A Problem Solving Approach to Animal Physiology

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A problem solving (PS) emphasis was used in a course for 15 students, sophomore through doctoral. Our working definition of PS included the ability to resolve a situation by knowing and recognizing pertinent facts, and being able to find at least one defensible alternative cause or outcome consistent with the student's state of knowledge. Activities of PS included PS strategy handouts, instructor modelling of PS, whole class PS activities in which the instructor acted only as a recording secretary, written PS assignments for the weekly laboratory activities, and periodic individual PS assignments. Lecture and textbook materials established a knowledge base upon which PS activities were affixed for summary and review. The evaluation criteria used for the PS activities were based on the identification of the issue, important factors associated with the problem, and alternative solutions, as well as evaluation of alternative solutions, relevancy of outcomes, and defense of student's preferred outcome. Written examinations also included 30% PS essay questions.

For laboratories, students were divided into small groups that enabled peer instruction in content and PS. Each group should be small, not include friends, and reflect different ages, sexes, backgrounds, and abilities. Group-generated written responses to content and PS questions were turned in at the beginning of each laboratory. Laboratory exercises required specific activities followed by an inquiry component, which progressively became a larger portion of the laboratory. For the inquiry part, the groups cleared their experiment designs with the instructor, carried them out, and shared their data with other groups. Groups also answered post-lab PS questions which often concerned the data from the inquiry portion of the laboratory.

An initial laboratory involved formulating, testing, and application of appropriate statistics to a hypothesis concerning the length of student fingers. Groups devised their procedures, wrote them up, and gave them to another group to perform. Group written directions often had to be revised for the other group to understand. Results were presented to the class, with discussion. At a later date an entirely inquiry-type laboratory required the students to determine what kinds of environmental conditions were perceived by adult *Tenebrio* (meal worms), and the neural receptors possibly involved. The groups presented their experimental design to the instructor for review, revised, and performed their experiments. Each group presented procedures, results (including appropriate tables and graphs), and conclusions to the class, followed by discussion. Group results were occasionally “negative” and conflicting, as is true of science. The students clearly improved their experimental design and PS skills during the semester.