California State University, Stanislaus  
**Institutional Review Board**  
OSRP/Campus Compliance, MSR 160  
Telephone (209) 667-3493  
Email: IRBAdmin@csustan.edu

### Applicant Information

<table>
<thead>
<tr>
<th>Principal Investigator: Marina Gerson</th>
<th>Co-Investigator(s): Michael Fleming, Stuart Wooley</th>
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<tbody>
<tr>
<td>Department: <strong>Biological Sciences</strong></td>
<td>Faculty Sponsor: N/A</td>
</tr>
<tr>
<td>Address: Street (including Apt/Unit #)</td>
<td>213 Hayes Drive</td>
</tr>
<tr>
<td>City: Turlock</td>
<td>State: CA</td>
</tr>
<tr>
<td>ZIP Code: 95382</td>
<td>Phone: (209) 664-6547</td>
</tr>
<tr>
<td>E-mail: <a href="mailto:mgerson@csustan.edu">mgerson@csustan.edu</a></td>
<td></td>
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</tbody>
</table>

**Title of Project:**  
Student success as a result of course redesign in introductory biology courses.

<table>
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<tr>
<th>Type of application</th>
<th>New ☒</th>
<th>Renewal ☐</th>
<th>&quot;Previous proposal number&quot;</th>
<th>&quot;Changes?&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master’s Thesis / Project?</td>
<td>YES* ☒ NO ☐</td>
<td>YES* ☒ NO ☐</td>
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**Sponsored project?** ☒ NO ☐  
**Source of funds:** Chancellor’s Office Course Redesign PLF

### Protocol Summary Instructions

Attach a document containing the following information:

1. **Title of Research Proposal**
2. Hypothesis statement and purpose of research (what are you investigating)
3. Methods, procedures, subjects (selection criteria, identification of and justification for vulnerable population)
4. Risks to subjects and precautions taken to minimize risks  
   (or methodology section of thesis/project if it includes all pertinent information)
5. Informed Consent Letter(s) (see sample on UIRB website, www.csustan.edu/uirb)
6. Instruments to be used (survey, interview guide, etc.)
7. Letters of support from outside agencies (school, hospital, etc. where study will take place)

### Certification and Signature

*I certify under the penalty of professional misconduct the attached statements are accurate and true.*

<table>
<thead>
<tr>
<th>Principal Investigator Signature: [Signature]</th>
<th>Date: 10/22/14</th>
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<tbody>
<tr>
<td>Faculty Sponsor Signature (if applicable):</td>
<td>Date:</td>
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</table>
I. Student Success as a Result of Course Redesign in Introductory Biology Courses

II. Background and Purpose of Research

In 2013, Drs. Michael Fleming, Marina Gerson, and Stuart Wooley were accepted into the CSU Chancellor’s Office Professional Learning Community for Proven Course Redesign, with the goal of meaningfully revising the CSU Stanislaus introductory biology courses to improve demonstrated student progress on learning outcomes and thus reduce the rates of repeatable grades in these courses. The courses involved are the major courses, General Biology 1 (BIOL 1050) & General Biology 2 (BIOL 1150), and the non-majors course Principles of Biology (BIOL 1010).

*The purpose of our research is: 1) to identify risk factors that predict poor performance in these courses, so we can implement better student support, and 2) to quantitatively and qualitatively evaluate the impact of course redesign on student success to inform future curriculum decisions. We hypothesize that some elements of the redesigned courses will be of higher impact than others.*

III. Subjects, Data Collection, and Analyses

Subjects
The subjects of our study will include all consenting students enrolling in BIOL 1050, BIOL 1150, and BIOL 1010 in the 2014-2015 academic year. Data from students withholding consent will be included only in summary class average data, but individual student data will not be linked nor tracked. The estimated number of participants for our study is 1500 individual students over two semesters.

Data Collection
Our methodology is primarily one of data organization and analysis. Data requests made to the Office of Institutional Research will include demographic and academic information (see section VI, below) for each participant. We also will request final course grades in the focal courses (i.e., BIOL 1050, 1150, and 1010) and in additional coursework in the Biological Sciences for students pursuing that degree objective. In challenging courses, student progress on learning objectives may not be clearly represented in the grade for the course, even though the student made significant gains to support continued learning. Thus, we wish to include a longitudinal aspect to our study. Follow-up courses for which final grades will be requested include: BIOL 3310, BIOL 3350, and the upper division Ecology (BIOL 4630, BIOL 4650, BIOL 4680, or BOTY 4600) and Physiology (BOTY 4200, MBIO 4500, ZOOL 4230, or ZOOL 4280) courses. BIOL 3310 and BIOL 3350 are required courses typically taken by sophomores in the Biological Sciences major, and the ecology and physiology requirements are generally fulfilled in the junior and senior year. This presents a skeletal picture of student progression through the major.

For the focal courses (BIOL 1050, 1150, and 1010), data will be collected on student performance on each element of the course (e.g., grades on assignments, quizzes, exams, presentations, class participation; time spent in online homework; number of times in attendance in Supplemental Instruction). These data will help us identify the aspects of course redesign that contributed most to student performance.

Analyses
On the basis of our own observations, interviews with past students, and published research, we posit the following explanations for the high failure rate in certain biology courses: (1) ESL and other
students struggle with written exams; (2) we are asking our students to answer exam questions written at the application and analysis levels of Bloom’s Taxonomy of Higher Learning Objectives; (3) many students do not understand or appreciate the time commitment required to succeed in these courses; and (4) students learn better if they are active, but most prefer to remain passive.

Prior research from other institutions shows that performing risk analysis helps instructors identify and understand reasons for high failure rates in courses, and more importantly, enact meaningful course reforms/changes that can specifically address factors identified as contributing to high failure rates.

It is the goal of our analyses to: 1) develop a predictive model of risk to success, based on student academic and demographic background. 2) Identify the course elements that most contribute to student performance gains in order to continue inclusion of course elements that promote success and thoughtfully discontinue those aspects of our courses that do not contribute meaningfully to student learning and success in the class. 3) Track student progress through key courses in the major, in order to continue inclusion of course elements that promote success and thoughtfully discontinue those aspects of our courses that do not contribute meaningfully to student learning and success in the class. If our analyses result in meaningful insight, we plan to submit our conclusions in the form of a research manuscript for peer-reviewed publication.

IV. Risks and Precautions

The major risk associated with this study is that of identifying individuals as members of at-risk groups. To minimize the risk, all identifier data will be stripped from the data set prior to analysis. The researchers will request the Office of Institutional Research to compile as much of the data as is possible, to minimize researcher awareness of the data points associated with individual participants. This is difficult, as the researchers are also instructors in the courses; on the other hand, researcher exposure to individual identify relating to course performance is less of a problem, since the researchers are already privy to student grade data and always treat these data as confidential. As a further precaution, data sets will be compiled and analyses performed after final course grades have been assigned.

V. Informed Consent Letter (see attached)

VI. Data Collection

The data to be collected include individual student grades on all assignments, quizzes, exams, labs, and other course work in the target courses, as well as demographic and academic variables (see below). For Biological Sciences majors, final grades in subsequent coursework will be added to the data set each semester. Once the data are compiled, individual identifiers will be removed, prior to analyses.

Demographic Variables (data source: Office of Institutional Research)

- **gender** to see if a gender-based achievement gap exists
- **age** to see if older students’ experience translates to improved success
- **zip code** time spent commuting to/from campus may impact performance
- **ethnicity** as Caucasian, Asian or URM (underrepresented minorities including African-American, Native American, Hispanic, or Pacific Islander) to see if achievement gaps are correlated with prior data showing underrepresented ethnic groups’ performance in STEM courses
- **student athlete** time spent being a student athlete may impact performance
• **member of Greek organization** (e.g. fraternity or sorority) → time spent on activities for their Greek organization may impact performance

• **veteran status** → experience in a highly structured environment may impact performance

• **type of financial aid received** (work-study, loan, grant, other) → to see if there is a correlation to final grade

• **EOP status** → to see if achievement gaps for EOP students are evident, as indicated in many prior studies

• **catalog year** → to see if class standing (e.g., prior experience) impacts performance

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**Academic Variables**

• **final grade in the course** (BIOL 1010, BIOL 1050, BIOL 1150) → our response variable for all predictors

• **declared major at time of course enrollment** → to see if academic “bent” impacts performance

• **incoming high school GPA, if true freshman** → a significant predictor in prior studies

• **incoming college/university transfer GPA, if transfer student** → may be an important predictor for our student population of many transfer students

• **overall CSU Stan GPA, if student was in residence at CSU Stan at time of enrollment** → performance in other CSU Stan courses may predict success in our courses

• **SAT verbal score** → a significant predictor in prior studies

• **SAT math score** → a significant predictor in prior studies

• **ACT verbal score** → verbal skills are a significant predictor in prior studies

• **ACT math score** → math skills are a significant predictor in prior studies

• **English Placement Test (EPT) score** → verbal skills are a significant predictor in prior studies

• **Entry-Level Math (ELM) score** → math skills are a significant predictor in prior studies

• **Test of English as Foreign Language (TOEFL) score** (international students) → ESL students often struggle with written exams, which impacts performance

• **grade in ENGL 1000 or ENGL 1006 course(s)** → verbal skills are a significant predictor in prior studies

• **remaining time to graduation at time of course** → to see if class standing (e.g., prior experience) impacts performance

• **credit load in the semester BIOL course was taken** → high credit load may reduce time spent preparing for our courses, which would impact performance

• **grade in BIOL 1020 if taken before or concurrent with BIOL 1010** (BIOL 1010 students only) → to see if reinforcement of lecture/lab content improves student success.

• **lab grade in BIOL 1050** (BIOL 1050 students only) → to test for correlation between lab and lecture points

• **date when BIOL 1050 was completed** (BIOL 1150 students only) → to check for 1150 prerequisite

• **final grades in BIOL 3310, BIOL 3350, and UD ecology and physiology** → to better understand long term impact of introductory course redesign

• **Overall GPA and major GPA at graduation** → to understand long term impact of introductory course redesign

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On the basis of analyzing these variables, we will first identify the most stable year-to-year predictors of success in these courses and build a linear regression model to predict the grade that incoming students are likely to receive in the respective courses as a function of the strongest predictors. In future semesters we will then correlate predicted grades to actual grades for each student in all three
courses to test the ability of our predictor model to successfully predict student success in the class. The predictor model also enables us to test course revision elements in ways that help students at high risk of failing to develop the discipline and intellectual tools required to be successful in these courses and beyond.

VII. Supporting Agency Information
Drs. Michael Fleming, Marina Gerson, and Stuart Wooley are participants in the CSU Chancellor’s Office Professional Learning Community for Proven Course Redesign (http://courseredesign.csuprojects.org/wp/proven-course-redesign/). This initiative targets identified bottleneck courses on each campus to support faculty in implementing new means to meet student needs and improve the rates of nonrepeatable grades while maintaining high standards. We each invested 120+ hours over summer 2014 analyzing the relative contributions of course elements (like online homework, supplemental instruction, and concurrent enrollment in labs) to student success and preparing new course materials for use in 2014-2015. Eventually, summaries of our course redesigns will be made available as ePortfolios at Merlot.org, a requirement of participation in the Professional Learning Community.
Fleming, Gerson, Wooley
Fall 2014

Informed Consent
for a study on Student Success as a Result of Course Redesign in Introductory Biology Courses.

Dear Participant:

Faculty in the Department of Biological Sciences are committed to providing excellent learning opportunities for students. You are being asked to participate in a research project to help us improve our teaching. We hope to learn which elements of your biology course may have contributed to your current and continued success.

If you decide to volunteer, you are asked to permit us to track your individual scores on assignments, labs, and exams and to track your participation in activities offered as support resources for the course. The CSU Stanislaus Office of Institutional Research will provide demographic and test (SAT, ACT) data that you provided when you applied to the university, allowing us to better understand how our teaching can supports students with diverse backgrounds. If you are not a Biological Sciences major, your participation will end at the end of the semester in which you complete General Biology 2 (BIOL 1150). If you are a Biological Sciences major, we will track your continued success, measured by your final grades and GPA, in additional biology coursework (BIOL 1050, BIOL 1150, BIOL 3310, BIOL 3350, Ecology, and Physiology), until your graduation date. Prior to analyses, your personal identifying information will be removed.

The alternative to participating in the study is to simply opt out. We will remove your individual information from our analyses, although we may still include summary data in our analyses (e.g., your grade included in a calculation of an average for the entire class). There are no known risks to you for your participation in this study, and your decision to volunteer or to opt out will not affect your course grade in any way.

It is possible that you will not benefit directly by participating in this study. The information collected will be protected from all inappropriate disclosure under the law. All data will be kept in a secure location. The CSU Stanislaus Office of Institutional Research and Drs. Michael Fleming, Marina Gerson, and Stuart Wooley will be the only entities to have access to the individual identifiers in the original data files. Analysis of the data will inform future curriculum decisions and may also be summarized in a formal research paper submitted for publication.

There is no cost to you beyond the time and effort required to complete this form. Your participation is voluntary. Refusal to participate in this study will involve no penalty or loss of benefits. You may withdraw at any time without penalty or loss of benefits.

If you agree to participate, please indicate this decision by signing below. If you have any questions about this research project please contact me, Marina Gerson, at (209)664-6547. If you have any questions regarding your rights and participation as a research subject, please contact the Campus Compliance Officer by phone (209)667-3794 or email IRBAdmin@csustan.edu.

Sincerely,

Dr. Marina Gerson
Associate Professor of Zoology
Informed Consent

I have read the attached explanation of the project *Student Success as a Result of Course Redesign in Introductory Biology Courses*, and I volunteer to have my data included in the study.

<table>
<thead>
<tr>
<th>Participant’s Name (PRINT)</th>
<th>Signature</th>
<th>Date</th>
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