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Providing Annotated Examples Increases Science Learning

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Providing Annotated Examples Increases Science Learning

Background & Goals

Background:
- Science 101 (SCI 101) is a first-year seminar class that incorporates UNLV’s 5 University Undergraduate Learning Outcomes (UULOs) (See Resources for link)
- A “high stakes” poster project (worth 33% of total grade) addressing an ethical question in the sciences (of the student’s choice) is assigned to improve scientific information literacy and achieve multiple UULOs
- Students consistently score low in the areas of application of scientific results, critical analysis of results, proper citation usage, and poster design (See Figure 1)
- I developed an example poster (Figure 2) to increase the transparency of assignment instructions (Winkelmes, 2014)

Goals:
- Compare freshman-level student performance prior to and after providing the annotated example to assess its effectiveness
- Evaluate the following areas:
  1. Poster Design (UULO 3.5) “Produce effective visuals using different media”
  2. Citations and References (UULO 3.2) “Effectively use the common genres and conventions for writing within a particular discipline or profession”
  3. Scholarly/Peer-Reviewed Results (UULO 1.3) “Apply research methods to solve and evaluate problems”
  4. Analysis of Results (UULO 2.5) “Evaluate and report on conclusions, including discussing the basis for and strength of findings, and identify areas where further inquiry is needed”

Methods & Results

Methods:
- Transparent instructions (Purpose/Task/Criteria) given on Webcampus in 2014 without example poster (See Resources for more information)
- Developed and verbally annotated example poster (See Figure 2) in Fall 2015
- Compared Fall 2012 posters (n=50) to Spring 2014 posters (n=24) and Fall 2015 (n=50) using a 5 point scale
- 5 (Mastered) to 1 (Failed)

Results & Resources

Results:

- Results: Student Performance Prior to and After Providing and Annotated Example
  - Poster Design
  - Citations
  - Scientific Results
  - Analysis
  - No Example Given 2012 (n=50)
  - No Example Given 2014 (n=24)
  - Example Poster Provided 2015 (n=50)

Results & Resources

- Figure 4. Actual students’ poster after the annotated example was given. Poster is a typical representation, with areas of improvement circled.
- Resources:
  - Example of an annotated STEM paper: http://www.unlv.edu/provost/transparency
  - UNULOs: generalized.unlv.edu/uulo.html
  - UNLV University of Nevada, Las Vegas

Potential Challenges & Applicability

Benefits:
- Providing freshman-level students with a verbally annotated example of a high stakes assignment:
  1. Expanded the application of scientific, peer-reviewed results
  2. Improved thoughtful analysis of results
  3. Increased proper usage and formatting of citations
  4. Reduced design flaws like the use of large blocks of text (Figure 4)

Potential Challenges:

- Plagiarism
  - With emphasis on only 1 example, 10% of students copied the design & wording too closely in 2015
  - Providing students with a printed annotated example in the Fall 2016 resulted in even more students using it as a template (42% or 15 of 35 groups copied parts of the wording)

- Limits on Intellectual Breadth/Creativity
  - Unknown whether the annotated example would negatively impact critical thinking in higher level course assignments

- Other Pedagogical Tools Are Necessary
  - The example poster was only one piece of increasing the transparency of the assignment – transparent instructions (See Resources) and verbal feedback on rough drafts also improved scores

Future Directions and Suggestions:

- Do not emphasize a single, printed example
- Use at least 2 annotated examples
- Allow online access to the examples
- It will be useful to evaluate the effectiveness of providing more than one annotated example poster – Will plagiarism decline?