Working Group Meeting Notes

3/14/14

Present: John Caraher, Bridget Gourley, Wade Hazel, Jeane Pope, Pam Propsom, Jackie Roberts, Michael Roberts, Naima Shifa, Brian Wright

We began with each individual writing a learning goal on the board:

Khadija couldn’t attend but sent her sample learning goal: Be able to identify which problem/task should be solved using computer algorithms/application.

Jeane: Students should be able to plot data and interpret graphs.

Bridget: Students completing the S&M graduation requirement should be able, given a set of data graphically represented, to predict an outcome of another trial.

Naima: They also should be able to explain plots, graphs, correctly.

John: Should understand how scientists communicate….should be able to explain why the conclusions of peer-reviewed research might be contradicted by further research (i.e., “might still be wrong”).

Brian: For the non-science/math student to be able to explain why there is importance/value in science/math literacy. (Jeane added: and understand the limits of science)

Wade: Students should be able to contrast assumptions of philosophical and methodological naturalism and describe why methodological naturalism is necessary for the use of the scientific method.

Michael: Here's my learning goal, which still needs to be refined a great deal (e.g. many of the steps use "understanding").

Student will be able to assess the limitation of inferential statistics when reading media reports and claims.

1.     Student will naturally look for and judge the sample size, statistical significance reporting, and effect size when evaluating a study reported in the media.

a.     Student will recognize that a large numeric effect (whether in absolute units relevant to the study, percentages, etc.) is only meaningful in relation to the amount of variance involved.

                           i.     Student can generate examples of large and small numeric effects that are (or are not) significant due to the small or large variance involved.

b.     Student will recognize the sample size and possibility of sampling error in a study.

                            i.     Student will understand that larger sample sizes generally have less sampling error.

                              ii.     Student will understand the central limit theorem and be able to apply it to specific sampling cases (e.g. in the context of a study they are evaluating).

c.      Student will understand how to increase statistical power and the relation to Type I and Type II errors.

                             i.     Student can generate examples of stronger treatment manipulations, larger sample sizes, less variance,

d.     Student will understand that a hyped, statistically significant result may have a small effect size and little practical significance.

What is scientific literacy? Jackie shared four different definitions of scientific literacy (handout). From the Gormally et al. article: the ability to “use evidence and data to evaluate the quality of science information and arguments put forth by scientists and in the media (NRC, 1996)”.

Pam will contact Gormally to see if the TOSL has been validated beyond biology. People seemed to think that the TOSL’s skills and questions are consistent with the skills we think would be valuable for our gen ed students.

How to proceed? Just accept Gormally et al.’s skills as our learning goals? Using Gormally et al., Jeane accepted skills 1, 3, 6, 9 from Appendix C. She questioned whether everyday citizens need to be able to make a graph (or just interpret one)? Others might have other lists of which skills they value most. Could we use these as a basis and edit, add, delete? And prioritize them?

What kind of feedback do we want from our departments (or individuals in our departments) regarding these learning goals?

Share the nine skills listed in the Gormally et al. paper and ask four questions of your departments (or individuals in your departments):

1. Does your department (or do the individuals in the department) value these skills as part of scientific literacy? Do these match your vision?
2. Could you envision your courses or your department’s intro courses addressing these skills? Which of them?
3. Would you be interested in changing your intro course(s) to address the skills? Or which of the skills could/would you address?
4. Are there skills that are missing from the nine identified by Gormally et al.?

Skills in Gormally et al.’s Test of Scientific Literacy

1. Identify a valid scientific argument (e.g., recognizing when scientific evidence supports a hypothesis)
2. Conduct an effective literature search (e.g., evaluate the validity of sources (e.g., websites, peer reviewed journals) and distinguish between types of sources)
3. Evaluate the use and misuse of scientific information (e.g., recognize a valid scientific course of action, distinguish the appropriate use of science to make societal decisions)
4. Understand elements of research design and how they impact scientific findings/conclusions (e.g., identify strengths and weaknesses in research related to bias, sample size, randomization, experimental control)
5. Make a graph
6. Read and interpret graphical representations of data
7. Solve problems using quantitative skills, including probability and statistics (e.g., calculate means, probabilities, percentages, frequencies)
8. Understand and interpret basic statistics (e.g., interpret error bars, understand the need for statistics)
9. Justify inferences, predictions, and conclusions based on quantitative data