**EMPIRICAL AND QUANTITATIVE SKILLS COMPETENCY**

**Competency Statement:** Students will demonstrate the ability to formulate an inquiry that is scientific or mathematical in nature, and then manipulate and analyze numerical data and/or follow an investigative process using empirical and/or quantitative reasoning to satisfy the inquiry and create informed conclusions.

**Operational Definition:** Upon completion of 30 hours in a degree plan at Amarillo College, students will apply and analyze scientific and mathematical concepts and will reach reasonable conclusions based on the analysis of available information.

**Benchmark:** 70% of all artifacts will score a 3 or higher.

**Description of Assignments (Artifacts of Student Work):** Assignments to be assessed can include work from any discipline where scientific or mathematical analysis may be required.

Empirical skills must address the thinking process as it is demonstrated through observation, experimentation, and/or experience and that can be demonstrated through quantitative data and/or qualitative reasoning. Quantitative skills will ideally demonstrate a student’s higher-order thinking capabilities through the use of applied mathematics and/or math assignments that have a purpose beyond merely providing the ‘right’ answer to a group of math problems.

Examples of possible assignments include, but are not limited to: case studies, reports, lab assignments, analyzing or creating graphs and tables related to statistical data, or any project that uses applied mathematics (e.g. nursing, engineering, math, psychology, etc.).

**Definitions of Concepts**

1. **Identification** – The extent to which the understanding of the nature of the inquiry and the desired outcome(s) of analysis is indicated. Identification clearly pinpoints what information is being sought and what kind of analysis is required.
2. **Assimilation** – The extent to which the information required for analysis is assimilated and identified. Assimilation reflects whether all necessary information is presented and used, whether the organization is logical, and whether any outside information should be integrated into the current assignment.
3. **Analysis** – The relevance of the steps taken toward achieving the desired outcomes, the logic and clarity within the presented methods, and the consistency and accuracy of the presented information.
4. **Presentation** – The point at which a clear conclusion and/or supplemental materials   
   (e.g. graphs, pictures, etc.) are presented
5. **Application** – The extent to which the results of analysis are applied to answer or address the hypothesis or problem.

**Empirical and Quantitative Skills Rubric\***

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| **Point Value** | **Detailed Description of Point Assessment** | **Simple Expla-nation** |
| 5 | An artifact scoring a 5 demonstrates the following:   * **Identification:** The purpose, components, and variables of the investigation/project are clearly identified. * **Assimilation:** The information that is required for an analysis of all investigative components is clearly evident. If applicable, values are correctly translated into variables and all necessary formulas are present. * **Analysis:** All investigative or quantitative components are methodically scrutinized. The steps followed are logical and relevant to the desired result. The proper tools/ technology were used and well integrated into the final product. Any notation is consistent and well defined. * **Presentation:** A concise summary of the analysis is presented. The presented information is correct, of high quality, and the terminology/figures are accurate and easy to understand. All visual representations of evidence are well-scaled and well represent the analysis findings. * **Application**: The coherent integration of all steps of the investigation lead to an accurate, complete, relevant conclusion that is relative to the initial investigative statement. | excell-ent |
| 4 | An artifact scoring a 4 demonstrates the following:   * **Identification:** The purpose, components, and variables of the investigation/project are clearly identified. * **Assimilation:** The information that is required for an analysis of all investigative components is evident. If applicable, most values are correctly translated into variables and all necessary formulas are present. * **Analysis:** All investigative or quantitative components are scrutinized. The steps followed are logical and relevant to the desired result. The proper tools/ technology were used and mostly integrated into the final product. Any notation is consistent and well defined. * **Presentation:** A good summary of the analysis is presented. The presented information is correct, of good quality, and the terminology/figures are accurate and easy to understand. Most visual representations of evidence are well-scaled and/or well represent the analysis findings. * **Application:** The coherent integration of all steps of the investigation lead to an accurate, mostly complete, relevant conclusion that is relative to the initial investigative statement. | good |
| 3 | An artifact scoring a 3 demonstrates the following:   * **Identification:** The purpose, components, and variables of the investigation/project are mostly identified. * **Assimilation:** The information that is required for an analysis of all investigative components is mostly evident. If applicable, some values are correctly translated into variables and most necessary formulas are present. * **Analysis:** All investigative or quantitative components are somewhat scrutinized. The steps followed are mostly logical and relevant to the desired result. The proper tools/ technology were mostly used and somewhat integrated into the final product. Any notation is mostly consistent and defined. * **Presentation:** A summary of the analysis is presented. The presented information is mostly correct, of good quality, and the terminology/figures are mostly accurate and easy to understand. Most visual representations of evidence are acceptably scaled and represent the analysis findings. * **Application: T**he coherent integration of most steps of the investigation lead to an accurate, mostly complete, acceptable conclusion that is relative to the initial investigative statement. | comp-etent |
| 2 | An artifact scoring a 2 demonstrates the following:   * **Identification:** The purpose, components, and variables of the investigation/project are somewhat identified. * **Assimilation:** The information that is required for an analysis of all investigative components is somewhat evident. If applicable, values are incorrectly translated into variables and some necessary formulas are present. * **Analysis:** Some investigative or quantitative components are scrutinized. Some steps followed are somewhat logical and relevant to the desired result. The proper tools/ technology were somewhat used and not integrated into the final product. Any notation is somewhat consistent but not defined. * **Presentation:** A partial summary of the analysis is presented. The presented information is somewhat correct, of adequate quality, and the terminology/figures are somewhat accurate and relatively easy to understand. Some visual representations of evidence are acceptably scaled and represent the analysis findings. * **Application:** The integration of most steps of the investigation lead to a somewhat accurate, partially complete conclusion that is relative to the initial investigative statement. | margi-nal |
| 1 | An artifact scoring a 1 demonstrates the following:   * **Identification:** The purpose, components, and variables of the investigation/project are not identified. * **Assimilation:** The information that is required for an analysis of all investigative components is not evident. If applicable, values are incorrectly translated into variables and no necessary formulas are present. * **Analysis:** Most investigative or quantitative components are not scrutinized. The steps followed are illogical and/or irrelevant to the desired result. The proper tools/ technology were not used and/or integrated into the final product. Any notation is not consistent and not defined. * **Presentation:** A summary of the analysis is either inadequately presented or not presented at all. The presented information is mostly incorrect, and/or of poor quality, and/or the terminology/figures are inaccurate and/or hard to understand. Few or no visual representations of evidence are acceptably scaled/ represent the analysis findings. * **Application:** The integration does not include all steps of the investigation and does not lead to an accurate, nor complete conclusion that relates to the initial investigative argument. | poor |

**\*This rubric was derived from the** [**LEAP Value Rubrics**](http://www.aacu.org/value/rubrics/index_p.cfm?CFID=37758558&CFTOKEN=93634622)**.**