TEACHING AND LEARNING PORTFOLIO

by

Xiaoyan Ge

January 2011

This portfolio submitted in partial fulfillment of the requirements for the Delta Certificate in Research, Teaching, and Learning.

Delta Program in Research, Teaching, and Learning
University of Wisconsin-Madison

The Delta Program in Research, Teaching, and Learning is a project of the Center of the Integration of Research, Teaching, and Learning (CIRTL—Grant No. 0227592). CIRTL is a National Science Foundation sponsored initiative committed to developing and supporting a learning community of STEM faculty, post-docs, graduate students, and staff who are dedicated to implementing and advancing effective teaching practices for diverse student audiences. Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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2007

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Teaching Philosophy

My philosophy of teaching is to teach students more than just facts. I want to help students develop the ability to think critically, to problem solve and to be life-long self-learners. As a scientist, I understand that active research around the world leads to new findings everyday. New concepts and new thoughts arise that challenge what we believed before. Science instructors should help students discover this exciting aspect of science, and teach accordingly. I also appreciate the importance of assessments and diversity in student learning. To help students achieve this goal, I believe instructors need to:

1. Emphasize critical thinking skills. Critical thinking is the ability to analyze and evaluate things with a view to improve them. Often instructors find it easier to deliver facts to students rather than helping them to develop their own ability to think critically. To help students develop critical thinking skills, I work to show students that the textbooks are not always right. I share with them new findings, often developed from the researcher's critical review of "old" facts. I also update course materials frequently. I stay up-to-date on the significant findings in the fields I am teaching and update my course materials accordingly.

2. Teach the ability to problem-solve. Science is not just facts, it is a process guided by the scientific method. This method is rooted in problem-solving. It is very important to understand the importance of problem-solving and to let the student practice solving their own problems. For example, when teaching about a scientific finding, I tell students both about the finding itself, as well as the methods that researchers used to uncover their finding. I also allow students to practice solving problems and ask them to describe the process they use to solve a particular problem.

3. Help students to become life-long self-learners. What students can learn from one specific class is limited. All of the new findings in science cannot be learned from one specific class or textbook. The ability to self-learn throughout their life will serve students for their whole life. I encourage students to learn through active self-learning, using various resources available, such as guest speakers, peer discussions, meetings, research articles, etc. I work to teach my students how to use these resources efficiently, and also how to search for the information that they need.

4. Assess student learning. I believe that assessments, such as exams should not just test students on their ability to memorize facts, but should also test the students on the ability to think critically, to problem-solve and to illustrate self-learning. As an example, the PrelimA test, a 5-day take home written exam in our department is composed of 10 essay type questions that test graduate students' ability to think critically, to problem-solve, to search for information they need, to design research experiments and to write research proposals. I have worked to create similar exam questions for undergraduate students that challenge them to demonstrate their understanding beyond the facts and illustrate their creative ideas.

5. Use Diversity to Enhance Learning. I apply different teaching strategies to meet students at

different levels. I use many real-world examples when teaching to relate the ideas to the students' real-world experiences. Also, I interact with students and encourage class discussion to help students learn from one another.

I will continue to work on improving as a teacher, helping my students learn and learning from them.

Teaching and Learning Activities (2003 – 2008)

Delta courses, programs, and activities that I have participated in

The College Classroom	Summer 2007
Effective Uses of Educational Technology	Fall 2007
Expeditions in Learning	Spring 2008
Delta Internship Seminar	Spring 2008

Non-Delta teaching and learning courses, programs, and activities that I have participated in

Teaching Assistant for Genetics 466 (General Genetics)	Fall 2003
Admission Committee of the Genetics Program	Spring 2005
Teaching Assistant for Genetics 566 (Advanced Genetics)	Spring 2007
Prelim A Committee of the Genetics Program	Summer 2007
Teaching Assistant for Genetics 565 (Human Genetics)	Fall 2007

Reflection 1: Teaching in the College Classroom

I took College classroom in Summer 2007, which is the first course that I took from the Delta program. It is truly a wonderful course! Through this course I learned a lot of important concepts in teaching. Some important concepts that I learned from this course include: backward design, concept maps, Bloom's Taxonomy, diversity, active learning, and different learning styles (active and reflective; sensing and intuitive; visual and verbal; sequential and global). I also learned how to write a teaching philosophy, how to write a good syllabus and what important components should be included in a good syllabus and how to design a lesson plan.

I really enjoyed this course. It was the first step that led me to engage in teaching-as-research. Dr. Sandy Courter, the course instructor, commented on my overall class participation as follows: "You contributed well throughout our learning experience and continue to demonstrate life-long learning skills. Stay in touch!"

I have included in this portfolio, the lesson plan for a microteaching activity I developed in the College Classroom Course. This lesson plan, which focuses on the ABO Blood Group, demonstrates my ability to articulate learning objective, develop a detailed learning plan, and assessment student learning.

I have also included the feedback of my peers on my microteaching. Overall, the feedback I received was positive. My peers I felt that I successfully helped them learn a fairly complex concept and pointed out that even though my lesson plan was targeted for an upper level genetics class, my instructional materials could be used with students who have no genetics background. In addition, the instructor of the College Classroom course commented that my microteaching demonstrated "Excellent preparation, implementation, and reflection."

Artifact 1: Microteaching: ABO Blood Groups Learning Plan

Topic/Concept The ABO Blood Group

Goals (general, overall goals for the lesson—broad, generic)
Students will understand the basic biochemistry and genetics about ABO blood group.

Objectives/ Learning Outcomes (specific, measurable)
Students will be able to:

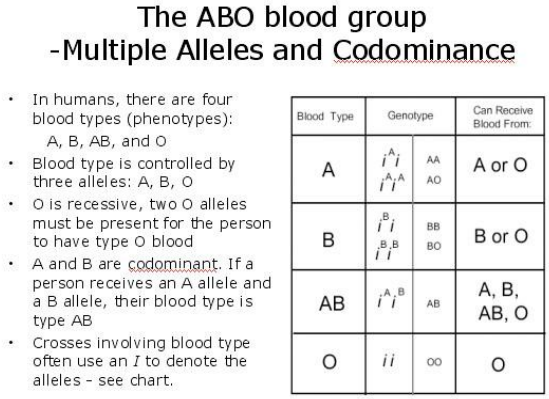
- Describe the difference of genotype and phenotype.
- Define the common ABO blood group and the special Hh blood group.
- List the genes involved in the blood group determination.
- Determine the genotype and blood type of the children knowing the blood types of their parents.
- Describe how some rare genes cause unusual blood types and how this is happening.

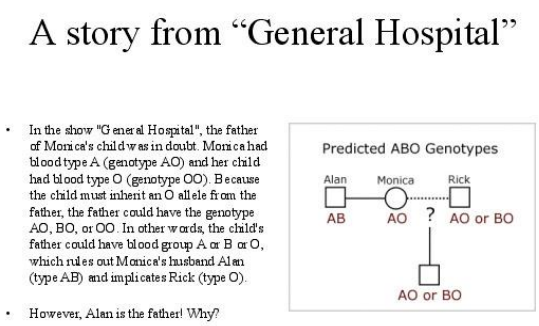
Opening Activity (to introduce the topic/concept)

1. Ask for a volunteer: Tell us his/her blood type.
2. Group discussion for about 2min. Write down your blood type and your parents'. Draw a pedigree tree for it. Figure out their genotypes if possible.
3. After the group discussion, ask for an example from the students. Then give my own example.

Task/Method (the means by which you will teach the concept)

1. Mainly PowerPoint slides. Featuring tables and pictures to visualize the concepts. Two example PowerPoint slides are shown below:





2. Before talking about a blood group, talk about a brief history about how it was discovered.
3. List the possible blood types and explain in details about the underlying genetics.
4. Use a lot of real life examples, for example, a story from the TV show "General Hospital"
5. Answer questions from the student discussion.

Examples

1. History of the Hh blood group.
2. A story from the TV show "General Hospital", and the genetics behind it:
3. Answer questions from the students if they are not covered in the lecture. For example, one student asked me what a blood type "A+" means. I explained to them that "+" means another blood group called "Rh blood group" that is not covered in the lecture. Tell them that there are a lot of blood groups and we are only covering two of them in this lecture.

Assessment/ Checking for understanding

1. Fill out two charts: Top chart is to fill out the possible ABO blood types of the child when the blood types of the mother and father are known. Bottom chart is to fill out the possible ABO blood types of the father if the blood types of the mother and the child are known.
2. Write down the genotypes of all the people involved in the story from "General Hospital".
3. Show the students two real questions from the preliminary questions of the Genetics graduate students exam. Let the students think about the answers. Ask the students if they believe they could answer the questions. (Note: These questions are very difficult genetics prelim questions; but the students said they felt that they were very easy after my lesson. This activity can help the students to feel very interested to see real prelim questions and feel confident.

Peer Review of the ABO Blood Group Lesson Plan: Comments from Peer Review

Successes (Effective strategies – content, delivery, visuals):

1. Good example of Bombay blood type.
2. Could add in more pictures to keep people engaged.
3. Would be interesting to know the rates of each blood type in different populations.
4. Very understandable speech.
5. Good humor.
6. Very nice job, you kept my interest and did a nice job explaining a fairly complex issue. I really liked your "real world" examples.
7. I liked the diagram of the ABO blood system.
8. Good idea to have students discuss possible parental blood types in groups. Fun activity☺
9. General Hospital example was good way of bringing knowledge together about the two different blood type systems.
10. Know how to use the available technology.
11. With upper level class – exposure to graduate questions is nice.
12. Did a nice job explain the Rh stuff that came up in discussion.
13. Good activity to engage us.
14. Nice you told us what was important.
15. LOVE the "General Hospital" example! (Nice relating to popular issues.)
16. The activity got us to think and compare notes.
17. The discussion got us to understand the difference between genotype and phenotype.

18. Starting with history is a good idea
19. Nice cues to students, “you don’t need to remember this”
20. Excellent visuals!
21. Great activity (May need more than 2 min.)
22. I LOVE your soap opera activity! This does a good job of making your point!

Opportunities (Suggested Improvement – content, delivery, visuals):

1. Sometimes it’s good not to put all information for a slide at once – add some as you talk.
2. Too much test on “History” slide – just explain this story without the text.
3. Speech – a little fast sometimes.
4. Lots of information – maybe don’t include the extra information.
5. Think of the Bombay example & General Hospital examples as stories you can tell – don’t need so much information on slide – just main points.
6. You had some tables that you didn’t talk about on entire column. You might just want to get rid of those columns to emphasize the important parts.
7. You can read text from your own notes, but try to avoid reading full text slides.
8. Could warm students ahead of time to bring their parents’ blood types.
9. Tell students how you will plan to use these prelim/assessment questions.

Reflection 2: Effective Teaching with Technology and Delta Internship

Effective Teaching with Technology was the second Delta course that I took in Fall 2007. As a graduate student with very limited technology knowledge, I hoped to learn a lot of new technologies that I can implement in teaching. And I wasn’t disappointed. Through this course I learned about eTEACH, Web 2.0, Clickers, podcast, wiki, and many more. Using what I learned from this course, with help from Alan Wolf, I developed a web-based tutorial for Human Genetics 565, the course that I was TAing at that semester. This project evolved into my formal Delta Internship project later.

Through this course, we had a hand-on experience on how vision, mobility and cognition can greatly influence the learning experience of the students. A guest speaker, a blind student was invited to showcase how he used a speech output system to read aloud text presented on the screen. I was deeply impressed how normal website design that is so easy for us could be a real challenge for some students with special needs. Now I am fully aware of the importance of using "universal design" principles to make a user-friendly website for every students. I will keep them in mind when I design other course websites in the future.

Based on this course, I developed a web-based tutorial for teaching population genetics. This tutorial is a combination of text, pictures and video -based learning tool, within a course management system, such as Learn @UW. My reason for focusing on this tutorial is that many students find population human genetics to be a difficult topic by itself, but once the students engage, they will find it is a very interesting topic. The UW Genetics department has a long history of great population genetics research and my goal was to increase student interest and confidence to choose population genetics as a future research area of interest.

I implemented the web-based tutorial for 57 undergraduate students in a Human Genetics course. The majority of the students were senior undergraduate students who choose Genetics as their major. There were also a few graduate students in the class who are interested in human genetics and population genetics. Overall the students found the tutorial a helpful addition to the lectures in the course. They found it very easy to use the tutorial within the Learn@UW system. Many students felt that the tutorial was very interesting and that it helped them understand the concepts. They suggested that the tutorial could be improved with more guided hands-on explanation of the questions.

Notably, an important concept that I learned through the development of this tutorial and through my Delta internship is awareness of learning through diversity. With a relatively large class size, there are variety of students with different needs, who might use a variety of ways to access the Web. For example, a student with visual impairment may use a speech output system that reads aloud text presented on the screen. A student with mobility impairment may be unable to use a mouse and may rely on the keyboard for web browsing. To design a website that is accessible to a variety of students, I applied "universal design" principles to make a user-friendly website, a website that is simple, consistent, well-organized and easy-to-read for every student. Here are some of the principles that I used in the web-based design. Overall these take some efforts to implement, but significantly help students with a variety of needs. I will keep them in mind when I design other course websites in the future.

1. Avoid fancy pictures or colors that are simply for decorative purpose.
2. Keep backgrounds simple while make sure there is enough contrast.
3. Whenever use color to convey information, also use an alternative indicator such as an asterisk (*).
4. Make sure that the user has control over the timing of content changes of the website. (This should be very easy to achieve.)
5. Put my contact information on the website if users have trouble accessing content within the site.

Artifact 2: A Web-based Tutorial for Human Genetics

Introduction

Human Genetics 565 is composed of two parts: human molecular genetics and population genetics. Population Genetics involves a lot of mathematics models that students often have trouble learning. One example is the Hardy-Weinberg Principle that students often have trouble understanding. My Delta Internship project was to develop a web-based tutorial to help students learn the Hardy-Weinberg Principle. I designed this tutorial for undergraduate students enrolled in Human Genetics 565.

Learning Objectives

After completing the web-based tutorial students should be able to do the following:

1. Calculate gene frequencies and genotype frequencies using Hardy-Weinberg rule.
2. Calculate gene frequencies and genotype frequencies when taking account of inbreeding.
3. Calculate gene frequencies and genotype frequencies when dealing with natural selection.
4. Calculate gene frequencies and genotype frequencies when dealing with mutation.

Contents

The web-based tutorial is a combined text, pictures and video-based learning tool. Flash animation is used to convey key concepts in an easily understandable way. Online pre-test and post-test help to assess student learning and evaluate the effectiveness of the tutorial itself.

Originally I planned to use Google Page Creator to make the web-based tutorial. (https://www.google.com/accounts/ServiceLogin?service=pages&continue=http%3A%2F%2Fpages.google.com%2F&ltmpl=yessignups)

Google Page Creator is a simple tool for creating preformatted webpages. No technical knowledge is required, and no external hosting is required. But, the functions are also very limited! After a few trials I found that this Creator lacked a few key features that I wanted, so I switched to Learn@UW, which contained all the functions that I needed. Learn@UW has a variety of functions that the instructors need for their courses, such as chat, class list, discussions, drop box, grades, links, quizzes, surveys, etc. The full list of tools available is shown in the "Tools" menu. A screenshot of the tools list is shown in Fig.1.

I included several components in this tutorial, which I will discuss in details below. A screenshot of the homepage of the tutorial is shown in Fig. 2.

In Figure 3, I show the animation I included for a detailed conceptual explanation of Hardy-Weinberg equilibrium. This animation explains Hardy-Weinberg equilibrium very well in 5 different conditions.

1. Nonrandom mating
2. Migration
3. Genetic drift

4. Mutation
5. Natural selection
http://zoology.okstate.edu/zoo_lrc/biol1114/tutorials/Flash/life4e_15-6-OSU.swf

I set up online pre-test and post-test using the Quiz function at Learn@UW, which can be used to assess student learning and evaluate the effectiveness of the technology. I have included the questions I developed for the online quiz (page 11). Learn@UW also has a nice "Grader" function, so that the instructor can input grades of all the students for all the exams. The TAs have been using this function for both mid-term and final exams. The website also has a place for students to input they comments. I told the students that if they had any questions or needed help with the tutorial, they could tell me through the comments function, or send me emails directly.

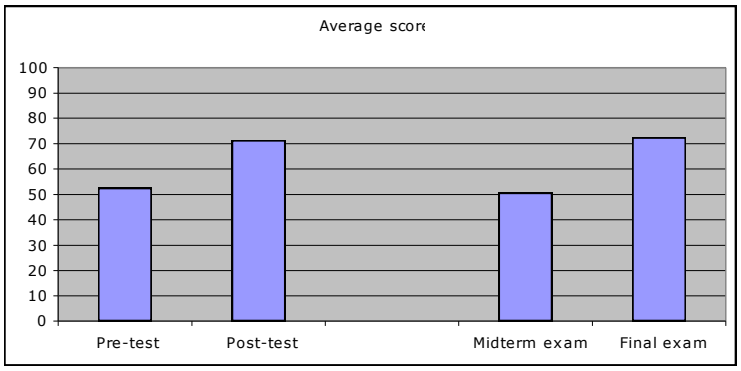
Finally, I gave a link of a funny rap about Hardy-Weinberg theorem (Fig. 4). It is cool, and it conveys all the important conditions of Hardy-Weinberg equilibrium precisely and completely.
http://hk.youtube.com/watch?v=Ifrawtxptlg

Results

Overall, many students felt that the tutorial was very interesting. They said the animation and video were very cool, and the tutorial helped them understand the concepts. However, the students also asked for more guided hands-on explanation of the questions. One drawback of the Learn@UW system, which the students complained about, is that it became very slow and gave errors as usage increased during last week of the semester.

The online pre-test and post-test did not work as well as I expected. Students complained that they felt lost what to do next. Or they knew what to do next, but do not know how to get to that part. If I were to implement this again, I would probably give the students handout of the pre-test and post-test at two different dates, which is much simpler to follow for the students. Nonetheless I got several students who successfully finished the whole process. The average score for the pre-test is 52.5; while the average score for the post-test is 71.3, which is a big increase, although the sample size is small.

We found that among the 55 students that completed this course, the average score for final exam (72.4, with tutorial) was significantly higher than the midterm exam (50.6, no tutorial). Notably the tutorial was used for the second half of the course, which includes final exam. The midterm exam following the first part did not have any web-based tutorial. Of course this increase in score could be due to many other factors such as the overall difficulty of the exam and the topics covered, but comments from many of the students indicate that they felt more confident with the material taught during the second half of the course, even though overall the materials covered in the second half were actually very hard.



Conclusion

In summary, the web-based tutorial uses a variety of functions available in Learn@UW. Overall the students found the web-based tutorial a helpful addition to the lectures of the course. They found the tutorials very easy to use within the familiar Learn@UW system. However, the quiz function was a bit too complicated for the students. Although the sample size is small, students did demonstrate better performance after using the tutorial. The results show that the web-based tutorial is an effective way to help students understand the course maternal; yet it has big room for improvements in the future.

Fig. 1. Screen Shot of the Learn@UW Tools Available to Students

Tool	Display Name
Articles	*Articles*
Chat	*Chat*
Checklist	*Checklist*
Classlist	*Classlist*
Content	*Content*
Discussions	*Discussion*
Dropbox	*Dropbox*
Email	*Email*
FAQ	*FAQ*
Glossary	*Glossary*
Grades	*Grades*

Fig. 2 Screen Shot of the Website Course Contents

Course Content

. Patterns of Inheritance
    1. ppt
. Chromosome Structure and Function
. The Human Genome
. Hardy-Weinberg tutorial
    1. A Primer of Population Genetics
    2. Hardy-Weinberg Animation
    3. Answers to quiz questions
    4. Add your comments here

Fig.3 Animation for a detailed conceptual explanation of Hardy-Weinberg equilibrium
http://zoology.okstate.edu/zoo_lrc/biol1114/tutorials/Flash/life4e_15-6-OSU.swf
A. Hardy-Weinberg equilibrium
B. Nonrandom mating
C. Migration
D. Genetic drift
E. Mutation
F. Natural selection

Screenshot for (A. Hardy-Weinberg equilibrium) is shown here.

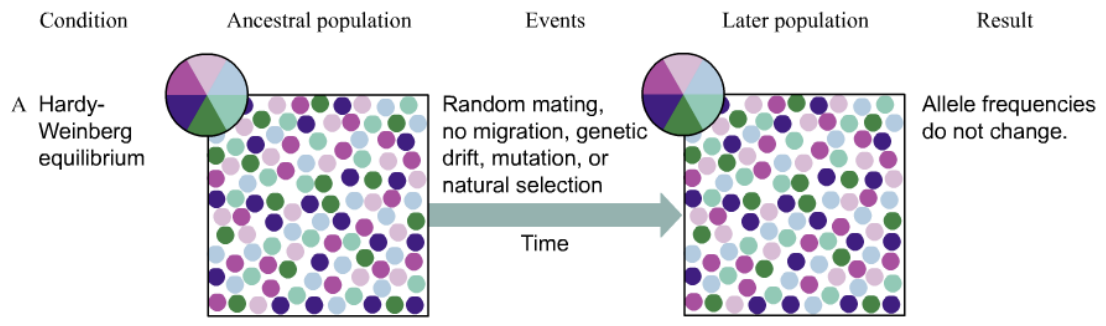


Fig. 4 Just for fun: Funny rap about Hardy-Weinberg theorem
http://hk.youtube.com/watch?v=Ifrawtxptlg

Quiz

Questions 1-2 refer to the following population:

Genotype	*AA*	*Aa*	*aa*
Sample	50	34	16

1. What is the frequency of the *A* allele?

2. Use a χ^2 test to evaluate the fit to Hardy-Weinberg proportions. Your answer should be the resulting p-value.

3. A recessive allele is found to cause an increased resistance to the hepatitis C virus. If its gene frequency is 0.017, how many individuals with the resistance phenotype would you expect to find in Madison (population 202,612)?

Questions 4-7 refer to the following data in which a sample from a human population was tested for A-B-O blood group system. Assume the population is in Hardy-Weinberg equilibrium. Some of the data are missing.

Allele Frequencies	Phenotype Frequencies		Genotype Frequencies	
A	A		AA	
B	B		AO	0.160
O	O	0.028	BB	
	AB		BO	
			AB	
			OO	

4. What is the frequency of the O allele?

5. What is the frequency of the A allele?

6. What is the frequency of the AB genotype?

7. What is the frequency of the B *phenotype*?

8. In the year 2000, Wisconsin had a population of 5,363,675. There were 23,004 men and boys with an X-linked recessive condition. How many women and girls had this condition? (Assume Hardy-Weinberg proportions.)

Reflection 3: Expeditions in Learning and Disability Resources

Expeditions in Learning is a discussion group focused on explorations of our diverse campus learning environment, in order to discover new ways to connect these experiences to advance our own teaching practice. I enjoyed the group discussions. All group members were very active and open to sharing their experiences and insights. We had four interesting expeditions in total:

1. Community spaces
2. Our diverse community
3. Undergraduate Experiences
4. Teaching as research

Among these expeditions I will focus on my visit to the McBurney Disability Resource Center, as my expedition to our diverse community.

My interest to visit McBurney center stemmed from one class from the Effective Teaching with Technology course. A guest speaker gave us hand-on experiences on how vision, mobility and cognitive can greatly influence the learning experience of the students. A blind student was invited to showcase how he used a speech output system to read aloud text presented on the screen. I was deeply impressed how normal website design that is so easy for us could be a real challenge for some students with special needs. Later in the Delta Internship seminar, Don Gillian-Daniel showed us a sample McBurney center visa for students with special needs, which got me really interested in the McBurney center in campus.

McBurney center is located in 1305 Linden Drive. (http://www.mcburney.wisc.edu/). New students with accessibility needs will go to the center and submit their application for a McBurney visa. A specialist interviews them and decides on the approval of a visa. Once the student gets a visa, it gives them access to the special services and accommodations that he/she needs on campus. Some of the most common services are: double time; document conversion, audio exam, preferential seating, etc. The categories of the disabilities are:

1. Learning Disabilities (LD), Attention Deficit Disorder (ADD), Traumatic Brain Injury (TBI), Dyslexia
2. Physical, Mobility, Chronic Health (ex: Rheumatism, Epilepsy, and Multiple Sclerosis)
3. Depression, Anxiety, OCD, Bipolar
4. Deaf, Hard of Hearing
5. Visual Disabilities, Adaptive Tech. Questions

McBurney Center strives to provide help and support to students with special needs. Document conversion volunteers assist with the Document Conversion Program to provide audio, electronic or Braille versions of textbooks to students with visual and learning disabilities. DoIt also have staffs to assist instructors to develop accessible websites to students with special needs.

Here I attached a sample syllabus with accessibility statement to demonstrate my awareness of

students with special needs. The accessibility statement is at the end of the syllabus.

Artifact 3: Syllabus with accessibility statement

Objective of the Course: Learn to read and present primary literature.

Instructors: Phone: email:

Teacher Assistants: Phone: email:
For questions regarding the material and presentation, students are encouraged to contact the Instructor. Questions regarding grading of Homework Assignments should be directed to the Teacher Assistant.

Class: **Tuesday and Thursday** **** Genetics/Biotechnology Center

Tuesday Lecture: Background information on the week's topic. There is no textbook for the course.

Thursday: Each student will be part of a 2 or 3-person team who will plan, organize and deliver a presentation on one of three assigned papers. The presentations should be about 20 minutes long, leaving 5 minutes for questions and discussions. There will be three presentations per week. All students are required to read all papers that will be discussed prior to class.

Office Hours: by appointment, with the specific instructor who lectured on the topic that you have questions on.

Class Website at Learn@UW.
The Website contains PDF copies of all of the required readings, the optional articles, the background review articles, the homework questions, and answer keys. PowerPoint presentations for the Tuesday lectures, when available, will also be posted as PDF files. Please make sure that you can access the Website and that you can open and read the PDF files.

Grading: Midterm Exam 25%, Final Exam 25%, Presentation 15%, Homework assignments 25%, Class Participation 10%

Exams: There will be two exams, a midterm, and a final, both in-class. One week before each exam, 1-3 research papers will be handed out. These papers will be based on topics that have been covered in class. For the exam, bring these papers and relevant papers that have been assigned in class (the exams will be *open book*). The exam questions will be a mixed format of questions based on these papers and questions based on overall concepts covered in lectures, presentations and homework assignments.

Makeup exams for conflicts will be available. If you have a conflict, please notify us as soon

as possible (except in case of emergencies, 3 week minimum notice is required)

Presentations: Please note that each person in a group should share an approximately equal part of the presentation, especially interpretation of the Results section of a given paper. Other parts of the paper (Background / Introduction and Discussion / Conclusions) can be distributed as determined by your team.

Homework Assignments: Homework will be given on Thursdays on the assigned weeks (see Syllabus) and will be based on the readings/lecture/presentation material of the week. Homework is due on the following Tuesdays, and will be graded. Succinct answers are encouraged: all answers to each week's homework should fit on 1-page sheet of paper unless specified in the particular assignment. Answer keys will be posted on the web after homework assignments have been handed in.

Class participation: will be determined by your own questions or comments, raised during presentations, as well as in-class assignments. Please help us keep track of this: if you have asked a question during a presentation, at the end of class, please give us a note with your name and the question that you have asked.

Disability Services: Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs. Please also contact the McBurney Disability Resource Center to coordinate reasonable accommodations for your documented disabilities. McBurney center online: http://www.mcburney.wisc.edu/.

Reflection 4: Admission and PrelimA exam committee of the Genetics Program

Admission committee of the Genetics Program

In spring 2005, I served in the admission committee to recruit new graduate students for the Genetics program. As a graduate student representative in the committee, this experience let me be more familiar with the recruiting process for graduate students. I learned important features such as: how to read recommendation letters; how to tell the potentials of an applicant; and how to attract good students to join a program. Although this is not directly related to my teaching experiences, I include it in my portfolio because it taught me how to better train undergraduate students so that they can get into a good graduate school program.

The recruiting process of the Genetics program is as follows: Committee members evaluate the application materials and mark their scores for each applicant on the score sheet. The graduate admission staff summarizes and sorts the scores and provides summary score prints for the meeting as a discussion and decision tool. At the meeting, the admission committee members discuss and decide the list of applicants for interviewing. Each applicant interviews with 5 faculty members they choose. After the interview, the faculty members give feedback on their impression of the students, which includes overall ranking, research experience, maturity, motivation/energy, and comments. During the interview week, the department also host "lab tour" and faculty dinner and other fun activities to attract the students. Current graduate students also interact with the prospective students and give feedback to the admission committee. After getting all the feedback from the faculty and graduate students, the admission committee members discuss again and decide the final list of applicants that will receive the offers. The qualities that the program is looking for from an applicant include: enthusiastic; mature; motivated; interactive; able to communicate peer-to-peer; interested in the program here; asked good questions in interview; research experiences; good understanding of their own research projects; etc.

Due to funding issue, top international applicants are sorted into A-list and B-list. A-list students get offer from the program and will rotate through the labs. B-list students are very strong students (but not the strongest) who will be made available to faculty for direct admittance into their labs. I worked hard with other faculty committee members to select best international students.

PrelimA exam committee of the Genetics Program

As a requirement for the UW Graduate Genetics program, all Genetics graduate students need to take a written exam called Preliminary Exam A (PrelimA). PrelimA is a written take-home examination with relatively open-ended questions covering the breadth of modern genetics. Every year the PrelimA questions are selected from a pool of questions submitted by faculty members and senior graduate students. The Prelim A Examination Committee is a standing committee of six faculty and two graduate students of advanced standing. It is the responsibility of this committee to produce the Preliminary A Examination each year.

I served in the PrelimA committee in summer 2007. In 2004 I took the PrelimA exam myself,

and passed the exam with honors. In 2005 and 2007, I helped my PI to grade the prelim questions he submitted. When I served in the PrelimA committee, I submitted two prelim questions that I designed by myself (see artifact #4). The first question was selected as an official prelim question that year. The other question was not selected as it covered the same topic as a prelim question in 2006.

By serving on the PrelimA committee, I learned how to design an effective open-ended question, and how to write a question in a clear and concise way. Grading the exam questions also taught me how to read students' answers and make constructive comments.

Artifact 4: Prelim Exam Questions and Answers

1. CSI: A SPECIAL CASE

Dr. Gil Grissom's crime lab recently took over with a new murder case. Tom, the victim, was found to be murdered in a parking lot. Tim, the suspect, was caught right on the crime scene. Greg Sanders found some blood and saliva samples on the scene and took them to the lab immediately for analysis. The lab found two saliva types: A type and O type; and one blood type, A type. The criminal carefully removed all his blood and fingerprint from the crime scene. It turned out that the victim Tom has A blood type and A saliva type. And the suspect Tim has B blood type. With some other evidence it is confirmed that there was only one criminal, and the O type saliva belongs to the criminal. Tim's lawyer claimed, "Tim has B blood type. Since saliva type and blood type are usually the same, Tim is innocent and we request an immediate release." The crime lab took a second blood sample from Tim and confirmed that his blood is indeed B type. Although it seems that Tim is not the criminal, Sara Sidle insists that she feels that Tim is the criminal simply with her sixth sense. Although Dr. Gil Grissom cannot find any additional evidence right now to support that, he agreed to do some further investigation. But with the pressure from the suspect, Capt. Jim Brass asked Gil's teem to release the suspect immediately. Gil and Jim argued hard about it. Finally, Jim agreed to keep the suspect for one more night. Is Tim the murderer? Explain how the complex genetics of blood and saliva types impacts this case. If you are a member of the crime lab, what can you do to determine, with certainty, whether Tim is the criminal? (Hint: consult the attached book chapter on blood groups; also online at http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=rbcantigen.chapter.ch06Hh.)

Reference:

Dean, L. *Blood Groups and Red Cell Antigens. Bethesda, National Library of Medicine, 2005*.

Answers:

Tim has a special saliva type so that his saliva type and blood type are not the same. He has B blood type and O saliva type. He is the murderer! This is due to the difference of the saliva type system and the blood type system:

Blood type: H(h)——>I^A,I^B,i

Saliva type: Se(se) ——>H(h)——>I^A,I^B,i

Normal people will have the Se allele and the H allele. So as long as he/she has I^A or I^B allele, his/her blood type and saliva type will have both A or B antigen. That is why normal people will have the same saliva type and blood type.

When one person has the h allele, no matter what I^A,I^B, i he/she has, the blood type and the saliva type will be O type. This is called Bombay type.

When one person has the se allele, no matter what I^A,I^B, i he/she has, the saliva type will be O type. But the blood type is still normal A/B/O type because the Se/se gene only controls the saliva type but not the blood type. In this case, the blood type and the saliva type are not the same. This is why the murderer Tim has O saliva type but B blood type.

In order to get more evidence to confirm that Tim is the murderer, the crime lab can simply take some saliva from Tim to check whether it is O type.

In order to determine the criminal with certainty, it is necessary to do DNA typing. DNA typing is used in forensic science, to match suspects to samples of blood, hair, saliva or semen. In the United States, there are 13 loci (DNA locations) that are currently used for discrimination. But in old days without DNA typing, the blood type and the saliva type were truly very important evidence.

2. IS MENDEL'S LAW WRONG?

A fundamental tenet of classical mendelian genetics is that allelic information is stably inherited from one generation to the next, resulting in predictable segregation patterns of differing alleles. Although several exceptions to this principle are known, all represent specialized cases that are mechanistically restricted to either a limited set of specific genes (for example mating type conversion in yeast) or specific types of alleles (for example alleles containing transposons or repeated sequences).

Recently one research group found an interesting mutant from their forward genetics screen in plants. The mutated gene is nothing special but a recessive housekeeping gene. What made this gene special was the interesting finding that mutants that are homozygous for the recessive mutant alleles can inherit allele-specific DNA sequence information that was not present in the chromosomal genome of their parents but was present in previous generations. These unusual offsprings are called "revertants". The observed frequency of the revertants is about 10% revertants per chromosome per generation. This is demonstrated in the picture below. With some careful experiments the authors ruled out several trivial possibilities: the reversion is not due simply to a drastic increase in mutation rate, and it could not have been caused by gene conversion, where a related gene from elsewhere in the genome is used as a template.

This finding definitely shakes the fundament of mendelian genetics and attracts wide attention in the genetics community. Please propose a model to explain this phenomenon. (A concise model that explains everything can get full credit. If you are not confident with your model, go ahead to propose more than one model. As long as one of them is correct you can get full credit.)

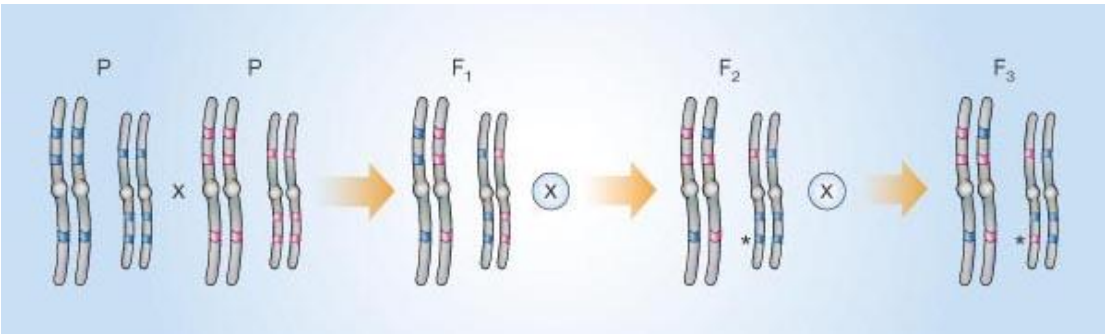


Fig. Two parents (P) with different DNA sequence variants at several positions (color-coded) in the genome are crossed. In subsequent generations (F1 and F2), plants are allowed to self-fertilize (indicated by a circled cross). In the F3 generation, there is reversion (asterisk) to a sequence originally present in the grandparent, but not in the immediate parent. This has been observed for several sites at surprisingly high frequency in the mutant.

Reference:

1. Lolle, S. J., Victor, J. L., Young, J. M. and Pruitt, R. E. (2005). Genome-Wide Non-Mendelian Inheritance of Extra-Genomic Information in Arabidopsis. *Nature* 434, 505-509.

2. Weigel, D. and Jurgens, G. (2005). Genetics: Hotheaded Healer. *Nature* 434, 443.

Reflection 5: TA experiences

Over the past years, I have worked as a teaching assistant for 3 courses in the Genetics department:

Teaching Assistant for Genetics 466 (General Genetics)	Fall 2003
Teaching Assistant for Genetics 566 (Human Genetics)	Spring 2007
Teaching Assistant for Genetics 565 (Advanced Genetics)	Fall 2007

Serving as a Genetics 466 TA is a departmental requirement for all the graduate students in the program. I subsequently worked as a teaching assistant for Genetics 566, a course for which my PI was an instructor. I then participated in the Delta program and I volunteered to TA Geentics565 as an opportunity to implement my internship project.

Working in Genetics 466 was my first TA experience. At that time I knew literally nothing about how to be a good TA. The weekly duties included: attending 3 classes, leading one discussion session; and having one office hour per week. I was also responsible for monitoring and grading the exams. In addition, I offered review sessions before each exam.

In order to train TAs for this class, the department holds a TA training session before the semester begins. Past TAs shared their experiences and answer questions. Even with this training, I was lacked knowledge about how to teach effectively. My experience in the Delta courses highlighted for me how naïve I originally was when as a new TA, although I was truly very enthusiastic about being a good TA.

Surprisingly, when I looked back, I found that actually I was using some effective approaches although I didn't really know the "theories" behind them. For example, I emailed all the students in my discussion session for comments and suggestions in the middle of the semester, which I now know is a form of informal mid-semester assessment. Below are the questions I asked my students:

"...And I also would like to receive some comments on my discussion section. Would you please tell me your feeling of my discussion section? I would like to know what you prefer to hear in the discussion, more review stuff for the lecture, or more explanations on the assigned problems? And are my explanations on the problems clear enough? Should I speed up a little bit, or slow down? And are those handouts useful? Should I leave some free time for you to ask questions, about problems, lectures, or exams? You may have other comments that I haven't thought about at all. Your feedbacks are highly appreciated! I look forward to hear from you. Thanks a lot!"

Quite a few students responded to my email with good suggestions. I emailed each of them back about my plans for future improvements. Sample emails between students and I about this survey are attached as an artifact.

I also believe that a good TA should be able to communicate with students effectively, and

understand their needs. I am always willing to answer questions from my students, in office hour, review sessions or by emails. Sample emails for answering questions are attached. But sometimes I also need to find an effective way to communicate with students, especially when they asked for answers for too many questions. An example of this is shown in my communication with student MS in the attachment.

After the end of the semester, students took surveys for TA Evaluation. The overall rank about my performance as TA is good. The TA evaluation result is attached.

I believe that fairness is also very important as a TA or instructor. The instructor should come up with a guideline for handling late homework, request for changing exam dates, etc. One good way of doing this is to address these issues in the course syllabus. In my TA experiences, I have encountered students with multiple late assignments. Also students may request to change exam dates due to various reasons. One instructor's rule is "I do not change exam dates except for medical reasons. No exceptions." I attached a case about this. Sometimes we also see students cheating on exams. I encountered one case in my TA experiences. Two students looked at each other's answer at the exam, which is caught by another TA. The instructor talked to the students and they dropped the course. They actually got very high scores for the exam, but this result is fair to all the other students in the class.

We also need to help students with special needs. Students with a McBurney visa, or temporally disabled, will get extra accommodations according to their needs. For instance, a couple of students with ADD got extra time for exams. A student who broke his arm also got extra time for exams. We also ask the students to talk to us in person about their special needs at the beginning of the semester.

Artifact 5: TA Evaluations and Email Exchanges with Students

Genetics 466 Fall 2003

TA Evaluation 16# surveyed

1=strongly disagree; 2=disagree; 3=neutral; 4=agree; 5=strongly agree

(1) Content of presentation was important & relevant.

N/A	1	2	3	4	5	AVERAGE
0	0	2	4	4	6	3.875

(2) Content of presentation did not repeat materials covered in other courses.

N/A	1	2	3	4	5	AVERAGE
0	0	3	7	2	4	3.4375

(3) Instructor/TA was prepared.

N/A	1	2	3	4	5	AVERAGE
0	0	0	2	6	8	4.375

(4) Instructor/TA was organized.

N/A	1	2	3	4	5	AVERAGE
0	0	0	5	4	7	4.125

(5) Instructor/TA was enthusiastic and interested.

N/A	1	2	3	4	5	AVERAGE
0	0	2	2	5	7	4.0625

(6) Instructor/TA was effective in presentation.

N/A	1	2	3	4	5	AVERAGE
0	2	3	2	7	2	3.25

(7) Instructor/TA was available for consultation.

N/A	1	2	3	4	5	AVERAGE
1	0	0	1	7	7	4.4

(8) Instructor/TA was helpful in consultation.

N/A	1	2	3	4	5	AVERAGE
1	0	1	2	7	5	4.06666667

(9) Instructor/TA made effective use of audiovisuals and/or handouts.

N/A	1	2	3	4	5	AVERAGE
0	1	2	7	4	2	3.25

(10) How would you grade the TA?

NA	A	AB	B	BC	C	D	F	GPA
0	3	5	4	1	2	1	0	3.0625

Comments:

1. Very prepared.
2. Loved how she outlined the chapters and did appropriate numbered textbook problems.
3. I learned some of this stuff in biochemistry 501 and Zoo 151/2
4. You need to focus more on the problems since the tests are almost all problems.

Sample email communications for mid-semester survey

Me: This is a test to see whether this email list works for all of you. And I also would like to receive some comments on my discussion section. Would you please tell me your feeling of my discussion section? I would like to know what you prefer to hear in the discussion, more review stuff for the lecture, or more explanations on the assigned problems? And are my explanations on the problems clear enough? Should I speed up a little bit, or slow down? And are those handouts useful? Should I leave some free time for you to ask questions, about problems, lectures, or exams? You may have other comments that I haven't thought about at all. Your feedbacks are highly appreciated! I look forward to hear from you. Thanks a lot!

Student: The email works! I come to discussion section every week, because it helps me understand lecture material. I think you do a good job of clarifying what Prof. Laughon or Prof. Engels is talking about. Sometimes we seem to run out of time for problems in discussion. A lot of times there is a lot of lecture material for you too cover, so it's ok, but I think during this probability and chromosome number sections we should do some problems since it looks likes the Practice Test is mostly problems. Maybe we could go over the practice test in discussion this week? I like that you explain what's going on in lecture and I think you do a great job of it with your charts and diagrams. But I think the best way to study for this upcoming exam is do Prof. Engels practice test and book problems. Maybe you could cover the main lecture points and then open up the class to questions since I'm sure there will be lots of them. Also the hand outs are very nice, and I think you teach at just the right speed. Great Job! See you Wednesday!

Me: Thank you for your nice suggestion. It is hard for me to decide whether I should focus on reviews or problems. Some students want me to do more review than problems. I guess it depends. This week I will do a mini review and then go to the additional problems on the handouts for the lecture. Then I will go to the problems on the book. I am sorry that I won't talk about the Practice Test this week since it is too early for most of the students to finish it. I should give them the chance to have the practice by themselves.

You are really a great student, well prepared for all the problems on time. I am always afraid that some of the students don't do the problems before my discussion, which makes my discussion less informative. But you are really good on it. And you are right: the practice test is very helpful. So I am thinking that I will probably give an additional review section sometime before the exam if more than 5 students want that, when I will talk about the practice test and other questions you guys may have for the exam. Otherwise I will talk about it on my discussion next Wednesday. And you are welcome to discuss with me about the practice test this Friday on my office hour if you think next Wednesday is too late.

Good luck for your exam! And let me know if you have any questions.

Sample emails to answer questions for students

Student: Hello, I'd like explanations for Genetics 466 homework questions (10.22 12.16 12.19 14.3(b) 14.35 & 36 18.6 18.16 18.22), please. Thank you.

Me: Let's figure those questions out at my office hour from12-2pm today at Genetics Room114. Is that ok? If you can't make it, I can write down those explanations tonight since it takes quite a long time. Good luck to your exam!

Me: Sorry I am still working on these explanations for you. But I just realized one thing - do you have the "Study Guide and Problems Workbook"? You can find short explanation for all the problems in the textbook. They are at the last part of that workbook. Please tell me whether you didn't know that and find it helpful now. If you still have questions after looking at those short explanations, please tell me again.

Me: Hope these are helpful.
10.22: The satellite DNA fragments would renature much more rapidly than the main-band DNA fragments. In D. virilus satellite DNAs, all three have repeating heptanucleotide-pair sequences. Thus essentially every 40 nucleotide-long(average) single-stranded fragment from one strand will have a sequence complementary(in part) with every single-stranded fragment from the complementary strand. Many of the nucleotide-pair sequences in main-band DNA will be unique sequences (present only once in the genome).

12.16: You just need to write down the whole mRNA sequence. If there is a promoter located upstream from this DNA segment, the nucleotide sequence of this portion of the RNA transcript will be 5'-UACGAUGACGAUAAGCGACAUAGC-3'. If there is no upstream promoter, this segment of DNA will not be transcribed.

12.19: You just need to count 30bp after the midpoint of the -30 TATA box. Assuming that there is a CAAT box located upstream from the TATA box shown in this segment of DNA, the nucleotide sequence of the transcript will be 5'-ACCCGACAUAGCUACGAUGACGAUA-3'.

14.3(b):attached-X method. You can refer to page 151 for details.

14.35: Yes. The template sequence for Gly(GGX) is CCX, which can be mutated by HNO2 to UCX, CUX and UUX. Then the mRNA product will be AGX, GAX and AAX. So the resulting amino acid is:
AGX: Ser or Arg (depending on X)
GAX: Asp or Glu (depending on X)
AAX: Asn or Lys (depending on X)

14.36: No. Nitrous acid deaminates G to xanthine, but xanthine still base-pairs with C. Thus G is not a target for mutagenesis by nitrous acid. So GGX cannot be mutated to other codons.

18.6: No. IS1 and IS2 are mobilized by different transposases.

18.16: M cytotype and P transposase. Please refer to page 449 for details.

18.22: No. The intron sequences would be removed by RNA processing prior to reverse transcription into DNA.
Is that clear? Feel free to email me if you still have questions!

Student: Yes, your explanations were clear. Thank you!

Reflection 6: Mentoring undergraduate students in the lab

As a graduate student, I have also been mentoring undergraduate students in the lab. These students have worked closely with me, learning the basics about bench work. Most of these student researchers do not have previous lab experiences. For such students, I found writing detailed lab protocols to be very helpful. One example of such detailed protocol is shown below.

As their direct supervisor and mentor, I found it important to teach young researchers not only the lab procedures, but also the theoretical background behind them. As a result, the students learn not only how to do lab work, but also how to be an active learner. Also it is important to teach them the ability to trouble-shoot when experiments do not work out as expected. The ultimate goal is to motivate undergraduate researchers to engage in research and perhaps consider a career as a scientist. This learning process is also very fruitful: one of my most talented undergraduate students earned authorship on a paper. A letter from her about my mentorship is in page 23.

Artifact 6: Detailed Protocol and Letter from Undergraduate Researcher

Mapping Protocol

PLEASE:

1. Keep everything sterile.
2. Always balance when using centrifuge.
3. When use the plastic cover for the PCR plate, make it tight to avoid evaporating.
4. Be careful not to transfer the wrong sample to the wrong well! If it happens, write that down.
5. Always put away stuff to the original places right away after you are done.

Day 1:

Tailclip. Use 96 well plates

1. In the lab, to each well, add 2.5ul proteinase K and 100ul extraction buffer.
   (Make master tubes. eg: for 96 fish, use 300ul PK+ 12mL gDNA buffer in the red tube. Thaw proteinase K before transferring 300ul. Use glass pipette to transfer 12ml gDNA buffer from the big gDNA buffer bottle on my bench. Mix and add 100ul to each well using multi-pipette.)
2. Take the 96 well plates and a plastic cover to the fish room. Clip tails and add directly to the plate. (Use 8*12 sheet to avoid mistakes.)
   (Make sure all the tails are in the solution instead of at the side. Cover the plate with plastic cover.)
3. Put in the PCR machine to incubate overnight. (Program: DNA)
   (DNA program: 55°C 15h, 94°C 10min, then 4°C)
   (Turn on the PCR machine->Start->select program DNA->enter)
   (To double check, you can see flashing words: Running DNA)

Day2:

1. Take the plate out. (Enter->exit->turn off the PCR machine.)
2. Transfer 20ul (avoid debris) to a new plate which contains 100ul MilliQ H2O in each well, mix well. (which makes a 1:6 dilution)
   (Mark the plate as following: hecate family# 1:6 diluted DNA J***-***, date)
3. Use 2.5ul diluted DNA for PCR.

Cover both original plate and 1:6 di plate and store at -20°C in my shelf.

(If needed for PCR again, centrifuge the plate at 1000rpm for 1min and change cover each time)

PCR:

Reaction Mix: (In the orange box of the small freezer, take the green Gobuffer and dNTP and thaw in RM. Mix by pippetting up and down before use. Take the colorless GoTaq enzyme in the blue freezer box. Take the 2 primers z59658 and z43564B from big -20°C in my shelf, box labeled as hecate SSLP primers. Thaw the primers before use.)

Recipe:

Green GoBuffer 2ul *228=456ul

dNTP	0.2ul	*228=45.6ul
GoTaq enzyme	0.05ul	*228=11.4ul
Primer	1ul	
Template(diluted DNA)	2.5ul	
Sterile MilliQ H2O	4.25ul	*228=969ul
Total	10ul	

This makes 1482ul mix#1 for 96 fish. Mix well.
Primer: use z59658 and z43564B. For each of them, use 108ul+702ul mix#1
Mix well. In order to use multi-pipette, transfer 100ul each to 8*strip tubes.
Add 7.5ul to each well using multi-pipette.
Add 2.5ul diluted DNA to each well using multi-pipette.
Use PCR program: MAPTESTJ

Letter from Undergraduate Researcher

To Whom It May Concern

Dear Sirs,
My name is Eva Dimitrova and in June of 2008 I began working in Pelegri's lab as an Undergraduate student where Xiaoyan Ge was assigned as my direct supervisor. Xiaoyan's style of work was very meticulous and helped me learn and understand not only the general lab procedures but also the theoretical background behind each one as well as the common mistakes and problems that may occur during variety of experiments. Her passion about the subject was motivating and provoked my curiosity, but what I found most valuable was that Xiaoyan was able to teach me how to think in an analytical type of way and how to logically develop each laboratory project. Working with her has been a pleasure and a privilege and will remain the dearest experience I have acquired as an Undergraduate student at UW Madison.

Yours Sincerely,
Eva Dimitrova
05/25/2009

Eva Dimitrova
UW Madison
Pelegri's Lab
dimitrova@wisc.edu

Acknowledgements

It is a pleasure to thank the many people who made this teaching and learning portfolio possible.

First and foremost, I would like to express my sincere gratitude to all the Delta faculty and staff, especially Chris Pfund, Don Gillian-Daniel, Tessa Lowinske Desmond, and Kristina Martinez, who guided and helped me in the pursuit of the Delta certificate in Research, Teaching and Learning. Andy Gardner did the initial peer review of my portfolio draft and made some nice suggestions. Chris Pfund spent tremendous time on reviewing and making comments on my portfolio. The final version of the portfolio has been greatly improved with her help and suggestions.

I also thank all the instructors for the Delta courses that I participated in. I am deeply grateful to Alan Wolf, who is the instructor for the Delta course Effective Teaching with Technology. Using what I learned from this course, particularly with a lot of help from Alan Wolf, I developed a web-based tutorial for Human Genetics 565. This project evolved into my formal internship project later.

I would like to thank the Genetics program for providing me opportunities to gain experience in teaching. I am thankful to get the opportunities to serve on the Admission Committee and Prelim A Committee of the Genetics Program.

I want to thank my advisor Francisco Pelegri for his continuous support of my Ph.D. studies and my participation in the Delta program.