ASBMB Research Coordination Network-Undergraduate Biology Education

NSF RCN-UBE Grant #0957205

Regional Workshop Planning Guide

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Planning Timeline

Timeline	Date	Done	Description
>6 weeks prior			• Determine your budget. An example budget is on page 4. • Reserve the meeting room, A/V equipment, WiFi access and catering. • Develop a list of local grad students, postdocs and faculty who may be interested in attending the workshop. • Create a workshop website (click here for example). • Finalize the agenda and post on the website.
6 weeks prior			• Open registration on the website. The ASBMB uses Survey Monkey to collect registration data. An example registration form can be found in Appendix IV. • Email invitations to participants and post information about the workshop on social media.
1 week prior			• Close registration and email participants a final confirmation with recommendation to bring a laptop, a reminder about any homework and an invitation to a workshop Dropbox folder if you would like participants to share files.
			• Workshop
Post-Workshop			• Meet with co-organizers to discuss perceptions and evaluation results. • Pay catering and meeting room bills. • Send workshop completion certificates to all participants.

Workshop Logistics

The basics:

1) Budget – The ASBMB budgeted $3,800 for each workshop. This includes up to $1,000 in travel and lodging stipend for the speaker, $1000 for participant travel stipends (see below) and up to $1,800 for remaining expenses (e.g. catering, meeting room space). Expenses could be minimized by inviting a local speaker and not offering travel stipends or meals.
2) Location – The ASBMB limited its workshops to 40 participants. Organizers should reserve a meeting room with capacity for their maximum participant number. They also should arrange audio/visual equipment and wireless internet access.
3) Catering – The ASBMB provided a light continental breakfast, lunch and a light afternoon snack, with options for vegetarians. The society recommends coffee, water and tea be available all day.

Workshop promotion:

1) The ASBMB coordinated one email invitation to members and contacts within a 4-5 hour driving distance of the workshop location.
2) The ASBMB posted announcements on its social media sites, the ASBMB homepage and in the ASBMB e-newsletter.
3) The ASBMB provided up to 10-$100 travel stipends if requested in advance by participants.

Workshop registration:

1) Attendees registered online in advance of each meeting (see Appendix IV for example form).
2) A final registration confirmation was emailed to all participants one week in advance of the meeting and included the workshop website, a homework reminder and a suggestion to bring a laptop or tablet.

Workshop materials:

If the organizers have any workshop materials, these should be made available electronically via Dropbox or a similar mechanism. Organizers should make copies of the evaluation and permission forms (pages for each attendee. The ASBMB provided name tags.

Post-workshop:

The ASBMB sent attendees participation certificates.

Sample Invitation Letter

Invitations were sent via email by the ASBMB on behalf of the workshop's host. An example is below. The targeted audience was BMB educators within 4-5 hours of the workshop location, including graduate students, postdoctoral fellows, community college faculty and faculty at four-year institutions.

Dear {courtesy title} {last name},

We would like to invite you to participate in a workshop to discuss pedagogical issues in biochemistry and molecular biology with colleagues from regional campuses.

This complimentary workshop, *Developing and Sharing Best Practices: From Concept to Classroom*, will be held on **{date} at {location}**. To learn more about this workshop and to register, please click here.

The workshop facilitators are {names, institutions}.

This workshop is part of a five-year initiative funded by the NSF to build networks to create and disseminate validated assessment tools for the foundational core knowledge and skills required for biochemistry and molecular biology degrees and to promote validated student-centered teaching approaches.

This workshop is a great opportunity for our community to forge networks among innovative educators who are interested in effective teaching and learning. It is our hope that the outcomes of meetings like this one will provide the catalyst for improving student preparation for careers grounded in a working knowledge of biochemistry and molecular biology.

We hope you will be able to join us.

Sincerely,

{Organizers}
{Organizers' institution}

Sample Workshop Program

ASBMB Research Coordination Network Workshop

Developing and Sharing Best Practices: From Concept to Classroom

{Location}
{Date}

Pre-registration is required for this workshop. Completing the optional pre-workshop assignments will ensure you receive the maximum benefits from attending this event.

9:00 - 9:30 AM	**Arrival and check-in** *Continental breakfast will be provided.*
9:30 - 10:00 AM	**Introduction and overview of the day's activities** {Speaker, Institution}
10:00 AM – 12:00 PM	**Workshop I - Developing and sharing best practices** Participants will select a BMB learning goal and work in groups to design a short, student-centered classroom activity to teach that goal and outline a complementary assessment.
12:00 - 12:45 PM	**Lunch (provided)**
12:45 – 1:45 PM	**Keynote lecture** {Speaker, Institution}
1:45 – 2:45 PM	**Workshop II** Report out of initial ideas: questions to and from the groups
2:45 – 3:15 PM	**Break** *Light refreshments will be provided.*
3:15 – 5:30 PM	**Workshop III** Participants will refine their activities and report new ideas to the group for discussion. They will then refine their work and will electronically submit it to the ASBMB for later use in the project.
5:30-6:00 PM	**Wrap up and final discussion**

Example Registration Form

The ASBMB used Survey Monkey to develop an electronic registration form. The following questions were used on the form.

1. Please provide the following information: first name, last name, institution, city/town, state, zip code, email address.

2. What courses do you teach? (Check all that apply.) General chemistry; organic chemistry; biochemistry-one semester course; biochemistry-two semester course; general, organic, biochem (GOB); introductory biology; molecular biology; genetics; other (please specify)

3. What topic(s) or concept(s) or visual abilities do you find most difficult to assess in a way that helps you to diagnose students' difficulties with their ways of reasoning and visualizing biochemistry concepts? Provide at least one.

4. Which of the following pedagogical approaches have you used in your teaching? (If you have used an approach, please rank your level of comfort from 1-5.) Lecture, laboratory instruction, undergraduate research training, problem-based learning (PBL), process-oriented guided inquiry learning (POGIL), peer-led team learning (PLTL), case studies, service learning, portfolios, clickers, other (please specify)

5. Which of the following assessment strategies have you used in your teaching? Multiple choice examinations, essay examinations, standardized examinations, concept inventories, concept mapping, oral examinations, group examinations

6. To what extent do you emphasize the following in your teaching? (1-5 scale) Facility with math, writing clearly, construction of logical arguments, interpretation of data, creating pictorial visual models by hand, one or more molecular modeling programs in class, molecular modeling in lab, molecular modeling take-home/out-of-class, other (please specify)

7. What do you hope to gain or learn by attending this workshop?

Please review the pre-workshop homework assignments on the workshop website. The homework assignments are optional but will allow you to best engage with your colleagues at the workshop.

Please note that you will not receive a confirmation email after clicking "Done" below. You will instead see a completion page stating you are registered. If you do not see this page or have questions, please contact education@asbmb.org. You will receive a reminder email on the Monday before the workshop.

Evaluation Form

We thank you for your attendance and thoughtful participation in today's workshop.

1. Which aspects of the workshop were most beneficial to you?

   _____

   _____

2. What improvements can you recommend for the benefit of future workshops?

   _____

   _____

3. Are there any points that remain confusing to you? If so, please describe.

   _____

   _____

   _____

4. How do you plan to apply what you've learned to your educational practices?

   _____

   _____

   _____

5. What type of follow-up support do you need?

   _____

   _____

   _____

6. Please add any additional comments you may have.

   _____

   _____

   _____

Permission Form
{Institution}
{Date}

Attendee name: _____

This workshop was part of the ASBMB's promoting concept-driven teaching strategies in biochemistry and molecular biology project. A major goal of this project is to develop a rich, searchable, peer-reviewed database of educational resources for undergraduate biochemistry and molecular biology educators. The ASBMB will be building such a database and uploading materials that have been contributed by educators around the country.

By signing this form, I grant the ASBMB permission to use the materials I developed prior to and during today's workshop. All materials will be housed under the society's project website. Please note that we have a large inventory of materials, many of which may be similar, and that by giving us your permission, it does not guarantee that your materials will be added to the repository.

_____ _____

Signature Date

Appendix I - Detailed Agenda

I. Pre-workshop preparation – Workshop host and project PI or steering committee member
- A. Create directory of attendees and make available to participants
  1. Names
  2. Institutions
  3. Email addresses
  4. Courses taught
- B. Summarize survey results
  1. Attendee goals
  2. Top objectives for concepts
  3. Top objectives for skills
  4. Top objectives for allied fields

II. Introduction (30 min) - Workshop host and project PI or steering committee member
- A. What is this all about?
  1. Project overview
  2. BAMBED papers
  3. Sample alignment table
  4. Vision moving forward
- B. Where do I fit?
  1. Summarize attendee goals from pre-workshop survey
  2. Purpose of regional workshops - networking and depth
  3. Generating pieces of a larger puzzle; products will be available to all
- C. What products?
  1. Start with direction from pre-workshop survey
  2. Top objectives for student-centered classroom activities
  3. Upcoming presentation on path from there (BMB alignment table)
- D. Who is supposed to do what?
  1. Regional host
     - Local expert as a resource, local logistics
     - Submit meeting report to ASBMB within two weeks post-workshop
     - Collect and submit all evaluations, permission forms and sign-in sheet
  2. Group moderators
     - Round out group numbers as needed
     - Keep time, monitor discussions, clarify/coach, let 3 members discuss
     - Report out only during the compare and contrast activity at end
  3. Group members
     - Literature searcher (to encourage evidence-based teaching)
     - Electronic submitter (to capture products from all workshops)
     - Verbal reporter (to communicate products to other attendees)
- E. Other preliminary questions attendees may have?

III. Decide Your Destiny activity (30 min) – Facilitator TBD

A. Pre-workshop preparation – assign group moderators

B. Create small groups of 3-4 people (20 min)

1. Attendees self-select their groups by the foundational concept area with which they wish to work
2. Each group should end up with at least three people
3. Each group selects their goal and objective. Refer to sample goals and objectives in Appendix II
4. Moderators can round out a group if needed, but should not be the reporter. Moderators will thus be helping at least two small groups

C. Make introductions within small groups (5 min)

1. Name, institution, courses taught

D. Select group member roles (5 min) -Moderators hit the highlights of the literature searching resource page

1. Literature searcher to encourage evidence-based teaching
2. Electronic submitter to capture workshop products using supplied templates
3. Verbal reporter to communicate products to other attendees

Literature Resources

Evidence is critical in any endeavor to create scientific teaching tools. What works? How do we know? What assumptions are in place? What are the limitations of the methods?

How to search:

By Journal

Without a subscription, try including the word "free" in your search. Some articles may be freely available, and the search algorithm may cluster the results for you.

PubMed

Search "undergraduate science education" and filter species for humans → 1522 hits on 10/4/13
Search "undergraduate biochemistry education" and apply human filter → 188 hits on 10/4/13
Search "clicker training" and apply human filter → 25 hits on 10/4/13

Education Resource Information Center (ERIC)

This literature database contains resources dating back to 1966.
www.ebscohost.com/academic/eric

Commonly cited journals and a few articles of potential interest:

Biochemistry and Molecular Biology Education (IUBMB)

S. L. Rowland, C. A. Smith, E. M. A. Gillam, and T. Wright (2011) The concept lens diagram: A new mechanism for presenting biochemistry content in terms of "big ideas." *Biochemistry and Molecular Biology Education* 39:267-279.

T. Eberlein, J. Kampmeier, V. Minderhout, R. S. Moog, T. Platt, P. Varma-Nelson, and H. B. White (2008) Pedagogies of engagement in science: A comparison of PBL, POGIL, and PLTL. *Biochemistry and Molecular Biology Education* 36:262-273.

CBE – Life Sciences Education (ASCB)

K. D. Tanner (2013) Structure matters: Twenty-one teaching strategies to promote student engagement and cultivate classroom equity. *CBE—Life Sciences Education* 12:322-331, doi: 10.1187/cbe.13-06-0115.

D. Allen (2012) Recent Research in Science Teaching and Learning. *CBE—Life Sciences Education* 11:351-352, doi: 10.1187/cbe.12-09-0167.

Journal of Chemical Education (ACS)

J. P. Andre (2013) Opera and poison: A secret and enjoyable approach to teaching and learning chemistry. *Journal of Chemical Education* 90:352-357, doi: 10.1021/ed300445b.

M. H. Towns (2010) Developing learning objectives and assessment plans at a variety of institutions: Examples and case studies. *Journal of Chemical Education* 87:91-96, doi: 10.1021/ed8000039.

Science (AAAS)

D. C. Haak, J. HilleRisLambers, E. Pitre, and S. Freeman (2011) Increased structure and active learning reduce the achievement gap in introductory biology. *Science* 332:1213-1216, doi: 10.1126/science.1204820.

A. Y. Zheng, J. K. Lawhorn, T. Lumley, and S. Freeman (2008) Application of Bloom's taxonomy debunks the "MCAT myth." *Science* 319:414-415, doi: 10.1126/science.1147852.

Appendix II – Alignment Tables

The following is an example BMB alignment table. While an overall goal may imply multiple specific learning objectives, only one objective is exemplified below. Alignment tables typically summarize the assessments and strategies, which are described more fully outside the table or in a separate document. Attendees should focus on <u>one</u> objective at <u>one</u> Bloom's level. See the template on the next page.

Example overall learning goal:
Students should understand the core concept of macromolecular structure and function, including the nature of biological macromolecules, factors that impact structure, the relationship between structure and function, interactions, and regulation of function.

Example specific learning objective:
Students should be able to **discuss** the diversity and complexity of various biologically relevant macromolecules and macromolecular assemblies in terms of the basic repeating units of the polymer and the types of linkages between them.

Example alignment table:

<table>
<tr><td colspan="3">Overall learning goal: Students should understand the core concept of macromolecular structure, including the nature of biological macromolecules and factors that impact structure.</td></tr>
<tr><th>Specific learning objectives</th><th>Learning assessments</th><th>Learning strategies</th></tr>
<tr><td><u>Bloom's Level 1-2</u>:
Students should be able to compare and contrast various biologically relevant macromolecules and macromolecular assemblies in terms of the basic repeating units of the polymer and the types of linkages between them.</td><td><u>Written Exam Question</u>
T/F or multiple choice
(3 pts.)</td><td rowspan="2"><u>Pre-class reading</u>
Biomolecular structure
(1 participation pt.)

<u>In-class group activity</u>
Table of biomolecules
Turn in one per group
(5 participation pts.)</td></tr>
<tr><td><u>Bloom's Level 3-4</u>:
Students should be able to sketch various biologically relevant macromolecules and macromolecular assemblies in terms of the basic repeating units of the polymer and the types of linkages between them.</td><td><u>Written exam question</u>
Sketch a polymer
(monomers – 2 pts.)
(linkage – 1 pts.)</td></tr>
<tr><td><u>Bloom's Level 5-6</u>:
Students should be able to defend classifications of unfamiliar, biologically relevant macromolecules and macromolecular assemblies in terms of the basic repeating units of the polymer and the types of linkages between them.</td><td><u>Written exam question</u>
Given a novel structure
(classify – 1 pt.)
(defend – 2 pts.)</td><td><u>Clicker question</u>
Given a novel structure
1 correct classification
Flawed distracters
(2 participation pts.)</td></tr>
</table>

BMB alignment table template:
Please save your template as a separate working document for your group with the filename "Alignment_LocationAbbreviation_LastNameA+LastNameB+LastNameC.docx" (e.g. Alignment_USD_Garcia+Nguyen+Smith.docx)

Designed by:
Name of group member
Name of group member
Name of group member

Selected BMB aspect:
Homeostasis, evolution, data analysis and interpretation, scientific process (circle one)

Keywords:
Search terms relevant to your alignment

Initial overall learning goal:
Insert the goal that accompanies your selected objective in its initial form.

Initial specific learning objective:
Insert your selected objective in its initial form.

Overall learning goal: Insert refined goal		
Specific learning objective	**Specific learning assessment**	**Specific learning strategy**
Insert refined objective and Bloom's level	Summarize assessment	Summarize strategy

Assessment:
Design your assessment here. Be sure to include the answer or scoring rubrics.

Strategy:
Design your classroom or laboratory strategy here. Be sure to include the time allotted.

Appendix III – Workshop Details

Workshop I

Activity: Goals and objectives – Moderators 30 minutes

A. Small groups (3 members) discuss selected goal and objective
   1. Literature searcher gathers any necessary evidence
   2. Electronic submitter fills in template
   3. Verbal reporter notes any significant discussion points

B. Emerge with a refined overall learning goal and refined specific learning objective
   1. Objective should support development of assessment and strategy
   2. Refined goal and objective should be saved in alignment template

Activity: Learning strategies – Moderators 60 minutes

A. Small groups discuss prior experience with strategies to facilitate learning of objective

B. Group members collaborate to develop one learning strategy
   1. Literature searcher gathers any necessary evidence
   2. Electronic submitter fills in template
   3. Verbal reporter notes any significant discussion points

C. Emerge with a learning strategy
   1. Strategy should be student-centered and facilitate learning of the objective
   2. Strategy should be saved in alignment template

Activity: Assessments – Moderators 30 minutes

A. Small groups discuss any prior experience measuring achievement of objective

B. Group members collaborate to develop one assessment with scoring rubrics
   1. Literature searcher gathers any necessary evidence
   2. Electronic submitter fills in template
   3. Verbal reporter notes any significant discussion points

C. Emerge with an assessment and scoring rubrics
   1. Assessment should measure achievement of the learning objective
   2. Assessment and rubrics should be saved in alignment template

Workshop II

Activity: Introductory report out (big picture overview) - Moderators 5 minutes

A. Small groups review progress and prepare flipchart/mind map 10 minutes

B. Small groups present 30 minutes
   1. Overall learning goal
   2. Specific learning objective
   3. Student-centered learning strategy
   4. Questions and Problems that arose

C. General questions and discussion 15 minutes

Workshop III

Activity: Refinement, final report out and electronic submission – Moderators 10 minutes

A. Small groups work on final refinement of ideas/strategies, etc. 60 minutes

B. Brief updates on strategies and assessment 20 minutes

C. Electronic submission 45 minutes

References

[1] J. T. Tansey, T. Baird, Jr., M. M. Cox, K. M. Fox, J. Knight, D. Sears, and E. Bell. (2013), Foundational Concepts and Underlying Theories for Majors in Biochemistry and Molecular Biology. *Biochemistry and Molecular Biology Education*. doi: 10.1002/bmb.20727.

[2] H. B. White, M. A. Benore, T. F. Sumter, B. D. Caldwell, and E. Bell. (2013), What Skills Should Graduates of Undergraduate Biochemistry and Molecular Biology Programs Have Upon Graduation? *Biochemistry and Molecular Biology Education*. doi: 10.1002/bmb.20729.

[3] A. Wright, J. Provost, J. A. Roecklein-Canfield, and E. Bell. (2013), Essential Concepts and Underlying Theories from Physics, Chemistry, and Mathematics for Biochemistry and Molecular Biology Majors. *Biochemistry and Molecular Biology Education*. doi: 10.1002/bmb.20728.

[4] J. Handelsman, S. Miller, C. Pfund (2006) *Scientific Teaching*, W. H. Freeman and Co.

[5] G. Wiggins and J. McTighe (1998) *Understanding by Design*, Association for Supervision and Curriculum Development.