BURST FORTH: A Pilot Program Incorporating Authentic Biology Research Experiences into Freshman Orientation
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Introduction & Statement of Problem
- CSUF Department of Biological Science is grappling with high enrollments in introductory majors’ courses but disappointing retention rates (1).
- Part of the problem stems from mismatches in student vs. department expectations of effort, engagement, critical thinking, quantitative reasoning, and problem solving skills.
- Individual undergraduate research experiences engage students, promote retention, and increase graduation rates (2), but these experiences are expensive and often reach only a limited number of students.

BURST FORTH at Freshman Orientation
- We developed the Biology Undergraduate Research Scholar Training program (BURST) Freshman Orientation Research Training Hour (FORTH) in 2014.
  o University New Student Orientation (NSO): one day experience
  o 153 incoming biology majors over 3 days of NSO
  o Stratified sampling design: participant (BURST FORTH) and non-participant (CONTROL) groups
  o Both groups: advising and registration
  o CONTROL group: department tour
  o BURST FORTH: 75 – 90 min research experience
  o Online survey: filter responses (over 18 yr). BURST FORTH = 30 students, CONTROL = 7 students.
  o Factor analysis to identify question categories.

- BURST FORTH:
  o Undergraduate peer mentors (7)
  o Graduate student mentors (2)
  o All mentors completed online survey
  o Faculty advisors (2)
  o CSUF Administrators invited to participate

- BURST FORTH Research Project: Study Questions
  How does incubation temperature of California grunion affect:
  a. hatching success?
  b. heart rate?
  c. eye diameter?
  d. oil droplet diameter?

Survey Results: Peer Mentors
“This experiment seemed to create a better sense of community within the biology department compared to if they had just come here to register.”

“This was a great way for students to know what they are getting themselves into and what biology is all about. It is also takes away some of the anticipation that some of the students are going to be feeling their first labs because they get experience in the laboratory. It was also very informative and the students were engaged.”

100% agreed the activity should become a permanent part of orientation.

Survey Results: Incoming Students

<table>
<thead>
<tr>
<th>Categories identified by factor analysis</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engage Extremely unlikely (1) to Extremely Likely (6)</td>
<td>How likely are you to:</td>
</tr>
<tr>
<td>Community Strongly Disagree (1) to Strongly Agree (6)</td>
<td>Feelings about students in orientation group:</td>
</tr>
<tr>
<td>Ask Questions Strongly Disagree (1) to Strongly Agree (6)</td>
<td>When I had a question:</td>
</tr>
<tr>
<td>Major Strongly Disagree (1) to Strongly Agree (6)</td>
<td>Regarding the Biology major at CSUF:</td>
</tr>
</tbody>
</table>

Fig 4. Data collection and communication.
(A) An undergraduate mentor assists BURST FORTH participants with data analysis and graphing.
(B) CSUF’s Assistant Vice President of Institutional Research & Analytical Studies works with a BURST FORTH participant (seated) and an undergraduate mentor.
(C) Data from each session were posted on the BURST Facebook page.

Survey Results: Incoming Students, cont.

Fig 5. BURST FORTH: N = 30 students, CONTROL: N = 7 students. Data are mean ± SE of the mean response for all questions in the category. Question categories were determined by factor analysis. * indicates significant difference between groups (Wilcoxon Rank Sums test, Median: 2 = 3.37, p = 0.02; all others p > 0.55).

- BURST FORTH participants felt more empowered to find information about major requirements (Fig. 5) and less isolated (Fig. 6) than CONTROL students.

Fig 6. BURST FORTH: N = 30 students, CONTROL: N = 7 students. Data are mean ± SE. * indicates significant difference between groups (Wilcoxon Rank Sums test, 2 = 3.37, p = 0.047).

- BURST FORTH increased student interest in undergraduate research (Fig. 7).

Fig 7. BURST FORTH: N = 30 students, CONTROL: N = 7 students. Data are mean ± SE. Vertical arrow = increased interest; horizontal arrow = did not change interest; * indicates significant difference between groups (Chi-square test of independence, x² = 5.51, p = 0.02).

- Low survey participation in control group limits strength of conclusions.

Next Steps
- Fall 2014: Follow-up survey of freshman (online)
- Spring 2015: NSO Reunion activities
- Summer 2015: Round 2 of BURST FORTH at orientation
- Long-term: track progress of participant and control students

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- Cabrillo Marine Aquarium staff & numerous volunteers helped with gamete collection and fertilization.

Works Cited
1. CSUF Department of Biological Science unpublished data.

Fig 1. BURST FORTH participants isolate a larval fish for data collection.
Fig 2. Grunion embryo at 30 days post-fertilization.
Fig 3. Grunion larva hatched at 10 days post-fertilization.