Improving a Field School Curriculum Using Modularized Lessons and Authentic Case-Based Learning

Roy V. Rea* and Dexter P. Hodder

ABSTRACT University course evaluations are replete with student comments expressing frustration with taking time out of work, paying money for, and putting energy into field education projects that lack authentic “real-world” problem-solving objectives. Here, we describe a model for field school education that borrows on pedagogical tools such as problem-based learning, hands-on instruction, field-based education, and teaching through research, and employs modularized teaching in a way that incorporates numerous resource management issues and values into a case study that addresses an authentic forest management issue. In presenting the model, we present data from student comments and course evaluations on the effectiveness of our approach and describe and underscore those elements that have served as the guiding force in refining the field school curriculum that we currently use at the University of Northern British Columbia. Additionally, we make recommendations on how to integrate other key elements into the curriculum that appear to be critical for conducting a successful field school.

Curriculum planning in ecology often lacks opportunities for students to engage in authentic, ecologically-based problem solving (Abrahams et al., 2000). Problems of this nature, unlike those posed to students in lecture halls and laboratories, are usually ill-defined and can be approached, interpreted, and solved in various ways (Fortus et al., 2004). Furthermore, although instructors tend to “cover” appropriate ecological principles in lectures and labs, examples are often far off places and of little local relevance for students (Abrahams et al., 2000). In this regard, field studies can give students the opportunity to gain valuable experiences not possible in other settings (Hall, 1995).

Traditionally, field school at the University of Northern British Columbia (Prince George, BC, Canada) has focused on students applying technical out-of-the-class skills in a series of mock planning exercises in different regions of northern British Columbia. Recently, our pedagogical approach to camp has shifted and now allows students to exercise those same skills, but in a local and more applied “real-world” and research-focused context.

To introduce the concept of ecologically-based problem solving of applied issues and add local relevance to our field school curriculum, we combined and employed the following pedagogical approaches:

1. Case-based learning—a pedagogical approach that introduces a problem-motivated investigation that requires students to analyze, integrate, and apply course materials, ethics, opinion, and real-world information to formulate a solution (Kendler and Grove, 2004, Bergland et al., 2006).


3. Field-based education—a teaching format that utilizes a field arena for inquiry-based, hands-on learning of science process skills (Hall, 1995).

4. Research in education—a teaching model that stimulates critical thinking and increases student interest in research and provides a migration vehicle for students seeking advanced degrees (Chandra et al., 1998).

Here we describe how we currently deliver a university forestry field school that employs these teaching styles. We elucidate the characteristics of our course and how we assess students. We also report student feedback and highlight educational outcomes in an attempt to provide information to others interested in similar forms of curriculum development.

Course Characteristics

The University of Northern British Columbia’s field school (Field Applications in Resource Management; Fig. 1) is an upper division course offered by the Ecosystem Science and Management.

Impact Statement

Field Applications in Resource Management is a finishing school for undergraduate students in Natural Resource Management. The course allows for student immersion in 2 weeks of concentrated “real-world” field work. Students do hands-on research, problem solve, and build relationships with instructors, community members, stakeholders, and resource professionals. Relationships started and fostered at the field school often result in job placements for students after graduation.
The purpose of this two-week field school is to provide students with an overall professional-level integration of forest resource management that draws on the student's collective undergraduate experiences. Field camp provides a setting for students, instructors and resource professionals to discuss, apply and integrate principles from undergraduate course and lab work, field, work and employment experiences. Field camp provides resource management students with an opportunity to gain practical experience applying creative and innovative integrated resource management skills and techniques to manage for timber and non-timber forest resource values at multiple temporal and spatial scales. Field camp provides third year students with a foundation for fourth year courses that require knowledge of multiple resource values and issues, and integration of this knowledge. The course is taught in a modular format with the content being delivered by local experts working in the field of integrated resource management. The course is carried out in a setting that promotes group discussion and teamwork.

Our Approach
During the last 4 years (2003-2006) our objective has been to remove mock planning exercises from the curriculum. To this end, both of the major components of campus—the modules and case study assignment—are tied to real-world management issues or research programs.

Modular Format
Approximately 20 different modules are taught at our field school each year by university professors, graduate students, government personnel, consultants, industry representatives, community members, and stakeholders. Although modules cover different topics, all modules are taught in the field and most have a hands-on component (for example, measuring bear den dimensions, analyzing soil samples, completing post-harvest assessments, setting mammal traps, assessing forest fire fuels). This structure combines the need for self-motivation and study and allows for individual student assessment, yet at the same time fosters team work and group participation.

Management Program. The course is required for forestry majors, but is open to all students and has no prerequisites. The course is often subscribed to by students interested in Environmental Studies and Field Biology. Students (30 max per group) meet throughout the last two weeks of the summer, just before the Labor Day holiday weekend.

We use a combination of tools to evaluate student performance including written assignments and quizzes (45%), a case study group mark (25%), field note books (15%), as well as participation, preparedness, and attitude (15%). This structure combines the need for self-motivation and study and allows for individual student assessment, yet at the same time fosters team work and group participation.

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Student Responses

Students complete module evaluations (Table 2) for each module presented. Evaluation results are used by the camp coordinators and instructors to evaluate if and how improvements can be made in the module delivery and content. Since 2004, we have also asked students to complete a detailed camp evaluation (Table 3) in addition to the module evaluations and the official course evaluation. This allows students to comment on aspects of the field school that are not found in the generic university course evaluation. As part of their participation mark, students are graded on their contribution to this process and are generally happy to provide module-specific and overall camp feedback.

Educational Outcomes

Although we do not ask students detailed questions on their perception of the utility of the various pedagogical tools that we are using to build the camp curriculum, we have asked students since 2004 to comment on, among other things, the overall camp curriculum and the case study. Combined data from 2004 (28 students), 2005 (16 students), and 2006 (11 students) indicate that 45 students were generally very satisfied with the overall camp curriculum, whereas 4 were very to somewhat dissatisfied; 43 students were generally very satisfied with the case study whereas 5 were very to somewhat dissatisfied (see Table 3).

Data from the official course evaluations indicate that implementation of these principles has been effective in increasing student understanding and comprehension of course materials over the years (Table 4). The process of curriculum development that we employ is an iterative one in which student comments and course evaluations are looked at and considered seriously with an aim to improve the curriculum in ways the students see appropriate.
Table 2. NREM 333 module evaluation form. Module title ______________________

1. Listed below are a number of statements concerning module delivery. Read each item and decide whether you are satisfied or dissatisfied, and to what extent. If you are very satisfied, circle “4”; if you are satisfied, circle “3”; if you are very dissatisfied, circle “1”; if you are dissatisfied, circle “2”; if you feel somewhere in between, circle a number between “1” and “4.” If you have no opinion or the statement is not applicable to the module you are rating, circle “5.”

<table>
<thead>
<tr>
<th>Item</th>
<th>Very satisfied</th>
<th>Somewhat satisfied</th>
<th>Generally satisfied</th>
<th>Very dissatisfied</th>
<th>Don’t know/doesn’t apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>The instructor’s presentation style</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The instructor’s level of knowledge</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The instructor’s level of preparedness</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The method of module delivery</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>The neatness of module content (i.e., the level of overlap with other UNR course content)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>The module’s relevance to “real world” issues</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The interest stimulated by module content</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>The knowledge you attained from this module</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The critical thinking required for the module</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>The amount of time allotted for this module</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>(If applicable) The quality of instructions provided to complete the exercise</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>(If applicable) The equipment provided to complete the exercise (e.g., field gear, aerial photos)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The level of integration between the hands-on exercise and the module content</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

2. On a scale of “1” (poor) to “10” (excellent), please give an overall rating for this module. Circle one number only.

1 2 3 4 5 6 7 8 9 10

3. Would you recommend this module for future field camps? Please circle yes or no and explain below.

Circle one

YES NO

4. Do you have any suggestions for improving this module? Please explain below:

I had no idea about any of this (forest stand dynamics). I learned more in one day out here in the field than in my entire degree program. This gets me excited about doing my masters. (Class of 2006)

...and although I knew nothing about that subject, I now want to pursue a graduate degree in that area. (Class of 2004)

There are 420s (professional reports) everywhere I look...modules opened my eyes to so many possibilities. (Class of 2005)

Interviewing community members in the field during our local values module made me realize just how important feedback and values of the locals are to properly managing the landbase. I am going to do my term paper in ethics on this topic. (Class of 2006)

I was exposed to different values in our forest area I have seen nowhere else. This gives me materials to consider for my paper. (Class of 2004)

The majority (~80%) of field camp students comment either verbally or in course evaluations on their appreciation for being able to participate in an authentic issue for the case study. They comment us for... not making us waste my time on yet another make-work, make-believe project. (Class of 2004)

Some comments from the course evaluations on the use of an authentic case-based study included:

I loved that the case study allowed me to be involved in a real issue in our forest. (Class of 2005)

Awesome exposure in observing real-life research and decision making. (Class of 2005)

...felt a real sense of ownership about the case study issue. (Class of 2005)

Some general comments about the field school, from students taking the field school between 2003 and 2006, include:

This is a great course that is very helpful with career planning.

I really enjoyed learning real field skills and practicing techniques.

My brain is too full. Setting up (mist) nets and handling the birds was unbelievable.

...very relevant and real issues...previously unknown to me before...were presented in interesting ways...a very rewarding experience.

I had a fun experience that I can incorporate into my knowledge base as I progress as a professional.

Lots of out-of-the-box thinking that is critical for new resource managers.

The course is a fantastic concept...well delivered...the best course I have ever taken.

Conclusions

Employer expectations have shifted in recent years and now require students to have both an applied and philosophical understanding of their discipline that they often do not receive in class (Miller, 1993). We believe our field school helps to fill this void.

With the use of modularized teaching and authentic case-based learning, our Field Applications in Resource

Table 3. NREM 333 overall course evaluation form.

1. Listed below are a number of statements concerning Field Camp delivery. Read each item and decide whether you are satisfied or dissatisfied, and to what extent. If you are very satisfied, circle “4”; if you are satisfied, circle “3”; if you are very dissatisfied, circle “1”; if you are dissatisfied, circle “2”; if you feel somewhere in between, circle a number between “1” and “4.” If you have no opinion or the statement is not applicable to the module you are rating, circle “5.”

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<tr>
<td>Camp curriculum</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Case study assignment</td>
<td>1</td>
<td>2</td>
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<td>4</td>
<td>5</td>
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<tr>
<td>Field notebook assignment</td>
<td>1</td>
<td>2</td>
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<td>4</td>
<td>5</td>
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<tr>
<td>Assignments/quizess</td>
<td>1</td>
<td>2</td>
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<td>5</td>
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<tr>
<td>Level of organization</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>Scheduling</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>How concerns are addressed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>Field camp location at JPRF</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>Camp cleanliness</td>
<td>1</td>
<td>2</td>
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<tr>
<td>Camp security</td>
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<td>2</td>
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<td>5</td>
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<tr>
<td>Accommodations</td>
<td>1</td>
<td>2</td>
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<td>4</td>
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<td>Food quality</td>
<td>1</td>
<td>2</td>
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<td>4</td>
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<tr>
<td>Food quantity</td>
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<tr>
<td>Driver safety</td>
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<td>2</td>
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<tr>
<td>Field safety</td>
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3. Would you recommend this module for future field camps? Please circle yes or no and explain below.

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With the use of modularized teaching and authentic case-based learning, our Field Applications in Resource
Management course now allows students to integrate their academic experience with hands-on learning in a novel way that combines several other pedagogical tools. This style of teaching, as reported by Smith (2001), is critical for better retention and for providing skills such as collaboration, communication, decision making, and leadership that are not easily obtained in the classroom. This has led to multiple benefits for our students, not the least of which, as described by Abrahams et al. (2000), is the opportunity to network with professionals in a context, which in our case, often results in career track returns.

Acknowledgments

Our deepest appreciation goes to all our guest presenters, especially those veteran instructors who return to camp each year. We also thank Sue Grainger, Kathy Lewis, Mike Jull, Melanie Karjala, and Erin Sherry who have played critical roles in helping us to build a relevant and thought-provoking field school.

References


About the authors...

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Roy Rea is a Senior Laboratory Instructor in the Ecosystem Science and Management Program at UNBC. He teaches animal physiology, plant systems labs, and field applications in resource management. Roy’s research interests include plant–animal interactions, mitigating wildlife–vehicle collisions using habitat alteration and driver education, and combining novel pedagogical approaches to enhance field-based science education.