Student engagement and learning with problem-based laboratories in histology

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Why Problem-Based Learning (PBL)?
PBL was formalized in the 1960s in medical curriculums. It is now used as a teaching tool in the basic sciences in the form of case studies.

Benefits of PBL:
- Active learning
- Problem solving
- Independent learning
- Improved performance on assessments
- Increased confidence in real-world situations

The Course: Histology, the Biology of Tissues
- One lecture followed by a two hour lab in which students examine slides corresponding to lecture topic
- Meets twice a week; 39 students (49% female)

Two types of lab activities:
1. Ungraded labs
2. Graded lab assignments

Labs included a descriptive packet and glass slides that students examined either in pairs or independently. High resolution digital scans of each slide were also available online using the Aperio ScanScope system.

Teaching staff:
Five TAs, and one instructor. It was my 2nd year as graduate TA in the course.

Methods
Case studies were developed from digital scans of specimens and case histories available as reports of the 2011 and 2012 Primate Pathology Meetings of the American College of Veterinary Pathology. Ten case study questions were added to the descriptive lab packet on each topic. Students were encouraged to use any sources to answer the questions.

Case 1: Respiratory system (week 10, not required for grade)
- Radiation-induced pulmonary damage and edema
- Class time + 1 week to complete assignment

Case 2: Female reproductive system (week 13, required for grade)
- Ovarian teratoma
- Class time + 3 days to complete assignment

Research Evidence
1. Student work: lab reports and quizzes
2. Classroom observations
3. Post-lab student surveys (2)
   - Open ended and rating scale questions
   - Paper survey attached to lab packet

Student Surveys
- Rate your interest in respiratory physiology after completing today's activity
- How enjoyable did you find today's activity?
- How motivated were you to complete today's activity?
- How well were you able to stay on task?
- How useful do you think today's activity will be to your future?

Table 1: Percent (n) of students ranking laboratory activity as "most useful"

Table 2: Student work: lab reports and quizzes

Methods
- Graded labs
- Ungraded labs
- Case studies

Conclusions
- Students generally rated the PBL activities positively
- Many felt that case studies are useful to their future as clinicians or scientists
- Students enjoyed the clinically relevant cases and problem solving
- Voluntary participation in Case 1 did not affect assessment score

Recommendations for Practice
- If case studies are new to your course, ensure students know exactly what they need to do to succeed (e.g., gathering outside information).
- Choose cases that will pique their interest; the bizarre was better in this course.
- Be sure to have adequate teaching support staff.

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