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Of Special Interest

Report On "Assessing Student Outcomes"

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…the exercise was designed to help the participants think and discuss the role of teachers in general and how the important concepts apply to themselves.

This workshop was composed of three interrelated topics: (1) learning styles, (2) teaching beliefs, and (3) group problems. To demonstrate different learning styles, an introductory survey was given to the participants to determine what learning styles were present in the group. The results of the survey were then discussed. The teaching beliefs of the participants were explored using another handout. The results from the group were then discussed as well as how the beliefs relate to teaching philosophy. Group problems were introduced through examples, and the workshop as a whole then negotiated a list of worthwhile characteristics for group problems.

"Assessing Student Outcomes" by Mary Nakhleh was presented at the "Day 2 to 40" workshop symposium held May 10–11, 1997. The two-day event was held in the Willard H. Dow Chemical Sciences laboratory building on the central campus of The University of Michigan in Ann Arbor, Michigan. Each of the articles that comprise this issue was written by one of the group of reporters whom I asked to attend each session to take field notes and then follow up with the session leader and participants afterwards.

—Brian P. Coppola, Proceedings Editor

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Chronology

1. The session began with a survey to determine what learning styles were present in the group of participants. The results showed that all four of the suggested styles were represented: Read/Write (10 people), auditory (5–6), visual (3), and kinesthetic (3).

2. The group discussed the usefulness of the survey.

3. The workshop was broken into groups to discuss teaching beliefs and metaphors. Each group's reporter then gave the group's answer to the workshop. There was a spirited discussion on several of the topics raised.

4. The workshop was directed to examine sample group problems in small groups, and each group's reactions were again reported back to the workshop.

5. The final product of the workshop was a group-generated list of characteristics of successful group problems.

Report

Mary Nakhleh did a wonderful job of providing a true workshop atmosphere to this workshop. Her opening monologues were largely confined to instructing the group how to approach the next task and then facilitating the resulting discussions. Because this is the way that her workshop was designed, nearly all the interesting points were brought out in the group dialogs at the end of each task.

Dialog

This workshop had many points of spirited discussion. The first came from interpreting the introductory survey. Several participants pointed out that a student is more complicated than this survey suggests and can exhibit several forms of learning at the same time or different times (reading and writing or kinesthetic for example). They suggested that a more accurate representation would involve either equilibrium graphs or a kinetic (animated) representation. Having to pick exactly one answer caused some participants considerable discomfort—and so they were not inclined to accept the numerical evaluation that resulted. Some of the other participants knew how they best learned (for instance visual learning) but the results of the survey had zero hits for this area. It was not surprising that in a roomful of chemists (most of whom

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learn well through reading and writing) almost all of the discussion focused on the other types of learning that are not traditionally exploited in a chemistry classroom setting.

Mary answered several questions about the interpretation of the survey during this discussion (a full description of the models are shown in the supporting material). To those students who have an even spread across the four learning types, she explained that they should be treated as kinesthetic learners. She also explained that younger children tend to be kinesthetic learners, but as they grow older they adopt (or are forced to adopt) other learning styles.

For Part 2, the exercise was designed to help the participants think and discuss the role of teachers in general and how the important concepts apply to themselves. There was a great deal of dissension within the small groups as to what is a good metaphor for "teacher". While one person suggested "expert," another felt that this word has a negative connotation. Because the instructions were for each group to negotiate an answer, these differences could not be glossed over, but had to be discussed. The wording of the questions caused some of the participants discomfort—particularly the use of the word "educator" in questions 1 and 3. The objecting party pointed out that this word means different things to different people, and so even defining the word could take a workshop in itself! An interesting observation is that about five minutes elapsed before the groups began freely discussing teaching beliefs as they were was asked to do.

The final group responses to the questionnaire were:

<u>Question 1: Give a metaphor for teaching.</u>

- farmer/gardener: plants seeds, manipulates environments, protects seedlings, allows to grow.
- coach/mentor/guide: challenges, finds players abilities, supports, inspires, encourages [Several differences between a coach and mentor/guide were discussed: a coach cuts players, is dictatorial, has a set system, has a common enemy, whereas a guide is none of these.]

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- expert: practical, an experienced learner, tutor, modeler, knows how to indoctrinate students.

Question 2: What are the qualities of your favorite teacher?

There was no disagreement arising from the answer to this question. Characteristics that the groups thought were important included humor, interest (was interesting and interested in you), enthusiasm, patience, thoroughness, showing the patterns in complex patterns, and the ability to get discussions going before and after class.

Question 3: What is your teaching philosophy?

All of the participants believed that the students take in information and weave it into knowledge. There was a section among the participants who wanted the question to be more forceful in eliciting responses (for example, How do the students weave the knowledge?) but there was a feeling that this was a focusing question for the groups because a consensus was quickly achieved.

After the groups reported the answers to the discussion questions, a long discussion concerning how beliefs about teaching should influence the teacher. Perhaps the most interesting and deeply reaching analogy discussed was the teacher as a gardener. In addition to the seed planting, care, and growth of the plants (students), there was questions raised about what to do about weeds and poor soil. The group compared weeds to incorrect science, confused thinking, misunderstanding concepts, and strongly held unsupported beliefs. Although no consensus was reached as to what the weeds represented, the subsequent discussion centered on the difficult task of contradicting strong beliefs without supporting evidence. Examples of beliefs the group felt have remained strong despite contradictory evidence are: the flat earth, creationism (as opposed to evolution), and creationism (as opposed to geoscience). Other belief systems (i.e., hot and cold calorimetry) are based on only a portion of the available data.

The group also brought up current events involving belief versus evidence. The “Heaven’s Gate” group returned the telescope that they had bought to see the spaceship behind the Hale-Bopp comet as defective because they couldn’t see the spaceship. The meteorite from Mars that was reported to show ancient life has believers on both sides of the question—but that belief is based on the notion of life or

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no life on Mars instead of the evidence. And, many times even well-established scientific facts (for example the tilt of the earth's axis) are taken as a "belief" by laypersons without examining the evidence (e.g., the seasons). This mixing of "belief" and "evidence" tends to hinder teaching in a scientific classroom. This hindrance is especially noticeable when the student has to unlearn something that they know is "right" and replace it with something they feel is "wrong".

For Part 3, the groups read the group problems in the study pack and discussed the strong and weak points of the problems. The entire workshop agreed that Problems 1 and 2 were relatively more fact-oriented than Problem 3. They also agreed that the answers to Problems 1 and 2 were, therefore, more likely to be right or wrong, more cut-and-dried, and therefore less likely to generate meaningful discussion than Problem 3, which had some gray areas to be negotiated by the students. The discussion centered on how the student responses should be graded. Some participants felt that imagination and clarity of solution were the most important factors, while others felt that rigorous adherence to formalisms and correct terminology was the most important characteristics of a correct answer. These views were well-stated, but no solution was obtained.

The problems Mary presented as examples were designed to meet several criteria: (1) the problems were to have a set boundary, (2) there could be many answers to an open-ended question, (3) there is usually an observation component, and (4) additional boundaries could be set by the student. The workshop's final task was to negotiate a list of characteristics that should be present for the writing of a successful group problem.

The workshop negotiated a list of five characteristics that all successful group problems should have:

- The problem should be rich enough to benefit from many different viewpoints.
- Each problem should have multiple components.
- Each problem should be set in a real world (read "interesting") context.
- The environment must be supporting (encouraging for cooperation).
- There must be enough time for the problem to be completed.

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General guidelines that seemed acceptable for everyone were: the problem should consume a time of about 1 hour (in lecture or using an entire recitation to be devoted to the problem), and small groups of 3–5 people should be used with one member of the group reporting to a chalkboard or overhead by the end of the class.

There was some concern that group projects must be handled carefully; otherwise, the question will be answered by an excellent student or "ringer." One suggestion was to force everyone to write down an answer so that they can bring something to the group for discussion. An additional concern that not all the students would have the background to answer the question was addressed by arranging the question to come to the class after all the background had already been discussed.

Adoptive Participation

Several participants responded that they intend to use the questionnaire about student learning styles presented by Mary in Part 1 of the workshop in the first days of the upcoming semester. They felt that the questionnaire was well selected and was one of the best handouts they received.

Adaptive Participation

Several participants indicated that they will use the group problems that Mary presented as guides for creating their own problems. Although they will not be using the problems directly, they will be using ideas generated from the workshop in addition to their own ideas as a new feature of their curriculum.

Feedback

Many of the respondents pointed out that they liked the free discussion form the workshop developed. They realized that Mary was taking a risk by deviating from the typical "seminar-style" presentation found at meetings, but felt that the risk was amply rewarded. Several of the participants noted that there were moments of digression and tangential discussion, but most of those accepted that such deviations are a result of the style of discussion chosen for this workshop. A few of the participants were quite irritated with the tangential discussions and arguments over semantics.

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Many of the participants felt that there could have been a more appropriate title than "Assessing Student Outcomes." Some of the suggestions were to more accurately reflect the content of the talk with a title like "Different Learning Styles," or "Constructing Group Problems," Several people wrote that they were expecting another topic based on the title and abstract.

The handouts were enthusiastically received by most participants. Several intend to use the student questionnaire for their own classes. The group problems were also well received, and some of the participants wrote that they wanted even more examples!

Many people wrote that they appreciated Mary valuing their opinion during the group discussions, and they pointed out that this was the one workshop that they felt they were able to contribute to for the full time period.

Workshop Participants

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