# Supplemental Material

Ebert-May *et al.*

**Development Of Learner-Centered Teachers**

# Supplemental Materials

## I. Details of Recruitment and Training of Regional Team Leaders (RTL)

### A. RTL Recruiting procedure:

Advertisement of the FIRST IV opportunity was made through listservs of professional biology societies (e.g., Ecological Society of America, American Society for Cell Biology) that provided broad dissemination to teaching institutions. A total of 128 and 141 PDs applied for cohorts 1 and 2, respectively.

### B. Training for RTLs:

The objectives of the RTL workshops were to 1) design the summer workshops for the PDs, 2) develop a RTL team plan for implementing the summer workshops, 3) further develop their skills in identifying and evaluating learner-centered teaching, 4) discuss ongoing research questions and preliminary findings of the FIRST IV project, 5) provide assessment data about their own professional development activities, and 6) discuss their mentoring responsibilities during the months between the summer workshops.

## II. FIRST IV-designed Surveys

### A. Background Survey (see pages 3 to 9 of this document)

The purpose of the Background Survey was to determine the prior experiences of the project participants with teaching and professional development, and their perceptions of potential challenges to implementation of learner-centered teaching.

**Development Of Learner-Centered Teachers**

**First IV Background Survey**

Q16 Welcome to the FIRST IV Program! We would like to get some background information on your previous experiences teaching biology. Please complete the following survey. Thanks!-The First IV Team

Q1 Do you have any teaching experience (broadly defined – as an undergraduate or graduate TA, a lecturer, teacher in the k-12 setting, etc.)?
❍ Yes (1)
❍ No (2)

Q2 In what capacities have you taught and for how long (years):

|  | Years (1) |
|---|---|
| TA as an Undergraduate (1) |  |
| TA as a Grad Student (2) |  |
| Adjunct/Lecturer/Instructor (3) |  |
| Elementary school (4) |  |
| Secondary school (5) |  |
| Other (please explain): (6) |  |

Q3 Estimate the percentage of your present appointment (0-100%) you currently dedicate to each of the following activities.     If none of your appointment is dedicated to a particular activity, record 0.
_____ Teaching activities and responsibilities (e.g., course preparation and administration, assisting students with coursework, projects, etc…)  (1)
_____ Service (e.g., committees, student advising, outreach)  (2)
_____ Administration (e.g., departmental chair, field station manager, program administrator, etc…)  (3)
_____ Research  (4)

Q4 With respect to your current department's commitment toward undergraduate education, please indicate to what degree you agree or disagree with the following statements:

|  | no basis or n/a (1) | strongly disagree  (2) | disagree  (3) | agree  (4) | strongly agree (5) |
|---|---|---|---|---|---|
| My department is committed to reforming curricula and courses to enhance active learning and inquiry- | ❍ | ❍ | ❍ | ❍ | ❍ |

**Development Of Learner-Centered Teachers**

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| based teaching. (1) | | | | | |
| I frequently discuss issues pertaining to the improvement of teaching and learning with colleagues in my department. (2) | ○ | ○ | ○ | ○ | ○ |
| Other faculty in my department feel the same as I do about the need to improve undergraduate biology teaching and learning. (3) | ○ | ○ | ○ | ○ | ○ |
| Faculty in my department collaborate to achieve effective biology teaching (e.g., team teach, and design, test, discuss curricula, etc…) (4) | ○ | ○ | ○ | ○ | ○ |
| Faculty in my department are interested in or are already conducting scholarly work about teaching and learning. (5) | ○ | ○ | ○ | ○ | ○ |
| Faculty in my department | ○ | ○ | ○ | ○ | ○ |

**Development Of Learner-Centered Teachers**

| are recognized, evaluated and rewarded for effective teaching. (6) | | | | | |
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| | | | | | |

Q10 Have you participated in any education-related professional development program within the past 2 years?

❍ Yes (1)
❍ No (2)

Q5 Please identify any education-related professional development programs you are participating in currently or have participated in within the last 2 years.     Provide the name and a brief description for each Program Type

Q6 Professional development projects (externally funded):

Q7 On campus workshops:

Q8 Reading groups/informal discussion groups:

Q9 Other (please specify):

Q11 Please rate your theoretical knowledge and first-hand experience with each of the following using a scale of 1 – 5 (1=lowest rating; 5=highest rating).

| | Theoretical Knowledge | | | | | First-hand Experience | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 (1) | 2 (2) | 3 (3) | 4 (4) | 5 (5) | 1 (1) | 2 (2) | 3 (3) | 4 (4) | 5 (5) |
| Biology education reform  (1) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Course/curriculum planning  (2) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Theories of learning (e.g., constructivism) (3) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Use of technology in instruction  (4) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Assessment  (5) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Cooperative learning  (6) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Case studies  (7) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Problem-based | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |

**Development Of Learner-Centered Teachers**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| learning  (8) | | | | | | | | | | |
| Inquiry-based lectures  (9) | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Inquiry-based laboratories  (10) | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Inquiry-based field projects  (11) | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Teaching portfolios (12) | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

Q12 Which phrase best describes your confidence about your current level of preparation as a teacher?
○  Extremely confident  (1)
○  Somewhat confident  (2)
○  Somewhat unconfident  (3)
○  Extremely unconfident  (4)

Q13 Please Explain

Q18 Do you have any experience developing, leading, or managing biology education projects.
○  Yes (1)
○  No (2)

Q14 We are interested in knowing more about your experience and success relate to developing, leading, and managing biology education projects.     Using a scale of 1 – 5 (1=lowest rating; 5=highest ranting), please rate your level of first-hand experience and degree of success with each of the following:

| | First-hand Experience | | | | | Degree of Success | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 (1) | 2 (2) | 3 (3) | 4 (4) | 5 (5) | 1 (1) | 2 (2) | 3 (3) | 4 (4) | 5 (5) |
| Planning, writing and submitting grant proposals.  (1) | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Maintaining communication with colleagues about a project's progress.  (2) | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Taking leadership of a | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

**Development Of Learner-Centered Teachers**

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| team. (3) | | | | | | | | | | |
| Working with people from different disciplines than your own. (4) | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Handling matters regarding: responsible conduct of research, human subjects in research, intellectual property. (5) | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Writing or speaking to the general public about your project's mission or outcomes. (6) | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

Q15 Please rate the extent to which each of the following issues pose a challenge as you implement an active-learning course. Please use the following scale:

| | n/a (1) | not challenging (2) | somewhat challenging (3) | very challenging (4) |
|---|---|---|---|---|
| Time to plan (1) | ○ | ○ | ○ | ○ |
| Time to develop or adapt materials (2) | ○ | ○ | ○ | ○ |
| Time to grade or give adequate feedback (3) | ○ | ○ | ○ | ○ |
| Time to train colleagues or TAs (4) | ○ | ○ | ○ | ○ |
| Cooperation of faculty in my department (5) | ○ | ○ | ○ | ○ |
| Cooperation of faculty in other | ○ | ○ | ○ | ○ |

**Development Of Learner-Centered Teachers**

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| departments (6) | | | | |
| Cooperation of TAs or instructional staff (7) | ○ | ○ | ○ | ○ |
| Support of campus administration (8) | ○ | ○ | ○ | ○ |
| Recognition or reward for teaching (9) | ○ | ○ | ○ | ○ |
| Tenure-related issues (10) | ○ | ○ | ○ | ○ |
| Issues for non-tenure track positions (11) | ○ | ○ | ○ | ○ |
| Student attitudes toward alternative teaching methods (12) | ○ | ○ | ○ | ○ |
| Student motivation for learning (13) | ○ | ○ | ○ | ○ |
| Student feedback through course evaluations (14) | ○ | ○ | ○ | ○ |
| Classroom infrastructure (15) | ○ | ○ | ○ | ○ |
| Technical issues with audience response systems ('clickers') (16) | ○ | ○ | ○ | ○ |
| Technical issues with other instructional technology (17) | ○ | ○ | ○ | ○ |
| Level of support staff or technical staff (18) | ○ | ○ | ○ | ○ |
| Balancing teaching with | ○ | ○ | ○ | ○ |

**Development Of Learner-Centered Teachers**

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| other responsibilities (19) | | | | |
| Financial support for teaching  (20) | ❍ | ❍ | ❍ | ❍ |

**B.      End of Year Two Survey (see pages 9 to 18 of this document)**

The End of Year Two Survey was taken by the participants upon completion of the FIRST

program.  The purpose of the survey was to obtain updated information on the participants'

teaching-related activities and the perceived effectiveness of the FIRST project.  Several items

on the survey are the same as in the Background Survey, thereby allowing pre-post comparisons

of the participants' perceptions and activities.

## First IV End of Year Two Survey

Q1 FIRST IV - End of Year Two Survey - Now that you have completed two years of FIRST IV, we ask you to take a few minutes to complete the following survey.  This survey assesses participant knowledge and activities at the end of year two and provides us data that we will use to evaluate the effectiveness of the project.     -The First IV Team

Q2 Participant Information:  Here is your current contact information on file with FIRST IV.  Please verify that it is correct.  If it is not correct, please visit this link to update your information.

Q56 Name:

Q3 Current Position Title:

Q5 Name of Institution, Agency, Company (Private Sector):

Q6 Department:

Q58 Current Email Address:

**Development Of Learner-Centered Teachers**

Q7 Since beginning the FIRST IV program, please list your teaching experiences.  For each course taught, list the full name of the course, whether you taught the whole course or part of the course [if part, please name the unit or module or classes you taught (e.g., ecology unit, two classes on cell signaling)], the year and semester you taught the course, and the course level (e.g., introductory, upper level, etc.).

Q8 Teaching Experiences

Q8 Since you began participating in FIRST IV have you taken on any additional responsibilities (e.g. curriculum development) related to your interest in and experience with improving teaching and student learning?
❍ Yes (1)
❍ No (2)

Q9 If yes, please explain.

Q10 Briefly, please update your research interests/activities since completion of FIRST IV.

Q11  Estimate the percentage of your present appointment that you currently dedicate to each of the following activities. (Please note that the 5 main categories must add to 100%).
_____ Teaching activities and responsibilities (e.g., course preparation and administration, assisting students with coursework, projects, etc…) (1)
_____ Service (e.g., committees, student advising, outreach) (2)
_____ Administration (e.g., field station manager, program administrator, etc…) (3)
_____ Research (4)
_____ Other (5)

Q12 Within the research category referenced above, what proportion of your time is spent: (Please note that these must add to 100%).
_____ mentoring postdoctoral associates on their research (1)
_____ mentoring graduate students on their research (2)
_____ mentoring undergraduate students on their research (3)
_____ working independently or collaboratively with colleagues (4)

Q13 If you could allocate the time spent in your present appointment in any way you desired, indicate the percentage you would dedicate to each of the following.  (Please note that the 5 main categories must add to 100%).
_____ Teaching activities and responsibilities (e.g., course preparation and administration, assisting students with coursework, projects, etc…) (1)
_____ Service (e.g., committees, student advising, outreach) (2)
_____ Administration (e.g., field station manager, program administrator, etc…) (3)
_____ Research (4)
_____ Other (5)

**Development Of Learner-Centered Teachers**

Q14 Within the research category referenced above, if you could allocate the time spent in any way you desired, what proportion of time would be spent: (Please note that these must add to 100%)

_____ mentoring postdoctoral associates on their research (1)
_____ mentoring graduate students on their research (2)
_____ mentoring undergraduate students on their research (3)
_____ working independently or collaboratively with colleagues (4)

Q15 If there is a difference between your actual and desired appointment time allocations, what factors do you believe contribute to that discrepancy?

Q16 To date, has your participation in FIRST IV met your initial goals?
❍ Yes (1)
❍ No (2)

Q17 Stated initial goals:

Q18 What did you gain from participation in FIRST IV?  Please be as specific as possible.

Q19 What would have improved your experience in FIRST IV?  Please be as specific as possible.

Q20 With respect to your current department's commitment toward undergraduate education, please indicate to what degree you agree or disagree with the following statements:

| | strongly disagree (1) | moderately disagree (2) | neutral (3) | moderately agree (4) | strongly agree (5) |
|---|---|---|---|---|---|
| My department is committed to reforming curricula and courses to enhance active, learner-centered classrooms. (1) | ❍ | ❍ | ❍ | ❍ | ❍ |
| I frequently discuss issues pertaining to the improvement of teaching and learning | ❍ | ❍ | ❍ | ❍ | ❍ |

**Development Of Learner-Centered Teachers**

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| with colleagues in my department. (2) | | | | | |
| Other faculty in my department feel the same as I do about the need to improve college science teaching and learning. (3) | ○ | ○ | ○ | ○ | ○ |
| Faculty in my department collaborate to achieve effective science teaching (e.g., share pedagogies, ideas, materials, revise curricula, co-teach etc.) (4) | ○ | ○ | ○ | ○ | ○ |
| Faculty in my department are interested in or are already conducting scholarly work about teaching and learning. (5) | ○ | ○ | ○ | ○ | ○ |
| Faculty in my department are recognized, evaluated and rewarded for effective teaching. (6) | ○ | ○ | ○ | ○ | ○ |

**Development Of Learner-Centered Teachers**

Q21 Other comments about your department's commitment:

Q22 During your time as a FIRST participant, has anyone on campus helped you become a better teacher?
- ❍ Yes (1)
- ❍ No (2)

Q23 If yes, who? (name, position, role)

Q24  Have you participated in any teaching professional development programs in addition to FIRST IV within the last 2 years?
- ❍ Yes (1)
- ❍ No (2)

Q54 If yes, please provide the name and a brief description for each program type below.

Q25 On campus workshops:

Q26 Workshops offered by professional/national societies

Q27 Reading groups/journal clubs

Q28 Other (please specify)

Q55 We are interested in knowing more about your experience and success related to developing, leading, and managing science education projects.Have you participated in any education projects in addition to your involvement with FIRST IV?
- ❍ Yes (1)
- ❍ No (2)

**Development Of Learner-Centered Teachers**

Q30 If you answered "yes" to the question above, using a scale of 1 – 5 (1=lowest rating; 5=highest rating), please rate your level of first-hand experience and degree of success with each of the following:     If you have not participated in any education projects, please skip to the next question.

| | First-hand Experience | | | | | Degree of Success | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 (1) | 2 (2) | 3 (3) | 4 (4) | 5 (5) | 1 (1) | 2 (2) | 3 (3) | 4 (4) | 5 (5) |
| Planning, writing and submitting grant proposals including ideas, projects, activities for science education in the "broader impact" section of a proposal (1) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Maintaining communication with colleagues about a project's progress.  (2) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Taking leadership of an education project team. (3) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Working with people from different disciplines than your own. (4) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Handling matters regarding: responsible conduct of research, human subjects in research, intellectual | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |

**Development Of Learner-Centered Teachers**

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|---|---|---|---|---|---|---|---|---|---|---|
| property, etc. (5) | | | | | | | | | | |
| Writing or speaking to the general public about your project's mission or outcomes. (6) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |

Q31 Please update the following information on presentations about teaching:    Since you began participating in FIRST IV, have you presented any seminars etc., related to teaching to your department, institution, or at a professional meeting?
❍  Yes (1)
❍  No (2)

Q32 If yes, please give the titles and audience for each presentation.

Q33 Please update the following information on science education grant proposals:    Have you submitted any grant proposals for science education projects since you began participating in the FIRST IV project?
❍  Yes (1)
❍  No (2)

Q34 If yes, please give: the title, funding agency, program within the agency, funding amount, and funding status (pending, not funded, funded) for each grant

Q35 Please update the following information on departmental change:    Since you began participating in FIRST IV, has your department made or initiated any curricular changes specifically to implement active, learner-centered courses?
❍  Yes (1)
❍  No (2)

Q36 If yes, please describe the changes.

**Development Of Learner-Centered Teachers**

Q37 Please rate your theoretical knowledge and first-hand experience with each of the following using a scale of 1 – 5 (1=lowest rating; 5=highest rating).

| | Theoretical Knowledge | | | | | First-hand Experience | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 (1) | 2 (2) | 3 (3) | 4 (4) | 5 (5) | 1 (1) | 2 (2) | 3 (3) | 4 (4) | 5 (5) |
| Science education reform (1) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Course/curriculum development, Backward design (2) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Theories of learning (e.g., constructivism) (3) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Use of technology in instruction (4) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Interdisciplinary approaches to inquiry and problem-solving (5) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Assessment (6) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Cooperative/collaborative learning (7) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Case studies (8) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Independent projects (9) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Problem-based learning (10) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Inquiry-based laboratories (11) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Inquiry-based field projects (12) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Teaching portfolios (13) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Other (please specify below): (14) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |

Q38 Other

Q39 Which phrase best describes your confidence about your current level of preparation as a teacher?
- ❍ Extremely confident (4)
- ❍ Somewhat confident (3)
- ❍ Somewhat unconfident (2)
- ❍ Extremely unconfident (1)

Q40 Please explain your answer:

**Development Of Learner-Centered Teachers**

Q41 Please rate the extent to which each of the following issues pose a challenge to you in using active, student-centered learning methods in your classroom. Please use the following scale:

| | n/a (0) | not challenging (1) | somewhat challenging (2) | very challenging (3) |
|---|---|---|---|---|
| Time to plan (1) | ○ | ○ | ○ | ○ |
| Time to develop or adapt materials (2) | ○ | ○ | ○ | ○ |
| Time to grade or give adequate feedback (3) | ○ | ○ | ○ | ○ |
| Time to train colleagues or TAs (4) | ○ | ○ | ○ | ○ |
| Cooperation of faculty in my department (5) | ○ | ○ | ○ | ○ |
| Cooperation of faculty in other departments (6) | ○ | ○ | ○ | ○ |
| Cooperation of TAs or instructional staff (7) | ○ | ○ | ○ | ○ |
| Support of campus administration (8) | ○ | ○ | ○ | ○ |
| Recognition or reward for teaching (9) | ○ | ○ | ○ | ○ |
| Tenure-related issues (10) | ○ | ○ | ○ | ○ |
| Issues for non-tenure track positions (11) | ○ | ○ | ○ | ○ |
| Student attitudes toward alternative teaching methods (12) | ○ | ○ | ○ | ○ |
| Student feedback through course | ○ | ○ | ○ | ○ |

**Development Of Learner-Centered Teachers**

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| evaluations (13) | | | | |
| Classroom infrastructure (14) | ❍ | ❍ | ❍ | ❍ |
| Technical issues with "clickers" (personal response systems) (15) | ❍ | ❍ | ❍ | ❍ |
| Technical issues with other instructional technology (16) | ❍ | ❍ | ❍ | ❍ |
| Level of support staff or technical staff (17) | ❍ | ❍ | ❍ | ❍ |
| Balancing teaching with other responsibilities (18) | ❍ | ❍ | ❍ | ❍ |
| Financial support or funding (19) | ❍ | ❍ | ❍ | ❍ |
| Other (please specify below): (20) | ❍ | ❍ | ❍ | ❍ |

Q42 Other:

Q43 Please describe any goals or activities you have that extend beyond your own courses to improve the quality of education for students at your institution.

Q44 When a course you teach is successful, how are your students different as a result (e.g., in terms of what they know, what they are able to do, attitudes, confidence)?