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Assessing Interdisciplinarity with ePortfolios

By Natalie McKnight
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The College of General Studies (CGS) at Boston University has been using ePortfolios for the past 5 years for assessment purposes, but we have found that they also enhance the interdisciplinarity of our program. CGS is a two-year, interdisciplinary general education program where students are placed on teams which share the

same faculty for two semesters. In the freshman year, a team consists of 4 professors, one in Humanities, one in Social Science and two in Rhetoric.

The team system allows professors to make connections with each other's courses in lectures, discussions and in formal writing assignments. The team system is also used in the sophomore year, with one Humanities, one Social Science and one Natural Science professor per team of 80 students; as is the case in the freshman year, sophomores benefit from the connections among courses that they



Natalie McKnight

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Coherence and Integration throughout the Curriculum

By Rick Szostak
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The Fall 2013 issue of Peer Review (a journal of the American Association of Colleges and Universities) on capstone experiences reached several important conclusions:

- Students need to be able to integrate across different courses, disciplines, and life experiences.
- Students need to see coherence in their educational experience.
- A capstone experience, in which students perform an extended piece of

independent (or group) integrative research (or community outreach or artistic production), is a powerful means of pursuing the twin goals of integration and coherence. Yet capstones do not always achieve these goals (see especially the empirical analysis by Jillian Kinzie).

• Such a capstone experience also instills critical thinking, problem-solving, and analytical skills, and thus further prepares students for life beyond college.

• Though capstones are invaluable, these goals – integration, coherence, and critical thinking – should be pursued throughout a student's education.

These conclusions regarding student

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McKnight: ePortfolios

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explore with the faculty. (After their sophomore year, students continue into their junior year in the college of their major, having already taken several electives in their chosen area of concentration.) In 2009 we began requiring students to post assignments from each of their core courses on electronic portfolios (using the Digication platform) and to use their postings to reflect on their progress at the end of both their freshman and sophomore years. This practice has led to a rich archive of student papers, reading responses, labs, and Capstone projects which serve as a showcase and a resource for our assessment of the impact of our program.

We ask students to set up an ePortfolio site and to include sections for each of their CGS courses and for their electives, advising, interdisciplinary reflections, and co-curricular activities (for an example of a student's homepage, see <https://bu.digication.com/nahomiv/Welcome/published>). Having all their work for each course in one site helps students gauge their progress throughout their college career. It also enables students to access material from one course and apply it to another. Additionally, the archive gives professors a more holistic sense of students' overall development and their interests and activities beyond the classroom.

Electronic Portfolios have also benefitted our advisors. Advisors ask students to set up an "Advising" section in their ePortfolios in which they address questions and prompts such as:

1. College is a transformative experience. Describe the ways in which you hope and anticipate you will grow.
2. What are your areas of interest, aside from academics?

3. What areas of study or possible majors are you considering or want to explore? What is it about these areas that you find interesting?

4. What career paths are you considering or want to explore? What is it about these areas that you find interesting?

Addressing these questions early in the freshman year encourages students to start discerning a major and/or career path. Their responses also help advisors get to know their advisees so they can have more productive sessions with them. Advisors can also access the work in each of the students' classes so they have a fuller sense of the students' academic performance.

Electronic portfolios have been useful in strengthening our interdisciplinary Capstone project as well. In the last four weeks of their sophomore year, our students work in groups of 5 or 6 on a 50-page research paper in which they analyze a contemporary real-world problem and propose a viable solution to it. Recent topics have included: dealing with the issue of hunger in Boston; developing a cross-campus plan to make Boston University more "green"; and addressing the problems of deforestation in particular geographical regions. We have always given students one group grade for the paper, but the grade that each student gets individually is a combination of the paper grade plus an assessment of his/her participation in the project and performance in the final two-hour oral defense. It was often difficult for us to gauge the individual's contribution to the project, but now with ePortfolios, we ask students to keep an individual log of all the work they do on the Capstone project each week, and we also ask them to post all the preliminary drafts they write. This supplies a record of the individual's contribution to the overall project, and prevents us from

Electronic portfolios have been useful in strengthening our interdisciplinary Capstone project as well.

having to rely solely on student peer review (which can be contradictory). Having weekly work posted also helps the members of a group keep track of each other's contributions, share sources, and develop a more coherent group voice through an ongoing collaborative process. These postings further aid students in reflecting on their progress through a self-assessment essay composed after they turn in the final project. This reflection, along with a similar assignment we ask them to write at the end of their freshman year, enhances their educational experience through metacognition and by articulating the value of their college experiences (Rodgers, 2002).

Of course ePortfolios also provide an excellent archive to aid in assessing our overall program, which is why we started using them to begin with. We developed a rubric that is based on AAC&U models, tweaked to better reflect the specific outcomes of our college (AAC&U, 2012). We have trained a group of faculty (our Assessment Committee) to use the rubric and its qualitative and quantitative values to assess the competency levels of students in each semester in each outcome area (e.g. critical thinking and perspective taking, integrative and applied learning, quantitative methods, etc.). Each year our Assessment Committee analyzes a statistically significant sampling of student ePortfolios, and we compute the competency level averages, the amount of change in scores from 1st to 4th semesters, and standard deviations. (See <http://www.bu.edu/cgs/citl/eportfolios-and-assessment/> for our rubric and a description of

our assessment work).

For the past two years, our students have shown an increase in competency of 28-32% in all outcomes areas with the sole exception of quantitative reasoning—since we do not have a required math course in our program, and no required science course in the freshman year, it is hard to get a baseline reading on quantitative skills. But we are now increasing the integration of quantitative reasoning in our Rhetoric, Social Science and Humanities courses in order to strengthen this outcome area. The average rates of improvement of our students are much higher than national averages such as those shown by Arum and Roksa (2011). They assessed the progress of thousands of students between first and fourth semesters using the Collegiate Learning Assessment test; their research showed typical improvement rates of only 7% between the beginning of the freshman year and the end of the sophomore year (the same period we are assessing).

Skeptics might think that our Assessment Committee sees progress in students' work because they want to see it, but in fact every member of the Assessment Committee, myself included, has observed portfolios that show no progress. Typically students make substantial progress, and we can

see that; but when they don't, we see that, too. We think our interdisciplinary approach to general education is partly responsible for the greater rates of improvement of our students (McKnight, 2014). The interdisciplinary approach allows each course to reinforce the other courses and trains students to think interdisciplinarily when they approach any subject or problem. The approach, in other words, helps students remember the material because it is amply contextualized and reinforced, and it makes them better critical thinkers, since bringing together perspectives from multiple disciplines is a key component of critical thinking. Of course we cannot know for sure that the interdisciplinarity of our program is the main factor contributing to our higher rates of student progress. But the data and our many years of witnessing students transformed by our interdisciplinary approach present a convincing picture.

This year we will approach assessment from a new angle that might help us better gauge the impact of the interdisciplinary aspects of our college in particular. We launched a January freshman program at the beginning of 2014, and the first class has kept ePortfolio records of their work, just as our September students do. We created the January freshman program to be even more consciously

interdisciplinary and integrated than our September program, with all three CGS courses exploring six “tipping points” in world history. When we assess the work of students from this program, we expect we might see even greater progress, particularly in the area of integrative and applied learning. If we do, then the heightened interdisciplinarity will likely be the cause. We will be conducting the assessment of the January freshmen this August — so stay tuned!

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Szostak: Coherence

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needs come at a fortuitous time. The literature in the field of interdisciplinary studies has “come of age” in recent years. There are now several texts (Augsburg, 2009; Repko, 2012; Repko, 2014; Repko, Newell, and Szostak, 2012; O'Rourke et al, 2014) and other resources (Bergmann et al, 2012;

About Interdisciplinarity, 2013) that summarize a diverse literature on how best to perform interdisciplinary research and teaching. These resources taken together allow us to infuse the entire college experience with integration, coherence, and critical thinking.

Coherence

Students should first understand the nature of disciplines. Any discipline at any point in time can be

characterized by:

- A set of phenomena that are studied (and the relationships among these);
- One or more theories that are employed;
- One or more methods that are employed;
- A set of concepts that are employed;
- Epistemological, ideological,

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aesthetic, and sometimes metaphysical preferences; and

- Rules governing hiring, publication, and graduate education.

Disciplines evolve through time, and at any point in time will likely contain minorities of scholars who pursue alternative theories, methods, or subjects. Nevertheless, the key point to stress is that these six elements of a discipline themselves cohere into an overall “disciplinary perspective.” Methods are chosen that are good at investigating favored theories, and these are applied to suitable subjects. This set of theory, method, and subject is justified philosophically, and members of the discipline are rewarded throughout their careers for pursuing accepted lines of research. A discipline’s terminology attempts to clarify the nature of its theories, methods, and subject matter.

The scholarly enterprise as a whole can be seen as the sum of the disciplines it contains plus interdisciplinary efforts to integrate across these. It is thus important for students to recognize several key characteristics of the scholarly enterprise:

- It addresses the sum of those phenomena addressed by each discipline. Since disciplines exercise considerable independence, it is inevitable that there are overlaps in coverage across disciplines. There are perhaps also some things that are ignored by all. Casual empiricism suggests, however, that the set of phenomena that scholars collectively study is roughly the same as the set of things that humans are aware of. It turns out to be surprisingly easy to classify and provide students with an overview of all these phenomena. Students need then to appreciate that these

many phenomena affect each other in myriad ways.

- A broad set of theories is applied. While there are thousands of these, and new ones are invented regularly, we can aspire to classify these along a handful of key dimensions. Students can thus better appreciate how, and often why, two theories differ. They also

The literature in the field of interdisciplinary studies has “come of age” in recent years. There are now several texts and other resources that summarize a diverse literature on how best to perform interdisciplinary research and teaching. These resources taken together allow us to infuse the entire college experience with integration, coherence, and critical thinking.

thus gain a better appreciation of the essence of the term “theory.”

- There are only about a dozen methods, broadly defined, used across the entire academy. It is thus feasible to acquaint students with some of the key strengths and weaknesses of each.

- Scholarship is characterized by a wide range of (often implicit) philosophical attitudes regarding the nature of reality, the possibilities of human understanding, and a range of other questions.

We can imagine (but need not draw) a multi-dimensional map of the scholarly enterprise comprising the full set of phenomena studied, and theories, methods, and perspectives applied. We could then place each discipline on this map. As noted above, there will be overlaps. It is likely that there are plausible combinations of theory, method, and subject eschewed by all (The various elements of this “map” are addressed in Repko, 2012 and *About Interdisciplinarity*, 2013).

It is a complex map, to be sure, but we kid ourselves if we try to achieve coherence in student education without actually

confronting the manageable complexity of the scholarly enterprise as a whole. Once we appreciate that students will draw upon information from diverse disciplines throughout their lives, coherence can only truly be achieved if the scholarly enterprise itself is appreciated to be coherent.

Integration

Graff (1992) has long championed “teaching the conflicts.” Students display a remarkable capability for compartmentalizing knowledge: they can do well on exams while remaining blissfully unaware that their economics and political science professors reached opposing conclusions about the value of free trade. We need to make sure that students do not achieve a false sense of coherence, imagining that scholars are always in broad agreement. Indeed, students should appreciate that conflict is essential to the scholarly project: it is in disagreeing that we clarify evidence and argument and hopefully advance our understanding. The danger is that students may become so overwhelmed by the ubiquity of conflict that they conclude that we never really either understand or resolve anything. It is thus essential that students learn explicit strategies for coping with conflict. The literature on interdisciplinarity has identified several strategies for doing precisely that (Repko, 2012; *About Interdisciplinarity*, 2013).

Different strategies are tailored

to different sources of conflict. Conflicts are often more apparent than real. In particular, disciplines tend naturally to think that the things they study are most important. An economist will proffer economic solutions to a social problem (say, inner city poverty), where a political scientist advocates community empowerment and an anthropologist cultural renewal. The interdisciplinarian can often see value in each of these, and ways that economic, political, and cultural variables interact. The technique of “organization” delineates these linkages. A student confronted with this sort of “conflict” can gain an appreciation of how disciplines can provide complementary insights.

But conflicts are often real. Sometimes scholars disagree because they are defining key terminology differently. The technique of “redefinition” involves clarifying the meaning of key terms.

Sometimes scholars disagree because the theories they employ use different assumptions or include different variables. The strategy of “theory expansion” extends a theory so that it absorbs elements of alternative theories.

Sometimes scholars disagree because they pursue directly opposing assumptions. An economist may stress rational decision-making and a sociologist non-rational decision-making. The technique of “transformation” places such opposites on a continuum: by appreciating that humans are neither perfectly rational nor completely non-rational we can borrow from the insights of both economist and sociologist.

Sometimes scholars disagree because they employ different methods. An understanding of the strengths and weaknesses of different methods can help us to “triangulate” across these different research results. For advanced students, mixed methods research

strategies may be suggested.

Often, of course, these strategies need to be applied in combination. Economists and political scientists may disagree regarding free trade because they emphasize different effects, employ different theories, and use different methods. And the simplicity of the various strategies for addressing conflict should not blind the student to the fact that creativity is generally required in their application. Some conflicts are more challenging than others. But students should appreciate that we can collectively strive to alleviate and even transcend conflict in order to achieve a more comprehensive understanding.

Critical Thinking

The literature on interdisciplinarity has also identified useful strategies for various other steps in interdisciplinary research: asking a good question; evaluating insights; mapping the research question; choosing relevant theories, methods, and disciplines; reflecting; testing; and communicating. Each of these steps instantiates critical thinking. Students are taught how to ask good questions, evaluate research across all disciplines, and reflect on their own and others’ biases (Repko 2014, 167-73).

It is common to observe in an era of information overload that a—perhaps the—key personal skill is knowing where to look for information. None of us can master an entire discipline, much less the set of disciplines implicated in the complex problems we all face in our lives as workers, citizens, and members of communities. By understanding the nature of disciplines, interdisciplinarity, and the scholarly enterprise that they together comprise, a student is best prepared to know where to look for the varied information they will need in life. And if they know how to integrate they will be better able to

apply that information usefully.

Conclusion

We should not and need not wait till the capstone to address student needs for integration, coherence, and critical thinking. There are concrete strategies for addressing these needs. We have identified above some concrete ideas and skills that can be communicated to students earlier in their university education. These might be addressed in dedicated courses on interdisciplinarity, the nature of the academy, or critical thinking. Or they might be addressed across several distinct courses. It would be best if the material were reinforced throughout the educational experience.

One key goal should be “self-conscious interdisciplinarity.” The challenge to interdisciplinary research and teaching a generation ago was the understandable but misguided belief that interdisciplinarity was impossible because it took years to master just one discipline. The challenge today is a belief that interdisciplinarity is easy: one just needs to do a bit of reading in other disciplines. The truth lies in between: interdisciplinarity is quite possible but not easy. It is thus invaluable to appreciate that there are strategies for doing interdisciplinary analysis successfully.

But the insight that students learn best while performing independent (or group) research should not be forgotten. Students best learn the steps and strategies for pursuing interdisciplinary research if they apply these as they are exposed to them. They will better understand the contours of disciplines and scholarship as they are required to perform integrative projects. Critical thinking is best mastered while exploring a complex issue.

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Relationalism: An Interdisciplinary Epistemology

Or, why our knowledge is more like a coral reef than fish scales

By Angus McMurtry and Jennifer Dellner

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[I]ntellectual progress usually occurs through sheer abandonment of questions together with both of the alternatives the assumed, an abandonment that results from their decreased vitality and a change of urgent interest. We do not solve them, we get over them.

— John Dewey

Most discussions of interdisciplinary learning continue to be framed in terms of traditional dichotomies of objectivity & subjectivity, external realities & internal human consciousness, or the hard sciences & humanities. In this article, we argue that there are more productive ways to think about our knowledge and world. These ways of thinking do not “choose sides” or even try to achieve a balance between these traditional extremes. Instead, they move beyond them, reframing learning and knowing in more relational terms and in a way that much better suits the spirit of interdisciplinarity.

Getting over traditional dichotomies: Why the world is not like a fish

Two uncritical assumptions that underlie many philosophical discussions are 1) there is a real world “out there” that we comprehend the rough boundaries of, and 2) we — as individuals, disciplinarians and interdisciplinarians — are like spectators with perspectives of that world. Knowledge is therefore framed in terms of correspondence between an external objective world and our subjective understandings or “representations” of it. Our job as academics is to construct models that accurately correspond to the world and cover as much of it as possible. To draw upon Donald Campbell's influential image, the world is like a fish and both disciplines and inter-disciplines attempt to fill the gaps and cover the fish with scales.

This way of framing the knowledge leads to polarized positions and intractable debate. Proponents of objectivity, on the one hand, point out that we have made progress in solving problems like curing diseases or building safe bridges. If we have not achieved the goal of objective truth, then it must be because our subjective limitations or biases have somehow contaminated the process. Those of a more critical, inter-subjectivist orientation, on the other hand, note that theories are always rooted in history, embed biases, and are regularly being reformulated. Knowledge from this perspective is more about subjective constructions and intersubjective accord than any definite relationship to the real, physical world.

Finally, some thinkers attempt to find a reasonable middle ground between these two extremes.

Østreng (2010), for example, encourages interdisciplinarians to take a post-positivist stance between the extremes of traditional positivist objectivity, on the one hand, and absolutely subjective postmodernism on the other. Bhaskar (n.d.) reaffirms the mind-independent ontological reality of being or objects, yet warns us to always “be critical of...our understandings of social and natural reality” (para. 6). And Welch (2012), in a recent issue of Integrative Pathways, articulates a common ground or “mutual nature” between reality and human consciousness.

We believe that the way to resolve this dilemma is not to choose sides or even aspire to a middle ground. Instead, we believe it is time to “get over” these dichotomous alternatives and the pervasive assumption that knowledge must be framed in terms of correspondence between objective, external realities and internal, socially-mediated subjectivities.

Knowledge is a relational: Why the world is more like a coral reef

There are, in our opinion, now better and more productive ways to think about individual, disciplinary and interdisciplinary knowing. Associated with recent writing in complexity theory, inter-objectivity, enactivism and pragmatism, these ways of thinking articulate learning in more relational terms and draw upon biological or evolutionary metaphors like trees, rhizomes and — in this article at least — coral reefs. This sort of relational thinking is not alien to interdisciplinary and integrative thinkers. As Klein (2005) points out, the “interplay” between factors studied by individual

disciplines (such as individuals and environments) has long been a focus of integrative thinking (p. 9).

These new relational approaches do not view knowledge as a commodity, thing or data stored in the minds of knowers. Rather, knowledge is understood as dynamic, participatory relationships among knowers and their world. To say that a people know something means that their knowledge allows them to interact effectively with something else. The physical and social world constrains what sorts of knowing are possible, so knowledge is never purely subjective. For instance, if I believe that I can fly and test it out from the top of my building, the world will most likely render that knowledge unviable. And if I believe that my students should treat me as an emperor, I will lose my job and possibly be locked up. The world does not, however, dictate any one specific kind of knowledge; many different sorts of knowledge have helped humans, for example, to grow agricultural crops

or negotiate social structures.

Similarly, academic fields and professions can be seen as generating more disciplined, elaborate collective knowledge that enables us to interact very effectively with various parts of our world. This knowledge needs to work in the contexts in which it is used, so it is never just a subjective social construction. But that does not mean that we are achieving, or moving towards, some final, objective truth. As the histories of the natural and social sciences themselves illustrate, paradigms are revolutionized or reformulated on a fairly regular basis. What we used to think was an objective representation of the world has usually turned out to be an imperfect human construction — albeit, like Newtonian physics, a very useful one. Furthermore, as all interdisciplinarians know, a wide variety of disciplines may provide rich insights into the same phenomenon; in fact, the integration of these insights may even produce

new, emergent knowledge that exceeds the sum of its disciplinary parts (Newell, 2001).

This relational position on knowledge actually fits quite well with constructivism. Some who fall within this camp — for example, the strong social constructivists who assert that all knowledge is socially constructed and see no need to refer to anything outside of such constructions — may ignore or minimize the role of reality beyond our individual and social construals. More sophisticated constructivist theorists, on the other hand, including Piaget himself, understand the world and especially our interaction with it as playing an important role in the knowledge we construct.

How, then, should human knowledge be portrayed? We think that evolving biological forms, like coral reefs offer a better metaphor. A reef is nurtured and shaped by its world: sunlight, ocean currents,

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Education is a combination of learning “stuff” and learning “how to think”; therefore, we should not just set students loose on a research project without providing them with the tools to succeed, nor teach those tools in isolation.

The texts and other resources cited above are tailored variously to the needs of students in each year of their undergraduate education (and provide much useful advice for graduate students and scholars as well). We can thus build gradually but thoughtfully toward success both in the capstone project and beyond the university. Students upon graduation will thus not just gain an increase in knowledge but

also acquire critical thinking skills, a coherent appreciation of the scholarly enterprise, and the ability to integrate.

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nutrients, other plants and animals, etc. And to survive and grow, it must adapt and interact effectively with this environment. But the reef does not objectively represent its world; rather, it "constructs" itself in relation to this world. And over the course of evolutionary history, the coral reef may diversify, adapt to changing conditions, become more complex, or simply die out.

Human knowledge can be seen as following a similar path, generally becoming more diverse and complex, but with the occasional "extinction event" like the fall of the Roman Empire in Europe or the loss of shipbuilding and navigational knowledge in China in the 15th century. It is true that we employ different and arguably more sophisticated strategies to mediate our interaction with the world, using language, mathematics and representational technologies such as maps or models. But that does not mean that our knowledge should be primarily conceived of in representational terms. As Osberg, Biesta and Cilliers (2008) write

[M]odels and theories that reduce the world to a system of rules or laws cannot be understood as pure representations of a universe that exists independently, but should rather be understood as valuable but provisional and temporary tools by means of which we constantly re-negotiate our understanding of and being in the world. (p. 218)

A few more useful insights can be "squeezed out" of this metaphor. The first concerns the boundaries of knowledge. If human knowing is like an evolving biological form, then we cannot predict the exact nature or boundaries of the knowledge that will exist in the future. Our world is

not like Campbell's fish, with pre-determined boundaries and gaps to fill with scales. Rather, it is like a coral reef, growing outwards and taking on new and different structures as it encounters new and unanticipated phenomena. It does not and may never comprehend the boundaries of the ocean in which it lives.

Unfortunately, examples of the narrow "fish-scale" approach can still be seen in both popular culture

We think that evolving biological forms, like coral reefs offer a better metaphor [for epistemology]. A reef is nurtured and shaped by its world: sunlight, ocean currents, nutrients, other plants and animals, etc. And to survive and grow, it must adapt and interact effectively with this environment. But the reef does not objectively represent its world; rather, it "constructs" itself in relation to this world. And over the course of evolutionary history, the coral reef may diversify, adapt to changing conditions, become more complex, or simply die out.

— for example, in political debates that present conservative and liberal views as the only options — and in academia, for instance, in psychology classes that present behaviorism and cognitivism as two poles that define the boundaries for understanding learning. These parochial views remind us of the lady in the movie *Blues Brothers* who states, "we got both kinds of music: country and western."

A second insight concerns the relationship between established and radical knowledge. Although human knowledge can be seen as growing outwards, new growth is based on and enabled by previous thinking. There is no such thing as an entirely revolutionary break from the past. As new coral constructs itself on the dead bodies of previous coral, or attaches itself to existing objects to begin a new reef, we

construct new knowledge based upon the thinking that came before us — even when our new knowledge conflicts in with it. Original thinkers may construct new ideas, but they do so on a landscape shaped by previous thinkers.

The account developed here has some ideas in common with Bhaskar's (2006) critical realism, as it rejects both 1) naïve empiricism's claim that "statements about how the world is" can capture reality

without the need for criticism or interpretation (p. 283) and 2) strong social constructivists' collapsing or reduction of "intransitive" non-human reality into our understanding of it (p. 284). There are also differences, however. Bhaskar continues to view knowledge primarily in terms of representations of the world in the minds of knowers, representations that have at least the potential to move toward an "absolute truth" (n.d. para. 22). In contrast, the account developed here defines knowledge in terms of viable relationships rather than representations, and as ever-expanding rather than moving toward a specific endpoint.

Implications for education and interdisciplinarity

If human knowing is understood in terms of dynamic, participatory

relationships with the world — and as continuously growing but offering no final, unequivocal and objective truth — then there are important implications for education, disciplinarity and interdisciplinarity.

First, as academics we can reinterpret our mission as engaging our students in a collective enterprise to construct more effective, nuanced and ethical relationships with our physical and/or social world. Together, we explore the boundaries of existing knowledge in order to push those boundaries and generate new knowledge. For us, this is a more realistic and exciting way to think about what happens in our classes than the traditional model of passing on “the facts.”

Understanding knowledge in terms of relation, rather than the dichotomy of external/objective and internal/subjective, also has implications for the perceived boundaries between the natural and human sciences. The former is often portrayed as “discovering” objective truths, while the latter is depicted as exploring subjective experience. From the relational perspective developed here, this distinction is unsustainable. First, no human construction can be said to objectively represent the world as it is; all we know are the constructions we create based on our interactions with the world. As Einstein and Infeld (1967) put it, “[p]hysical concepts are free creations of the human mind, and are not, however it may seem, uniquely determined by the external world” (p. 31). Dr. Neil Turok, director of the Perimeter Institute for Theoretical Physics makes a similar point: “We had to give up any notion of being able to picture things as they really are, or of being able (even in principle) to measure and predict everything there is to know” (Globe and Mail, Oct 13, 2012, F3).

Second, our experiences and understandings are never entirely

subjective either. After all, we do not live “outside” the world like a passive spectator, fabricating entirely idiosyncratic interpretations. In fact, we too are part of the “real” world, shaped by millions of years of evolution, physical and social interactions within our own lifetime, and the norms and practices of our culture. Furthermore, what we think shapes our actions and thus the unfolding of our world. The natural and human sciences, then, can be understood as studying different phenomena and employing different methods, but not as generating fundamentally different kinds of knowledge.

Third, it helps interdisciplinarians resist what Oberg (2011) terms “a naïve understanding of holism” where “one is expected to take everything into account, which is impossible...”. If one views human knowledge as growing outwards, provisional and transcending its previous boundaries through interplay with its world, then “the whole” as a totalizing truth can never be reached.

Finally, the view of learning that we have presented here is much better suited to the spirit and process of interdisciplinarity than traditional dichotomies. If we assume that knowledge must be understood in traditional terms — that is, as correspondence between an external objective reality and the internal, subjective representations of knowers— then there can only be one true representation or perspective. This position is not only an intellectual dead end (which has ensnared Western philosophy for centuries), it is quite hostile to interdisciplinarity and its conviction that complex phenomena in the world can best be understood by all integrating diverse — and often irreducible — perspectives.

By contrast, viewing knowledge in relational terms, and disciplines as offering constructions that enable us

to interact effectively with different aspects of our world, offers a much more welcoming environment for interdisciplinarity. It is one capable of turning what Newell (2001) has termed the “multiplicative power of integrative [or interdisciplinary] strategies in learning” (p. 198) into the multiplicative power of knowing and creating. Teaching and learning are shifting from the reproduction of “truths” to more open, dynamic and interdisciplinary frameworks in which problem-solving and construction are emphasized (e.g. “maker labs” designed to bring together various disciplines in a creative space). The relational conception of knowledge put forward in this article supports this shift, as it invites us to seek out diverse perspectives and to reform how we know the world and the questions we ask of it.

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Wayne State University Launches New Interdisciplinary Research Website

The Office of the Vice President for Research (OVPR) at Wayne State University is committed to enhancing interdisciplinary activities across campus. To support this initiative, a new Interdisciplinary Research website, <http://research.wayne.edu/idre/>, is now available.

The website is aimed at helping groups improve their performance of inter- and trans-disciplinary research and team science. The effort is led by Julie Thompson Klein, who is faculty fellow for Interdisciplinary Development in the Division of Research and professor of Humanities in the English Department.

The site is a support tool designed for faculty, research managers, and students. It includes materials developed to support self-tutorials, short courses, modules and workshops. Annotated bibliographies highlight key literature and other online resources, while Coaching and Training Modules annotate key resources and provide tips for using them. The site will expand over time in response to user needs, including a new module on Leadership, forthcoming in Fall semester of 2014, and an enhanced module on

Inter/Transdisciplinary Curricula for classroom use and self-tutorials, forthcoming in Winter semester of 2015.

For the time being, the resources include:

- **Beginning Bibliography on Interdisciplinarity:** includes introductions and overviews, strategies for change, scholarly studies, and key works in science and technology, social sciences, and humanities. An annotated bibliography.

- **Resources for Interdisciplinary Education:** includes places to start, overviews of practice, pedagogy and learning, textbooks for students, learning assessment, and tips for finding resources in particular domains. An annotated bibliography.

- **Barriers and Strategies:** identifies common barriers and disincentives along with strategies and mechanisms for overcoming them. Step 1 describes annotated bibliographies and training modules on the OVPR site. Step 2 highlights materials from key works focused on barriers and strategies. A coaching and training module.

- **Education and Training:** includes introductions and overviews, best practices, learning

outcomes and criteria for learning assessment, as well as online and grounded training modules and courses with sample syllabi and course descriptions. Emphasizes team science in a coaching and training module.

- **Evaluation:** includes introductions and overviews, international models from major evaluation projects, resources with useful graphics, curriculum models and learning assessment. A coaching and training module.

- **Tenure and Promotion:** includes overviews, guidelines and lessons from experience, and further readings and other resources. A coaching and training module.

- **Resources for Team Science:** includes introductions and overviews, strategies for successful collaborations, evaluation, training and continuing professional development, and ways to find more resources and stay up to date. A combined annotated bibliography and coaching and training module.

The OVPR hopes you will find these resources useful, and are welcome to download and copy the files for free with proper credit to the Division of Research at Wayne State University.

Transforming STEM Higher Education

Network for Academic Renewal Conference
November 6-8, 2014
Atlanta, Georgia

The Transforming STEM Higher Education Conference, co-sponsored by AAC&U and PKAL, addresses both the importance of increasing the number of STEM baccalaureate degree earners who master complex STEM content and competencies

and also the importance of enhancing STEM literacy for all students. To these ends, the conference will strategically address several dimensions of STEM higher education reform, including innovative and effective approaches to undergraduate STEM teaching and learning; strategies for measurement and evaluation; inclusive excellence; faculty professional development; and advancement of effective

institutional change strategies.

The potential for discovery and innovation to successfully address society's most significant challenges is enhanced by the synergy that exists between rapidly advancing technologies and deepening scientific knowledge. In order for the U.S. to fully realize this potential and remain globally competitive, however, one million more STEM baccalaureates are needed in the next ten years (President's

Council of Advisors on Science and Technology, 2012). As noted in the 2013 AAC&U Survey, *It Takes More Than a Major*, these STEM graduates will also need to possess capacities to think critically, communicate effectively, and solve complex problems as part of a broad portfolio of learning that is required for graduate/professional school persistence, successful employment, and societal contribution.

Successfully cultivating a national appreciation of the importance of STEM higher education and its inextricable link to a competitive workforce and a scientifically-literate citizenry will require radical approaches that not only enhance

undergraduate STEM learning, but also broaden the participation of underrepresented groups and empower STEM faculty. Thus, our success in reforming undergraduate STEM education lies in our capacity to embrace all disciplines, our intentionality to include all students, and our willingness to engage all perspectives. This meeting seeks to bring together key campus leaders and communities to advance these multiple goals.

Sponsors: Please contact the Development Office at (202) 884-7421 or e-mail Development@aacu.org for information about sponsorship opportunities for this conference.

Announcing 'Interdisciplining Digital Humanities'

By Kelly Witchen

We are very happy to announce a new title from digitalculturebooks, *Interdisciplining Digital Humanities: Boundary Work in an Emerging Field* by Julie Thompson Klein. This is the fifth book in our Digital Humanities series and explores how digital technologies and new media are changing the nature of research, teaching, and learning in the humanities.

Interdisciplining Digital Humanities sorts through definitions and patterns of practice over roughly 65 years of work, providing an overview for specialists and a general audience alike. It is the only book that tests the widespread claim that Digital Humanities is interdisciplinary. By examining the boundary work of constructing, expanding, and sustaining a new field, it depicts both the ways this new field is being situated within individual domains and dynamic crossfertilizations that are fostering new relationships across academic boundaries. It also accounts for

digital reinvigorations of "public humanities" in cultural heritage institutions of museums, archives, libraries, and community forums.

In addition, we're excited to announce *Interdisciplining Digital Humanities* will launch with the annotation and commenting tool Hypothes.is. Hypothes.is supports sentence-level annotations, and allows for discussion at the paragraph level to facilitate community peer review. As the first scholarly monograph to use Hypothes.is, we encourage readers to explore and add their own annotations to enrich the reading and learning experience of others.

Julie Thompson Klein is Professor of Humanities in the English Department and Faculty Fellow for Interdisciplinary Development in the Division of Research, Wayne State University.

Interdisciplining Digital Humanities is freely available to read online. Print copies of the book are in production and will be available for purchase from the University of Michigan Press in 2015.

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About AIS

The Association for Interdisciplinary Studies is the U.S.-based international professional association devoted to interdisciplinary teaching (including service learning), research, program administration, and public policy. Interdisciplinarity integrates the insights of knowledge domains to produce a more comprehensive understanding of complex problems, issues, or questions. AIS serves as an organized professional voice and source of information on interdisciplinary approaches and the integration of insights from diverse communities to address complex problems in education and research. Founded in 1979, it is incorporated as a non-profit 501(c)3 educational association in the state of Ohio.

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