

Undergraduate Research Course Redesign Project Narrative  
Chang Sung  
Assistant Professor  
Department of Biological and Health Sciences  
Texas A&M University-Kingsville

**Project Title**

Course Redesign for Biomedical Research Centered Learning Experience

**Project Summary**

My Undergraduate Genetics course (BIOL 3402) is one of the most challenging courses in the Department of Biological and Health Sciences. This is a required course and is offered during Fall, Spring and Summer II. The average student enrollment per regular semester for past 2 years is 71. This course mainly serves sophomore and junior students in biology, biomedical, pre-med, pre-pharmacy, pre-dental, physical education, animal science and wildlife programs. My ultimate objective for the course redesign is to increase students' research learning experience within the classroom and to help students prepare for further studies in graduate or professional school, or for careers in the biomedical research and teaching fields. Each student is supposed to develop a research proposal that focuses on the genetic technologies that are used in the modern biomedical laboratories. Each proposal is also peer-reviewed and revised based on the reviewers' comments.

**Methodology**

Each student develop a research proposal regarding the recombinant DNA technologies and tumor suppressor gene cloning strategies in a small group setting during the course's recitation sessions. Students choose their own research topics with the guidelines provided by the instructor. Each proposal is peer-reviewed, revised based on the reviewers' comments and submitted as a final research proposal for evaluation.

**Student-Learning Outcomes**

Students have the opportunity to master the modern concepts of biomedical genetics, including the regulatory mechanisms of gene expression, roles of tumor suppressor genes in carcinogenesis and new technologies used in biomedical research fields.

At the conclusion of this course with the redesign, students are able to:

- Describe the importance of the recombinant DNA technologies in biomedical studies
- Develop cloning strategies for gene delivery and protein purification
- Analyze genetic data from the research articles published in scientific journals

- Master the concepts of technologies including restriction enzyme digestion, polymerase chain reaction, recombinant DNA cloning, protein purification and immunoblotting that are frequently used in modern biomedical research
- Design their own experiment protocols for successful gene cloning, protein purification and functional analyses

### **Project Description**

Students have the opportunity to master the modern concepts of biomedical genetics, including the regulatory mechanisms of gene expression, roles of tumor suppressor genes in carcinogenesis and new technologies used in biomedical research fields. Students develop the research proposals that focus on the gene cloning strategies that can be employed in the modern molecular biology laboratories.

### **Assessment and Results**

Students worked on the research project for 10 weeks mainly focusing on the development of their own biomedical research protocols that target to clone a putative tumor suppressor and to purify the gene product for further functional assays. During the first few weeks, students formed a small group (2 – 3 students per group), investigated research articles published in scientific journals and selected their own research topics. Guidelines for good topic decisions were provided by the instructor. The course's recitation sessions were mainly used for student discussion and sharing ideas. Students then focused their investigation on the experimental approaches for the construction of a new vector system for the putative tumor suppressor gene cloning/protein purification and functional assays to determine its roles in tumorigenesis or pathogenesis. Based on their findings, students developed their research proposals, and the first drafts were evaluated by their classmates with the peer-review guidelines provided by the instructor. Their revised proposals including the responses to the reviewers' comments were submitted as the final reports, and their proposed research approaches and strategies were evaluated by the instructor. Each student also received plagiarism reports via Turnitin.

### **Continuation of Project**

I successfully implemented the redesign of my Genetics course in Fall 2016, adding research components to the course in order to enhance undergraduate students' interest in Genetics and recombinant DNA technologies. I continue to include this research component in the Genetics course.