Proposal for Quality Enhancement Plan Project
Cover Sheet

Biology
Department Name

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List of faculty and staff involved

We understand that the following project proposal elements must be included in all proposals considered by the UWF Quality Enhancement Steering Committee:

- Project Rationale
- Relationship to the University's QEP goals (see Appendix A) and the program's Academic Learning Compact (see Appendix B)
- Project student learning outcomes (see Appendix C for suggested format)
- Outcomes assessment procedures
- Instructional /learning strategy enhancements focusing on active learning/student engagement
- Project assessment plan (see Appendix D for suggested format)
- Information dissemination plan
- Institutionalization plan
- Resources needed (see Appendix E for suggested format)
- Timeline for project activities and events

We understand that the UWF Quality Enhancement Plan Steering Committee will recommend funding only if the project is consistent with the intent of the University's Quality Enhancement Plan. We further understand that all funds must be expended in accordance with the terms and conditions of approval.

Hui-Min Chung			
Print name of contact person	Signature	Date	Phone
George Stewart			
Department/Division Head	Signature	Date	Phone

(Signature signifies departmental endorsement of the project.)

Jane Halonen			
Dean/Vice President	Signature	Date	Phone

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Date and time application was received:

Signature:

University of West Florida Quality Enhancement Plan

Project Title: Integration of a discovery-based project into a Biology course

Contact Person: Hui-Min Chung

Project Rationale and description

Rationale

This proposal is to develop a discovery-based laboratory project that is integrated in the Genetics course of the Biology Department. It aims to enhance students' learning of modern genetics using computational biology, so that they can apply the concepts of modern genetics in understanding biology globally. In addition, we aim to develop students' skill in communicating their knowledge with the general public so that science education can be extended beyond the campus. To achieve these objectives, we apply four elements in formatting this project, with emphasis on the individual learning of specific knowledge (elements 1 and 2), as well as project management skills (elements 3 and 4), they are:

1) computational biology problems to acquire science knowledge and discipline problem-solving, and hypothesis-testing skills
2) written reports to sharpen critical thinking and communication skills
3) poster design and presentation to enhance verbal communication and project management skills
4) student participation in the evaluation process of poster presentation to enhance their criticism making ability.

We intend to use this pilot project to gather pivotal data for submission of NSF CCLI (Course Curriculum Laboratory Improvement Program) grant in May 2006 through joint efforts of 4 biology faculty members, Chung, Behan, Fox and Ryals.

Project description

The task of the project is for students to use certain human genetic information, which is in the form of a DNA sequence, to develop a proposal related to enhancing human health. This project requires students' familiarity with three basic techniques that they will learn during the course: genetic information data search (genomic data mining), science literature search, and the DNA amplification experimental technique called PCR.

Three to four students will work as a group to manage the project. Each group will be given an unknown human DNA sequence by the instructor and asked to resolve the nature of the unknown DNA sequence through genomic

data mining, and then to use the information, through science literature search and experimental PCR, to find out its significant biological property in humans and in the global animal kingdom. For example, after genomic data mining, the unknown human DNA is found to have originated from a gene called CF1 (what this gene is), which later produces a protein that is an important gate keeper of the cell (what this gene is for). If the gene is mutated, it may cause occurrence of a disease (cystic fibrosis). The CF1 gene not only exists in humans, it also has counterparts in other species (e.g., the insect the fruit fly). The student group can then use PCR experimentation and other molecular methods to prove the existence of the CF1 gene in the fruit fly. Lastly, each group will present a poster to explain their discovery, the significance of this particular gene to human health, and to propose what they intend to do with this knowledge (e.g.: proposing a survey on local community population as to how many suffer from the cystic fibrosis, or proposing a public presentation on how to do the genetic diagnosis of cystic fibrosis).

In summary, to achieve the project goals, each student needs to learn specific techniques during the course and develop his/her critical thinking ability to determine which literature to be used. He/she also needs to develop project management skills and work dynamically with his/her team members, so that the whole group can develop a proposal for what they intend to do with the information. The assessment of the project includes a report written by each student individually about his or her finding, and a poster designed and presented by the group. The instructors will grade the students' written report, and each student will evaluate the poster presentations outside his or her own group. The instructor will invite guest faculty members to the poster presentation exhibition to give comments and suggestions. An interactive web-site will follow the project from its inception to its conclusion, providing deadlines, suggestions, and feedback.

Relationship to QEP Goals and Program ALC Student Learning Outcomes

Several aspects of the project address important skills that extend beyond the immediate scientific goals of the genetics course, and are integral to the ALC Outcomes defined by the Biology Department (Content, Critical Thinking, Communication, Integrity/Values and Project Management). The project also aims to achieve some elements of the UWF QEP, specifically to improve student learning of knowledge, skills, and values relevant to Project Management, and to increase the use of active learning and student engagement instructional strategies.

1. *Developing analytical and computational skills and problem solving ability.* Students exercise their analytical skills and arrive at the correct interpretation in the context of control experiments, thus understanding the process by which scientists come to conclusions and illustrating the nature of scientific pursuit. The on-site computer power will create an

environment that will encourage student/teacher interactions, and allow demonstrations without limiting the discourse to high tech classrooms. (ALC: content and critical thinking.)

2. *Developing skills in rigorous scientific writing*. The required written research paper strengthens students' writing skills in general and introduces them to the rigors of scientific writing in particular. These reports are written individually by each student (not team-written), and can be revised to improve their grade. (ALC: content, critical thinking, communication.)
3. *Gaining valuable experience in group dynamics and project management*. Students work in small teams (3-4 students per team) for their poster presentation assignment and set goals and deadlines for implementation so they can effectively present the results of their project, thus developing the skills identified in the QEP to identify and adhere to steps in planning and implementation of a project and to adapt to and work with other team members of differing attitudes, skills, and backgrounds, and refining individual roles in a team effort. (ALC: project management, critical thinking.)
4. *Increasing student engagement in improving the future course design.* Students are in charge of grading the poster presentation, thus actively participating in evaluating poster presentations and providing comments to other fellow students. The overall evaluation and feedback will be utilized as data for improvement in future projects. This goal is consistent with the QEP in that students will evaluate the process and result of the project, and make recommendations for improvement. (ALC: communication, critical thinking.)
5. *Provide opportunities for faculty and staff development related to improving student learning (QEP goal).* Ultimately the instructor will use comments and suggestions from the poster presentation as data to gather a better sense of the class's potential and capabilities, and can develop a mechanism to address deficiencies in the Genetics course as well as the prerequisite classes. Information about the project, from design through final presentation will be displayed on a website affiliated with Biology department, providing a model for faculty members to integrate active learning and project management into course design. The project and the funding for the NSF grant workshop will be key in earning a CCLI NSF grant in 2006, with the result that several Biology classes will benefit.

Project student learning outcomes: The successful student will be able to:

Project Student Learning Outcomes	Relationship to QEP Goals	Relationship to Program Academic Compact
Utilize public access databases to identify the gene of which the DNA sequences originated. Perform data analysis to compare and contrast human and non-human DNA sequences with respect to similarities. Accurately perform analytical experiments to isolate and amplify a targeted gene sequence.	Increase the use of active learning and student engagement instructional strategies.	Content Critical Thinking Discipline specific skills
Develop one aspect related to the significance of the gene, such as bad gene causing genetic disease, and communicate it by writing a research report. Propose a future experiment or project to investigate the finding.	Develop a proposal for a project that uses information, skills, and/or methods of inquiry pertinent to the discipline. Effectively present the results of a successful project in the discipline using written means.	Content, Communication, Project Management
Design a poster presentation in concert with 2-3 other students that integrates several facets of the disease into a professional presentation, and discuss the poster with a student and guest faculty audience. Evaluate other students' projects and make suggestions for improvement in other projects and in the total project mechanism.	Identify, describe, and adhere to steps or phases in planning and implementation of a project. Adapt to and work with other team members of differing attitudes, skills, and backgrounds. Effectively present the results of a successful project in the discipline using appropriate visual and oral means. Develop and refine appropriate assessments, both direct and indirect.	Communication, Project Management, Critical Thinking

Outcomes assessment procedures and project assessment plan

The written report and poster presentation will be direct measurements of the project performance. The written report will have first, second and final drafts at specified times during the semester, so that students have the chance to improve their writing and their grade. Deadlines for submission of each draft will be strictly adhered to. First draft will be returned with instructor's comments for improvement. Second draft will be peer reviewed by two fellow students. The instructor will then grade the final lab report. Evaluation standards of all writing will be based on a rubric that will already be posted in the syllabus. For the poster preparation, each group will first submit the outline for comments and suggestions from the instructor at a given time before the actual presentation exhibition. Each poster will be evaluated by fellow students from other groups, using a rubric posted in the course syllabus. In addition to the instructor and students of the class, the poster exhibition will be available to invited guest faculty members. Students' and guest faculty opinions about the poster presentation will be an indirect measurement of the performance of each project and the overall exhibition.

Assessment Plan Summary

Project Student Learning Outcomes/Activities	**Assessment Plan**	**Assessment Measure(s) and adjustment**
Utilize public access database, perform data analysis, and accurately perform analytical experiments.	Determine whether students can utilize public access database, perform data analysis, and accurately perform experiments.	Direct measurement of success by correct answer to problem. Incorrect answers require remediation.
Develop one aspect related to the significance of the gene, such as bad gene causing genetic disease, and communicate it by writing a research report. Propose a future investigation of the gene or disease.	Determine if students have obtained the scientific knowledge related to the inquired gene, and were able to develop a related global knowledge.	First draft of the paper will be returned with comments for improvement. Second draft will be peer reviewed and returned. The final revisions will earn the grade. The instructor will also have indirect measurement will be based on how much a student has improved in revising his report.
Poster design and presentation	Determine whether students can integrate several facets of a disease provided by fellow students, and integrate that knowledge into a professional presentation. Assess the students' ability to objectively score other work using a rubric.	Direct measurement of the poster presentation will be based on the group grade composed of inputs from fellow students from other groups based on a rubric posted in the course syllabus. Indirect measurement will be based on the comments from instructors, fellow students and guest faculty member.

Instructional/learning strategy enhancements

Rationale for selected activities of the project

A project requiring an inquiry-discovery process serves as an excellent vehicle for active learning (1, 2). Starting with an unknown genetic information (inquiry), students will employ activities selected in this proposal to resolve the unknown (discovery), and to develop an integrated knowledge related to this information (discovery). The project is basically composed of three phases. The first phase is to collect data in order to solve the problem, the second phase is to select and digest the gathered information to develop an integrated knowledge, and third phase to use the existing knowledge to propose the next step in understanding or solving the problem. To monitor the student progress and assess the project, we use the formats of a written report and a poster presentation. The written report with revision allows students the opportunity to improve their writing and sharpen their critical thinking ability without too much worry of their grades during the process. One of the revisions (the second draft) takes the means of peer review since we expect that students will learn even more about detailed writing by taking the different perspective of an audience member. The students will also quickly step into the process of how to being a critic. This peer approach is not new to us as researchers, but is new to us as instructors; it has been successful in other disciplines (3, personal communication C. Stanny). The poster presentation is an excellent means to develop student's abilities of communication and project management. Not only does it provide practice for students to communicate with the general lay audience, it is a dynamic process that requires students to work out their difference of attitudes, opinions, and engage them in the decision making process in order to accomplish the project. Putting students in charge of poster grading also provides them opportunities to actively engage the process of assessment.

Overall, the project includes the following strategy enhancements focusing on active learning/student engagement:

- *Developing analytical and computational skills and problem solving ability.*
- *Developing skills in rigorous scientific writing*.
- *Gaining valuable experience in group dynamics and project management*.
- *Increasing student engagement in improving the future course design.*
- *Providing opportunities for faculty and staff development related to improving student learning.*

Information dissemination plan

This project and its results will be featured on a web-page accessible through the Biology department website. The web-page will have excerpts from the RFP, a timeline with commentary on the progress, a window for student and guest comments, and PDF files of the students' final projects. Furthermore, the information will be incorporated into the CCLI grant revision and submitted in the 2006 cycle.

Institutionalization plan

In 2005, Drs. Chung, Behan, Fox and Ryals from the Biology department wrote an NSF grant for Curriculum Improvement (CCLI) entitled "Integration of discovery-based learning into Contemporary Biology Courses" to increase active learning and student engagement in several biology courses, including Genetics, Biochemistry I and II, Plant Physiology, and Molecular Diagnostics through the common themes of computational and molecular biology. This proposal received favorable reviews, but was not funded. The funding from this QEP proposal will finance a pilot project to be showcased in the NSF grant that we submit in 2006. Part of the budget of this UWF QEP proposal will pay for Dr. Chung to attend a workshop on NSF grant proposal writing. Furthermore, we expect that our website showcasing this project will guide other members of the Biology faculty in submitting their own proposals to the QEP.

Resources needed

Budget item No.	Budget Item	Description	Unit Cost	Total Item Cost
1	**NSF workshop on grant writing**	**Registration, accommodations, travel expenses**	**$350 $308 $280**	**$960**
2	**IMAC computers (2)**	**Hardware for data analysis**	**$1300**	**$2600**
3	**Printer**	**Laser printer**	**$300**	**$300**
4	**Design oligonucleotides**	**Custom made primers for DNA synthesis**	**$40**	**$400**
5	**Miscellaneous supplies**	**Pipettors, Test tubes, reagents, paper, toner**	**various**	**$740**

Note: item No. 2 and 3 are one-time purchases; item No. 4 and 5 are recurring costs that can be offset by lab fees in subsequent semesters

Grand Total: $5,000

Timeline for project activities and events

The project will be implemented fall 2005 during Genetics class. The paper will be due 3 weeks prior to the end of the term. The poster presentation will be due the week before finals. The NSF workshop is in October 2005.

References cited:

1. Chet Meyers and Thomas B. Jones, *Promoting Active Learning, Strategies for the College Classroom* (San Francisco: Jossey-Bass Publishers 1993).

2. Jane Albert Hubbard, Department of Biology, New York University, *Discovery-based Laboratory in Genetics* (NSF Award #0126469, 2001).

3. Claudia Stanny, Psychology Department, University of West Florida, personal communication.