Common Degree Outcomes Assessment Pilot Project
Year 2 Report
2017-2018

Common Degree Outcome 3
The graduate can demonstrate how to employ mathematical knowledge.

Prepared by:

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Introduction

In their 2016 visit, the Higher Learning Commission (HLC) evaluators noted the progress Macomb Community College had made in assessing student learning outcomes. In an effort to continue progress in assessment, the Office of Academic Development in the Center for Teaching and Learning formed a team of faculty, administrators and staff to begin the Common Degree Outcomes (CDO) Assessment Pilot Project. The goal of this project was to assess one of Macomb Community College's CDOs while developing efficient assessment processes.

The pilot team chose to conduct CDO assessment as a double-blind study to ensure the anonymity of both the faculty who teach the selected sections and the students whose artifacts are assessed. The first year of the project yielded positive results, faculty interest and participation. The team continued their efforts the following year and chose to assess CDO 3, *The graduate can demonstrate how to employ mathematical knowledge*.

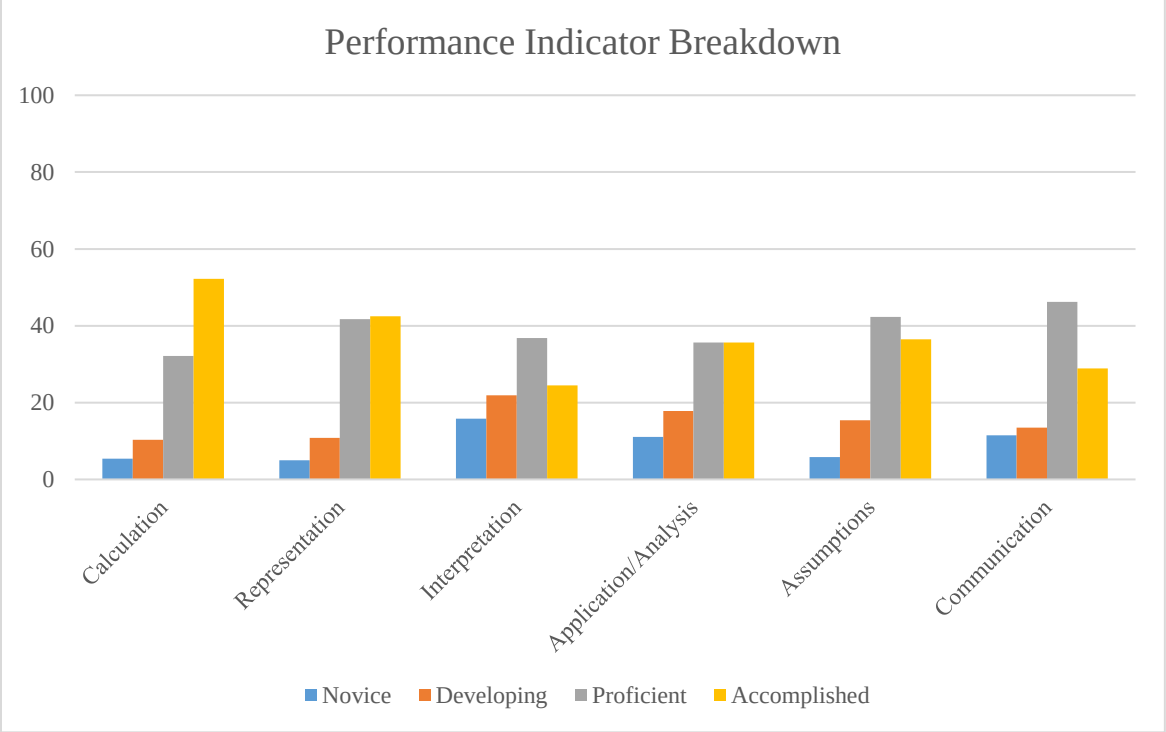
On May 16, 2018, faculty volunteers joined the CDO Assessment Team for Assess Fest, a day-long event where student artifacts were assessed, using a common rubric, for evidence of mathematical knowledge.

The report that follows is a summary of the project and assessment results.

Results & Analysis

On May 16th 2018, 191 student artifacts were assessed, using a common rubric, by 15 assessors comprised of faculty, staff, and administrators representing different divisions within the college community. Each artifact was assessed based on criteria that were pre-selected by the submitting faculty member. The rubric included six criteria assessed at four performance levels (1) novice level, (2) developing level, (3) proficient level and (4) accomplished level. In the graph below the bars show the percentage of student artifacts that achieved each performance level, for each rubric criterion.

Of the 191 artifacts that were submitted for assessment faculty determined that 184 artifacts met the calculation criteria, 120 artifacts met the representation criteria, 114 artifacts met the Interpretation criterion, 90 artifacts met the Application/Analysis criterion, 52 artifacts met the Assumptions criterion, and 52 artifacts met the Communication criterion.



Listed below are the assessment results for each criterion. The percentages indicate the overall proficiency level for the artifacts that that were scored on the rubric at the proficient or accomplished level.

- 84% Calculation
- 84% Representation
- 62% Interpretation
- 71% Application/Analysis
- 79% Assumptions
- 75% Communication

Project Details

Course Section Selection

The project focused on how well associate degree recipients of Macomb Community College achieved the Common Degree Outcomes. Each course has an Official Course Syllabus, where faculty select the Common Degree Outcomes (CDO) that pertain to the course. To maintain focus on students likely to earn an associate degree, the Office of Institutional Research determined that students earning 44 or more credits are most likely to graduate. The following two criteria were used by Institutional Research in the random selection of course sections.

- *Have CDO 3 checked on the Official Course Syllabus*
- *Have five or more students enrolled with 44 or more earned credits*

In year two of this assessment project, the number of course sections selected was doubled and included 8-week online courses and late start 12 week courses. In the winter 2018 semester, 913 active courses had CDO 3 checked on the Official Course Syllabus. Of those courses, 2,321 were active course sections and 1,144 met the selection criteria. From the 1,144 active course sections, Institutional Research randomly selected 160 course sections to participate.

Those course sections were representative of the following areas and populations within the college:

- *73 sections from Arts & Sciences and 87 sections from Career Area*
- *71 sections from Center, 45 sections from South, and 44 online sections*
- *128 full-time faculty and 32 adjunct faculty*

Collection of Student Artifacts

Replicating the Request to Participate method from the year one project, all selected faculty members received envelopes from Institutional Research containing participation instructions and supporting materials. Of the 160 randomly-selected course sections, faculty participants returned 40 envelopes containing student artifacts to Institutional Research for assessment.

Artifact Cover Sheet

The envelope sent by Institutional Research to participating faculty contained the Artifact Cover Sheet. Participating faculty provided important information on this cover sheet in order to give assessors information about the submitted artifact. Faculty were asked to describe the aspects of the assignment that spoke to CDO 3 and, in a departure from year one, were also asked to select the assessment criteria from the rubric that aligned to the assignment. This information proved valuable to the assessors.

Rubric

After selecting CDO 3 for assessment, the team used the process from year one to identify a rubric for artifact assessment. After considering several pre-existing rubrics, the team selected a revised version of the Association of American Colleges & Universities (AAC&U) Quantitative Literacy rubric.

The common rubric used to assess CDO 3 included the following six assessment criteria:

- *Calculation*
- *Representation*
- *Interpretation*
- *Application/Analysis*
- *Assumptions*
- *Communication*

To support the assessment process, participating faculty members identified the applicable assessment criteria from the rubric.

Four performance levels and associated scores were associated with each of the six assessment criteria.

- *Novice – 1*
- *Developing – 2*
- *Proficient – 3*
- *Accomplished – 4*

An artifact that demonstrated Communication, for example, could be scored at the Novice (1), Developing (2), Proficient (3), or Accomplished (4) level. If an assessor determined they were unable to assess a selected criterion, it was marked 'unable to judge' on the rubric. Please see Appendix A for a copy of the rubric used.

Artifact Assessment - Assess Fest

Assess Fest in May of 2018 provided an opportunity for faculty members to work among their cross-disciplinary colleagues to examine artifacts for evidence of mathematical knowledge – the skill identified in CDO 3.

Assess Fest was comprised of three interrelated sessions: norming, assessing and gathering feedback.

The day began with the norming session led by Professor Cindy Bily, a faculty member of the CDO Assessment Pilot Project team. This session provided an opportunity for the assessors to practice using the common rubric with common sample artifacts and discuss any discrepancies in scoring those artifacts. This norming session was longer than the previous year, allowing for more conversation and interaction between the assessors. The facilitated conversation allowed faculty assessors to come to an agreement on how to use the rubric to score different aspects of artifacts. After the norming session concluded, the assessment of student artifacts began. There were 15 assessors made up of faculty, staff, and administrative members representing different divisions within the college.

This year, a second round of assessment was added to Assess Fest. During Round 1 all student artifacts were assessed and folders were returned to the CDO Team who removed the completed rubric before Round 2. In Round 2 all artifacts were assessed again by a different assessor. Institutional Research used an inter-rater reliability test to determine if there were significant differences between the Round 1 and Round 2 assessments.

Inter-rater Reliability

In order to make continual improvements in the CDO assessment process, to refine the tools and procedures we use in assessment, we wanted to know the degree of agreement among the assessors of the CDO 3 artifacts. The research question we had was: To what degree did the two assessors of an artifact agree that it did or did not demonstrate proficiency in CDO 3, Mathematical Knowledge?

To understand the overall level of consensus on the artifacts' proficiency, we performed two analyses on the binary categories of *Proficient* or *Not-proficient* on CDO 3. The first analysis was a simple comparison of the percentage of agreement (both rated the artifact as proficient or not proficient) and disagreement (one rated it proficient; the other rated it not proficient). We found that in 77% of the cases (artifacts) the assessors agreed on the decision of proficient or not proficient. In 23% of the cases, the assessors disagreed on this key assessment.

Inter-rater Decision on Proficiency	Count	Percent
Raters Agreed	147	76.96%
Raters Disagreed	44	23.04%
Total Artifacts Scored[a]	191	100%

[a]Although 216 artifacts were submitted for the project, there were only 191 that were rated by two assessors; only those could be tested for inter-rater reliability.

Assessor Feedback

The day ended with an informal anonymous participant survey. Assessors were asked to provide written responses to the following questions:

- How well did the rubric allow you to express your ideas about the artifacts?
- What could we have done differently to make the day go better for you?
- What could we do to attract more participants for future Assess Fests?
- How confident were you in your ability to assess mathematical knowledge and skills (even if outside your discipline)?

The CDO Team will use the assessors' feedback to continue to improve the assessment process.

Dissemination

The completed Year 2 Report will be shared with all stakeholders in a variety of ways, similar to the Year 1 Report. The report and the completed CDO action plan will be housed in the Assessment Resource Center and the public-facing Focus on Assessment Macomb website. All faculty and academic administrators will receive a copy of the report. Additional presentations may take place at college events, such as Faculty Development Day, Institutional Development Day and the Learning Leadership Team meeting.

Highlights of Implemented Changes

At the conclusion of the project's first year, the CDO Pilot Assessment Team reviewed of all of the processes and solicited feedback from faculty whose sections had been selected and faculty that participated in Assess Fest, for insight on how the processes could be improved.

In general, we learned that the process, resources, timelines, communication pieces, level of participation, collection and assessment of artifacts, and analysis, went really well. In year two we built on those processes, implementing these strategic changes for improvement.

Review of current CDO language

- The CDO Pilot Team wrote an email to the Curriculum Committee Chair and Provost requesting a review of the current CDO language. With the chair's permission, at the first Curriculum Committee meeting of the year, a faculty representative of the team addressed the topic with the committee. A Gen Ed task force has been assembled to begin the process of review in order to determine if the CDO language needs to be updated or changed.

Collection of Student Artifacts

- For the first year of the assessment project, the selected course sections for artifact submission included only sixteen-week courses. For the second year, the number of sections selected was doubled, eight-week online courses and late-start twelve-week courses were added to the selected group.

Artifact Cover Sheet & Rubric

- The Artifact Cover Sheet, which is completed by the faculty of the selected section, was edited in year two to be more helpful to the assessor. Each faculty member was asked to describe the aspects of the assignment that spoke to CDO 3, and to select the rubric criteria they believed were closely aligned with the assignment. This information proved to be very useful to the assessors.
- A nationally-normed AAC&U VALUE rubric for math was used.

Artifact Preparation

- In year two, artifacts were organized in groups determined by the course section. Assessors had the opportunity to assess all of the artifacts from a course section. In year one the artifacts were not grouped together. The CDO Team made this change based on feedback from year one. It allowed assessors to move more quickly through the artifacts because they did not have to consider a new assignment with each folder.
- Assessors received folders containing one student artifact, a rubric, the Artifact Cover Sheet completed by the submitting faculty member, and an answer key if one was submitted. During year one answer keys were not collected for the assessment of student artifacts.

Assess Fest

- Increased time spent on norming allowed for more conversation and interaction. Faculty came to an agreement on how to rate different aspects of the rubric prior to assessing.
- Faculty from different disciplines sat together which was helpful for cross-discipline discussions of assessment.

Assessment Moving Forward

As we move into year three the CDO Team and the Curriculum Committee's Sub Committee on Assessment will combine efforts as the new Assessment of Student Learning Committee. This new committee will continue to focus on improving the assessment process, taking faculty feedback into consideration as the project continues. The Assessment of Student Learning Committee will continue to assess the remaining CDOs, while striving to provide practical feedback, based on assessment results, to the college community.

Appendix A

CDO 3 Artifact Assessment Rubric

CDO 3: The graduate can demonstrate how to employ mathematical knowledge.

The student can apply the concepts of math. | The student can use quantitative data in everyday life. | The student can evaluate quantitative information.

Criteria	**Novice** **1 point**	**Developing** **2 points**	**Proficient** **3 points**	**Accomplished** **4 points**	**Points**	**Unable to Judge**
	Limited or no understanding observed through the evidence provided.	*Unclear if student understands based on observed evidence.*	*Mostly/Somewhat clear understanding based on observed evidence.*	*Clear understanding based on observed evidence.*		*The assessor feels unqualified to assess the criterion.*
Calculation Performing mathematical calculations to solve a problem or complete a task.	Calculations are attempted but are both unsuccessful and are not comprehensive.	Calculations attempted are either unsuccessful or represent only a portion of the calculations required to comprehensively solve the problem.	Calculations attempted are essentially all successful and sufficiently comprehensive to solve the problem.	Calculations attempted are essentially all successful and sufficiently comprehensive to solve the problem. Calculations are presented clearly and concisely.		
Representation Converting information into a mathematical form (e.g., equations, graphs, diagrams, tables, words, spreadsheets).	Little or no conversion of information is attempted.	Some information is converted, but it is irrelevant or inaccurate.	Some correct and relevant conversions are present but others are incorrect or not present.	All relevant conversions are present and correct.		
Interpretation Explaining information presented in mathematical forms (e.g., equations, graphs, diagrams, words).	Attempts to explain information presented in mathematical forms, but draws incorrect conclusions about what the information means.	Provides somewhat accurate explanations of information presented in mathematical forms, but occasionally makes minor errors related to computations or units.	Provides accurate explanations of information presented in mathematical forms.	Provides accurate explanations of information presented in mathematical forms. Makes appropriate inferences based on that information.		

Application/Analysis Making judgments and drawing conclusions based on quantitative analysis	Either no reasonable conclusion is made or, if present, is not based on quantitative analysis.	An incorrect quantitative analysis is given to support a conclusion.	Quantitative analysis is given to support a relevant conclusion but it is either only partially correct or partially complete.	Uses correct and complete quantitative analysis to make relevant and correct conclusions.		
Assumptions Making and evaluating important assumptions in estimation, modeling, and data analysis.	Attempts to describe assumptions.	Explicitly describes assumptions.	Explicitly describes assumptions and provides compelling rationale for why assumptions are appropriate.	Explicitly describes assumptions and provides compelling rationale for why each assumption is appropriate. Shows awareness that confidence in final conclusions is limited by the accuracy of the assumptions.		
Communication Expressing quantitative evidence in support of the argument or purpose of the work (in terms of what evidence is used and how it is formatted, presented, and contextualized).	Presents an argument for which quantitative evidence is pertinent, but does not provide adequate explicit numerical support. (May use quasi-quantitative words such as "many," "few," "increasing," "small," and the like in place of actual quantities.)	Uses quantitative information, but does not effectively connect it to the argument or purpose of the work.	Uses quantitative information in connection with the argument or purpose of the work, though data may be presented in a less than completely effective format or some parts of the explication may be uneven.	Uses quantitative information in connection with the argument or purpose of the work, presents it in an effective format, and explicates it with consistently high quality.		