

EDU T&L 110, 2 credit hours, Autumn 2002, Thursdays, 1:30 -2:48pm, 286 Arps Hall.  
Call# 20078-8

## **Teaching and Learning Life Science**

### **Instructors:**

Dr Mike Beeth  
[Beeth.1@osu.edu](mailto:Beeth.1@osu.edu)  
253 Arps Hall  
292 5377

Robert Day  
[day.3@osu.edu](mailto:day.3@osu.edu)  
294 2178

### **Course Description and Rationale:**

Although teacher education is a university-wide responsibility, mechanisms for sharing this responsibility between disciplines are rare. Students who are interested in becoming teachers are typically expected to learn science content as undergraduates, but do not learn pedagogical methodology until they enter an entirely separate graduate program. Recent trends in education have led to the creation of state-mandated standards that require K-12 students to achieve specific scientific competencies, many of which emphasize learning through actually "doing" science. This can be an intimidating prospect for teachers who did not choose a science subject as their college major. For these non-scientists, required introductory science classes such as biology 101 may be their only opportunity to develop a deep understanding of basic scientific concepts. "Teaching and Learning Life Science" is designed to make the most of this opportunity by connecting content to pedagogy and by encouraging students to reflect on their own learning experiences. It is also intended to help students develop an accurate understanding how science is "done" and how scientists progress along their career paths. Without this knowledge, it is hard to imagine how teachers can present a realistic and inspiring picture of contemporary science to their students.

The class is intended for undergraduate students interested in teaching at the K-12 level. It is particularly suitable for non-life science majors who are interested in teaching elementary or middle school students, since high school science teachers are more likely to be expected to teach only within their area of expertise. An alternative class is available for life science graduate students with similar interests (EDU T&L 772).

The course is repeatable and is taught as a companion to Introductory Biology courses (BIOL 101, 102, 113 and 114 or equivalent). It is intended that each time "Teaching and Learning Life Science" is offered, it will concentrate on the unique syllabus and pedagogy of a different introductory biology class.

### **Course Learning objectives:**

- Forge links between content knowledge and modern pedagogic methods for designing, constructing and assessing safe and effective science instruction.
- Prompt students to reflect on ways that scientific concepts might be taught by drawing on their own ongoing learning experiences.
- Familiarize students with national science curriculum standards and examine the implications for teachers working with children of all ages.
- Develop students' understanding of the scientific method and the nature of scientific careers by introducing them to authentic research in laboratories at The Ohio State University.
- Examine issues such as inquiry learning, lab safety, scientific ethics, classroom technology and professional development for new teachers.
- Extend and augment life-science content knowledge and encourage students to embark on a program of life-long learning that will allow them to make sense of contemporary research and find ways to effectively explain it to their students.
- Suggest additional resources that students might use to learn more about science content, science pedagogy, teaching materials, using technology in science lessons and state-mandated standards.

### **Administrative Notes:**

Office hours are by appointment.

All assignments are to be submitted electronically to [day.3@osu.edu](mailto:day.3@osu.edu)

Access to an internet-capable computer is required for this class. **Please conduct all correspondence via your OSU email account only.**

Students with disabilities who require special arrangements or facilities for any part of this class should contact the instructors at the beginning of the quarter.

Scores for assignments will be posted via email or using "Course Sorcerer" depending on the class enrolment. Details will be announced in class.

Details of this syllabus and class schedule may be subject to change. Check your OSU email regularly for updates and announcements.

The class will hold some meetings in laboratories around campus. Attendance at these meetings is required. Since these field trips depend on the good will of scientists who

take time out of their very busy schedules to meet with us it is **EXTREMELY** important that you arrive on time and properly prepared. Be sure you know exactly how to get to the designated meeting place. Ask for directions in class if you need them.

Likewise, the class may also involve optional field trips to local schools. If you commit to attend one of these trips you **MUST** honor your commitment and conduct yourself in a professional manner since the educational experience of future students depends on the goodwill of the teachers who agree to meet with us.

### **Class Schedule:**

Week	Date	Topic	Readings
1	9/26/02	Introduction and overview. The Scientific Method Why study science? Brief look at science education initiatives.	1 2 3
2	10/3/02	Review of week one. Teaching science as inquiry. Overview of some theories of learning	4 5 6
3	10/10/02	National State and local standards for science teaching.	7 8
4	10/17/02	Experiencing scientific inquiry Log and lesson one due (written only).	9 10
5	10/24/02	Experiencing scientific inquiry.	11 12
6	10/31/02	Experiencing scientific inquiry	13 14
7	11/7/02	Design of lessons appropriate for teaching science concepts. Resources that might help. Log and lesson two due.	14
8	11/14/02	Laboratory safety. Ethical treatment of animals.	15 16
9	11/21/02	Technology in the classroom. Technology as a visual aid. Log and lesson three due.	17
10	11/28/02	NO CLASS - THANKSGIVING	18
	11/5/02	Last day of classes. Unfinished business, review Short final exam.	

### **Readings:**

All readings are available online unless otherwise stated. This list will be emailed to all students so that they will be available simply by clicking on the appropriate links. Be ready to discuss the readings at the beginning of each class. Taken together, the complete list of URLs can be thought of as the "lecture notes" for this class.

1) Leonard, William H. "Research Matters - to the Science Teacher." Web site.

<http://www.educ.sfu.ca/narstsite/research/inquiry.htm>

2) Project 2061 and "Science for all Americans."

<http://www.project2061.org/>

<http://www.project2061.org/tools/sfaa/default.htm>

<http://www.project2061.org/tools/sfaaol/sfaatoc.htm>

Especially: <http://www.project2061.org/tools/sfaaol/Chap14.htm>

This is a large site. Browse as much of it as you can and mention the article you find most interesting in the first entry of your journal. This site will be referred to several times during the quarter.

3) Actually this is not so much a single reading as a collection of resources and a summary of the first lecture for those who missed it:

<http://www.angelfire.com/ri/skibizniz/T&L110/110one.html>

4) Beeth, M.E & Wagler, M. (1997) The Heron Network: Changing the ways students learn science. *Electronic Journal of Science Education*. Available at:

<http://unr.edu/homepage/jcannon/ejse/beethwagler.html>

5) American Association for the Advancement of Science Benchmarks.

<http://www.project2061.org/tools/benchol/bolframe.htm>

6) List of learning theory web sites and resources for biology teachers. Also features a useful cognitive science glossary.

<http://www.angelfire.com/ri/skibizniz/theory.html>

7) National Science Education Standards presented by "Education World."

<http://www.education-world.com/standards/national/science/index.shtml>

8) Ohio Department of Education and its online science standards document

<http://www.ode.state.oh.us/>

[http://www.ode.state.oh.us/academic\\_content\\_standards/LifeScienceIndicators.asp](http://www.ode.state.oh.us/academic_content_standards/LifeScienceIndicators.asp)

9) Illinois Learning Standards for Science.

<http://www.isbe.state.il.us/ils/science/science.html>

<http://www.isbe.state.il.us/ils/science/scg11.html>

10) Frequently asked questions about inquiry learning.

<http://www.learner.org/channel/workshops/inquiry/faq.html>

11) Developing educational standards

<http://edstandards.org/StSu/Science.html>

12) Atlas for science literacy (AAAS).

<http://www.project2061.org/tools/atlas/default.htm>

We should also be able to arrange for you to look at the actual atlas itself since Dr Beeth has a copy.

13) Bonnstetter, Ronald J. (1998) Inquiry: Learning from the Past with an Eye on the Future. *Electronic Journal of Science Education*. Available at:

<http://unr.edu/homepage/jcannon/ejse/bonnstetter.html>

14) Some lesson plan sites.

<http://unr.edu/homepage/jcannon/ejse/bonnstetter.html>

[http://www.pbs.org/teachersource/sci\\_tech.htm](http://www.pbs.org/teachersource/sci_tech.htm)

[http://www.teach-nology.com/teachers/lesson\\_plans/science/  
www.enc.org](http://www.teach-nology.com/teachers/lesson_plans/science/www.enc.org)

15) ENC safety site.

<http://csss.enc.org/safety>

16) Institutional Animal Care and Use Committee web site, produced by the American Association for Laboratory Animal Science.

<http://www.iacuc.org/>

17) International society for technology in education.

<http://cnets.iste.org/index2.html>

18) NSTA Standard for Science Teacher Preparation.

<http://www.nvgc.vt.edu/nsta-ncate/november98.htm>

### **Course Requirements / Evaluation:**

Evaluation will be based on three things:

Three log entries with lesson plans:

First, written only:	20 points
Second, written with short presentation:	30 points
Third, written with presentation and materials:	40 points.

Participation and attendance:	10 points.
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Final exam:	100 points
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Grade Scale (based on percentage of total points scored):

94 - 100	A
90 - 93	A-
87 - 89	B+
84 - 86	B
80 - 83	B-
77 - 79	C+
74 - 76	C
70 - 73	C-
67 - 69	D+
60 - 66	D
< 59	E

More on evaluation:

#### 1) Logs with lesson plans:

Students will write three one - four page log / lesson plans. These are intended to encourage students to think about how to choose a lesson subject, how to tie their lesson to educational theories and standards documents and how to actually plan and deliver a lesson. Each assignment should be divided into two sections: 1) the lesson plan itself and 2) A reflective log entry. Each of the three lesson plans should be based on a different concept you have learned in your biology class. The written portion need only consist of

a list of bulleted points or a rough outline listing any materials you need, the procedure to be used and the learning objectives of the lesson, as well as references to any published or online sources you used. The plans should become more elaborate and complete as we progress through the quarter and should take note of feedback from the instructor and the rest of the class. Points will be awarded for evidence of a literature search, tying the lesson to standards documents and (for the second two lessons), for the use of effective visual aids or teaching materials.

The second "log" part of the assignment is to be a more reflective description of the thought processes you used to decide on the subject of your lesson plan, its theoretical basis (i.e. what learning theory does it use?) and the problems you encountered when you tried to think of a way to teach your concept to young children. The second section of each assignment is also the place to discuss other issues that have struck you as important for a potential science teacher. These could include (but are not limited to): What did you think of the way the concept you chose for your lesson plan was taught in your biology class? What pedagogic approach did your instructor use? Did it work? Did you understand the concepts presented? What would you have done differently? What theoretical model of learning do you think the lecture or lab exercises were trying to use to help you? What is your response to any related readings in this syllabus? Did anything in the readings change the way you thought about your biology class? Do you have any concerns about the actual content of your biology class? (Feel free to ask specific questions about anything you did not fully understand.) Was there anything in your biology class that you feel you could NOT teach to your own students? Why not? How would feel about giving it a try as your next lesson plan? How do you feel about learning through the inquiry method so far? Why? What did you think about the lab that you visited (if you visited one that week)? What surprised you about the research that you saw? How is the "real" inquiry process in the labs you visited different from the inquiry activities you performed in the biology class laboratory exercises?

Each assignment should be sent to [day.3@osu.edu](mailto:day.3@osu.edu) by the listed due date. Don't worry too much about writing fine prose. Just record your thoughts as honestly and completely as you can. If you are pressed for time, err on the side of brevity rather than submitting your entry late.

Small sections of your journal may be anonymously circulated around the class by email in an attempt to spark some debate and solicit responses. Please be courteous and reasonable with your critiques of others' ideas in this forum.

All comments, questions and requests for clarification of material in the student logs should be sent to [day.3@osu.edu](mailto:day.3@osu.edu). Do not email other students directly. The content of the logs and lesson plans, as well as the email addresses of all students will be considered the property of the class and will not be revealed to anyone but the instructors. Similarly, the identity of the authors of comments and questions that get distributed will be withheld in order to promote free and unfettered flow of information. The instructors reserve the right to edit inappropriate or verbose language.

## 2) Participation and attendance

You must have a written excuse for any absences. Failure to provide one will mean minus 5 points. Participation in class discussions is important, but participation in online discussions may be even more important because email allows the instructor to keep an objective written record of each student's contributions. Submit your ideas and questions frequently! Again, the instructors reserve the right to edit inappropriate or verbose language.

## 3) The Final Exam

This will be designed to make sure you have done the readings and understood the basic principles of the class. It will be fairly brief and very straightforward. It will be "open book" in that you will be allowed to bring in up to 5 pages of your own notes and you will be supplied with a copy of the questions approximately a week before the exam. Satisfactory performance should be insured by a good understanding of the class material rather than rote memorization of every detail.