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A TRANS-DISCIPLINARY APPROACH FOR TEACHING IMPLEMENTATION RESEARCH AND PRACTICE IN PUBLIC HEALTH

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Abstract

The trans-disciplinary approach for teaching implementation research and practice (IR&P) in public health seeks to present related concepts on IR&P from multiple perspectives without paying an exclusive service to a specific home discipline. It is a response to the demand for a pedagogical approach to teaching that promotes a unity of knowledge around a subject that extends beyond the disciplinary boundaries within public health. Based on the experience of establishing a flagship course in IR&P at a graduate school of public health, we draw from existing theories and offer practical steps for developing and delivering content for IR&P from a trans-disciplinary perspective. The potential of this teaching approach is its ability to demonstrate the pervasiveness and easy transfer of relevant concepts in IR&P across multiple disciplines and settings. This teaching approach has relevance for influencing the overall technique to graduate level instruction in the health professions where multiple disciplines intersect.

The pedagogical approach to teaching a subject has implications for how students learn and use that subject in professional practice – that is, how a subject is taught is integral to defining the subject (Grossman, 2009). The study of implementation, actions, and processes associated with carrying out an intervention or policy to realize an effect (Peters, Adams, Alonge, Agyepong, & Tran, 2013), has gained traction in recent years as scientists and decision makers seek greater impacts from public health research investments. While an implementation focus can be found in many public health funded initiatives for programs and research and is the subject of recent texts (Brownson, Colditz, & Proctor, 2012), journals (Eccles & Mittman, 2006), and conferences (Academy Health/National Institutes of Health, 2015), there is limited literature detailing how implementation research and practice (IR&P) is taught in graduate public health programs (Norton, 2014). The paucity of literature about IR&P pedagogy has implications for building the subject of IR&P in that without such scholarship there is a missed opportunity to establish a common set of concepts and definitions, and to stimulate new researchers and practitioners to take up a career involving IR&P (El-Sadr, Phillip, & Justman, 2014).

Attention to pedagogy in teaching IR&P is particularly relevant because of the multidisciplinary nature of implementation. Epidemiology, health policy, health behavior,

health services research, and biostatistics all contribute to the theory and methods used in implementation of public health work. Furthermore, implementation is relevant to public health interventions that address all types of diseases and injuries, and in varied settings around the world. Indeed, the combination of various elements of public health disciplines needed to train public health professionals who will be working in implementation is a challenge. We searched for graduate level courses in implementation science and found some graduate schools of public health that offer intra-departmental courses on the distinct and sometimes overlapping aspects of implementation. While this approach provides robust academic content for the represented disciplines, it risks leaving students interested in IR&P with the burden of compiling components of available courses to obtain a complete understanding of the subject. Such a process may leave students less prepared to take on IR&P careers than their colleagues who pursue training and employment in a more traditional area of public health.

Other public health training programs responded to this need by establishing centers, units or customized programs for training in IR&P (Meissner, et al., 2013; Zerhouni, 2005). With support from the National Institutes of Health (NIH), short, intensive programs such as the Training in Dissemination and Implementation Research in Health (TIDRH) emphasize building capacity among established biomedical researchers to conduct implementation research with less emphasis on preparing graduate public health students in IR&P (Meissner, et al., 2013). Other programs, such as the Clinical and Translational Science Awards (CTSA), are housed in academic medical institutions and focused on attracting clinician-scientists into applied research (Zerhouni, 2005).

Purpose

We see a need for a third approach to IR&P training that embraces the multidisciplinary nature of IR&P and of pedagogy with cross-disciplinary collaboration at its core. The primary goal of this article is to present this third approach to IR&P teaching in graduate schools of public health and thus encourage and contribute to the dialogue about how to teach IR&P. We draw from our experience with establishing a flagship course in IR&P as part of the educational efforts of the newly formed Center for Implementation Research at the Johns Hopkins Bloomberg School of Public Health. The article includes three sections: the first provides a brief description of the characteristics and principles of IR&P. The second section is a narrative of how we designed and fielded the IR&P flagship course, and the third section describes the salience of the trans-disciplinary approach to teaching IR&P based on our experience with the flagship course. The secondary goals are to provide guidance for instructors interested in designing similar courses, and to inform the overall approach to graduate level instruction in other subjects where multiple disciplines intersect.

Characteristics and Principles of IR&P

IR&P, viewed by some as a new field and others as a re-emerging subject, is multidisciplinary and characterized by a set of defining attributes (Peters, et al., 2013; Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004; Fixsen, Naom, Blasé, & Friedman, 2005). IR&P focuses on articulating effective interventions, that is, devices, ideas,

or behaviors organized as programs, policies, or practices known to improve human endeavors by effecting, sustaining, or hindering a course of action (Grol, Bosch, Hulscher, Eccles, & Wensing, 2007). It also facilitates the diffusion of innovations throughout a specified population, and promotes widespread adoption and mainstreaming of innovations at scale to achieve desired outcomes (Peters, et al., 2013; Greenhalgh, et al., 2004; Fixsen, et al., 2005). These principles lend themselves to key approaches which further define IR&P, including that it takes place in real-life settings, operates as a highly iterative and dynamic process, and involves multiple actors to create a complex adaptive system (Peters, et al., 2013; Lobb & Colditz, 2013).

The implications of these defining characteristics and principles for teaching IR&P are that IR&P instruction is best approached from multiple perspectives, and should incorporate relevant constructs, theories, and approaches from different disciplines illustrated with examples from different settings. For example, the central notion of *implementation outcomes* - constructs that describe the effects of a deliberate and purposive action to implement an intervention, and *implementation strategies* - approaches designed to support or otherwise enhance the implementation of an intervention in IR&P (Peters, et al., 2013) exists in different disciplines which should facilitate instruction on these concepts from multiple perspectives.

Description of the Flagship IR&P Course

The flagship IR&P course at the Bloomberg School of Public Health, Johns Hopkins University is one outcome of a School-wide center to advance scholarship in the science and practice of implementation. The Center was established in 2013 to provide a centralized infrastructure to amplify the diffuse research and teaching in implementation research and practice underway at the School (and later the University) and to facilitate new initiatives in this broad area. Towards that end, the need for a survey course to incorporate the diverse contributions of the Center's faculty from across several departments was clear. The importance of incorporating the complementary training requirements for students of research and students of practice was also clear.

To develop this survey course, a team of co-instructors was selected based on their disciplinary expertise, depth of experience in implementation research and practice, and interest in contributing to the School's emerging IR&P curriculum. The resulting team of four included a behavioral scientist, an epidemiologist, a health systems planning and administration expert, and a health policy expert. Their research focused on HIV and AIDS, health systems and health care services delivery, and injury prevention. Two team members were physicians; two worked primarily in global health; and none had worked together prior to agreeing to develop and teach the course. The team's first task was to conceptualize the domains of knowledge that a multidisciplinary course in IR&P should include. These domains were then organized into an outline, and objectives for learning were developed for each domain. Through a series of collaborative meetings, the knowledge domains and learning objectives were debated and the outline was streamlined and organized to fit into the 8-week format of the Johns Hopkins School of Public Health courses. The course content was developed by assigning specific knowledge domains to each of the team

members based on their expertise, experiences, and interest. Prior to fielding the course, the resulting product was shared with select faculty from the team's respective departments, and faculty at a Center for Implementation Research meeting.

The teams' general approach to the course development drew from the stages of implementation frameworks and involved different stages extended from the exploration phase through preparation, piloting, and full implementation (Fixsen, et al., 2005). The implementation process described in this article summarizes the salient lessons from the preparation and piloting phases. These lessons informed the trans-disciplinary approach for teaching IR&P.

Trans-disciplinary Approach to Teaching IR&P in Public Health

The trans-disciplinary approach seeks to unify knowledge and involves teaching from a universal perspective, that is, to present a subject from its many perspectives without any special recourse or exclusive service to a specific discipline –(Nicolescu, 2012). This is distinguished from a multidisciplinary approach that blends perspectives on the same subject from multiple disciplines to enrich understanding in a home discipline (Nicolescu, 2012). For example, extending counterfactual theories on causation from philosophy into strengthening cause and effect claims in epidemiology could be viewed as a multidisciplinary approach in epidemiology. The trans-disciplinary approach in this context would seek to present other notions around causation, e.g. from theology, without conforming those explanations to the framework in epidemiology. This approach has the advantage of eliminating disciplinary boundaries and allowing students to infer the pervasiveness of relevant concepts across multiple disciplines (Nicolescu, 2012).

For the flagship course on IR&P at the Johns Hopkins Bloomberg School of Public Health, IR&P was conceptualized as comprising distinct and yet overlapping perspectives from various disciplines within the field of public health or health profession practice. The process of packaging knowledge on IR&P from these multiple perspectives without any special recourse to a particular public health discipline is referred to as the trans-disciplinary approach to teaching IR&P. This approach can be summarized into three key steps and six main activities based on the experience of establishing the IR&P flagship course at the Johns Hopkins School of Public Health (Table 1).

Step 1: Organizing for content development

Formulating multidisciplinary teaching team—Because IR&P takes place in real-life settings, it tends quite naturally to instruction by a multidisciplinary team, i.e. having faculty from multiple disciplines co-teaching the course, to create a whole perspective. Forming a multidisciplinary team is a critical component of the trans-disciplinary approach. This should not however be confused with the multidisciplinary approach to teaching described earlier. The multidisciplinary approach, i.e. blending perspectives on the same subject from multiple disciplines to enrich understanding in a home discipline, does not necessarily require a multidisciplinary team to implement as does the trans-disciplinary approach, but could be implemented by a single faculty. The advantages of multidisciplinary teams are many, including increasing students' motivation and awareness of the possibilities to transfer

learned knowledge across subjects, providing abstraction of theoretical concepts and relations among subjects in applied settings, and enhancing students' broad view of IR&P (Wicklein & Schell, 1995; Senge, 1990). Instruction by a multidisciplinary team could also facilitate complex, higher-order thinking where the path of action is not predetermined, leading to multiple context-specific solutions (Resnick, 1987). Such problem solving opportunities are critical for implementation practice training. In addition, such multidisciplinary teams help to remove 'artificial' teaching barriers (such as could arise due to the way academic departments define curricula); enhance advanced learning among instructors; and facilitate cooperation and professional growth (Wicklein & Schell, 1995).

Team building begins with leadership's commitment to constitute a multidisciplinary team (Mackin & Harrington-Mackin, 2014). This leadership support should originate from the various disciplines which contribute to the teaching team. In a graduate school of public health, such commitment may rest with the department chairs. Selection of team members should be based on interest and experience in IR&P. This could be accomplished through self-selection or nomination by the departmental leadership.

The mission of the team – to establish a graduate course in IR&P without any exclusive service to a specific home discipline, i.e. a trans-disciplinary course – should be clarified by the leadership from the outset. Also, support from the departments should be continuous throughout the process of implementing the course. It is important that such multidisciplinary teams are not viewed simply as a tool, but as a culture – an entity with unique ways of thinking and being (Mackin & Harrington-Mackin, 2014) within which significant learning and adaptation takes place, given the level of cooperation and respect for the contributions of complementary disciplines needed for success. Hence, it may require considerably long time to achieve its mission (Mackin & Harrington-Mackin, 2014).

Whereas the value of a graduate IR&P course led by a multidisciplinary team is apparent, the realization of such multidisciplinary collaboration could be a complicated undertaking (Younglove-Webb, Gray, & Abdalla, 1999). Challenges could include: different worldviews by team members which could obstruct a common vision for the course; 'disciplinary chauvinism' - the perception of inferiority of methods and lower esteem held by one's disciplinary peers for multidisciplinary research (Dobbs, 1987); disparity of status among team members which could impact team coordination and communication (Rickson & Rickson, 1982; Jackson, May, & Whitney, 1994); and logistical problems related to organization and time availability (Baldwin & Austin, 1995; Landry, Traore, & Godin, 1996). Leadership turmoil could also arise within the team when a team leader is not apparent and unequal allocation of tasks and responsibilities could lead to conflict among team members. One approach to mitigating these challenges is to discuss these potential issues at the outset and dedicate time for adopting a consensus decision-making approach to the team building and course development processes.

Adopting a consensus approach—Consensus, simply defined as group solidarity (Merriam-Webster Dictionary, 2015), may not always be the preferred view of each member of the team, but is a view that most team members can generally support; as opposed to the ruling or preferred view of a favored majority or a top-down approach where decisions are

prescribed from a higher order without input from all concerned (Hartnett, 2011). With a consensus approach, the aim is to create an egalitarian, inclusive, and cooperative environment for every team member. This approach could be decided passively or actively depending on the degree of interaction among team members and the commonalities they share in their disciplinary approach to scientific methods. If active consensus is sought, then roles, decision rules, and dissent options should be explicated at the team’s inception (Hartnett, 2011).

A consensus approach should be applied to deciding the course specifics including objectives, outline or framework, class sessions topics, activities, and sequence. This will require multiple in-person planning meetings early on; first to gauge the dynamics of the teaching team, and later to make decisions on the specifics of the course. One major advantage of such a consensus approach, aside from encouraging collaborative participation and group ownership of the process, is the opportunity for cross-disciplinary learning and validation of the course specifics and content (Michie, et al., 2005). Since each team member involved in the decision making inherently validates the decisions against disciplinary norms and existing theories from the discipline they represent, validation occurs organically. A major drawback however is that this process may require considerable time and effort.

Step 2: Content development

Developing a common framework and learning objectives—Whereas it is ideal to develop the course objectives prior to developing the course content and outline; this process is not necessarily linear. It is more apt to describe it as an iterative process which often originates with discussion around the course objectives. The objectives should inform the content, which are further refined as the content and outline are developed. One major factor that should guide development of the course objectives is the knowledge and skills that should be conveyed through the course. Mapping knowledge and skills goals to course objectives can assure that these are both reflected in the final learning objectives. Box 1 lists the course objectives developed for the Johns Hopkins Bloomberg School of Public Health IR&P course.

BOX 1

COURSE OBJECTIVES FOR ‘IMPLEMENTATION RESEARCH AND PRACTICE’ AT THE JOHNS HOPKINS BLOOMBERG SCHOOL OF PUBLIC HEALTH

Learning Objectives

- 1 Identify the relevant nomenclature and disciplines that contribute to implementation research and practice in order to develop future implementation projects.
- 2 Apply key implementation science constructs and theories to public health problems.
- 3 Distinguish implementation outcomes from efficacy, service, and client outcomes.
- 4 Apply strategies for improving the adoption of evidence-based interventions in a variety of setting.
- 5 Characterize different types of evidence in public health interventions and frameworks for evaluating evidence.

6	Recognize and critically evaluate common study designs and methods for addressing implementation research aims.
7	Develop an implementation research and/or practice grant proposal by applying concepts, theories, and methods in implementation science to public health problems.

Unlike most other science subjects where research often precedes practice, the converse is often true for IR&P (Fixsen, et al., 2005). By definition, implementation is the ‘doing’; and the process of refining knowledge of how best ‘to do’ forms the basis of the science in implementation which is studied through research. Therefore, there is less of a distinction between research and practice in implementation relative to other fields, and any such distinction should be de-emphasized. It is important to develop IR&P course content with this understanding and to emphasize and demonstrate this characteristic throughout the course.

The course content should cover aspects of the core characteristics and principles of IR&P in public health and describe the boundaries and overlap with other fields. It should provide a whole perspective of the subject and discuss original constructs, theories, and methods used in IR&P from various public health disciplines and incorporate content about the application of IR&P to specific contexts. The course should also include specific activities to facilitate acquisition and testing of knowledge and skills, as outlined in the objectives (Table 2).

Building course content by areas of specialization—Once the learning objectives and course outline are specified, each class session should be independently developed by a team member with disciplinary expertise in that aspect of the course. This approach encourages disciplinary rigor in related theories, methods and approaches as applied to IR&P and maximizes the contributions of the faculty. The course content should also be guided by the core principles of IR&P as presented in scientific publications and through relevant practice initiatives. These principles and characteristics (including those listed in the introduction section) serve two purposes: they operate as field validation tools that constrain each class session to contents that are relevant for IR&P while preserving disciplinary rigor; they add consistency to the class content and help to bridge any potential multidisciplinary divide. It is also important to establish cross-disciplinary content validation first through a team review of each class session, followed with a review by other faculty members with relevant expertise, as appropriate. Inviting input from the whole teaching team as well as outside faculty helps to further minimize any ‘disciplinary chauvinism’, enrich the course content, improve acceptance of the course in the broader academic environment, and generally strengthen the rigor of the IR&P content presented.

It is important to depict the fluidity between research and practice in different contexts and how this forms a critical component of IR&P. This may be best illustrated with case examples showing embedded implementation research in practice settings. The benefit of the multidisciplinary team in this regard is that co-instructors are able to take examples from their respective discipline to create diverse content that mirrors the trans-disciplinary relevance of IR&P concepts. It is also important to adopt an iterative approach while

developing the course content – that is, not to regard each class session as final once the content is satisfactory. This allows for incorporation of the ongoing and dynamic nature of IR&P and for modifying the content accordingly. Hence, future iterations of the course should reflect new knowledge and respond to evolving student needs.

Step 3: Content delivery

Blending pedagogical approaches—Pedagogical approaches could be broadly defined to include instructional approaches on how to present content materials, the form of interaction between faculty and students, and how learning is accomplished and assessed (Grossman, 2009; Korthagen, Kessels, Koster, Lagerwerf, & Wubbels, 2001). Four commonly used approaches in teaching public health courses are (Table 3) – the conventional approach, Keller’s Personalized System of Instruction, Socratic-Type Programming, and Service Learning (Keller, 1968; Hovell, Adams, & Semb, 2008; Hou, 2009). Whereas each of these approaches emphasizes different components useful for instruction, they all focus on the ‘how’ of content delivery and do not necessarily incorporate the process of content development in prescribing the delivery approach. The implication of this for a subject which overlaps multiple disciplines, like IR&P, is that different approaches would be suitable for the different aspects of the subject and this understanding should be incorporated into the process of content development, and into planning the class session delivery.

These different pedagogical approaches can be pursued independently or combined based on the content of each class session, and students’ needs. Hence, a feedback mechanism should be in place to track the success or failure of content delivery (as distinct from the content itself) and the teaching team should be ready to respond with changes as appropriate.

Service-learning is particularly relevant for teaching IR&P. Unlike other fields of science where ideas and theories are first tested in controlled settings before they are carried out in real life conditions, implementation questions and theories often arise under practical real-life conditions and are falsified under such settings (Peters, et al., 2013). Hence, there is a need to expose aspiring implementation researchers and practitioners to real life implementation scenarios so they have opportunities to apply scientific techniques to specific aspects of an implementation process and acquire new knowledge or revise existing knowledge around such processes. This might be practically implemented as a complementary laboratory session, practicum, or internship program depending on the time available for the course and the needs of the service-learning partner. The Johns Hopkins Bloomberg School of Public Health IR&P teaching team is developing small-scale service-learning practicum that will link students to live projects and task them with producing an implementation deliverable for a local community-based organization. Through this reciprocal approach, an organization will receive an implementation product such as a fidelity assessment tool, while students will receive hands-on experience in implementation research and practice. Irrespective of the pedagogic approach chosen, the IR&P class delivery should combine didactic elements with dedicated participatory learning strategies that may draw from field experiences or incorporate case based learning in order to build problem-solving skills.

Beta testing—Initial testing of the course is important. Indeed, the course does not have to be fully developed in order to gain lessons to incorporate into the final version. The composition and size of such a beta-class should be both diverse and manageable. For example, while the Johns Hopkins Bloomberg School of Public Health IR&P course included complete lectures and laboratory activities when it was tested, the course framework (as outlined in Table 2) was not finalized until after the beta-class which allowed students to provide feedback about the course content and pedagogical approaches. For the first year, the course was offered as a special studies course – an option at the Johns Hopkins Bloomberg School of Public Health to preview a new course and obtain feedback before submitting it for formal review by the School. Twenty masters, doctoral, and post-doctoral students from four different departments and the interdepartmental Masters of Public Health program completed the course. Class sessions were a combination of didactic instruction, group discussions, and reviews of published works. The need for case studies using real-life implementation projects were discovered after the beta-testing and this was added during the second run of the course. During the beta testing, students should be encouraged to provide ongoing feedback on course readings and activities. However, the course content and delivery approach are not the only considerations that should be made during the beta-testing. Course logistics such as timing, sequencing of class sessions, student evaluation, and availability of other complementary courses should also be considered. For instance, it was only after the first iteration of the Johns Hopkins Bloomberg School of Public Health IR&P course had started that the selected timeslot was observed to conflict with a required course in one of the teaching faculty’s departments. Such scheduling conflicts are better dealt with during beta-testing, prior to a full rollout of the course.

Conclusion

IR&P has emerged in recent years as a distinct subject of interest in public health as researchers, practitioners, and decision-makers seek greater returns on investment to improve population health. However, the pedagogy in teaching IR&P is underdeveloped and limited in its ability to reflect the trans-disciplinary nature of IR&P. Based on our experience of establishing a flagship course in IR&P at the Johns Hopkins Bloomberg School of Public Health; we have outlined three steps and six key activities which describe a trans-disciplinary approach to teaching IR&P in graduate schools of public health. The trans-disciplinary teaching approach, though implemented by a multidisciplinary team, is unlike a multidisciplinary teaching approach because of its focus on presenting multiple perspectives about a subject without an exclusive service to a home discipline. The process of conceptualizing and delivering an IR&P course in public health - with a goal of developing a subject that transcends individual disciplines of public health in its approach and delivery - is at the heart of the trans-disciplinary approach to teaching IR&P. The initial goal of the trans-disciplinary approach is not to seek common definitions in IR&P, although it will later pave the way for this, but to present the many facets of IR&P related concepts. The practical steps described in this approach are relevant for teaching IR&P in other settings and have significance for other subjects that cut across multiple disciplines. Because of the relevance of knowledge across disciplines and the changing paradigm in scientific inquiry with a bias towards concepts developed by multidisciplinary teams, we view this approach as one that

will provide practical guidance in the future for teaching graduate level academic courses in public health.

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TABLE 1

TRANS-DISCIPLINARY APPROACH TO TEACHING IMPLEMENTATION SCIENCE AND PRACTICE

STEPS	ACTIVITIES
1. Organizing for content development	a) Formulating a multidisciplinary teaching team
	b) Adopting a consensus approach for determining key aspects of course content
2. Content development	c) Developing a common framework and learning objectives
	d) Building course content by area of specialization
3. Content delivery	e) Blending pedagogical approaches
	f) Beta testing

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OUTLINE FOR THE IMPLEMENTATION AND PRACTICE COURSE AT THE JOHNS HOPKINS BLOOMBERG SCHOOL OF PUBLIC HEALTH

TABLE 2

Week	Topic	Objectives for class session	Linkage to overall course learning objectives (from Box 1)
One	Defining and Conceptualizing Implementation	<ul style="list-style-type: none"> Define how implementation research and practice (IR&P) has evolved in recent years and how varying disciplines are contributing to IR&P. Articulate the unique focus and goals of IR&P. Identify the key stakeholders in IR&P. Explain the interplay between research and practice in IR&P and complementary roles of researchers and practitioners in implementation initiatives. 	<ul style="list-style-type: none"> Linked to overall course learning objectives 1 and 7
		<p>LAB: Description of an Implementation Issue</p> <ul style="list-style-type: none"> Conduct interview with identified implementers for a project in a specific program areas¹. Describe an implementation issue based on the interviews. Assess the methodological and practice challenges in the implementation issue. 	
Two	Building Blocks of IR&P: Implementation Outcomes and Strategies	<ul style="list-style-type: none"> Describe outcomes that define the effect of implementation. Distinguish implementation outcomes from efficacy, service, and client outcomes. Describe other important variables that influence implementation. Describe common strategies for implementing public health interventions. 	<ul style="list-style-type: none"> Linked to overall course learning objectives 2, 3, 4, and 7.
		<p>LAB: Operationalizing the Building Blocks of IR&P</p> <ul style="list-style-type: none"> Articulate relevant outcomes and variables for the implementation project. Compare approaches for measuring the outcomes and variables of interest. Identify and prioritize relevant implementation strategies for the methodological and practice challenges in the implementation project. 	
Three	Methods I: Evidence & Research Questions in IR&P	<ul style="list-style-type: none"> Formulate implementation study aims, research questions, and hypotheses. Identify construct measures for addressing implementation research aims. Explain hierarchies of evidence in public health intervention 	<ul style="list-style-type: none"> Linked to overall course learning objectives 2, 5, and 7.
		<p>LAB: Development of Research Question and Specific Aims</p> <ul style="list-style-type: none"> Refine the description of the implementation issue for the implementation project using a problem statement development approach. Characterize specific aims for the implementation project assignment based on the problem statement. Link pre-identified implementation outcomes to your specific aims. 	

Week	Topic	Objectives for class session	Linkage to overall course learning objectives (from Box 1)
Four	Application of Theories & Conceptual Frameworks in IR&P	<ul style="list-style-type: none"> Evaluate evidence to see whether there is supporting evidence to recommend voluntary counseling and testing for HIV using established evidence frameworks. Describe the utility of frameworks and theories for IR&P. Describe common theories and framework relevant for IR&P in public health. Demonstrate how the theories discussed apply to the spread and sustained use of public health interventions (e.g. diffusion, dissemination, adaptation, and implementation). Identify the common themes across theories used in IR&P. 	<ul style="list-style-type: none"> Linked to overall course learning objectives 1, 2, and 7.
Five	LAB: Developing a Conceptual Framework	<ul style="list-style-type: none"> Identify theories relevant to addressing the specific aims for the implementation project Draft a conceptual framework for the implementation project 	<ul style="list-style-type: none"> Linked to overall course learning objectives 1, 2, 4, and 7.
Six	Methods II: Study Designs for IR&P	<ul style="list-style-type: none"> Articulate the purpose of theories in formulating implementation programs/policies and strategies. Explained relevant constructs relevant for implementation programs/policies and strategies. Describe relevant theories for formulating implementation programs/policies and strategies. Identify, integrate, and synthesize relevant literature about the implementation project. Draft a background/introduction section for a grant proposal on the implementation project Use identified theories to refine the strategies for the implementation project. Incorporate relevant IR&P constructs into the conceptual framework described for the implementation project. 	<ul style="list-style-type: none"> Linked to overall course learning objectives 6 and 7.
LAB: Describing Appropriate Research Methods	Methods II: Study Designs for IR&P	<ul style="list-style-type: none"> Briefly describe relevant qualitative research designs in IR&P Describe established and emerging designs for quantitative studies in IR&P, including observational and experimental designs Highlight the differences between explanatory and pragmatic approaches Explain the connections among study aims, research questions, and study designs Identify relevant research designs for the questions to be addressed in the implementation project 	<ul style="list-style-type: none"> Linked to overall course learning objectives 6 and 7.

Week	Topic	Objectives for class session	Linkage to overall course learning objectives (from Box 1)
Seven	Organizational Context: Assessing readiness for implementing change at the organizational level	<ul style="list-style-type: none"> Describe the utility of this study design, the limitations, and potential improvements Describe the specific challenges of balancing internal and external validity with the chosen study design Describe the nature and levels of organizational change in IR&P Describe concepts and approaches for assessing organizational readiness for implementing change Articulate some steps for implementing change within organizations 	<ul style="list-style-type: none"> Linked to overall course learning objectives 2, 4 and 7
	LAB: Course overview	<ul style="list-style-type: none"> Review key concepts and approaches in IR&P from previous classes Review a prototype call for proposal for an implementation project and criteria for assessment Use key concepts and approaches discussed in class to address critical elements of the call for proposal 	
Eight	Students Presentations	<ul style="list-style-type: none"> Faculty and peer assessment of group presentations on grant proposals developed for the implementation project 	<ul style="list-style-type: none"> Linked to overall course learning objective 7

Program areas: students were organized into eight groups based on their programmatic interests. The program areas were selected based on current research work being coordinated by faculty in the multidisciplinary team and these include: implementation of social support programs in the United States, implementation of gun policies in the United States, health services delivery in low and middle income countries (LMICs); improving the delivery of HIV-AIDS services in LMICs; implementation of mental health services in the United States and LMICs.

TABLE 3

COMMON PEDAGOGICAL APPROACHES FOR DELIVERING PUBLIC HEALTH COURSES

	Pedagogical approaches	Main characteristics
1	Conventional approach	Identifies specific learning objectives (skills and/or knowledge) and uses lectures by faculty to transmit information needed for accomplishing the identified objectives
2	Personalized System of Instruction	Combines the conventional approach with use of proctors and teaching assistants for individualized instructions and modifying lectures for motivation or reinforcement (as opposed to just transmitting information)
3	Socratic-Type Programming	Combines conventional approach with active student engagement in class to emphasize student responses over traditional presentations by instructors
4	Service-learning	Integrates active community service with structured class instruction to enrich and make the learning experience relevant to real-life applications

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