Quantitative Reasoning Assessment in Macroeconomics (ECN211)

Estrella Mountain Community College- Fall 2015

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Introduction

The faculty at Estrella Mountain Community College (EMCC) have identified seven general education abilities that it intends to develop in its student population during the course of regular instruction and learning practices. Each semester, the faculty choose one (or two) of these general education abilities to assess, according to the general education abilities assessment cycle. In the fall 2015 semester, this general education ability was quantitative reasoning. The quantitative reasoning assessment was assessed using the EMCC General Education Ability Rubric for Quantitative Reasoning (see **Appendix A**).

The economics faculty at EMCC intend to develop their students quantitative reasoning skills while teach the economic principles courses, Macroeconomic Principles (ECN211) and Microeconomic Principles (ECN212). To learn how well our students are developing in this ability, four economics faculty members developed and piloted a common quantitative reasoning assessment aligned with EMCC’s Quantitative Reasoning rubric in ECN211.

The assessment required the students to place themselves in a hypothetical role of a leader of a task force appointment by the new President of the United States to recommend a strategy for eliminating the US Budget deficit within a year (see **Appendix B**). To complete this successfully, students needed to address all areas of the quantitative reasoning rubric. Individual instructors of the course assessed their own students’ work as part of the students’ grade in the class.

Results

Due to a technical miscommunication, only three of the four instructors’ results were usable in the current study. This constituted 95 students enrolled across 4 sections. Not all students however participated in the study (some did not submitting an assignment), and 75 (78.9%) had at least one recorded piece of data in the assessment. The results of the study are as followed:

*Table 1: Summary of Results*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Abilty/ Skill | Describe the problem | Understand the problem | Develop strategy and apply math skills | Analyze and interpret solution | Test or evaluate correctness of solution | Generalize or extend problem to new situation |
| Count | 75 | 73 | 70 | 63 | 65 | 66 |
| Average | 3.12 | 2.64 | 2.87 | 2.56 | 2.85 | 2.80 |
| Standard  Deviation | 0.84 | 0.81 | 0.88 | 0.82 | 0.92 | 0.95 |

Analysis

Students averages were highest on “describe the problem” (X=3.12, SD=.83), suggesting most students were between “above proficient” and “proficient” in this area. Students did less well on the other areas. Students scored the lowest on “understand the problem” (X=2.64, SD.81), suggesting they scored between “proficient” and “approaching proficient”. By comparing these first two results together, the data suggest that students could broadly understand the larger context of the problem, but had difficult detailing the issue through tabular form.

Students performed relatively better at “develop a strategy” (X=2.87, SD=.88), “test or evaluate the correctness of the solution” (X=2.85, SD=.92), and “generalize or extend the problem to new situations” (X=2.80, SD=.95) relative to “analyze and interpret the solution” (X=2.56, SD=.82). Together, when considered with the first two ability sub-levels, one interpretation that can be drawn is that students struggled with constructing and/or presenting tables, as these two lower scoring areas required this skill.

Limitations, Discussion, and Recommendations

There were multiple limitations to this study. First, the sample may not represent the “typical” economics student at EMCC. The students that participated in the study were not randomly selected, but were the result of the instructors that volunteered to participate, and of this sub-set, those students that were still enrolled in the course at the point of the assessment and chose to finish it. This may bias the sample and limits extrapolation.

A second limitation is the issue of inter-rater reliability. As each instructor assessed her or his own students and without formal training, some instructors may have assessed work differently than their colleagues or used different degrees of rigor.

A third limitation is the difference in instruction and assignment completion. In some classes, instructors provided more instruction on the topic than others before they assigned it, which could reasonably be suspected of influencing students’ results. Some allowed students to work on these in groups or in pairs while others assigned it as an individual student project.

Despite these limitations, there are multiple benefits to this collaborative project. First is increased awareness of the importance teaching and assessing quantitative reasoning among our students is in our classes. Instructors may know implicitly this is important, but having a collaborative effort to assess this helps to clarify these standards and brings them to the forefront of teaching and learning.

Second, we do see patterns in student performance that indicate where we could direct are teaching efforts in the future. For example, it may be beneficial to provide some instruction (or at least supplemental resources) on areas where students perform weakly in, like table creation.

EMCC’s faculty will be assessing quantitative reasoning again in the fall 2018 semester. The results of that assessment will help put this data into context. Recommendations for improvement next iteration include practicing with inter-rater reliability with some of actual student artifacts from this semester. Another recommendation is to provide resources for students in how to create tables to address the weaker areas. A third recommendation is to communicate more effectively with all economics faculty on the technical application of this assessment to maximize sample size and participation.

**Appendix A**

**Student Academic Achievement Committee**

**EMCC General Education Ability Rubric for Quantitative Reasoning**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Ability/Skill** | **Above Proficient** | **Proficient** | **Approaching Proficient** | **Below Proficient** | **Not Applicable**  **(N/A)** |
| **1. Describe the problem (and the solution path) using correct mathematical terminology and conventions.** | All terminology and conventions are completely accurate. | Terminology and conventions have minimal errors. | Uses some correct terminology and conventions. | Rarely uses correct terminology or conventions. | Problem is provided by the instructor. |
| **2. Understand the problem. Identify any assumptions that are required in defining the problem.** | Completely understands the problem; identifies all relevant assumptions. | Understands the problem and identifies the assumptions with minimal errors. | Understands part of the problem; identifies some of the relevant assumptions. | Does not understand the problem. |  |
| **3. Develop a strategy and apply appropriate mathematical skills to solve the problem** | Develops an adequate strategy and applies all the appropriate skills needed to solve the problem. | Strategy developed and appropriate skills applied will solve the problem with minor adjustments. | Develops a partially adequate strategy and applies some appropriate skills to solve the problem. | Does not develop an adequate strategy and does not apply appropriate skills to solve the problem. |  |
| **4. Analyze and interpret the solution in the context of the problem** | Analyzes and interprets the complete solution in the context of the problem with 100% accuracy. | Correctly analyzes or interprets the complete solution in the context of the problem. | Partially analyzes or interprets the solution in the context of the problem. | Does not analyze and/or interpret the solution in the context of the problem. |  |
| **5. Test or evaluate the correctness and usefulness of the solution.** | Completely and accurately tests and evaluates the correctness and usefulness of the steps leading to the solution. | Completely and accurately tests or evaluates the correctness and usefulness of the steps leading to the solution. | Partially tests and/or evaluates the correctness and usefulness of the steps leading to the solution. | Does not test and/or evaluate the correctness and usefulness of the solution. |  |
| **OPTIONAL: 6. Generalize or extend the problem solution to a new situation.** | Correctly and accurately extends the solution to a new situation with no errors. | Correctly and accurately extends the solution to a new situation with minimal errors. | Partially extends the solution or makes some errors in generalizing the solution to a new situation. | Does not generalize or extend the solution to a new situation. |  |

**NOTES:**

* For category 1, if the instructor provides the problem to be solved, then mark the N/A category.
* Category 6 is optional. This row is applicable if the instructor extends the problem solution, or process, to a new situation.

*Updated by SAAC Committee Spring 2015*

**Appendix B**

ECN211 Quantitative Reasoning Assessment

Moving Towards a Balanced Federal Budget

Assignment: In your groups you will be completing a report. Within your report, you will be responding to the following questions and prompts. Though you may keep them numbered, they can also flow seamlessly as long as all elements are included.

Scenario: You are appointed by the new President of the United States to lead a task force to propose a plan for balancing the federal budget for the next fiscal year. Use the information provided in your textbook as well as from the following website:

<https://www.nationalpriorities.org/budget-basics/federal-budget-101/spending/>

1. Describe the federal budget deficit for 2015. How much revenue was collected and how was it collected? How much money was spent and on what? Based on the difference between revenue collected and government spending, what was the federal budget deficit in 2015?
2. Using the National Priorities website, prepare a table of the key components of the 2015 US spending and revenue. Include the budget deficit amount at the end. Your table should be easy and clear to read and include the major components of the budget as presented by the National Priorities website.
3. Based on the table you created above, develop a strategy for reducing the budget deficit. What will be your guiding process for deciding which areas increase or decrease?
4. Present a revised budget on the coming fiscal year based on the table you created in step 2. In dollars, indicate clearly which areas you propose to increase and which areas you propose to reduce. At the end, indicate the balanced budget (i.e., a budget deficit of $0).
5. Evaluate and defend your plan. Why did you choose to change some of the areas and not others? Who is likely to be helped or hurt by this plan?
6. After completion of this exercise, what has been learned that can be extended to households that are finding themselves spending more than they earn? What are the limitations of this comparison?