Coaching and Training Module

Education and Training for Interdisciplinary and Collaborative Research

The Coaching and Training Modules are designed to help individuals and groups learn about key aspects of interdisciplinary research and team science. Individuals may use them as self-tutorials. Project and program directors and advisors may use them for coaching researchers and students, as well as the basis for workshops and short courses.

Additional related bibliographies on this website focus on Resources for Team Science and on Resources for Interdisciplinary Education.

The urgency of solving complex problems has increased the importance of interdisciplinary and collaborative approaches across disciplines and fields, including health care and medical research, engineering and information science, social and behavioral sciences, and humanities and communication studies. Interdisciplinary and transdisciplinary research, however, pose challenges for traditional approaches to education and training. Programs must provide sufficient content knowledge as well as skills for integrative and collaborative work.

This module highlights key resources for developing and implementing interdisciplinary education and training for students and researchers throughout all phases of the career life cycle. It covers four areas:

1) conceptual frameworks, principles, and philosophies
2) "best practices" for program design and pedagogy
3) learning outcomes and criteria
4) additional online and grounded modules and courses.

Note. Access to article links requires a Wayne State University (WSU) access ID and password. All URLs were accessed 11 June 2014.

Introductions and Overviews

Stokols, D. (2014). Training the next generation of transdisciplinarians. In M. Rourke, S. Crowley, S. Eigenbrode., & J. D. Wulfhorst (Eds.) *Enhancing Communication and Collaboration in Interdisciplinary Research* (pp. 56- 81). Los Angeles, CA: Sage.
https://webfiles.uci.edu/dstokols/Pubs/Stokols%20Chapter%2004-Orourke.pdf

Provides a conceptual overview of transdisciplinary (TD) training based on literature review. Argues that a TD orientation is an intra-individual construct that should allow for broad exposure at undergraduate, post-graduate, and post-doctoral levels, as well as in-depth career mentoring.

• Individual researchers, mentors, and groups can use the five-factor framework as a checklist for developing and assessing a transdisciplinary orientation. It may also form a basis for designing inter- and trans-disciplinary programs, assuring that each step develops requisite skills.

Valuing: a broad and comprehensive understanding of complex research and social issues and translating these broader conceptions into solutions
Attitudes: positive dispositions for bridging boundaries of multiple disciplines in seeking solutions to research and social issues
Belief: conviction that integration is essential to furthering understanding of complex scientific and social phenomena
Knowledge Base: sufficient breadth and depth to allow for high levels of integration and synthesis
Behaviors: actions such as working with colleagues in different disciplines, coursework in other areas, and efforts to develop and promote transdisciplinary concepts and methods.

Nash, J. M. (2008). Transdisciplinary training: key components and prerequisites for success. *American Journal of Preventive Medicine*, *35*(2), S133-S140.
http://www.sciencedirect.com.proxy.lib.wayne.edu/science/article/pii/S0749379708004108

Presents an overview of mentorship, methods, and common concerns with accompanying discussion of nomenclature, and preparation for career trajectories.

• Individuals may use the tools and conceptual overviews for self-tutorials and mentoring others.
• Groups may use the article use as a discussion piece.
• **Figure 1** will be a helpful handout and conceptual framework for writing a training grant, with a "big picture" model of training approaches, barriers, and facilitators.
• **Table 2** could be handout or presentation guide describing the range of training strategies and specific elements that have proven to be successful.
• **Table 3** is also useful as a handout or rubric for evaluating the degree to which a proposal or a manuscript meets criteria for interdisciplinarity. Faculty mentors can use it to guide assignments, evaluations, training, and practical approaches to conducting research.

Best Practices

Haire-Joshu, D. and McBridge, T. (Eds.). *Transdisciplinary Public Health: Research, Education, and Practice*. San Francisco: Jossey Bass.
http://books.google.com.proxy.lib.wayne.edu/books?hl=en&lr=&id=CI63CaTt9o0C&oi=fnd&pg=PP1&dq=Transdisciplinary+Public+Health:+Research,+Education,+and+Practice&ots=P1nDM5kpDo&sig=bfLmgREQcXWGz0BaVQJwAEENGBs#v=onepage&q=Transdisciplinary%20Public%20Health%3A%20Research%2C%20Education%2C%20and%20Practice&f=false

Contains essays on transdisciplinary research and education in public health, including lessons from practice, teaching, and policy. Many chapters include related competencies and skills that both students and career professionals need, and some include replicable evaluation frameworks and pedagogical approaches. See especially chapters 2, 3, 4, 8, and 9.

- Instructors and teams may use the highlighted chapters for background reading, curricular models, learning competencies, pedagogy, and assessment.

Chang, S., Hursting, S. D., Perkins, S. N., Dores, G. M., & Weed, D. L. (2005). Adapting postdoctoral training to interdisciplinary science in the 21st century: The Cancer Prevention Fellowship Program at the National Cancer Institute. *Academic Medicine*, *80*(3), 261-265.
http://journals.lww.com.proxy.lib.wayne.edu/academicmedicine/Abstract/2005/03000/Adapting_Postdoctoral_Training_to.11.aspx

Describes the Cancer Prevention Fellowship Program of the National Cancer Institute as an exemplary model of how to train health science researchers for careers in interdisciplinary areas.

- Groups may use **pp. 262-63** to define principles for interdisciplinary education, mentoring, and professional development within Cancer Prevention research.
- They may use **pp. 263-64** to define best practices for integrating features of traditional postdoctoral training with newer approaches suited to interdisciplinarity.

Domino, S. E., Smith, Y. R., & Johnson, T. R. (2007). Opportunities and challenges of interdisciplinary research career development: Implementation of a women's health research training program. *Journal of Women's Health*, *16*(2), 256-261.
http://online.liebertpub.com.proxy.lib.wayne.edu/doi/abs/10.1089/jwh.2006.0129

Presents a qualitative evaluation of the Building Interdisciplinary Research Careers in Women's Health program at the University of Michigan. Includes discussion of mentoring and regular meetings to discuss building of interdisciplinary careers and collaborative research orientations.

- Instructors and groups may use definitions of interdisciplinary research on **p. 257** as the basis for a common definition and/or handout.
- They can also use the monthly seminar outline on **p. 258** as a guide to preparing brownbag events or monthly professional development seminars.

- The 14-point career development plan on pp. **259-260** is useful for handouts and/or online training materials and resources that may serve as a comprehensive training guide or be organized by theme (e.g., research, teaching, funding, tenure and promotion).

Holmes, D.E. and Osterweis, M. (1999). *Catalysts in Interdisciplinary Education: Innovation by Academic Health Centers*. Washington, D.C.: Association of Academic Health Centers [AAHC]. Available for purchase from multiple online booksellers.

Compilation of case studies of interdisciplinary health professions education at seven institutions of the AAHC, with focus on strategies of institutionalization to reverse subspecialization and fragmentation. Includes leadership styles, strategic planning, cross-institutional contracts, and development of a core curriculum.

- Chapter 9 is a powerful model from the University of Texas-Houston Health Science Center. Program planners and teams can use it as an overview of planning, and the tables detail the interdisciplinary curriculum model, challenges for interdisciplinary education and alternatives, and recommendations for leaders.

See also:
The National Institutes of Health Team Science Toolkit, a searchable resource for curricula and training modules. https://www.teamsciencetoolkit.cancer.gov/public/home.aspx?js=1

Learning Outcomes and Criteria for Learning Assessment

Gebbie, K. M., Mason Meier, B., Bakken, S., Carrasquillo, O., Formicola, A., Aboelela, S. W., & Larson, E. (2008). Training for interdisciplinary health research defining the required competencies. *Journal of Allied Health*, *37*(2), 65-70.
http://waynestdetroitmi.library.ingentaconnect.com.proxy.lib.wayne.edu/content/asahp/jah/2008/00000037/00000002/art00002

Reports results of a key informant approach to defining core competencies of interdisciplinary research. Defines 19 competencies including activities outside home disciplines, such as reading and learning nomenclature, teaching courses, employing and integrating other methodologies, and meeting with colleagues.

- Instructors and teams can use the 19 core competencies as a checklist for assessing student learning, divided into three categories of Conduct Research, Communicate, and Interact with Others.
- They can combine the table of competencies with resources on training structures such as multiple mentorships and disciplinary rotations to link training structures and outcomes.
- **Table 1** can be used to define successful competencies for completing doctoral work in interdisciplinary research.
- **Table 3** can be a reference guide for developing specific training elements or defining measurable learning outcomes for a TD/ID training programs.

Borrego, M., & Newswander, L .K. (2010). Definitions of interdisciplinary research: Toward graduate-level interdisciplinary learning outcomes. *The Review of Higher Education 34* (1), 61-84.
http://muse.jhu.edu.proxy.lib.wayne.edu/journals/review_of_higher_education/v034/34.1.borrego.html

Addresses the disparity between increasing demand for interdisciplinary research training and lack of an empirically validated pedagogy. Based on a meta-analytic review of 129 National Science Foundation-funded grants in which ID training was a central or core feature.

• Instructors, mentors, and teams can use the five key categories of outcomes, methods, or benchmarks as frameworks for implementing and assessing ID grade programs:

Disciplinary Grounding: the degree to which a student is sufficiently versed in "disciplinary theories, findings, examples, methods, validation criteria, genres, and forms of communication," insuring adequate depth to be produce quality research and draw appropriate insights from findings;

Conceptual and Methodological Integration: a dialectical approach in which insights from multiple disciplines are synthesized and new conceptual frameworks, models, metaphors, etc are produced, insuring an adequate level of integration for a more effective and empirically grounded account of phenomena under study;

Communication skills: cross-disciplinary competence in finding "common ground" for developing and sharing concepts and findings across multiple disciplines, insuring communication across differing disciplinary styles and jargon in conveying concepts, methods, and results;

Critical awareness: awareness of philosophical, social, and cultural underpinnings of disciplines that shape "meta-discipline" assumptions," and facilitating critical comparison and integrative resolutions of differing theories and methods;

Teamwork: possession of skill sets such as being able to manage and organize interrelated groups of researchers, build consensus, and recognize sometimes competing priorities of team members, while fostering a sense of cohesiveness.

Additional Online and Grounded Training Modules and Courses

A **self-directed** set of online learning modules by Bonnie Spring, Arlen C. Moller, and Holly Falk-Krzesinski organized around four training modules at http://www.teamscience.net/

- The first module is a good introduction to the field with text and video segments, a library, and the capacity to search individual topics.
- All modules may be used for tutorials, short courses, and certificate programs.

Module 1: **The Science of Team Science: Research Resources ["Team Science 101"]**
Features an introduction to core concepts and resources, incentives and challenges, as well as assembling and managing a team, and evaluating team performance;

Module 2: Behavioral Science Team Wing
Targets senior investigators pursuing a P-01 grant through a series of topics, such as forming a team, identifying funding and proposal submissions, project kick off, managing teams, and evaluating mid-project success;

Module 3: Biomedical Team Science Wing
Targets large center grants, and includes segments on project initiation, proposal and budget development, developing relationships with a funder/program officer, and promoting collaboration;

Module 4: Clinical Medicine Team Science Wing
Targets junior investigators applying for an R-01 grant through topics of assembling a team and developing a leader, team-building activities, managing conflict, sustaining team engagement and communication, and evaluating team vs. individual success.

For a fuller description of how to use this site, see: Klein, J. T. (2012). Media review: COALESCE: CTSA online assistance for leveraging the science of collaborative effort." *Journal of Clinical Anatomy, 25(5)*: 670-72.
http://onlinelibrary.wiley.com.proxy.lib.wayne.edu/doi/10.1002/ca.22072/abstract

For Team Science Syllabi and Course Descriptions

MSCI 307: Team Science, Instructor (Fall, 2011): Holly Falk-Krzesinski, PhD

The syllabus for a course organized around key topics in team science. Based on selected articles and book chapters covering theory, principles, evaluation, leadership and membership, distributed teams, collaboration readiness, conflict management, diversity, and training.
http://www.learningace.com/doc/4440035/9676aefd870ea26a7f072a891d389dc2/msci307fall2011teamsciencesyllabus

- Instructors and teams may pattern full courses or units on this model.

MSCI 307: Team Science, Instructors (Winter, 2014): Bonnie Spring, PhD and Fruma Yehiely, PhD.

A course on team science focusing on collaborative and interdisciplinary orientation for complex research problems. Includes learning modules, written assignments, and evaluation strategies.
http://www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCcQFjAA&url=http%3A%2F%2Fwww.nucats.northwestern.edu%2Feducation-career-development%2Fgraduate-programs%2Fmaster-of-science-in-clinical-investigation%2Fwinter%25202014%2520team%2520science%2520syllabus%2520FINAL1.docx&ei=HTImU8-AI8adqAGs9YG4Bw&usg=AFQjCNF7fI_C7xQZ6vfSg_i82cpDSYzOuA&bvm=bv.62922401,d.aWM

- Instructors and teams may pattern full courses or select units on this model.