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Preparing Emerging Doctoral Scholars for Transdisciplinary Research: A Developmental Approach

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Abstract

Research models that bridge disciplinary, theoretical, and methodological boundaries are increasingly common as funders and the public push for timely, effective, collaborative responses to pressing social and environmental problems. Although social work is inherently an integrative discipline, there is growing recognition of the need to better prepare emerging scholars for sophisticated transdisciplinary and translational research environments. This paper outlines a developmental, competency-oriented approach to enhancing the readiness of doctoral students and emerging scholars in social work and allied disciplines for transdisciplinary research, describes an array of pedagogical tools applicable in doctoral course work and other program elements, and urges coordinated attention to enhancing the field's transdisciplinary training capacity.

Keywords

transdisciplinary; translational; interdisciplinary; pedagogy; doctoral education

> "A radical shift toward greater integration among disciplines and greater integration between knowledge production and its application, calls for similar educational transformation" (Neuhauser, Richardson, Mackenzie & Minkler, 2007, p. 10).

Transdisciplinarity has been described as "research across disciplinary boundaries and in collaboration with stakeholders…[that] orients scientific research towards issues of social concern" (Tötzer, Sedlacek, & Knoflacher, 2011, pp. 840–841). A primary driver of transdisciplinary (TD) research is growing urgency regarding the need for timely, innovative responses to complex real-world issues. Calls for collaborative, impact-oriented science resonate with social work, which has always been concerned to closely link its science, service, and social change missions (Kirk & Reid, 2002). As an integrative, boundary-spanning profession (Mor Barak & Brekke, 2014; Oliver, 2013), social work is well positioned for leadership in TD efforts. An emphasis on cross-disciplinary research is thus evident in discussions regarding shaping a science of social work (Brekke, 2012; 2013), proposals to focus the profession on meeting grand challenges (Grand Challenges Executive Committee, 2013), the Society for Social Work & Research's 2012–2017 strategic plan, and

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the Group for Doctoral Education's (GADE) recently published *Quality Guidelines for Doctoral Education* (Harrington, Petr, Black, Cunningham-Williams, & Bentley, 2013).

In social work, as in other fields, there is however growing recognition of the need to carefully prepare scholars-in-training for this rapidly evolving research landscape (Fong, 2012; Davis, 2011; Kemp & Nurius, 2013). Sarah Gehlert (Gehlert 2012; Gehlert & Browne, 2013) has strongly advocated a pipeline approach to TD education, beginning in doctoral programs and building towards post doctoral and early career training opportunities. In sustainability science, where TD research is well is established, attention is likewise shifting from short-term training modalities to longer term educational strategies (Lyall & Meagher, 2012). Similar calls are evident in public health (Krettek & Thorpenberg, 2011; Larson & Begg, 2011; Neuhauser et al., 2007) and social ecology (Stokols, 2014).

Given the emergent nature of these discussions, the literature on the practicalities of preparing doctoral students for TD research is still relatively modest. Helpful guidance is afforded by the work of Stokols and his colleagues in the School of Social Ecology at the University of California Irvine (Misra, Stokols, Hall, & Feng, 2011; Stokols, 2014), by various publications based in experiences with National Science Foundation (NSF) funded Integrative Graduate Education and Research Traineeships (IGERTs) (Graybill et al., 2006; Graybill & Shandas, 2010; Schmidt et al., 2012), by scholars of higher education (Manthunga, Lant, & Mellick, 2006), and by publications and training materials produced by several groups outside the U.S., primarily in sustainability science (Lyall & Meagher, 2012; Mitchell, 2009). In social work, useful framing materials can be found in Gehlert's publications (Gehlert, 2012; Gehlert & Browne, 2013) and in materials related to discussions of social work and science (e.g., Fong, 2012; 2013; Mor Barak & Brekke, 2014; Nurius & Kemp, 2013; in press). In general, however, these resources stop short of offering specific curricular and programmatic suggestions.

With the goal of moving these discussions a step closer to the realities of doctoral education, this paper outlines a framework for enhancing TD readiness in social work doctoral students illustrated by practical and pedagogical tools applicable in coursework and other program components. We recognize that social work doctoral programs already expose their students to a variety of cross-disciplinary learning experiences. However we see opportunities for a crafting an approach to TD development that builds on and amplifies those learning opportunities already in place, creates new ones as feasible or appropriate, and more intentionally scaffolds the learning process for students.

The material we present is based in work that we have been doing in our own doctoral program, as well as a thorough assessment of the available literature and related materials in other fields. It is also informed by our experiences spanning very different kinds of interdisciplinary and transdisciplinary research efforts. Susan Kemp's scholarship entails broad-based collaborations with colleagues in the spatial sciences and design professions, including geography, architecture, urban planning, and landscape design, as well an orientation to public health and environmental science. Paula Nurius' work, in contrast, focuses on multi-level models relating to health and development outcomes and disparities, drawing from multiple health and social science disciplines that operationalize mechanisms

through which effects of environmental adversity are conveyed and life course stress biologically embodied. Common to both our experiences is increasingly pointed recognition that transdisciplinary expertise is hard come by, even for social work scholars with strong grounding in relational practice.

To ground the paper in a common language, we first provide brief definitions of disciplinary terminology. We then outline and elaborate on a developmental approach, grounded in core TD competencies and attributes, aimed at enhancing the readiness of social work doctoral students for TD research. Since we view preparation for TD research as equally if differentially important for students in the practice doctorates, who are particularly well positioned for collaborative, boundary-spanning practice-based research (Anastas & Videka, 2012), our aim is to chart a roadmap broadly germane to doctoral training in social work. Individual programs can then determine fit relative to their training priorities and the characteristics of their particular educational and community setting.

Defining Disciplinary Relationships

The terms unidisciplinary, multidisciplinary, interdisciplinary, and transdisciplinary share points of overlap but also represent differing configurations and implications. Viewed broadly, they represent a continuum of increasing disciplinary integration and interdependence. Each can be pursued by a single scholar or in teams working together on a particular research enterprise. We use the umbrella term cross-disciplinary when referring to discipline-spanning models overall. The following definitions build from those suggested by Gehlert et al. (2008), Hall (2013), Nash (2008), Rosenfeld (1992), and Stokols (2006), and include examples of related programmatic components.

Unidisciplinary (UD)

scholars from a single discipline work together within a common, discipline-defined framework. Drawing on the “apples and oranges” metaphor, Hall (2013) represents unidisciplinarity as a single type of fruit. Disciplines are defined by their histories, priorities, and definitional boundaries as well as their key conceptual and methodological tools and lenses. Socialization to a discipline is an important part of doctoral training, often pursued through cohort based coursework involving only or predominantly students within a discipline or program, with content attentive to the discipline’s history, central tenets, and commitments. Program requirements (e.g., the general examination, dissertation) often involve articulation and defense of a plan of study relative to a home discipline’s values and priorities.

Multidisciplinary (MD)

scholars from different disciplines work together, separately or sequentially, on common research questions or goals, but maintain their primary disciplinary frameworks (visualize a platter with a variety of different fruits on it). Students may achieve some degree of multidisciplinary training through courses taken in other departments. Many times these “outside” courses are anchored in another home discipline (e.g., psychology, sociology), providing students with valuable information about that discipline’s knowledge, methods,

and perspectives. Varying degrees of integration can evolve through this type of exposure, but this is not automatic. Unless classrooms are constructed to stimulate purposeful interactions among students or assignments press for integrative outcomes, students tend to exit doctoral education with multidiscipline breadth but limited synthesis.

Interdisciplinary (ID)

scholars work jointly on a common problem with the intention of transferring knowledge from one discipline to another; ID collaborations are marked by researchers regularly interacting with and influencing one another. ID-oriented courses tend to emphasize the interrelationships among disciplinary perspectives. Courses and programs may require students to articulate an integrated distillation of content, theory, or methodologies that prompts multi-domain or multi-level understanding. Theoretical and methodological training typically allows deeper grasp of findings and connections across disciplinary divides. Metaphorically, ID training may be represented as a fruit salad: through the training process, students craft linkages across disciplines and disciplinary content, while retaining their individual disciplinary identities. Frequently, students are also encouraged to hone skills that facilitate communication, comprehension, and innovation across disciplinary borders.

Transdisciplinary (TD)

scholars work collaboratively to transfer knowledge and methods, develop shared conceptual frameworks, and generate novel methodologies. Extending the fruit metaphor, TD teams can be thought of as ‘smoothies’ – each participant works at the “interface” of the collective disciplines to more fully grasp complex causal mechanisms and craft novel and accelerated solutions. A TD orientation is typically explicitly multi-level (e.g., cells to societies, Gehlert et al., 2008), attentive to complex relationships among mechanisms, and methodologically pluralistic (Cassinari et al., 2011; Stokols, 2006). Increasingly, transdisciplinarity involves close collaborations between researchers and community stakeholders, who work together to understand and ultimately resolve collectively-identified problems (Cram & Phillips, 2012).

Transdisciplinary Readiness: Core Domains and Competencies

Effective participation in TD research calls for disciplinary depth, the ability to both navigate and integrate diverse methodological and theoretical frameworks, and sophisticated communication and collaborative skills. Klein (2004) has described transdisciplinarity as “simultaneously an attitude and an action” (p. 521). Transdisciplinary scholars tend to be “inclusive…thinkers, broad gauged and contextually oriented in their theorizing and research, methodologically eclectic,…open-minded and respectful of divergent view points, and adept at promoting good will and cross-discipline tolerance” (Mitrany & Stokols, 2005, p. 439). Although social work students typically enter doctoral education with strong relational skills, additional training is needed to hone the research integration skills central to confident participation in TD scholarship. These ‘meta’ cognitive, scientific, and collaborative skills are summarized in Table 1.

The competencies in Table 1 provide a valuable point of reference in considering how best to programmatically enhance TD readiness. At Washington University's Brown School, for example, faculty in the public health program constructed a set of learning experiences (and related outcome competencies) regarding students' ability to *explain* why complex problems benefit from TD approaches, to *describe*, *distinguish*, *develop*, and *apply* theories, methods, and TD competencies in problem solving research, and to *communicate* TD evidence to stakeholders with the aim of influencing policy and practice (Arnold, Kuhlmann, Hipp, & Budd, 2013). This kind of competency-oriented thinking provides a helpful model for mapping where and how to incorporate TD-oriented content within and across courses and other program elements.

Cultivating Transdisciplinary Readiness: A Scaffolded Developmental Approach

The approach to TD preparation we detail below rests on two interlocking assumptions. First, we take a developmental approach, keeping centrally in mind students' maturational trajectories as emerging scholars, the incremental nature of doctoral education, and the importance of appropriately aligning TD learning with both these realities. We think differently, for example, about TD preparation for first year students than we do for those who are writing dissertations and preparing to graduate. Drawing from Graybill et al. (2006) and Graybill and Shandas (2010), we conceptualize this developmental trajectory as beginning with *initiation*, progressing to *navigation*, and concluding with *maturation* (a graphical illustration is provided in Figure 1). Although for heuristic purposes we present this progression as linear, we are acutely aware that learning is recursive and that in reality no hard lines can be drawn between one point in students' TD development and another.

Second, supporting students' maturation as transdisciplinary and translational scholars requires careful institutional, pedagogical, and interpersonal scaffolding, not only through coursework but in other key elements of doctoral education, including research experiences, mentoring, advising, and dialogue with peers. Most social work doctoral programs actively encourage students to take courses in other departments, but often it is left to the students to process and make sense out of these various learning experiences. In Anastas' (2012) recent survey of social work doctoral programs, respondents noted this as often problematic, leading to confusion, reticence, and at times outright reluctance to continue pursuing cross-disciplinary training opportunities. The literature on TD development, in contrast, emphasizes the importance of providing students with consistent, ongoing structural supports, threaded throughout their training (see e.g., Graybill et al., 2006). Since the influences on students' scholarly development are both multiple and cumulative, this curricular scaffolding needs to be thoughtfully staged to provide iterative opportunities for developing and consolidating the core TD competencies outlined in Table 1. The following principles, derived from the TD literature, provide general guidance:

1. *Begin early*. There is increasingly concurrence that preparation for ID/TD research should begin early and be threaded iteratively throughout students' training (Gehlert, 2012; Stokols, 2014). Recognizing that this approach raises concerns about the potential dilution of students' disciplinary identities as social work

scholars – and that disciplinary depth is an essential prerequisite for effective transdisciplinarity – we view ID/TD preparation as complementary to, rather than a replacement for disciplinary preparation.

2. *Mix and phase forms of disciplinary training and exposure*: Klein (2008) points out that educational benefits derive from each aspect of disciplinarity and also from 'quadrangulation,' or purposeful gleaning from the strengths of each; gaining, for example, depth from UD; breadth from MD, integration from ID, and competencies for new forms of team science and translation from TD. Just as forms of disciplinarity represent a continuum from less to more integrative, so will emphases vary across students' programs of study – typically moving from an initial emphasis on UD training to a deepening focus on cross-disciplinary engagement and synthesis (Misra et al., 2011).

3. *Infuse TD content throughout courses and program elements*: Ideally, TD coursework and related learning experiences are threaded both horizontally and vertically throughout the curriculum. An excellent example of a "matrix" approach to TD training can be found in Neuhauser et al.'s (2007) description of the development of a TD doctoral program in public health. This approach contrasts with tendencies to either rely on the broad theoretical and methodological overviews provided in foundational survey courses and/or to bracket TD content in later electives (Pallas, 2001).

4. *Incorporate a mix of didactic and experiential teaching methods and learning experiences*. Given that TD competence blends relational, communicative, conceptual, and methodological skills, multiple pedagogical approaches are required to support students' TD development (Frodeman, Klein, Mitcham, & Holbrook, 2010). Active, experiential, team-based learning is a however key: "through collaboration…students develop critical thinking skills that help them understand the value of others' perspectives, tolerate ambiguity in problem-solving situations, establish productive habits of communication…, and build interdependent working relationships" (Wagner, Baum, & Newbill, 2013, p. 1).

5. *Provide opportunities for shared dialogue and reflection*: Learning communities emerge in the literature as critical to mutual support, intellectual exchange, and identity formation (Willetts & Mitchell, 2006; Mor Barak & Brekke, 2014). TD learning is facilitated when students have structured opportunities for dialogue with each other and more senior colleagues around difficult questions related to integration, bridging cross-disciplinary differences, and the development of "habit[s] of responsible participation" (Klein, 2014, p. 26). Reflecting on their experiences in an IGERT training program, for example, Graybill et al., (2006) point to the central importance of expertly facilitated opportunities to process often complex learning experiences.

Initiation: The First Year Doctoral Curriculum

The first year of social work doctoral education typically focuses centrally on two things: 1) orienting incoming students to their new roles as social work scholars; and 2) providing

them with a strong theoretical, methodological, and policy foundation for later individualized programs of study. Appropriately, required courses and related learning opportunities foreground disciplinary (UD) socialization (see Figure 1). Nonetheless, this first year affords important opportunities to also expose students to the landscape of ID/TD research and lay an initial base for the development of a TD orientation. Consistent with the matrix approach we described above, this orienting content will ideally be distributed across first year coursework, with required courses incorporating those elements most relevant to their particular foci and aims. Methods courses, for example, can include readings and discussions orienting students to developments in translational and TD research and related skills and competencies. Policy courses might underscore the ways in which policy knowledge and research inform multi-level approaches to pressing social issues. Theory courses, including those focused primarily on social work theory, provide necessary foundations in diverse theoretical traditions.

Often under-emphasized, however, are opportunities for developing the epistemological skills foundational to supple engagement with diverse theoretical and methodological frameworks. Linking back to Table 1, these competencies include students' ability to:

1. Demonstrate critical awareness of the underlying assumptions of their own discipline, its scope, contributions, and limitations;
2. Navigate and reflexively engage multiple disciplinary languages, worldviews, theories, and methods.

Courses that include philosophy of social science content or exploration of different theoretical and methodological paradigms are particularly appropriate venues for a sharpened focus on these skill sets. Pedagogical elements that support such development include:

1. Structured opportunities for students to reflect on their personal knowledge frameworks,
2. Course content that not only immerses students in core disciplinary frameworks but allows for critical reflection on disciplinary assumptions,
3. Readings, presentations (e.g., guest speakers from other disciplines), and discussions that expose students to contrasting knowledge paradigms and disciplinary worldviews, preparing them to "understand, appreciate, and assimilate the alterative philosophical assumptions, constructs, and methods associated with disparate fields and levels of analysis" (Stokols, 2014, p. 71),
4. Conversation and dialogue with peers, within and beyond students' home discipline, aimed at strengthening communication and collaboration skills.

To illustrate potential teaching strategies, we offer two brief examples, the first from the lead author's doctoral theory course, the second developed in a NSF-funded IGERT project (Eigenbrode et al., 2007).

Intellectual biographies—Students come to doctoral education with world views and intellectual frameworks already deeply shaped by their personal, cultural, educational, and

professional experiences. Those with social work degrees and related practice experience also have to make an often challenging shift in identity from practitioner to scholar (Mor Barak & Brekke, 2014). A simple strategy for stimulating reflection on and conversation about the assumptions students bring with them is to elicit students' intellectual biographies: the personal, cultural, and educational experiences that inform their current intellectual and conceptual frameworks. We have found that sharing intellectual biographies (including the instructor's) in the first session of our first year theory course underscores the diverse intellectual resources in the class, increases students' awareness of their own and others' training and disciplinary assumptions, and serves as a useful point of reference when the course content explores different knowledge paradigms. This initial orientation to one another's' intellectual frameworks also gives students and instructors ways of interpreting and understanding each other beyond identity markers such as gender, race and ethnicity, or sexual orientation.

The Toolbox Dialogue Method—The "Toolbox" is a structured method for facilitating individual reflection or collective dialogue regarding the fundamental conceptual, methodological and value assumptions underlying differences in approaches to research. Frequently left unexplored, these assumptions are highly consequential – and often problematic – in the context of collaborative research efforts. Grounded in philosophy, the Toolbox facilitates the identification and exploration of epistemological differences, whether by an individual student or in a group. Developed in the context of STEM (science-technology-engineering-medicine) research (Eigenbrode et al., 2007), it has also been adapted for translational behavioral research (Schnapp, Rotschy, Hall, Crowley & O'Rourke, 2012). Organized around a set of core questions, the Toolbox questionnaire is a useful, relatively straightforward method for generating discussion about issues that frequently underlie misunderstandings not only in research teams but among students in doctoral seminar discussions. Illustrative core questions include the following: What is your primary motivation for conducting research? Do values have a legitimate role in research? What types of evidentiary support are required for knowledge? Must scientific research be objective to be legitimate? (Eigenbrode et al., 2007; Schnapp et al., 2012).

Involving Students from other Disciplines: We have found that discussions such as those above frequently are richer and more productive when they include students from other disciplines. Many social work doctoral programs have a tradition of cohort-based approaches to the first year of doctoral coursework. While discipline-centric content and identity formation are clearly important, our experience has been that involving students from other disciplines in social work courses does not threaten the disciplinary identities of social work doctoral students. Rather, their involvement enriches discussions, providing opportunities for students to share different perspectives and examine one others' assumptions. Cross-disciplinary exploration and exchanges conducted *within* a social work frame of reference also orient students from other disciplines to the nature and contributions of social work research. We are thus enthusiastic about the potential for more proactively opening up social work doctoral courses, for example by reworking and "rebranding" existing courses so that they attract students from programs beyond social work.

Advising and Mentoring: First year advisors play a key linking role – assisting students to navigate and make connections across their various learning experiences, serving as a sounding board as students begin to think through their programs of study beyond the required foundational coursework, brokering connections for students with colleagues in other disciplines, and reviewing possible external courses and research opportunities. Our emphasis here is on advising that is planful and anticipatory. Clearly, TD learning should be appropriately tailored to students' educational development and research aims. Nonetheless, graduates reflecting back on their training experiences emphasize the critical role of early and ongoing planning to later TD readiness (Graybill et al., 2006).

Beyond Initiation: Developmental Navigation and Maturation

By the end of the first year, doctoral students are moving beyond prescribed foundation coursework and beginning to construct individualized programs of study oriented to their own areas of focus and specialization. In this section, we describe a range of planning, instructional, and mentoring tools relevant to scaffolding students' ongoing TD development.

Individualized Learning Plans (ILPs)

Individualized Learning Plans (ILPs, sometimes referred to as Individual Development Plans) provide a structure wherein students frame initial statements of their research aims and identities, then iteratively hone these as they progress through various learning experiences (e.g., course work, independent studies, qualifying examinations, research opportunities, dissertations). [1] ILPs serve a range of helpful functions in relation to TD development, particularly around planfulness and coherence. As scaffolding tools, they encourage students to justify their selection of theoretical, substantive, and research methods courses and the cross-disciplinary linkages that appear most important given their research aims. These selections, in turn, form an individualized foundation for the incremental development of more fully integrated theoretical models, methodological tools appropriate to students' aims, and the collaborative skills needed to function effectively in research teams in their substantive arena.

Transdisciplinary Seminars

It is not typical for social work doctoral programs to construct courses specifically designed to attract graduate students from across campus and, thereby, create incubators for ID and TD engagement and integration. In our experience, however, these courses provide a number of important benefits: 1) increased recognition of social work's value as a campus resource for (and not only consumer of) doctoral level courses; 2) opportunities for social work faculty to forefront disciplinary priorities, such as reducing disparities and optimizing health-promotive environments; and 3) integrative opportunities for engaging with colleagues from multiple disciplines—both students and faculty—around a social or health

[1]Examples of individualized learning plan guidelines and formats can be found at Intersections of Mental Health Perspectives in Addictions Research Training: http://www.addictionsresearchtraining.ca/resources/forms.html and University of Washington social work doctoral program: http://socialwork.uw.edu/programs/phd-manuals-forms/guidelines-for-the-program-of-study-leading-to-the-general-examination-0

topic of shared interest. For illustrations of curricula and course structures designed to foster a TD orientation, including pipeline considerations from undergraduate through post-graduate, see Larson and Begg (2011), Lyall and Meagher (2012) and Stokols (2014).

We have been part of TD-oriented courses focused on prevention science, stress embodiment and health disparities, and people-place relationships, each of which has included differing disciplinary sets of students. Pedagogical elements that we have found useful in furthering ID/TD goals include the following:

1. Explicit framing in the course description and aims regarding disciplinary integration across the course content and among the participating students,
2. Structuring course content to illuminate both specialized disciplinary contributions (e.g., neuroendocrinology of stress) and interdisciplinary applications or integration (e.g., integration of neurophysiology into frameworks that account for environmental factors, lifespan development, psychological mediators, and tools usable by non-biological specialists),
3. Inclusion of faculty from other disciplines to illustrate theories and methods distinctive to their discipline but germane to the course focus (with the core instructor ensuring accessibility and integrative coherence of content),
4. Activities that foster students' cross-disciplinary interaction (e.g., identifying disciplinary lenses, eliciting succinct cross-disciplinary consultation on one another's models, spontaneous construction of hypothetical collaborations among small mixed disciplinary groups), scaffolded by guidelines for communication and navigation of differences,
5. Course assignments that require each student to produce an ID/TD product appropriate to the course aims, content, and the student's level of training (e.g., an abbreviated, mock grant proposal; a briefing document describing a new TD-oriented researcher role or research team needed to investigate the student's research topic; a neighborhood assessment representing and integrating multiple disciplinary perspectives).

Transdisciplinary courses such as these provide rich opportunities for fostering and deepening many of the qualities and competencies identified in Table 1. We have found that students often use course assignments to help develop their thinking toward qualifying examinations, dissertations, or grant proposals, such as drawing multi-level 'box and arrow' theoretical models with summaries designed to be understandable to colleagues in other departments as well as stakeholders in the field. Guided opportunities designed to strengthen students' ability to communicate effectively in these venues serve as powerful aids in solidifying the "cognitive architecture" underpinning their theoretical perspectives, as well as their confidence as social welfare researchers conversant in a larger platform of science. Sources noted in the mentoring section below also illustrate activities useful in this kind of coursework.

Matrix Planning Across Program Components

As students move into the more individualized parts of their doctoral training, they need structured opportunities to progressively turn their intellectual fruit platters into fruit salads – and ultimately (even if post-PhD) into smoothie-type syntheses. Program elements such as general examinations, the dissertation prospectus, and research activities are key platforms for the development of integrative ID and TD research readiness. Incorporating TD-focused aims into these core program components provides students and their mentoring faculty with benchmarks that can also be included in their ILPs. Building on coursework, these program elements are important pedagogical vehicles for the navigation and maturation developmental phases (see Figure 1) wherein students progressively refine their own intellectual architecture, deepen their team science readiness, and begin to develop some of the more advanced competencies outlined in Table 1. Meaningful achievement of these goals in the more individualized phases of doctoral training is significantly enhanced by clear guidelines (e.g., in program guideposts for completion, advising checklists) and TD-oriented mentoring and supervision.

Evolving Mentoring Considerations

As we noted earlier, students need ongoing opportunities to connect the dots across these various experiences in conversation with peers and senior colleagues. Ideally students will have a consistent relationship over time with a primary mentor who works with the student to develop and actualize her or his individualized learning plan. Increasingly, ID/TD-oriented supervision also involves multiple mentors with expertise spanning disciplines or specializations. Key mentoring roles include helping students involved in cross-disciplinary training to stay focused on their particular ID/TD goals, and to set boundaries that appropriately balance depth, breadth, and complexity (Graybill et al., 2006). Issues of scope and balance are salient across TD training, from course selection and qualifying examinations to decisions about hybrid dissertations and collaborative publications.

Supporting students in tolerating and persisting through the ambiguity inherent in constructing a synthesized research identity and operating in the spaces between disciplines is also essential (Wagner, Baum, & Newbill, 2013). One place where tension often manifests is in ID doctoral committees, which require both students and mentors to engage with “unfamiliar others” who bring differences in disciplinary and departmental languages, methodologies, and cultures (Fuqua et al., 2004; Nash 2008). Traditionally such committees have tended to function in a multidisciplinary fashion, with members from other disciplines providing their expertise and looking for ways that this expertise is well represented in the student’s work. As Olivero (2014) points out, this traditional model is not well suited to a more explicitly integrationist agenda. Lyall and Meagher (2012) illustrate conundrums such as committee members expecting chapters targeted to their respective disciplinary interests or only being willing to review segments familiar to their discipline. To support students’ TD development, lead mentors and others such as program directors will need to foster changes in supervisory committee norms – to encourage integrated rather than compartmentalized products, for example, or publications accessible to readers spanning relevant disciplines and stakeholders such as service providers.

Mentoring in Research Training

Research activities should also come more centrally under the umbrella of mentoring. Many social work research teams are multidisciplinary, yet research practica and assistantships tend to focus on training students in research methods, missing opportunities for experienced researchers to articulate and make visible to students the processes underlying ID/TD research. How did they arrive at an integrated theoretical formulation, for example? Or negotiate conflicting perspectives in the team about how best to operationalize mechanisms spanning levels of phenomena? This kind of modeling provides students with “how to” insights vital to successfully navigating real-world ID/TD research collaborations.

The qualities that make for effective ID/TD mentors overlap those needed in students, such as open-mindedness, curiosity toward learning from and with other disciplines, and willingness to undertake challenges such as mastering new languages, questioning one’s own assumptions, navigating tensions that come with differences, and persistence. Lyall, Meagher and Tait (2008) note for example that TD-oriented students often test out a range of disciplinary frameworks before settling on the right mix. Mentoring these students involves serving as a thoughtful sounding board, as well as practicalities associated with facilitating cross-disciplinary connections and maintaining steady progress. Helpful guidelines for TD mentoring have been developed by the Institute for the Study of Science Technology and Innovation (see ISSTI, 2014).

Group Mentoring

Group mentoring models also hold promise as mechanisms for building mentoring capacity within doctoral programs, with one or a small group of faculty taking the lead, working closely with the program director, and exchanging resources and feedback on experiences with instructional and mentoring faculty. We have found considerable value, for example, in seminars that purposefully engage students across multiple years within our program as well as students from other disciplines (see also Mech, 2001). To foster a sense of trust within a collegial learning community, these year-long seminars have reasonable workloads but expectations of regular participation. We have drawn from a number of resources in structuring scenarios and engagement activities; see, for example, Interdisciplinary Wiki Homepage; Lyall, Bruce, Tait, & Meagher, 2011; Mitchell, 2009; Team Science Toolkit-NCI.

Beyond the PhD

Evaluations of transdisciplinary doctoral programs (Mitrany & Stokols, 2005) suggest that by the time they graduate, participating students will have developed a strong ID orientation and a platform of readiness for entering initial ID/TD research careers. To be fully successful in TD research team relationships, roles, and productivity, early career graduates will nonetheless need continued mentoring and institutional scaffolding. As students prepare to graduate, they thus need to be charting with mentors the post-graduation steps of their TD roadmap: reflecting on what they need to look for in their next scholarly environments, and planning the strategic development of scholarly portfolios that illustrate expertise in their home discipline as well as readiness to engage with others in research design,

implementation and translation (Hall, Vogel, Stipelman, Stokols, Morgan, & Gehlert, 2012; Millar, 2013).

Concluding Note

At the 2014 Society for Social Work & Research annual conference, a roundtable session on the science of social work fostered productive conversation about issues related to fostering social work's capacity to excel as an integrative scientific discipline. To our perception, it was doctoral students and early career faculty who most reflected a sense of urgency about crafting and sustaining a productive research career in contemporary research environments. The issues they raised were pragmatic, specific, and real-time; for them, the time for capacity-building is now. Discussions in a workshop we facilitated at the same conference had a similar flavor. The doctoral students in particular were both immersed in cross-disciplinary experiences and eager for more programmatic support and guidance. Although there are few off-the-shelf, one-size-fits all solutions, other fields offer useful tools and experiences. Drawing on these, we have attempted in this paper to outline a pragmatic approach to strengthening social work's transdisciplinary doctoral training capacity that builds on existing program elements while leaving room for programmatic diversity. We encourage social work doctoral programs to experiment; a good deal can be achieved by amplifying areas of existing programmatic readiness and crafting stronger and more explicit connections across students' learning experiences. But there is also room for boldness – for social work doctoral education to mirror, in fact, the spirit of urgency, innovation, and openness to change that animates the best of transdisciplinary science.

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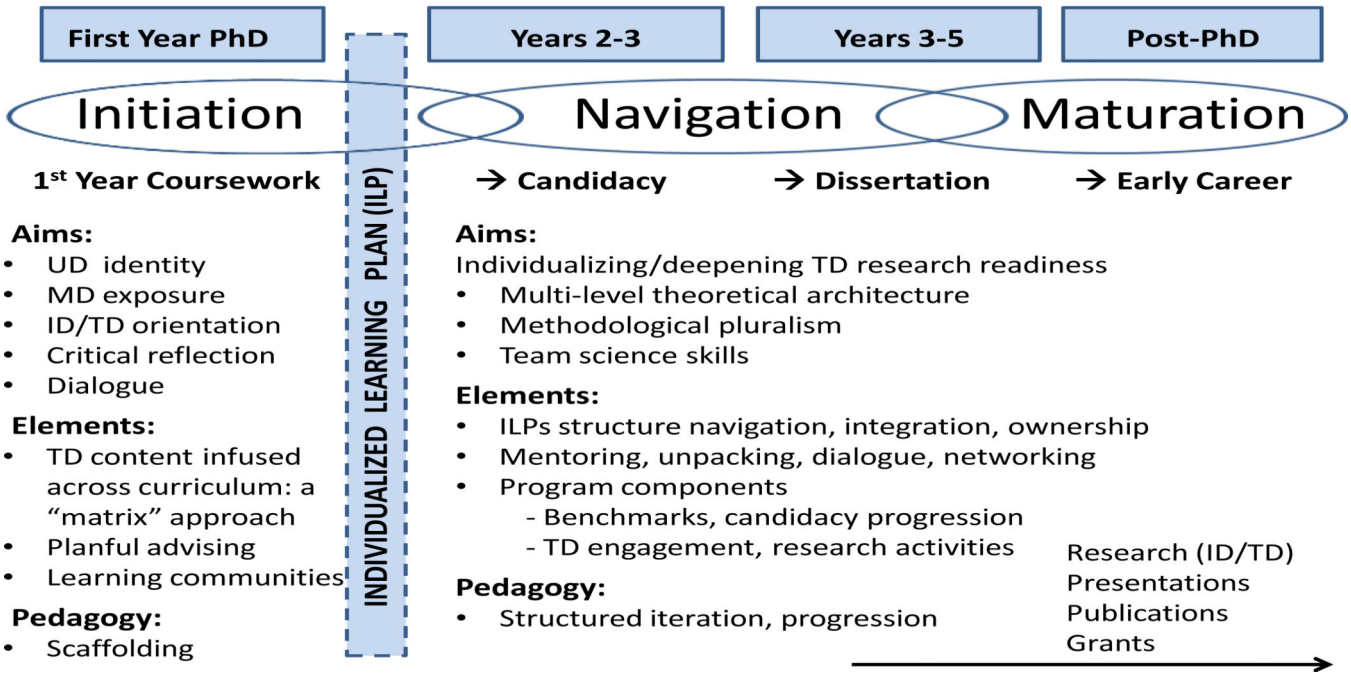

Figure 1.
TD Developmental Roadmap

Table 1

Transdisciplinary Readiness: Qualities and Competencies*

By the end of their doctoral programs, students will be able to:

Critically Engage, Reflect, and Integrate:

- Demonstrate critical awareness of the underlying assumptions of their own discipline, its scope, contributions, and limitations
- Navigate and reflexively engage multiple disciplinary languages, perspectives, and worldviews
- Think broadly and contextually about complex, multilevel problems
- Identify higher order relationships, synthesize, and integrate

Collaborate:

- Engage colleagues from other disciplines and community stakeholders to gain their perspectives on research problems, frameworks, or topics
- Respect the roles and contributions of others
- Effectively navigate tensions and conflict
- Stay at the table (persistence)

Communicate:

- Explain their own work and perspectives clearly and confidently to others
- Read publications and attend conferences beyond her or his own discipline
- Disseminate research results within and beyond her or his own discipline
- Publish with colleagues from other disciplines

Conduct Research:

- Flexibly use theories from multiple disciplines in developing integrative, multilevel conceptual frameworks
- Integrate concepts and methods from multiple disciplines in designing research protocols
- Modify research agenda as a result of interactions and input from other colleagues
- Design, seek funding for, and implement interdisciplinary research projects in collaboration with scholars from other disciplines and community stakeholders.

* Adapted from Gebbie et al., 2008; Hall, 2013; Larson & Begg, 2011; Nash, 2008; Stokols, 2014