Appendix A**). This performance would be expected of students in initial stages of critical problem analysis.

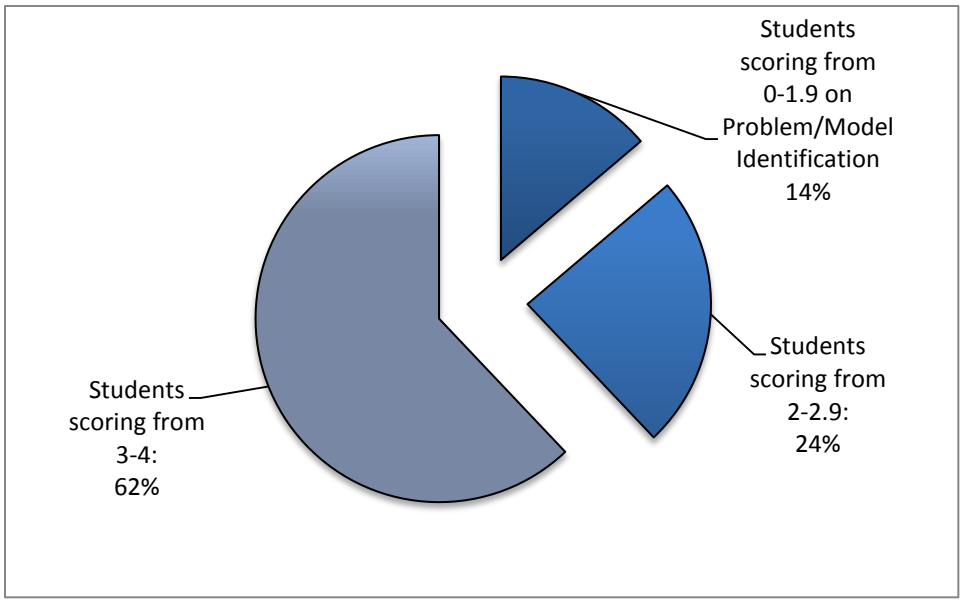

Figure 13. Problem-Solving: Problem Model Identification

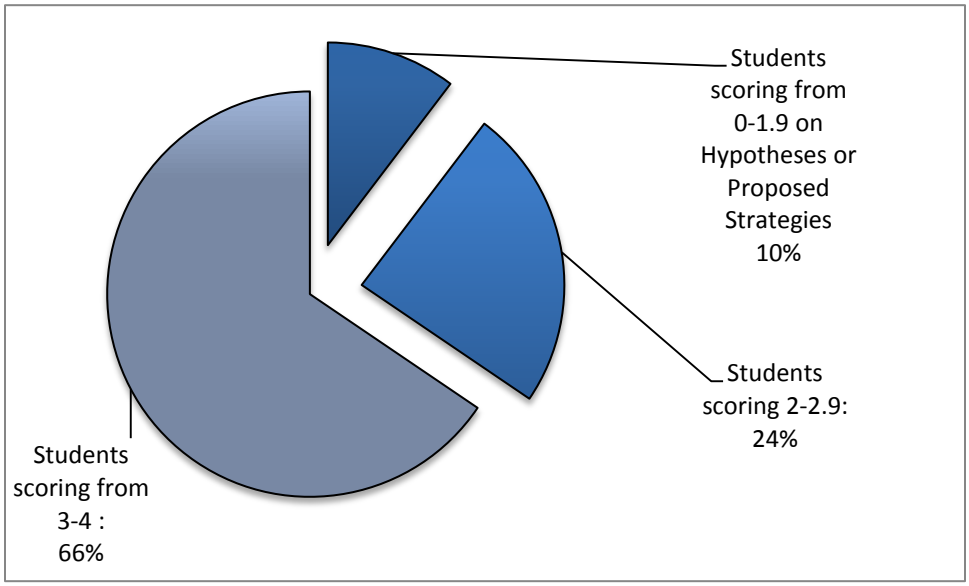

Figure 14. Problem-Solving: Hypotheses or Proposed Strategies

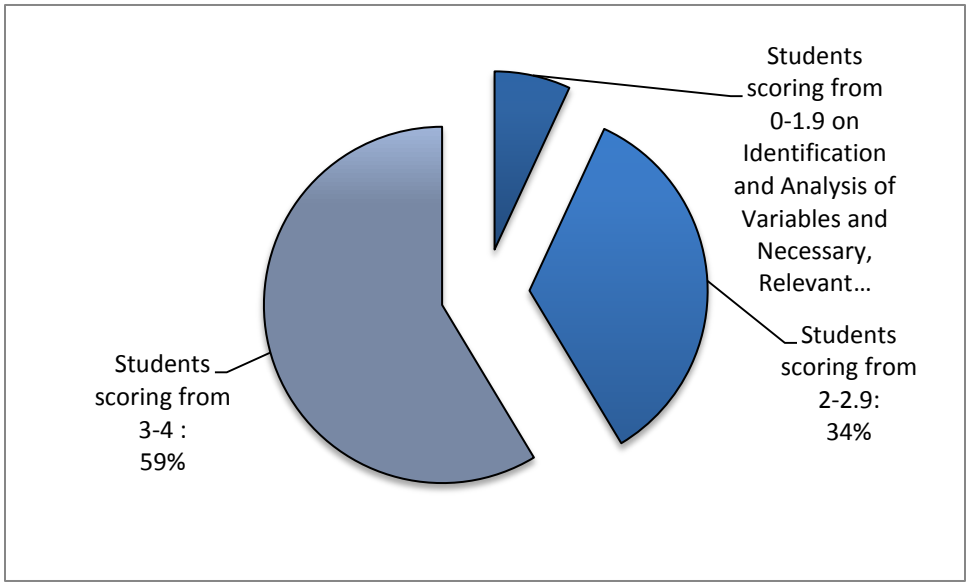

Figure 15. Problem-Solving: Identification and Analysis of Variables and Necessary, Relevant Information

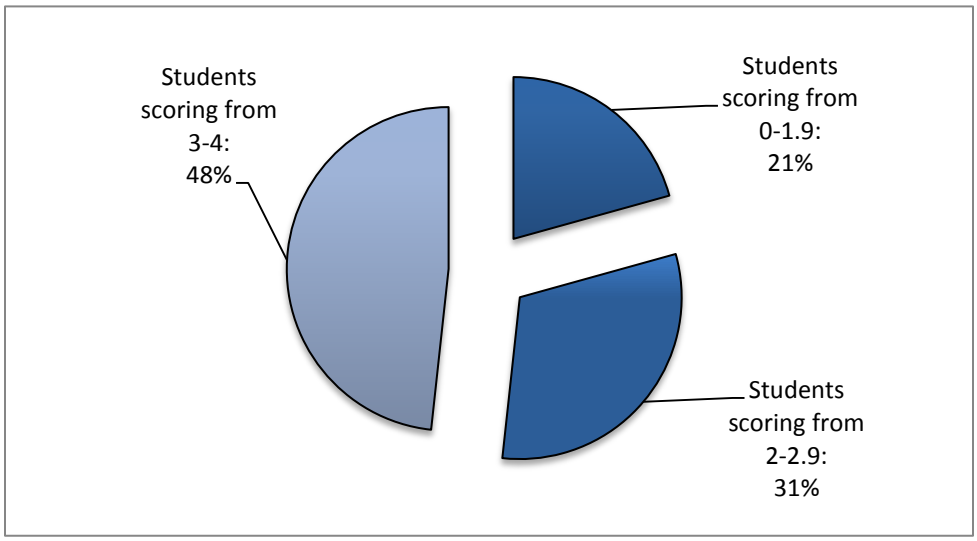

Figure 16. Problem-Solving: Logical Presentation of Solution/Process

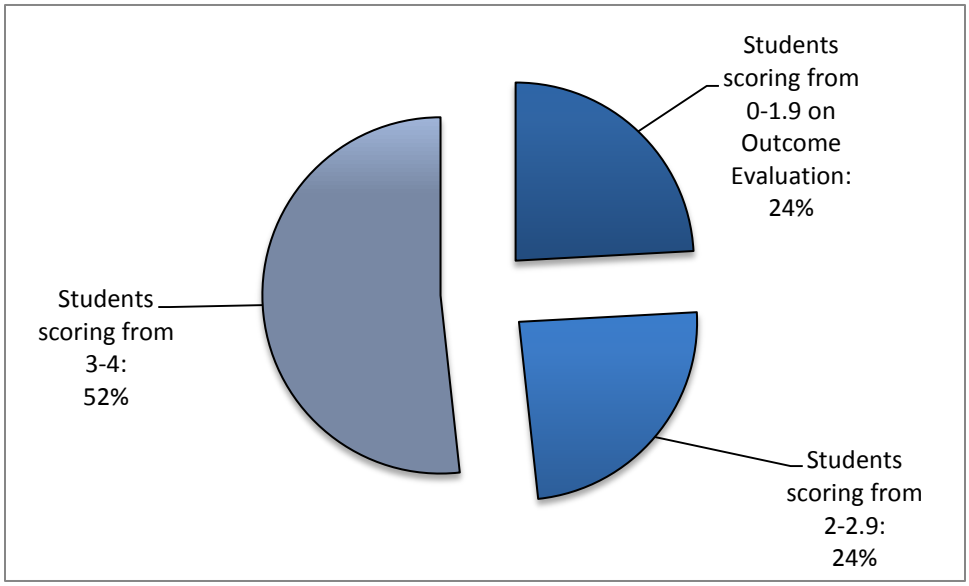

Figure 17. Problem-Solving: Outcome Evaluation

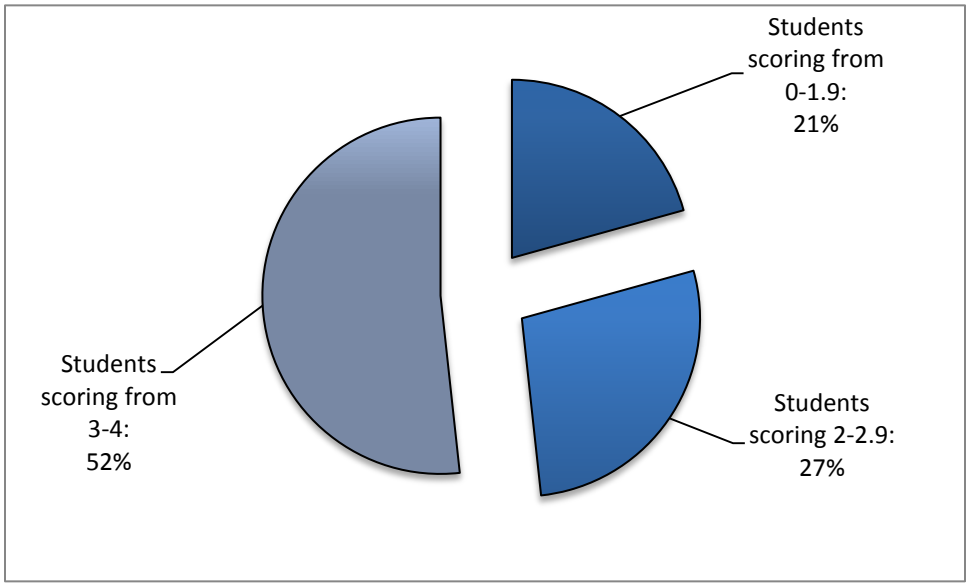

Figure 18. Problem-Solving: Integration of Prior Learning

Research Question 2: Does completion of college-level math courses improve Problem-Solving skills?

- There is evidence that students who have taken Math 100+ level courses outscore students who have not taken college-level courses in four out of six criteria, as well as overall: Problem/Model Identification, Logical Presentation of Solutions/Process, Outcome Evaluation, and Integration of Prior Learning.

Research Question 3: Does completion of English/ 95 and/or English& 101 improve Critical Thinking skills?

- There is very strong evidence that TCC students who have completed English 95 or higher exceed the scores for Critical Thinking of those students who have not.
- There is strong evidence that 50% of TCC students who have completed English 101 (and are therefore meeting the most common requirement for degree completion) meet or exceed the level 2 threshold for the Critical Thinking criteria on average.

These primary findings are only suggestive, as the total number of artifacts and their representative courses were nowhere near the level needed for definitive connections in answers to our questions. However, with the answers to our basic questions above, our data indicated that:

- On the average, TCC students meet a basic competency level of 2 or above in Critical Thinking and Problem-Solving.
- Generally, students do not yet meet a level of mastery in Critical Thinking and Problem-Solving, but do have a basic foundation to draw on in honing their skills in future study and practice.

While writing and communication skills were not areas this project aimed to assess, readers did note a need in many students for clearer and fluent writing skills. Limited student writing skills hindered students' ability to express cogent arguments and analyses, which made assessment of thinking in these areas more difficult. Similarly, these low-level skills in our samples reinforce the findings of the 2012-13 COM DLO report which called for greater support for Writing, Reading, Research across the Curriculum (WRRAC) on campus.

Conclusions

Strengths and Challenges of the Project

<u>Collection of artifacts</u>

Of the designated and requested courses, barely 50% submitted assignments. This led to under-representation in some subject areas. Of those assignments submitted, some assignments did not include components such as the reflection piece, complete assignment instructions, or grading criteria. Some submissions did not remove student identifying data, as requested, to preserve anonymity. Few artifacts were named correctly with the student identification number (SID). After randomly selecting artifacts, some scanned artifacts were found to be illegible.

Sample Sizes and Representation

The Problem-Solving assessment examined just 29 student artifacts. The smaller sample size for Problem-Solving was due to the smaller number of courses identified as best classified as Problem-Solving, compounded with a small number of submissions.

Only one course (with multiple sections) was represented in the "no English prerequisite" category." Also, disaggregation tools were not available to determine which students in this course had not actually taken English 95 or 101. A broader representation of courses in this category would have been preferable, for purposes of contrast. Future student database tools may help to disaggregate student data for similar studies.

Reading process

Occasionally, readers had difficulty interpreting artifacts in certain subject areas outside their areas of expertise. For some artifacts, readers also found it difficult to interpret what the instructors wanted students to do. A few of the student artifacts were scored with both rubrics because some readers found more correlation between the artifact and the Critical Thinking or the Problem-Solving rubrics. Overall, however, challenges related to subject areas and instructor intent were fewer than anticipated.

Canvas as electronic repository and assessment tool

Creating a repository of artifacts in Canvas and adapting assessment tools in Canvas was a major undertaking, though less labor intensive than it was logistically challenging. A way had to be found to attach a rubric to a single artifact, yet permit two readers to read that artifact. Data from scored artifacts had to be collected and analyzed. Canvas has robust tools for question analysis of online quizzes, but not for rubric scoring of artifacts. Solutions and workarounds were found to enable multiple readers of a single submission. Data was later collated in Excel.

Despite the challenges of adapting Canvas for this project, and limitations on tools in Canvas for mining data directly, using Canvas was a success in several points. As expected, the integration of rubrics in Canvas, and the ease of using the SpeedGrader tool were features that facilitated reading and assessment. Use of Canvas for archiving the project in a single repository, with paperless, secure storage and ease of access for readers makes Canvas worth considering for future use. Canvas also has Outcomes tracking, which gave us the data needed to import into Excel worksheets.

Considerations and suggestions from the Task Force members:

- Consider previewing instructor assignments first then select which assignments to collect.
- In future, Canvas may allow tagging of embedded assignments to collect easier. Outcomes would be linked to assignments and tracked across courses.
- Consider using instructor evaluations of the sample artifacts instead of having 3rd party readers.
- Consider common assignments/exam questions, whether by department or division if not campus-wide.
- The great difference in rigor of assignments from instructor to instructor may not provide clear baseline student data.
- We should consider collecting student ID information so transcripts can be checked for completed courses and more accurately track and compare achievement over time and subject.
- How can we assess scaffolding of knowledge across courses?
- Reviewers need more time between days of retreats to follow up with conclusions.
- Uploading from DLO Sharedrive to Canvas was not seamless. Back-tracking to insert instructions or separated documents was time consuming.
- Submitting faculty needed more instruction in the Critical Thinking and Problem-Solving rubrics before we collected their student artifacts.
- This previous point revealed a disconnect between what students were asked to do and rubric application.
- It is important to provide greater ease of compliance for faculty if they are called upon to submit artifacts; conversely, greater faculty participation /compliance is needed for assessment to be institutionally and statistically significant.

Recognition

A notable area of success in the project:

There were many faculty and departments who were outstanding in their cooperation and support. Some faculty provided complete class sets of student submissions and had clearly put great efforts into clear instruction sheets, ensuring that students attached reflection pieces, and ensuring that assignments matched the needs and guidelines of the project.

Conversation with Faculty on September 17, 2013

At the post-report presentation, we again discussed the sample-size and validity questions in this DLO assessment, as we all recognized that the pool of artifacts was smaller than we needed for statistical validity. We agree that our numbers and statistics are suggestive rather than definitive; however, with a robust mechanism for randomization, the findings in this report do point us toward specific investigations. In particular we will be reviewing our process for selecting courses with English 101/95 and Math 95 prerequisites. Faculty shared anecdotal evidence that concurs with this recommendation for further study.

Current efforts for improving Critical Thinking and Problem-Solving in coming years will include a Critical Thinking Core Leadership Team**, "**which will take a leadership role in facilitating conversations among faculty about how to enhance CRT on the part of students" (Rzeszewicz, email).

Regarding the comparability of the prompts for the artifacts and their subsequent review according to a standard rubric, faculty members were concerned about the disparity in the course origins and nature of the assignments. Artifact submissions varied in complexity. Faculty also echoed the reviewer's consideration of the types of task asked for in different course levels; for example, courses that required Math 100+ were more likely to ask students to use prior knowledge in Problem-Solving. The differences in the prompts for the artifacts made comparability less clear, as assignments leading to the artifacts reviewed may not have asked for all elements of Critical Thinking or Problem-Solving. Faculty expressed an interest in considering common assignments, at least within their departments, to assess things like Critical Thinking.

Appendix A: Rubrics

CRITICAL THINKING RUBRIC

Definition of Critical Thinking: Compare, analyze, and evaluate information and ideas.

	Exceeds Expectations (4) (Stellar- A+)	Clearly Meets Expectations (3) (Typical TCC A)	Minimally Meets Expectations (2) (Typical TCC B or C)	Expectations Not Met (1) (Below standard)	N/A (0)
Topic selection	Identifies a creative, focused, and manageable topic that addresses potentially significant yet previously less-explored aspects of the topic.	Identifies a focused and manageable/doable topic that appropriately addresses relevant aspects of the topic.	Identifies a topic that while manageable/doable, is too narrowly focused and leaves out relevant aspects of the topic.	Identifies a topic that is far too general and wide-ranging as to be manageable and doable.	
Explanation of issues	Issues/problems to be considered critically are stated clearly and described comprehensively, delivering all relevant information necessary for full understanding.	Issues/problems to be considered critically are stated, described, and clarified so that understanding is not seriously impeded by omissions.	Issues/problems to be considered critically are stated but description leaves some terms undefined, ambiguities unexplored, boundaries undetermined, and/or backgrounds unknown.	Issues/problems to be considered critically are stated without clarification or description.	
Evidence ***Selecting and using information to investigate a point of view or conclusion***	Information is taken from source(s) with enough interpretation/evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned thoroughly.	Information is taken from source(s) with enough interpretation/evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are subject to questioning.	Information is taken from source(s) with some interpretation/evaluation, but not enough to develop a coherent analysis or synthesis. Viewpoints of experts are taken as mostly fact, with little questioning.	Information is taken from source(s) without any interpretation/evaluation. Viewpoints of experts are taken as fact, without question.	
Influence of context, analysis and assumptions	Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts, patterns, differences, or similarities when presenting a position.	Identifies own and others' assumptions and several relevant contexts, patterns, differences, or similarities when presenting a position.	Questions some assumptions. Identifies several relevant contexts, patterns, differences, or similarities when presenting a position. May be more aware of others' assumptions than one's own (or vice versa).	Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts, patterns, differences, or similarities when presenting a position.	
Design Process	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 subdisciplines.	Critical elements of the methodology or theoretical framework are appropriately developed, however, more subtle elements are ignored or unaccounted for.	Critical elements of the methodology or theoretical framework are missing, incorrectly developed, or unfocused.	Inquiry design demonstrates a misunderstanding of the methodology or theoretical framework.	
Student's position (perspective, thesis/ hypothesis)	Specific position (perspective, thesis/hypothesis) is creative, taking into account the complexities of an issue. Limits of position (perspective, thesis/hypothesis) are acknowledged. Others' points of view are synthesized within position (perspective, thesis/hypothesis).	Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. Others' points of view are acknowledged within position (perspective, thesis/hypothesis).	Specific position (perspective, thesis/hypothesis) acknowledges different sides of an issue.	Specific position (perspective, thesis/hypothesis) is stated, but is simplistic and obvious.	
Conclusions and related outcomes (implications, limitations and consequences)	Conclusions and related outcomes (consequences, limitations, and implications) are logical and reflect student's informed evaluation and ability to place evidence and perspectives discussed in priority order.	Conclusions are logically tied to a range of information, including opposing viewpoints; related outcomes (consequences, limitations, and implications) are identified clearly.	Conclusions are logically tied to information (because information is chosen to fit the desired conclusion); some related outcomes (consequences, limitations, and implications) are identified clearly.	Conclusions are inconsistently tied to some of the information discussed; related outcomes (consequences, limitations, and implications) are oversimplified.	

Adapted from the AAC&U VALUESRubrics, value@aacu.org
Version 1.2--- 8.1.13

PROBLEM SOLVING VALUE RUBRIC

for more information, please contact value@aacu.org

Definition Use sound thinking skills to solve problems.					
	Exceeds Expectations (4) (Stellar- A+)	Clearly Meets Expectations (3) (Typical TCC A)	Minimally Meets Expectations (2) (Typical TCC A or B)	Expectations / Not Met (1) (Below standard)	N/A
Problem/Model Identification	Demonstrates the ability to clearly identify the problem with appropriate models. Broadens scope of models beyond the immediate class focus.	Demonstrates the ability to identify the problem with appropriate models from those taught at student's level.	Begins to demonstrate the ability to identify the problem with appropriate models but problem statement or model is superficial or incomplete.	Demonstrates a limited ability in identifying problem statement or recognizing appropriate models.	
Hypotheses or Proposed Strategies	Proposes an hypothesis or multiple approaches for solving the problem that indicate detailed comprehension of the problem.	Proposes an hypothesis or one or more approaches for solving the problem that indicate comprehension of the problem.	Proposes an hypothesis or an approach for solving the problem that does apply within a specific context.	Proposes an hypothesis or approach for solving the problem that does not apply within a specific context.	
Identification and Analysis of Variables and Necessary, Relevant Information	Assigns appropriate weight to items of information, and uses information at hand to identify appropriate new information to seek.	Assigns appropriate weight to items of information.	Distinguishes between relevant and irrelevant information, but does not assign appropriate weight to items of information.	Does not distinguish between relevant and irrelevant information.	
Logical Presentation of Solution/Process	Solution or process is elegant (for example, contains thorough explanation) and demomstrates sound logic/reasoning.	Solution or process is adequate (for example, contains a complete explanation) and demomstrates logic/reasoning.	Solution or process shows some flaws in logic/reasoning.	Solution or process shows minimal logic/reasoning.	
Outcome Evaluation	Reviews results to determine reasonability and optimality of solution(s).	Reviews results to determine reasonability of solution(s).	Reviews results with some attention to reasonability of solution(s).	Fails to review results or reviews with no attention to reasonability of solution(s).	
Integration of Prior Learning	Integrates information from beyond the current focus of the assignment, either from earlier in the course or from other courses.	Integrates some information from beyond the current focus of the assignment.	Integrates information from the current assignment.	Integrates only some information from the current assignment. (Including math skills)	

Adapted from the AAC&U VALUESRubrics, value@aacu.org
Version 1.3---8 .1.13

Appendix B: Statistical Analysis

Problem-Solving hypothesis analysis

Hypothesis 1: Mean Problem-Solving score > 2, "meets expectation"

t = 7.03

p = 5.22×10^{-10}

Conclusion: Very strong evidence (5.22×10^{-10}) that mean Problem-Solving score of students who have completed a college-level math course is greater than rubric column 2, "meets expectation."

Hypothesis 2: The proportion of students who have completed a college-level math course is greater than 50%

z = 2.31

p = 0.0105

Conclusion: There is strong evidence (p = 01.0105) that a majority of students who have completed a college-level math course meet or exceed Problem-Solving expectations.

Hypothesis 3: College-level math courses improve Problem-Solving skills

Two-sample T-Test

T = -1.28; p = 0.099
Df = 140.4

x-bar1 = 2.51 sx1 = 0.709
x-bar2 = 2.67 sx2 = 0.805

Conclusion: Insufficient evidence that college-level math improves Problem-Solving.

Critical Thinking Hypothesis

Hypothesis 1: Mean Critical Thinking score > 2, "meets expectation."

t = 1.497; p = 0.089 n = 8

Conclusion: Evidence below threshold (p = 0.89) that the mean critical-thinking score of students who have completed English 101 is greater than 2, "meets expectation."

Hypothesis 2: Proportion of students who have completed a college-level English course is greater than 50%

t = 2.12; p = 0.016 n = 8

Conclusion: Solid evidence (p = 0.016) that the proportion of students who have completed English 101 who have met Critical Thinking criteria 2, "meets expectation, is greater than 50%.

Hypothesis 3: English 95 Prerequisite > No English Prerequisite

t = -6.1255

$p = 1.128 \times 10^{-9}$

Conclusion: There is very strong evidence ($p = 1.128 \times 10^{-9}$) that English 95 improves Critical Thinking over no English prerequisite.

Hypothesis 4: English 101 Prerequisite > English 95 Prerequisite

t = 2.203

p = 0.017

Conclusion: There is solid evidence (p = 0.017) that English 101 improves Critical Thinking over only English 95.

Hypothesis 5: English 101 Prerequisite > No English Prerequisite

t = -4.99

$p = 5.48 \times 10^{-6}$

Conclusion: There is strong evidence ($p = 5.48 \times 10^{-6}$) that English 101 improves Critical Thinking over no English prerequisite.

Appendix C: Definitions of Terms

Interpret:

From Merriam Webster Online Dictionary
1.: to explain or tell the meaning of **:** present in understandable terms <*interpret* dreams> <needed help *interpreting* the results>
2**:** to conceive in the light of individual belief, judgment, or circumstance **:** CONSTRUE <*interpret* a contract>

From Dictionary.Com
verb (used with object)
3. to give or provide the meaning of; explain; explicate; elucidate: *to interpret the hidden meaning of a parable.*
4. to construe or understand in a particular way: *to interpret a reply as favorable.*
5. to bring out the meaning of (a dramatic work, music, etc.) by performance or execution.
6. to translate orally.

Analyze:

From Merriam Webster Online Dictionary

1: to study or determine the nature and relationship of the parts of by analysis (see ANALYSIS)

From Dictionary.com

***verb (used with object)*, an·a·lyzed, an·a·lyz·ing.**
2. to separate (a material or abstract entity) into constituent parts or elements; determine the elements or essential features of (opposed to synthesize): *to analyze an argument.*
3. to examine critically, so as to bring out the essential elements or give the essence of: *to analyze a poem.*
4. to examine carefully and in detail so as to identify causes, key factors, possible results, etc.
5. to subject to mathematical, chemical, grammatical, etc., analysis.

Synthesize:

From Wikitonary

synthesize (*third-person singular simple present* **synthesizes**, *present participle* **synthesizing**, *simple past and past participle* **synthesized**)

1. (*transitive*) To combine two or more things to produce a new, more complex product.

2. (*intransitive, of two or more things*) To be combined producing a new, more complex product.

Words to look for in a prompt or in the instructions that will expect critical thinking:

Analysis:

- Differentiate
- Discriminate
- Select
- Organize
- Attribute
- Integrate
- Deconstruct

Evaluation:

- Check
- Coordinate
- Critique
- Monitor
- Test
- Judge
- Validate

Creation:

- Generate
- Hypothesize
- Plan
- Design
- Produce