PS126 – Physical Science for Elementary Education
Washburn University
Spring 2015

Instructor: Dr. Brian Thomas    Office: Stoffer 210B
Office Hours: By appointment; please contact me in class, by phone or email.
Phone: 785-670-2144    E-mail: brian.thomas@washburn.edu
Instructor’s website: http://www.washburn.edu/faculty/bthomas/

REQUIRED TEXTS:
Physical Science & Everyday Thinking, Student Edition (2nd Ed.)
Elementary Science & Everyday Thinking (supplement for use in elementary classrooms)
Note: It is strongly recommend that you purchase a 3-ring binder to hold the PSET curriculum materials.

DESCRIPTION:
The purpose of this course is to give future elementary educators a background in the physical sciences. Students should gain a basic familiarity with the terms, methods and concepts of the sciences of physics and chemistry, as well as the ability to find and understand new information in the physical sciences.

This course falls under the Natural Sciences and Mathematics General Education Distribution area.

Primary Student Learning Outcome: Quantitative and Scientific Reasoning and Literacy:
“Quantitative reasoning involves the ability to work with numerical data and the higher-order thinking skills required to make and understand mathematical arguments. Scientific literacy involves the acquisition and application of skills and knowledge necessary to understand the nature and content of science, and to evaluate scientific arguments using evidence-based reasoning. Students will be able to understand and develop arguments supported by quantitative evidence, clearly communicate those arguments in a variety of formats (using words, tables, graphs, statistical inference, mathematical equations and functions, etc., as appropriate), and apply mathematical and scientific methods to solve problems from a wide array of contexts and everyday situations.”

Course objectives that address the SLO:
Upon successful completion of this course students will be able to:
1. Understand the process, methods and tools of science generally, as well as how these are used in the physical sciences specifically.
2. Define and explain major terms and concepts in physics and chemistry.
3. Apply understanding of concepts to make reasoned arguments supported by evidence.
4. Apply understanding of concepts to answer questions and solve problems in physics and chemistry.
This is an activity-based and discussion-oriented course with four major goals:

1. **Physical Science Content**: To help you develop a deep understanding of physics and chemistry ideas that can be used to explain interesting phenomena, and are related to the ideas included in the elementary school science curriculum;

2. **Nature of Science**: To help you practice and develop an understanding of how knowledge is developed within a scientific community: that doing science involves using evidence and creative thinking, that knowledge is established through collaboration and consensus, and that science knowledge can change over time;

3. **Elementary Students’ Ideas**: To help you understand the thinking of elementary school children by observing (via video) and analyzing their discourse when they are in the process of learning science.

4. **Learning about learning**: To help you become more aware of how your own science ideas change and develop over time, and how the structure of the learning environment and curriculum facilitate these changes.

There will be very little formal lecturing in this course. Indeed, all class sessions will take place in the lab. **The basic aim of the PSET format is to allow you to take charge of your own learning, with the instructor as a guide.** During class you will spend most of your time performing experiments, working occasionally with computers, and discussing ideas with your classmates. We expect you to continue your learning at home through a series of carefully designed homework assignments, many involving use of the web. We hope you will find many of our teaching and learning strategies valuable and appropriate for you to use when you begin your teaching career.

The PSET curriculum is divided into the following chapters:

- Chapter 1: Interactions and Energy
- Chapter 2: Interactions and Forces
- Chapter 3: Interactions and Systems
- Chapter 4: Interactions and the Behavior of Gases
- Chapter 5: Interactions and Physical Changes
- Chapter 6: Interactions and Chemical Changes

The goal of each chapter is to have you develop a set of ideas that can be used to help explain phenomena that will be explored within that chapter, as well as to consider issues of learning science. **There are three types of activities and homeworks within each chapter.** The first several activities are called **Developing Ideas** activities. During these activities you will perform experiments to collect evidence in support of ideas that you will develop. The final activity in a Chapter is an **Applying Ideas** activity. In that activity you will compare your ideas with those developed by scientists, then apply the ideas to explain interesting phenomena. Sprinkled throughout the curriculum are a series of **Learning About Learning** activities, some done during class, most done for homework. During these LAL activities you are asked to think about your own learning, the learning of children and/or the learning of scientists (namely, how they develop scientific knowledge).
Structure of the PSET activities:
Each individual activity consists of several sections with slightly different aims.

Purpose
A short introduction describing the aims of the activity and how it ties in to the topic. It also poses the key question(s) for the activity.

Initial Ideas
Questions that give you a chance to express your own initial ideas on the topic of the activity, before you do any experiments. These initial ideas are important, as they will form the basis on which you build further understanding.

Collecting and Interpreting Evidence
Here’s where you do the experiments and record your predictions, observations and data that provide the evidence to support or refute your ideas.

Summarizing Questions
Working together, the whole class will try to summarize what they have learned in the activity by answering a few questions.

Throughout the activities you will be writing answers to questions on the activity sheets themselves. Three types of questions will be identified by small icons:

 Prediction Question. A chance for you to use your current thinking to anticipate what you think will happen. In each case, your prediction should be justified in terms of your current idea(s). This is a vital step in your learning and should not be “glossed over”. If the results of an experiment do not agree with your prediction DO NOT go back and change it – this is valuable evidence of how your ideas are evolving.

 Observation Question: A place for you to record the results of experiments. These results may take several forms, including describing observations, sketching diagrams, or recording numerical values in a table.

 Making Sense Question. This is where you get to interpret the results of experiments in terms of your ideas. Do the results agree with your predictions, or not? If so, they provide evidence to support your ideas. If not, maybe your ideas need to be modified.

ATTENDANCE AND PARTICIPATION:
You will be primarily responsible for your own learning in this class. By engaging in meaningful discussions with your group members, by actively participating in whole class discussions, and by performing interesting experiments, you will develop with your classmates a set of ideas. Similar to the way in which scientists develop ideas, your ideas will be based on evidence gathered from the experiments you do. At appropriate times, you will be able to
compare your ideas with those developed by scientists. It is expected that except for some
special jargon, the ideas you develop with the class should be quite similar to the scientists’
ideas.

Because YOU will play such an important role in your own learning, and especially the learning
of your classmates, you are expected to come to class on time every class period and participate
throughout the period. **You will receive one participation point for each class fully attended.**
**If you are absent or more than 20 minutes late for class, you will not receive the
participation credit for that day.** If you do miss class, you should discuss what you missed
with another student.

**HOMEWORK:**
Home-work will be assigned regularly and due in class. Several homework assignments will
require you to run computer simulations or watch videos on the web. The PSET simulator index
page is at [http://cpucips.sdsu.edu/psetsims](http://cpucips.sdsu.edu/psetsims). If you do not bring your homework to class, I will
accept it as an e-mail attachment no later than midnight on the day it is due. (Electronic copies
are available at [http://petpset.its-about-time.com/htm/pset2.htm](http://petpset.its-about-time.com/htm/pset2.htm) **If you have a major issue
such as illness and cannot attend class, please contact me; absences are not excused, but I
may allow you to turn the homework in later for a valid excuse.** Each regular assignment is
worth 2 points and will be graded according to whether you provided reasonable answers to all
the questions.

For certain homework assignments you will be watching video (available at [http://petpset.its-
about-time.com/htm/pset2.htm](http://petpset.its-about-time.com/htm/pset2.htm)) and analyzing children’s thinking. (We can refer to these as
“Children’s Ideas Homework.”) You need to cite appropriate sections from the transcript and
clearly explain how the transcript evidence supports your claims.

**EXAMS:**
There will be an exam at the end of each chapter. Exam questions will be short answer and will
look similar to the kinds of questions you will complete on the in-class activities and homework.
No final exam is scheduled, however, due to potential schedule changes the last exam may occur
during finals week.

**GRADING CRITERIA AND TENTATIVE DATES:**
Grades will be based on the following:

<table>
<thead>
<tr>
<th>Course component:</th>
<th>% of total grade</th>
<th>Approx. Date – Subject to change!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam 1</td>
<td>10%</td>
<td>Feb. 10</td>
</tr>
<tr>
<td>Exam 2</td>
<td>10%</td>
<td>Feb. 24</td>
</tr>
<tr>
<td>Exam 3</td>
<td>10%</td>
<td>March 9</td>
</tr>
<tr>
<td>Exam 4</td>
<td>10%</td>
<td>March 26</td>
</tr>
<tr>
<td>Exam 5</td>
<td>10%</td>
<td>April 10</td>
</tr>
<tr>
<td>Exam 6</td>
<td>10%</td>
<td>April 27</td>
</tr>
<tr>
<td>Homework</td>
<td>20%</td>
<td>Due periodically, schedule TBA</td>
</tr>
<tr>
<td>Participation</td>
<td>20%</td>
<td>1 point per class period</td>
</tr>
</tbody>
</table>
OVERALL GRADE RANGES:

A = 90%-100%
B = 80%-89%
C = 70%-79%
D = 60%-69%
F = below 60%

PLEASE NOTE:
There will be NO excused absences or make up work in this class, for ANY reason!
Homework may be turned in late, as noted above and with a valid excuse.

Mission of the University:
Washburn University enriches the lives of students by providing opportunities for them to develop and to realize their intellectual, academic, and professional potential, leading to becoming productive and responsible citizens. We are committed to excellence in teaching, scholarly work, quality academic and professional programs, and high levels of faculty-student interaction. We develop and engage in relationships to enhance educational experiences and our community. Washburn University Board of Regents, 2010

Definition of a Credit Hour:
For every credit hour awarded for an undergraduate course, the student is typically expected to complete approximately one hour of classroom instruction, online interaction with course material, or direct faculty instruction and a minimum of two additional hours of student work each week for approximately 15 weeks for one semester or the equivalent amount of work over a different amount of time.

Notice of Non-Discrimination/Safe Educational Environment:
Washburn University prohibits discrimination on the basis of race, color, sex, religion, age, national origin, ancestry, disability, marital or parental status, sexual orientation/gender identity, genetic information, or other non-merit reasons, in University programs and activities, admissions, educational programs or activities, and employment, as required by applicable laws and regulations. The following person has been designated to handle inquiries regarding the non-discrimination policies: Dr. Pamela Foster, Equal Opportunity Director, Washburn University, 1700 SW College Ave, Topeka, Kansas 66621, 785.670.1509, eodirector@washburn.edu

Academic Misconduct Policy:
All students are expected to conduct themselves appropriately and ethically in their academic work. Inappropriate and unethical behavior includes (but is not limited to) giving or receiving unauthorized aid on examinations or in the preparation of papers or other assignments, or knowingly misrepresenting the source of academic work. Washburn University’s Academic Impropriety Policy describes academically unethical behavior in greater detail and explains the actions that may be taken when such behavior occurs. For guidelines regarding protection of copyright, consult http://www.washburn.edu/copyright. For a complete copy of the Academic Impropriety Policy, contact the office of the Vice President for Academic Affairs, Bradbury Thompson Alumni Center Suite 200, or go on-line to:
http://www.washburn.edu/academic-impropriety.
**Student Services Center:**
The Student Service Center is the place where students can take care of a range of matters related to admissions, financial aid, student records/registration, and student accounts. The "one-stop" concept in Morgan Hall, room 152 incorporates the front office services of the Business Office, Financial Aid and the Registrar in one convenient location. Stop in and visit with a University Service Advisor for assistance or give us a call at (785) 670-2162. You can also email us at SSC@washburn.edu.

**Student Health Services:**
Student Health Services (SHS) provides support for students experiencing challenges with learning and adapting to university life. SHS offers urgent care for illness and injury; sports, school, and travel abroad physicals (including TB testing); well woman exams; STD and pregnancy testing; immunizations/vaccinations; and care of chronic illness. Services are provided by Board Certified Advanced Practice Registered Nurses (APRN) who collaborate with WU Student Counseling Services and physicians in the Topeka area. More information can be found at http://www.washburn.edu/health

**WU Counseling Services**
Licensed mental health professionals are available in the Counseling Services’ office for personal, academic, and mental health support. This is accomplished by providing a variety of counseling services as well as resources and referrals to students. More information can be found at http://www.washburn.edu/counseling

**Disability Services:**
The Student Services Office is responsible for assisting in arranging accommodations and for identifying resources on campus for persons with disabilities. Qualified students with disabilities must register with the office to be eligible for services. The office MUST have appropriate documentation on file in order to provide services. Accommodations may include in-class note takers, test readers and/or scribes, adaptive computer technology, brailled materials. Requests for accommodations should be submitted at least two months before services should begin; however, if you need an accommodation this semester, please contact the Student Services Office immediately.

Location: Student Services, Memorial Student Union/Mosiman Room (MOVED effective 1/6/2014)  
Web: http://www.washburn.edu/student-services  
Phone: 785-670-1629  
E-Mail: student-services@washburn.edu

Students may voluntarily identify themselves to the instructor for a referral to the Student Services Office.

**Center for Student Success:**
As a Washburn student, you may experience difficulty with issues such as studying, personal problems, time management, or choice of major, classes, or employment. The Center for Student Success (Office of Academic Advising, University Tutoring and Writing Center, First-Year Experience, and Testing and Assessment) is available to help students either directly through academic advising, mentoring, testing and developing learning strategies or by identifying the appropriate University resource. If you feel you need someone with whom to discuss an issue confidentially and free of charge, contact the center at 785-670-1942, advising@washburn.edu, or visit Mabee Library, Room 201.

**Withdrawal Policy:**
During fall and spring semesters, students may go online and withdraw from full semester courses during the second week of class with no recorded grade. From the third through the eleventh week a
“W” is recorded for any dropped course. After the eleventh week, there are NO withdrawals, and a grade will be assigned for the course. These deadlines will be different for short-term, out-of-sequence, or summer courses. To view the deadline dates for your courses visit the “Last Day” Deadlines web page at: https://www2-prod.washburn.edu/self-service/coursedates.php Depending on the timing of the request to withdraw from a course, students may be eligible for a full or partial refund. Information regarding tuition refunds is available at http://www.washburn.edu/current-students/business-office/tuition-refunds.html Please note: tuition refund amounts and deadlines are changing effective Fall 2014. In addition, depending on the timing of the request to withdraw from a course, students may be responsible for repaying all or a portion of their financial aid. Students who do not attend their courses and fail to officially withdraw themselves will receive a grade of “F” and may also be required to repay all or a portion of their financial aid based on their non-attendance. For further information, contact the Financial Aid Office at 785.670.1151 or e-mail financialaid@washburn.edu.

Attendance/Administrative Withdrawal:
Although it is the student's responsibility to initiate course withdrawals, an instructor, after due notice to the student, may request withdrawal of the student from a course because of nonattendance through the same date as the last day a student may withdraw from a course. This would NOT absolve the student of financial responsibility for tuition/fees for the course in question. The inclusion of this information in the course syllabus is considered due notice.

Official E-Mail Address:
Your Washburn University e-mail address will be the official address used by the University for relaying important messages regarding academic and financial information and the University will consider this your official notification for important information. It may also be used by your instructors to provide specific course information. If you prefer to use an alternate e-mail address to receive official University notices you can set a forwarding address in the Outlook Web App by following the steps below.

Outlook Web App: Set Forwarding Address
1. Go to http://outlook.washburn.edu
2. Sign in
3. Click the Gear in the upper right
4. Choose Options
5. Select Forward your email from the list on the right
6. In the lower portion of the screen, enter the email address to which you want to forward all your email.
7. Click the start forwarding button

It is your responsibility to ensure that your official e-mail box does not exceed your message quota resulting in the inability of e-mail messages to be accepted into your mailbox.

Success Week:
Success Week for undergraduate students is designated as the five week days preceding the first day of scheduled final examinations each Fall and Spring semester. Success Week is intended to provide students ample opportunity to prepare for final examinations. For academic programs, the following guidelines apply:

A. Faculty are encouraged to utilize Success Week as a time for review of course material in preparation for the final examination. If an examination is to be given during Success Week, it must not be given in the last three days of Success Week unless approved by the Dean or Department Chair. Assignments worth no more than 10% of the final grade and covering no more than one-fourth of assigned reading material in the course may be given.
B. Major course assignments (extensive research papers, projects, etc.) should be due on or before the Friday prior to Success Week and should be assigned early in the semester. Any modifications to assignments should be made in a timely fashion to give students adequate time to complete the assignments.

C. If major course assignments must be given during Success Week, they should be due in the first three days of Success Week. Exceptions include class presentations by students and semester-long projects such as a project assignment in lieu of a final. Participation and attendance grades are acceptable.

The Success Week policy excludes make-up assignments, make-up tests, take-home final exams, and laboratory examinations. It also does not apply to classes meeting one day a week for more than one hour. All University laboratory classes are exempt from this policy.