From Critical Thinking to Reflective Practice About Environmental and Health Sciences in Their Social Context

Peter Taylor, September 2005

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Program in Science, Technology, and Values
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In the fall of 1998 I was appointed to the "science and technology" position in the Program in Critical and Creative Thinking (CCT) in the Graduate College of Education (GCOE) at UMass Boston. From the following spring until this last academic year I was the sole full-time CCT faculty member.[1] With the responsibilities of directing/coordinating the CCT Program I had fewer opportunities to teach in my specialty area of science in its social context, but my affiliation with the undergraduate Program in Science, Technology, and Values has now led to my becoming assistant director in 2002 and, since 2004, the director.

Critical thinking, as I view it, means that you understand things by placing established facts, theories, and practices in tension with alternatives. But where do a critical thinker's ideas about alternatives come from? Not out of individual inspiration, but from borrowing and connecting. The more items in your tool box—the more themes, heuristics (rules of thumb), and open questions you are working with—the more likely you are to make a new connection and see how things could be otherwise, that is, *to be creative*. Yet, in order to build up a set of tools that works for you, it is necessary to experiment, take risks, and reflect on the outcomes. Such *reflective practice* is like a journey into unfamiliar or unknown areas—it involves risk, opens up questions, creates more experiences than can be integrated at first sight, requires support, and yields personal change.[2] Indeed, the experienced educators and other mid-career professionals who pursue an M.A. in CCT have always viewed the Program

[1] The other full-time member of the Program began an extended medical leave in 1999 and eventually retired in 2002. Nina Greenwald has served as a visiting faculty member on a half-time basis in 2000-3 and on a full-time basis since Fall 2004.
[2] Taylor, P. J. (2001) "We know more than we are, at first, prepared to acknowledge: Journeying to develop critical thinking," Working paper available at http://www.faculty.umb.edu/pjt/journey.html

in terms of changing their *practice* as much as learning about *thinking*. Let me say that it has been an unusual privilege to serve as a guide and a witness to their CCT journeys, to personal and professional development that stretches well beyond my formal training.

Moving from critical thinking to reflective practice also characterizes the rest of my work, where my professional goal has been to contribute to discussions, research collaborations, and educational initiatives that influence researchers' intellectual and practical responses to, in a very broad sense, complexity and change (see sect. I.A, below). Building on my view of critical thinking, I envisage audiences for my work

> defined not by field or discipline as much as by three qualities: an interest in exploring new propositions, themes, questions, or framings and seeing how these might adapt to their own inquiry; a sense that disciplinary boundaries (for example, between science and interpretation of science) give them trouble in their work; and a disposition to reflect on the conceptual and practical choices they have made in relation to alternative possibilities, past and future.[3]

In this spirit, my statement and accompanying materials[4] convey not only my accomplishments, but also the ongoing self-assessment and development of research, teaching, and institutional development across disciplinary boundaries. The cross-fertilization among those three aspects of my work, which together I consider to be my scholarship, is also significant. Taken as a whole, this should demonstrate that I continue to be productive and innovative as a researcher, teacher, and colleague and, with more than six years in leadership positions in CCT and elsewhere in the GCOE and University, have met the College and University research, teaching, and service criteria for promotion to full professor.

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[3] Taylor, P. J. (2005). Unruly Complexity: Ecology, Interpretation, Engagement. Chicago, University of Chicago Press, xviii

[4] Much of these materials can be viewed online using links provided in these footnotes or through my updated Practitioner's Portfolio, http://www.faculty.umb.edu/pjt/portfolio05.html

I. Research and Writing

I.A Unruly Complexity: Ecology, Interpretation, Engagement (U. Chicago Press, 2005)

As the prologue of *Unruly Complexity* begins (p. xiii-xiv):

> Simply put, this book explores concepts about complexity and change. To be more specific—although at this point very abstract—I am interested in situations that do not have clearly defined boundaries, coherent internal dynamics, or simply mediated relations with their external context.

The book is a contribution to critical thinking about environment, science, and society in the sense that many alternatives emerge that can be put in tension with "established facts, theories, and practices" as soon as we examine the ways that situations are built up over time from *heterogeneous components*, are subject to ongoing restructuring, and are *embedded* or *situated* within wider dynamics—in short, once we contrast what I call *unruly complexity* with prevalent assumptions that situations are well-bounded systems. The book is also a contribution to moving from critical thinking to reflective practice in that

> … I explore the significance of unruly complexity in three realms: in ecology and socio-environmental change (in which social and ecological processes are interwoven); in the interactions among researchers and other social agents as they establish what counts as knowledge; and in efforts to feed interpretations of those interactions so as to influence ecological research—or, more broadly, to link knowledge-making, interpretation, and engagement in social change.
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> I construe social change broadly. Its scope may be as far-reaching as stemming the degradation of some natural resource or redirecting government policies for allocation of funds to different scientific fields. But social change may also be as local as securing a three-month extension to complete a research project or managing to focus an audience's attention on certain themes. Indeed, the latter is closer to the spirit of this book. I do not provide possible solutions to pressing environmental, scientific, or social problems, nor a comprehensive theory of their causes. My goal—which is ambitious enough—is to stimulate scientists who study ecological complexity and researchers who interpret the ecological-like complexity of scientific change to become more self-conscious and systematic about the ways they deal with the unruliness of complex situations. This shift would involve researchers reflecting more *critically*—that is, in relation to alternative possibilities—on their efforts to modify the social and technical conditions in which their research takes shape.
>
> The way I promote critical reflection on concepts and practice is to introduce questions and themes, which are intended to disturb conceptual boundaries used by researchers when they focus attention on (supposedly) well-bounded systems and push complicating dynamics or processes out of view. I develop these questions and themes through concrete cases from my own work; these cases open up one to the next in a way

> that mirrors to some degree the critical reflection I favor. The cases all involve ecological or socio-environmental situations, but their style and content differ according to the intellectual field in which each case is centered—first, theoretical ecology, then philosophy of science, history of science, sociology of science, socio-environmental studies, and eventually, critical reflection on practice.

[Moreover—and this is one of the strengths of the book—by chewing further on issues in various fields that are no longer in the spotlight, I develop fresh perspectives and expose problems that were not well-resolved or recognized when researchers in the field moved on.[5]]

> The sequence of cases should help researchers and students in this wide range of fields appreciate more acutely the limitations of assuming that ecological, scientific, and social complexity can be delimited into well-bounded systems. My hope is that readers will then take steps—on their own and in collaboration with others—to reconstruct the unruliness of complexity without suppressing it, to link knowledge-making to social change, and to wrestle with the potential and limitations of critical reflection as a means to redirect practice. In the words of Raymond Williams (1980, 83), I want to encourage others not to "mentally draw back [and be] spared the effort of looking, in any active way, at the whole complex of social and natural relationships which is at once our product and our activity."[6]

The reviews on the cover are appreciative of the different qualities of the book. I look forward to seeing how a wider audience reads the work, which has only just appeared.

I.B The Study of Complex Interactions in the area of Environment, Health, Science, and Society

This area represents a new focus for my research and writing about critical thinking and reflective practice. As evident from the previous section, my previous case studies have been related primarily to ecology and socio-environmental research. However, NSF-funded research that I began in 2003 initiated a shift that allows me to make more use of my scientific training in quantitative analysis and modeling and to seek opportunities for day-to-day engagement with researchers and their subjects. (My previous work had led me into case studies of field research on socio-environmental change in remote regions, especially in Africa, but teaching and family commitments are not conducive to my spending extended periods abroad collaborating with field researchers.)

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[5] Many of these issues are presented in the forms of puzzles with which the chapters begin.
[6] Williams, R. (1980). "Ideas of Nature," in Problems in materialism and culture. London, Verso, 83.

The project, "Genes, Gestation, and Life Experiences: A Critical Comparison of Concepts and Methods Used in Analyses of Biosocial Development," is described in the following overview and in a 2004 publication[7]:

> Everyone "knows" that genes and environment interact, but, in this "Age of DNA," genetics is often seen as the way to expose the important or root causes of behavior and disease or as the best route to effective therapeutic technologies.[8] Several scientific currents, however, are bringing back into the picture environmental contributions in the development of behavioral and medical conditions over any individual's lifetime. This trend provides a wealth of potential issues and case material for science and technology studies (STS).
>
> The particular project proposed here centers on a comparison of the questions, concepts, and methods of three fields:
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> • Research on gestational programming, which has identified associations between nutrition during critical periods in utero and diseases of late life, including heart disease, diabetes, and death by suicide[9];
>
> • Life events and difficulties research, which has exposed relationships between severe events and difficulties over a person's life course and the onset of mental or physical illness[10]; and
>
> • Reciprocal causation models of IQ development in which there is a matching of traits and the changing environments in which traits develop so as to allow both high heritability and large gains from one generation to the next.[11]
>
> The three fields have been chosen for this project for the following reasons:
>
> 1) The fields are active, but not yet well known in North America. They have well-articulated questions, concepts, and methods for analyzing human development in ways that integrate biological and social processes.[12] The conceptual and methodological commitments of the fields differ quite markedly and continue to evolve;
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> 2) The fields complicate persistent contrasts in scientific and social thought: inborn and unchangeable *versus* environmental and changeable; and biological *versus* social. The project aims to show how the fields challenge both sides in longstanding debates about biological determinism;
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> 3) The fields go beyond general statements that traits arise from interactions of genes and environment and beyond the general dictates of developmental systems theory.[13] By comparing these fields' specific attempts to address the complexities of

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[7] Taylor, P. J. (2004). "What can we do? -- Moving debates over genetic determinism in new directions." Science as Culture **13**(3): 331-355.

[8] Kevles, D. and L. Hood (Eds.) (1992). The Code of Codes: Scientific and Social Issues in the Human Genome Project. Cambridge, MA: Harvard University Press.

[9] Barker, D. J. P. (1994). Mothers, Babies, and Diseases in Later Life. London: BMJ Publishing Group.

[10] Harris, T., Ed. (2000). Where Inner and Outer Worlds Meet. London, Routledge.

[11] Dickens, W. T. and J. R. Flynn (2001). "Heritability estimates versus large environmental effects: The IQ paradox resolved." Psychological Review 108(2): 346-369.

[12] Taylor, P. J. (2001). "Distributed agency within intersecting ecological, social, and scientific processes," in S. Oyama, P. Griffiths and R. Gray (Eds.), Cycles of Contingency: Developmental Systems and Evolution. Cambridge, MA: MIT Press, 313-332.

[13] Oyama, S., P. E. Griffiths, et al., Eds. (2001). Cycles of Contingency: Developmental Systems

> environmental contributions to development, this project aims to supplement discussion of the conceptual problems of genetic determinism with more attention to the methodological and other practical challenges of realizing alternative conceptual structures;
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> 4) The fields provide suitable material for me to employ my scientific background in statistics and quantitative methods and to further an approach to STS research that uses close examination of conceptual and methodological developments within a field to open up questions about the interactions of scientists' concepts and methods with their work organization and wider social relations.[14]

I had a lot to learn about researchers' methods, concerns, and collaborative practices in this general area of "social epidemiology" (i.e., the reconstruction of the biological and social factors that build up over the life course of any person's development). During the last two years my research has centered on reading, conducting interviews with selected researchers, and attending seminars and courses as a visiting research fellow at Harvard (2004-5). I am now preparing the publications and web-based teaching material laid out in the grant proposal and am planning the resulting book manuscript.

An offshoot of my research on reciprocal causation models, however, has already led to a pair of papers (soon to be submitted to *Biological Theory* by request of the editor[15]) and a grant proposal for further research.[16] The two papers and the proposal examine conceptual and methodological issues that have been overlooked or not well appreciated in research and policy debates about genes and intelligence. Extremely briefly, I argue that there is room to question—again in the critical thinking spirit of holding alternatives in tension—any

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and Evolution. Cambridge, MA, MIT Press, 2.

[14] Taylor, P. J. (1992). Re/constructing socio-ecologies: system dynamics modelling of nomadic pastoralists in sub-Saharan Africa. The Right Tool for the Job: At Work in the Twentieth Century Life Sciences. A. Clarke and J. Fujimura. Princeton, Princeton University Press.

---------- (1995). "Building on construction: An exploration of heterogeneous constructionism, using an analogy from psychology and a sketch from socio-economic modeling." Perspectives on Science 3(1): 66-98.

---------- (1998). "Natural Selection: A heavy hand in biological and social thought." Science as Culture 7(1): 5-32.

---------- (2003). Gene-environment complexities: Modeling and measuring what is interesting. The Evolution of Population Biology: Modern Synthesis. R. Singh, S. Jain and M. Uyenoyama. Cambridge: Cambridge University Press.

[15] "Heritability and heterogeneity: I. The limited relevance of heritability in investigation of genetic and environmental factors," II. The irrelevance of heritability in explaining differences between means for different human groups or generations," to be submitted to Biological Theory.

[16] "The Significance of Heterogeneity in Debates about Biological Determinism," NSF proposal, submitted August 2005.

assumption that, when similar responses of different genetic types are observed, similar conjunctions of genetic and environmental factors have been involved in producing those responses. Even if the similarity among close relatives in IQ test scores is associated with similarity of genetic factors, these may not be the same factors from one set of relatives to the next. For this and other reasons, I argue that the statistical quantity heritability has limited relevance in investigation of genetic and environmental factors and no relevance in explaining differences between means for different human groups or generations.

In future research and writing I plan to delve further into the work of researchers who consider the heterogeneity of factors operating at different levels—from the individual to the community—and to examine ways that such research can go beyond the conventional epidemiological emphasis on exposures impinging on subjects. How can quantitative researchers accommodate the effects on health and behavior of people becoming resilient and able to reorganize their lives and communities in response to social changes?[17]—i.e., how can researchers adopt what I call an "agent-oriented" emphasis?

I.C Contributions to New Interdisciplinary, International, and Educational Projects

Bringing critical analysis of science to bear on the practice and application of science is not well developed or supported institutionally, so I continue to initiate or participate in new collaborations, programs, and other activities, new directions for existing programs, and collegial interactions across disciplines. In this spirit I have contributed to four major grant proposals since 2001 (three UMB; one non-UMB) that link science, education, and professional development[18] and to seven interdisciplinary anthologies, many of which that evolved from

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[17] E.g., White, C. and D. Denborough, Eds. (1998). Introducing Narrative Therapy: A Collection of Practice-based Writings. Adelaide, Dulwich Centre Publications; Griffin, J. and I. Tyrrell (2003). Human Gvens: A New Approach to Emotional Health and Clear Thinking. Chalvington, UK, Human Givens Publishing.

[18] Advisory Panel for "Biocomplexity: Research-Rich Applications for Integrative Problem Solving in Diverse Environments" (PI: J. Greenler, Beloit College/BioQuest Curriculum Consortium; not funded)

"Watershed-Integrated Sciences Partnership, GK12" (PI: R. Chen, funded)

Co-PI on "Modeling Changes in Biodiversity in Response to Climate Change and Demographic Pressures" (PI: K. Bawa; under revision for resubmission)

Senior personnel on "IGERT- Biodiversity and Environmental Informatics: Graduate training for the e-science generation" (PI: R. Stevenson; under final review)

conference sessions or workshop series that I helped run.[19] As I describe in section IV on integration of research, teaching, and service, seed funds received last year from NSF allowed me to initiate the New England Workshop on Science and Social Change, an annual workshop with international participation that links science, science education, and science and technology studies.

I.D Research and Writing in relation to College of Education Indicators of Excellence in scholarship

Indicators of Excellence in scholarship

The category of scholarship is broadly construed to include all original inquiry (both theoretical and empirical); systematic analysis or critique of problems (both practical and theoretical) that result in original writings or products; systematic program development work; and creative activities (such as artistic production). In general, the category of scholarship involves the question of through what scholarly and creative efforts, the faculty member is adding to society's understanding of education and counseling, and is strengthening capacities for identifying and resolving issues in those fields. The assumption is that productive scholarly activities in the College will take many forms and involve many disciplines or combinations of disciplines. The measure of what is productive scholarship is that it is judged to be creative, rigorous, and valuable after being publicly scrutinized by professional peers.

The advancement of theory and practice in education, counseling, school psychology, and related fields of the College calls for many kinds of scholarship. Therefore, various specialized forms of scholarship are likely to be found among faculty. Each specialized form requires somewhat different criteria for judging the significance and soundness of the faculty member's work. In many areas, scholarship is heavily empirical, analytic, and quantitative, drawing from a variety of methodological traditions in the natural and behavioral sciences. In other areas, the approaches may be more qualitative, drawing upon naturalistic or ethnographic approaches. In some areas of education, counseling, and school psychology, faculty members contribute through applied or decision-oriented inquiry as opposed to conclusion-

[19] See full references in sect. I.D, below, or my C.V.
Handbook of Ecological Concepts
How Nature Speaks: The Dynamics of the Human Ecological Condition
Appropriating Technology: Vernacular Science and Social Power
Conhecimento Prudente para Uma Vida Decente: *Um Discurso sobre as Ciências* Revisitado [Prudent Knowledge for a Decent Life: A Discourse on the Sciences Revisited; revised version to appear as Cognitive Justice in a Global World: Prudent Knowledges for a Decent Life]
Encountering Global Environmental Politics: Teaching, Learning, and Empowering Knowledge
Cycles of Contingency: Developmental Systems and Evolution
"Critical Reflections on the Use of Remote Sensing and GIS Technologies in Human Ecological Research," Human Ecology, 31 (2), 2003 (with M. Turner).

oriented inquiry. The development and evaluation of policy is another important form of inquiry in these fields.

Evidence of scholarly work in almost every field will include written documents (articles, chapters, and books as well as evaluation reports, grant proposals, etc.) or other products (computer software, videos, etc.) that show:

- deep theoretical underpinnings relevant to the current state of the discipline and its related fields;
- rich conceptualization of some aspect of the field's problems/issues/questions and of how particular areas of inquiry or activity might be relevant to addressing them;
- an approach to scholarly inquiry/applied scholarly activity that is well justified, coherent, and appropriate to the goals of such inquiry or activity;
- analysis, synthesis, model-building, or otherwise making sense of what is being learned from this endeavor;
- with whatever has been learned, some sense of its implications and what real difference it might make to the work that goes on in relevant settings.

It is recognized that certain types of scholarship require more effort and are held to higher standards of public and peer evaluation. Therefore, the College Personnel Committee recommends that in major personnel decisions, different weightings be considered. Listed below are two categories, A and B, in which the A category requires more stringent public scrutiny and, therefore, should receive more weight in personnel reviews.

Scholarship activities include (but are not limited to):

Category A [only publications since 1998 listed; sole or senior author for all items, except two marked *; items marked ** are those selected for review]

a. Articles published in refereed journals

** "What can we do? -- Moving debates over genetic determinism and interactionism in new directions," **Science as Culture**, 13 (3): 331-355, 2004.

"Critical Reflections on the Use of Remote Sensing and GIS Technologies in Human Ecological Research," **Human Ecology**, 31 (2): 179-182, 2003 (with M. Turner*).

** "Situatedness and Problematic Boundaries: Conceptualizing Life's Complex Ecological Context," **Biology & Philosophy**, 16 (4):521-532, 2001. (with Y. Haila)

"The Philosophical dullness of classical ecology, and a Levinsian alternative," **Biology & Philosophy**, 16 (1), 93-102, 2001. (with Y. Haila*)

"Socio-ecological webs and sites of sociality: Levins' strategy of model building revisited," **Biology & Philosophy**, 15 (2), 197-210, 2000.

"How does the commons become tragic? Simple models as complex socio-political constructions" **Science as Culture**, 7 (4), 449-464, 1998.

** "Natural Selection: A heavy hand in biological and social thought," **Science as Culture**, 7 (1), 5-32, 1998. Reprinted as "La selección natural: Un lastre sobre el pensamiento biológico y social," **Ludus Vitalis**, 7 (12), 27-55, 2000.

b. A scholarly book that advances the knowledge base or synthesizes existing knowledge

** Unruly Complexity: Ecology, Interpretation, Engagement. Chicago: University of Chicago Press, 2005.

d. Chapters in books written by or for scholars or practitioners

"Conceptualizing the heterogeneity, embeddedness, and ongoing restructuring that make ecological complexity 'unruly'," in Handbook of Ecological Concepts, ed. K. Jax and A. Schwarz. Dordrecht: Kluwer, in press.

** "Exploring themes about social agency through interpretation of diagrams of nature and society," in How Nature Speaks: The Dynamics of the Human Ecological Condition. Ed. Y. Haila and C. Dyke. Durham, NC: Duke University Press, in press.

** "'Whose trees/interpretations are these?' Bridging the divide between subjects and outsider-researchers," pp. 305-312 in R. Eglash, J. Croissant, G. DiChiro, R. Fouché (eds.), Appropriating Technology: Vernacular Science and Social Power. Minneapolis: University of Minnesota Press, 2004.

"A reconstrução da complexidade ecológica sem regras: ciência, interpretação e prática reflexiva crítica" [Reconstructing unruly ecological complexity: Science, interpretation, and critical, reflective practice], pp. 529-551 in Conhecimento Prudente para Uma Vida Decente: *Um Discurso sobre as Ciências* Revisitado [Prudent Knowledge for a Decent Life: A Discourse on the Sciences Revisited], ed. B. de Sousa Santos, Porto: Afrontamento 2003. Revised version to appear in Cognitive Justice in a Global World: Prudent Knowledges for a Decent Life, ed. B. de Sousa Santos, Madison: University of Madison Press, forthcoming.

"Gene-environment complexities: What is interesting to measure and to model?" pp. 233-253 in The Evolution of Population Biology: Modern Synthesis, ed. R. K. Singh and M. Uyenoyama. Cambridge: Cambridge University Press, 2003.

** "Non-standard lessons from the 'tragedy of the commons'," pp. 87-105 in M. Maniates (ed.) Encountering Global Environmental Politics: Teaching, Learning, and Empowering Knowledge. Boulder, CO: Rowman & Littlefield, 2003.

** "Distributed agency within intersecting ecological, social, and scientific processes," pp. 313-332 in S. Oyama, P. Griffiths and R. Gray (Eds.), Cycles of Contingency: Developmental Systems and Evolution. Cambridge, MA: MIT Press, 2001.

"Philosophy of Ecology," Encyclopedia of Life Sciences. London: Macmillan, 2001. (with Y. Haila)

** "From natural selection to natural construction to disciplining unruly complexity: The challenge of integrating ecology into evolutionary theory," in R. Singh, K. Krimbas, D. Paul & J. Beatty (eds.), Thinking About Evolution: Historical, Philosophical and Political Perspectives, Cambridge: Cambridge University Press, 377-393, 2000.

"What can agents do?: Engaging with complexities of the post-Hardin commons," pp. 125-156 in L. Freese (ed.), Advances in Human Ecology, Vol. 8. Greenwich, CT: JAI Press, 1999.

"Mapping complex social-natural processes: Cases from Mexico and Africa," in F. Fischer and M. Hajer (eds.) Living with Nature: Environmental Discourse as Cultural Critique, Oxford: Oxford University Press, 121-134, 1999.

g. Receipt of a major research and/or training grant (with high impact on programs, students and the institution)

NSF Grant, "Genes, Gestation, and Life Experiences: A Critical Comparison of Concepts and Methods Used in Analyses of Biosocial Development," $71,670

Category B[20]

a. Presentation of a research or scholarly project at a prominent international, national, or regional conference or gathering of professionals
b. Presentation of a solicited or referred scholarly paper at a prominent international, national, or regional conference or gathering of professionals
See C.V., "SELECTED PRESENTATIONS" (average of 9 presentations or workshops led per year since 2001)

c. Publication of a scholarly review of a book for a professional journal or other major publication
See C.V., "Reviews, commentaries, and notes"

g. Membership on an editorial board of a major professional journal
Science as Culture

II. Teaching and Advising

My work as a teacher and advisor has continued to exemplify the themes identified in previous reviews and in my practitioner's portfolios.[21] In this section I highlight two areas in which significant developments have occurred since 2001.

II.A Guiding Research and Writing for Reflective Practice

Since 2001 I have been involved with 63 CCT students developing and completing their M.A. syntheses[22] on a very wide range of topics (appendix A). Four features of my courses on research and writing have come to fruition in meeting this challenge[23]:

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[20] See section III.C of Annual Faculty Reviews

[21] In a 2001 review, which can be viewed at http://www.faculty.umb.edu/pjt/portfolio01sTA.html, I discussed my teaching under the headings:

A. Wide Scope of My Teaching and its Active, Ongoing Development
B. The Philosophy of Teaching Critical Thinking I Brought to UMB
C. Teaching Critical Thinking about Science in its Social Context
D. Leading Students from Critical Thinking to Taking Initiative
E. Learning from Difficult Courses in a Thoughtful, Respectful, and Professional Manner
F. Learning from Educators beyond CCT
G. Promoting Collegial Interaction Around Innovation in Teaching

Discussion of related themes and exhibits from a 1999 review can be viewed at http://www.faculty.umb.edu/pjt/portfolio99exhibits.html.

[22] The synthesis is a capstone requirement that requires substantial research and writing, but offers more options than a traditional thesis; see http://www.cct.umb.edu/capstone.html.

1. A framework of ten *phases of research and engagement*[24] that the students move through, then revisit in light of: a) other people's responses to what they share with them; and b) what they learn using tools from the other phases. This sequence and iteration allows students to define projects in which they take their personal and professional aspirations seriously, even if that means letting go of preconceptions of what they "ought" to be doing. During the pre-synthesis course, CCT698, the students are introduced to range of tools for each phase, then practice using those tools in class and in assignments. A downloadable library of previous students' work illustrates the different ways these tools can be taken up.[25]

2. A *model of "cycles and epicycles" of action research* that integrates evaluation, constituency building, reflection and dialogue, and can be applied to professional and personal change as well as educational and organizational change (Appendix B[26]).

3. *Dialogue around written work*—written and spoken comments on each installment of a project and successive revision in response[27]—which allows me to accumulate a portfolio for

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[23] As the sole full-time CCT faculty member for many years, I have had primary responsibility for moving students through the final three research and writing courses of the M.A. program and onto completion of their syntheses. With the record number of students entering CCT in 2001-3, I have been the major advisor of 35 of the 65 syntheses produced since then, second advisor for 12 and, of the remaining 18, 16 took their initial shape during the pre-synthesis, Practicum course (CCT698), I teach.

[24] See http://www.faculty.umb.edu/pjt/698Phases.doc

A. Overall vision
B. Background information
C. Possible directions and priorities
D. Propositions, Counter-Propositions
E. Design of research
F. Direct information, models & experience
G. Clarification through communication
H. Compelling communication
I. Engagement with others
J. Taking stock

[25] http://www.faculty.umb.edu/pjt/698-05.html#Examples

[26] Also available at http://www.faculty.umb.edu/pjt/693ARcycling.doc

[27] Explanation of "Dialogue around written work" provided in Course "Notes on Teaching/Learning Interactions"

> I try to create a dialogue with each student around written work, that is, around your writing, my responses, and your responses in turn. Central to this teaching/learning interaction are requests to "Revise and Resubmit." The idea is not that you make changes to please me the teacher or to meet some unstated standard, but that as a writer you use the eye of others to develop your own thinking and make it work better on readers. I may continue to request revision when I judge that the interaction can still yield significant learning. Such a request does not mean your (re)submission was

each student in each course[28] that facilitates generative interactions with students even when I am not an expert in their areas. By "generative" I mean students bring to the surface, form, and articulate their ideas (as illustrated especially by syntheses marked ** in appendix A).

4. *Making space for taking initiative in and through relationships*: "in building horizontal peer relationships, in negotiating power/standards, in acknowledging that affect is involved in what you're doing and not doing (and in how others respond to that), in clearing away distractions from other sources (present and past) so you can be here now… Don't expect to learn or change—or to teach—without jostling among the five aspects. "[29]

These four features form the basis of the "exit self-assessment" CCT instituted in which graduating students reflect on their development through the Program and identify specific areas for further work. The insight shown in most of these self-analyses gives the CCT faculty confidence that the graduates can continue learning without our superintending them.[30]

"bad"—even when the first submissions of written assignments are excellent, angles for learning through dialogue are always opened up.
In my comments I try to capture where the writer was taking me and make suggestions for how to clarify and extend the impact on readers of what was written. After letting my comments sink in, you may conclude that I have missed the point. In this case, my misreading should stimulate you to revise so as to help readers avoid mistaking the intended point. If you do not understand the directions I saw in your work or those I suggest for the revision, a face-to-face or phone conversation is the obvious next step—written comments have definite limitations when writers and readers want to appreciate and learn from what each other is saying and thinking. **Please talk to me immediately if you do not see how you are benefiting from the "Revise and resubmit" process.** I am still learning how to engage students in this in ways that take into account your various backgrounds and dispositions and my own.

[28] Carbon paper is an invaluable educational technology here, ensuring that I keep copies of comments made on written work, during conferences, and on in-class presentation. I can fashion subsequent comments viewing a complete picture of what I have said and the student's response (or lack thereof).

[29] This formulation evolved from teacher research on "dialogue around written work;" see http://www.faculty.umb.edu/pjt/citreport.html and "We know more than we are, at first, prepared to acknowledge: Journeying to develop critical thinking," op. cit, note 2.

[30] For an example, see http://www.cct.umb.edu/HSexitselfassess.pdf; copies of others can be viewed on request.

II.B Creating Problem-Based Learning Units and Other Innovations to Accommodate Students' Diverse Interests Within Interdisciplinary Courses

Following the lead of my colleague, Nina Greenwald, an expert in Problem-Based Learning (PBL)[31] and building on my involvement in BioQuest curriculum development workshops,[32] I have introduced PBL or Action Research units in several courses, including one course at a doctoral level.[33] I position the units at the start of the course, with the aim of allowing students to expose and coordinate a range of angles for investigating an issue, practice tools for rapid research, and gain a shared experience to refer back to during the discussions and activities that make up the rest of the course.

On another tack, I was pleased with the students' response when I integrated the content of my scholarship with CCT-like reflective practice in an advanced graduate seminar that I taught at the Yale School of Forestry and Environmental Studies. The seminar theme was research, policy, and participation in issues of Conservation and Development. As well as critically reviewing literature on selected topics students also learned new approaches for developing their own writing and supporting others to write. I was able to link these two strands under the theme of paying attention to the challenges for individuals participating in collaborative endeavors.[34]

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[31] PBL begins best from a scenario in which the problems are not well defined. Students brainstorm so as to identify range of problems related to the scenario and choose which of these they want to investigate and report back on. Their problem-definitions may evolve as they investigate and exchange findings with other students. The teacher facilitates brainstorming, coaches the students in their individual or small-group tasks, and serves as resource person by providing contacts and reading suggestions when asked. See Greenwald, N. (2000). Science in Progress: Challenges in Problem-based Learning for Secondary Schools.

[32] Lifelines Online: http://bioquest.org/lifelines/sitemap.html (viewed 21 June '02)

[33] CCT611, 645, 693, Political Science 260, and PublicPolicy 749. Scenarios and instructions are available as handouts linked to the webpages for these courses linked to http://www.faculty.umb.edu/pjt/portfolioCourses-TOC.html

[34] http://www.faculty.umb.edu/pjt/759-03.html

II.C Teaching and Advising in relation to College of Education Indicators of Teaching Excellence and Advisement Contributions

1. Indicators of teaching excellence

a. consistently high responses via student evaluations with an analysis of any weak evaluations and steps taken to address any specific concerns
   - See official evaluations and some personally designed course evaluations.[35]
   - For example of steps taken to address concerns, see syllabus for CCT698 revised in response to students' request for easier access to the material and requirements (compare the 2001 and 2002 syllabi[36]).

b. evidence from student evaluation comments and student letters that show impact of teaching on student understanding and student development
   - See student comments on personally designed course evaluations.[37]

c. evidence from course materials/syllabi substantiating: a rich conceptualization of the field, how the relevant knowledge of the course relates to the conceptualization of the field, and pedagogical design that gives students both immediate and larger critical and evaluative understandings
   - For rich conceptualization, see webpages and downloadable materials linked to syllabus webpages for individual courses.[38]
   - For innovation in pedagogical design, see Problem-Based Learning (PBL) units developed for CrCrTh 611 [Fall '01], 645, PPol 749, PolSci 260 and Action Research units for CrCrTh693 (see handouts linked to syllabus webpages for individual courses). [39]

d. evidence of course development to accomplish the above (c) within courses, and of new course development that contributes to a richer conceptualization of the program and includes expansion or deepening of course materials, activities, and updated bibliographies
   - Part of undergraduate course, "Politics and the Environment" (PolSci 260) & doctoral course, "Science, Technology & Public Policy" (PPol 749/ CrCrTh 649).[40]
   - Developed a new syllabus for CCT645 (previously taught as CCT611 in Spr 99).
   - Developed a syllabus for a new course, "Research & Writing for Reflective Practice," designed to bolster students' research and writing practices early in their program of study (not yet offered).[41]

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[35] Available from pages linked to http://www.faculty.umb.edu/pjt/portfolioCourses-TOC.html
[36] http://www.faculty.umb.edu/pjt/698-02.html and http://www.faculty.umb.edu/pjt/698-01.html
[37] ibid.
[38] ibid.
[39] ibid.
[40] ibid.
[41] http://www.faculty.umb.edu/pjt/603-03.html

e. evidence of activities related to improving one's own teaching as well as modeling and mentoring for others (such as participation in and/or leading teaching improvement seminars or professional development activities)

Updated on-line Practitioner's Portfolio, including Student comments on personally designed course evaluations: http://www.faculty.umb.edu/pjt/portfolio05-TOC.html

Undertook Teacher-research survey on students in the Practicum class functioning as a support & coaching structure to get most students to finish their reports by the end of the semester. The peer support was very strong in 2003 and continued through the synthesis semester.

See II.B (above) re: Problem-based learning units and Action Research unit in CCT693.

Participation in CIT Fall '03 faculty seminar on "Teaching Globalization," which led to my leading a faculty development workshop on "Teaching Global Perspectives in the Sciences" at Mt. Mary College, Wisconsin during 2004.

Promoted and modeled educational innovation as part of New England Workshop on Science and Social Change, 2004 & 2005.[42]

See online "publications" on Teaching/learning dynamics[43], especially in regard to use of computers in education, e.g., "Guidelines about specific situations and specific ways in which specific technologies are of significant pedagogical benefit"[44] and associated presentations to UMB audiences (see C.V.)

f. consideration of actual teaching loads, numbers of students taught, modality (seminar, lecture, on-line course), extra efforts to meet teaching needs of program (e.g. summer sessions, training, field experience)

For the three research and engagement courses I taught (CCT693, 698, 694), the student numbers often exceeded the course cap, which itself was set higher than comparable Teacher Research courses until recently for CCT693 and 698. I served as the major or second advisor for many syntheses even when I was not the instructor for the seminar.

See also independent studies, summer course, and new courses listed in AFRs.

g. evidence from personal statement of reflective practice in teaching and advising, including a grounded understanding of what students need to learn within their field and program, of personal teaching goals within that context, of the efforts made to accomplish those goals, and of one's own learning from those efforts

See sect. II.A, above

h. evidence from personal statement, if appropriate, of ways in which teaching and advising are integrated with, contributing to, or informed by one's scholarship and service

See New England Workshop on Science and Social Change (in sect. IV, below) and Inter-college faculty Seminar in Humanities and Sciences (in sect. III, below) for research and service informed by my CCT teaching.

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[42] http://www.stv.umb.edu/newssc.html

[43] http://www.faculty.umb.edu/pjt/TL-TOC.html

[44] http://www.faculty.umb.edu/pjt/etguidelines.html

i. additional supporting documentation such as portfolios, web pages, examples of student work, (with consent forms filled out by students); examples of mentoring and peer coaching with colleagues, etc.

On-line Practitioner's Portfolio[45]

See webpages for courses, which now include as links weekly handouts and student reports[46]

PDF compilation of tools used in teaching[47]

2. Indicators of advisement contributions:

a. Number and type of advisees

Average of 27 current students at any given time, as well as (until Fall '04) all prospective & incoming students.

b. Quality of advisement based on an evaluation of both advisor and advising

The online CCT handbook, which I designed and keep up to date, is structured to allow most students to self-advise on administrative matters, leaving the person-to-person interactions with advisors free for substantive issues of shaping projects and designing the best program of study.[48]

c. Contributions to dissertation, thesis, and final project committees with distinctions between serving as chair or reader and with designations regarding this work in relation to teaching load.

Of the 65 M.A. syntheses completed since Fall 2001: 32 I was major advisor; 15 second advisor; 16 of the other 18 took their initial shape during the pre-synthesis, Practicum course, I taught.

See II.A, above

3. Evidence of serving as a model and mentor to students, faculty, and colleagues:

A broad vision of critical thinking and reflective practice concerning science in its social context has informed an extensive series of workshops I have organized and faculty-development workshop sessions I have led at UMB and elsewhere (Appendix C). As a particular example of mentoring, from 2000-2002 I organized a Thinktank for Community-college teachers of critical thinking, in which CCT graduates and associates "explore[d] issues of interest to each of us in our quest to promote effective thinking and problem solving in our professional lives and communities" and "consider[ed] ways to share the results of our explorations with wider audiences."

See also #e above.

[45] http:// www.faculty.umb.edu/pjt/syllabi-TOC.html or http://www.faculty.umb.edu/pjt/portfolioCourses-TOC.html

[46] Linked to ibid, e.g., www.faculty.umb.edu/pjt/698-03reports.html

[47] http://www.faculty.umb.edu/pjt/tools.html

[48] http://www.cct.umb.edu/handbook.html or http://www.cct.umb.edu/handbook.pdf

III. Service and Institutional Development

I view service in terms of *institutional development*: a) to initiate and sustain new projects concerning critical reflective practice in science and science education (see sect. I.C); and b) to respond in existing programs to the shifting resources, priorities, and other challenges we persistently face in public education. In both arenas, my efforts are characterized by:

- *planning* that takes into account the often-limited and uncertain state of resources, guides where we put our not-unlimited energies, and seeks to make the result sustainable or cumulative;
- *community-building*, not only for the sake of a sustainable product, but so participants/ collaborators value their involvement in the process;
- *probing what has been taken for granted* or left unarticulated until coherent principles emerge to guide our efforts;
- *transparency and inclusiveness* of consultation in formulating procedures and principles and in making evaluations available;
- *documenting* process, product, and evaluations *to make institutional learning more likely*; and
- *organization*, including efficient use of computer technology, to support all of the above.

I do not claim to have been successful on all counts in each of the examples of service and institutional development that I highlight below, but these qualities should stand out.[49]

III.A Building a Basis for Interdisciplinary Science and Environmental Education

1. Science, Technology & Values Program. When I became assistant director of this zero-budget program in Fall 2002, I created a program website that provides up to date information for students and, when printed out, doubles as a flyer to advertise during registration periods the upcoming course offerings.[50] I helped initiate monthly discussion meetings of interested faculty, and built on this in organizing a semester-long thematic **Inter-college faculty Seminar in Science and Humanities** each spring, which started 2004. ISHS is a "forum for discussion and interaction among faculty at UMass-Boston. Faculty from different disciplines and colleges come together to focus on topics of common interest,

[49] The first four headings match those of my previous review, but the work described is mostly new.

[50] http://www.stv.umb.edu

exchange ideas, renew their intellectual energy, and advance their work in a spirit of adventure and collaboration."[51] As well as building community around the STV program, ISHS is designed to bridge the Humanities/Sciences gap after the separation of the College of Arts and Sciences into two colleges.

Since becoming STV director in January 2004, I have articulated and pursued many other concrete steps[52] grouped under four overall goals:

> build the students numbers in the Program;
> maintain a regular and rich set of courses to fulfill STV requirements;
> build a community of faculty and students around the program; and
> build external recognition for the program.

2. Curriculum development for Education for Sustainability. In fall 2002, Chancellor Gora and Dean Kibel reactivated Education for Sustainability initiatives at UMB and appointed me chair of the committee to Infuse Sustainability into the Curriculum, assisted by Steve Rudnick of Environmental Studies. The committee developed a vision of sustainability that integrated an environmentally sustainable ("green") economy, with just and equitable governance, and an engaged populace.[53] The corresponding teaching mission[54] was that curricula should seek to develop students' ability to:

> appreciate and monitor the state of the environment, social structure, human health —to become "environmentally literate";
> understand and analyze the complexities of phenomena that link economics, politics, culture, history, biology, geology, and physical processes;
> be involved in dynamic, vigorous exchange across the traditional disciplinary boundaries within and between natural and social/human sciences; and
> work within specific communities to facilitate self-conscious, reflective engagement with linked socio-environmental processes.

The plans of this committee[55] progressed as far as hosting a pair of faculty curriculum development workshops in the spring, from which some new curriculum units or courses arose.[56] Since these workshops, however, we have not sustained our efforts; my judgement was that we needed to pause until the reorganization of the Environmental Science and

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[51] http://www.stv.umb.edu/ISHS.html
[52] http://www.stv.umb.edu/STVplans.html
[53] http://www.cct.umb.edu/efsvision.html
[54] http://www.cct.umb.edu/efsgamission.html
[55] http://www.cct.umb.edu/efsgaplans.html
[56] http://www.cct.umb.edu/efscurrdev.html

Studies units was completed and until what has become called the Center for Environmental Health, Science, and Technology had taken shape. While this was happening, the administrators who had sponsored the Education for Sustainability initiative left the University and I was made director of STV. Steve Rudnick has taken over primary responsibility for any further work of this committee.

3. The **International Society for History, Philosophy and Social Studies of Biology** (ISHPSSB) has been the most significant venue for my work outside my formal appointments. In its biennial summer meetings the ISHPSSB brings together scholars from diverse disciplines, including the life sciences and history, philosophy and social studies of science. I served on the Executive from 1993-99 and as President I established committees and procedures, a graduate student prize, a Presidential plenary, and other traditions that have continued under the subsequent "administrations." My earlier contributions on the program committee (1987-89) and as program organizer (1989-91) were equally significant. It was during this period that the society was being formalized, and I worked hard to ensure that institutionalization did not undermine the tradition of innovative, cross- disciplinary sessions and discussions. Although I established an Education Committee in 1997 and served on it until this year, and although I continue to organize sessions at ISHPSSB meetings, my ISHPSSB-style efforts have shifted more to the smaller and more focused **New England Workshop on Science and Social Change**, which I leave until sect. IV to describe.

III.B Ensuring a Viable CCT Program without another Full-time CCT faculty Member

Since the Graduate College of Education became the home college for the inter-college CCT Program in 1996-7, the core priorities of the College have taken precedence and resources of all kinds for CCT have progressively declined.[57] Nevertheless, students continued to be admitted—in record numbers for the years 2001-3—and it fell to me, as the sole regular faculty member since 1999 dedicated to CCT, to ensure that the College's responsibilities to serve the matriculated students were fulfilled. I have no hesitation in calling this yeoman's service to the College, especially after January 2001 when program directors in GCOE lost their formal

[57] In 04-05 and now 05-06, Nina Greenwald has been appointed full-time on annual basis and Graduate Studies has restored a (fractional) graduate assistantship dedicated to the Program.

status and course release.[58] My annual faculty reviews describe the many routine administrative and advising duties performed as a program director/coordinator,[59] but I undertook concrete steps directed at additional, program-sustaining goals, namely, to:

> i) streamline the administration of the Program so it could run without Administrative assistance;
> ii) arrange community events and orientations as ways students could get more support and input from each other and from alums; and
> iii) address problems around moving students through to completion and reinforce guidelines to prevent those problems in the future.[60]
> At the same time, the program needed to maintain its higher enrollments, so I continued to work on
> iv) outreach for recruitment;
> v) clarifying and strengthening CCT's role in the GCOE [see III.D below].

These efforts took place in line with a set of specific Objectives under six broad Goals (see below) laid out in the AQUAD (Academic QUality Assessment and Development) plan for CCT, which I submitted in June 2000.[61] These goals were:

A. To provide graduate students with an understanding of the processes of critical thinking and creativity, and with ways of helping others develop these processes in a variety of educational, professional, and social situations.
B. To establish planning parameters that allow CCT faculty to determine the best use of their experience and energies and [added since 6/00] adjust operations to work within those parameters.
C. To contribute to increased cross-program collaboration in the GCOE.
D. To contribute to increased collaboration with and contributions to other units within the University.
F. To support CCT faculty and students in research on and publication of their distinctive contributions to the fields of critical and creative thinking.
G. To evaluate and continue developing the Program.

The goals and associated objectives became the basis for the Program's self-study as part of the 2002-3 seven-year AQUAD review of CCT described in the next section.

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[58] The official policy announced by the GCOE Dean to the College in Sept. 2000 was that Department Chairs would take over responsibilities of the directors of all Programs based in the GCOE. Although the Dean's annual report for 2000-1 stated that this policy had been implemented, that has not been the case for CCT and some (all?) other GCOE programs.

[59] See sect. IV.A.1 in http://www.faculty.umb.edu/pjt/afr02.doc, http://www.faculty.umb.edu/pjt/afr03.doc, http://www.faculty.umb.edu/pjt/afr04.doc, http://www.faculty.umb.edu/pjt/afr05.doc

[60] See "Forms and handouts related to CCT Syntheses," http://www.cct.umb.edu/synthforms.html

[61] "AQUAD Planning Document, June 2000," http://www.cct.umb.edu/aquad00.html

III.C Clarifying and Strengthening CCT's Status in GCOE and UMB

The 2002-3 AQUAD review was seen as an opportunity to resolve the long-standing uncertainties about CCT's status in the College and University. The self-study I coordinated was, by all accounts, exemplary.[62] The external review was very favorable, recommending "that a relatively small amount of resources be invested in this program to ensure that UMB can continue to provide the leadership in innovative multi- and inter-disciplinary pedagogy represented by this Program." Restoration of resources for CCT did not, however, match the priorities of the College or the Provost, so a moratorium was placed on admissions and the existing students were to be moved speedily through to graduation.[63]

For a short time this settled the status of CCT, but then incoming GCOE Dean Goodchild wished to preserve the Program as part of a possible new interdisciplinary Center focused on psychology and education. In fall 2003, I formulated post-AQUAD proposals for: 1) a smaller admissions cohort that could be served without additional resources[64]; 2) for a Center for Science, Education and Society that incorporated existing CCT and STV initiatives and strengths[65]; 3) for incorporation of appropriate CCT courses as substitutes for required courses in the Teacher Education programs that had been redesigned to meet State Department of Ed. requirements[66]; and 4) a certificate partnership with the Division of Continuing Education to preserve a program identity and a basis for courses needed by Teacher Education students even if the M.A. admissions moratorium continued (see sect. III.D). In short, I continued to take initiative and respond constructively to possibilities floated by administrators in the context of continuing uncertainty about the institutional status of and resources for CCT.

An interdisciplinary center incorporating CCT has not yet emerged, but the GCOE Dean managed to secure an end to the admissions moratorium with the appointment of Nina Greenwald on a full-time basis for '04-05 and now '05-06. I continue to seek a secure planning frame in which to recruit M.A. students and offer courses. While Nina has taken the lead in program outreach and admissions recruitment, I am concentrating on providing guidance and

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[62] http://www.cct.umb.edu/aquad02report.pdf
[63] The self-study, external review, and responses can be viewed at http://www.cct.umb.edu/aquad03.html
[64] Not accepted by the Graduate Dean.
[65] Eclipsed by the NSF-funded Boston Science Partnership.
[66] Still under consideration.

backup to maintain the core advising and administrative functions and on making the Certificate partnership a success (see sect. III.D, to follow).

III.D Developing CCT in New Directions

The AQUAD self-study evaluated a number of options for the Program's institutional role and location, but these were eclipsed first by the decision to put admissions on hold, then by the new GCOE Dean's vision of a future interdisciplinary Center linked to Psychology and Education. I have, however, shepherded into being one of the post-AQUAD proposals (see sect. III.C), namely, the partnership with the Division of Continuing Education (CCDE) to promote the existing 15-credit CCT graduate certificate with a marketing focus on "Creative Thinking at Work."[67] (This focus subsumes the popular "Dialogue and Collaboration in Organizational Change" focus I had built up since Summer 2000.) The partnership agreement requires CCT to develop several online sections so that students could, in theory, complete the certificate from a distance. I have recruited the faculty for these sections, which will all be up and running by Fall 2006.[68] The next step is to improve the publicity so that not only do the sections fill, but also new students join CCT after experiencing one of the "Creative Thinking at Work" courses. A key plank in the publicity strategy is to build a network of CCT graduates who take initiative in making CCT-related presentations in their workplace or community.

Separately from the publicity network, I have initiated the organization of a Reflective Practice Support Group to support CCT graduates in putting into practice, taking stock of outcomes, and extending what they learned during CCT studies and afterwards. This group would meet a long-expressed need of CCT graduates for a community to support their steps after they graduate. Arranging such support matches the emerging emphasis in education programs on mentoring and support of recent graduates. On a personal level, I would value the opportunity to experiment in such a supportive setting with new approaches for individual reflection and group interaction. The organizing committee plans to convene the group this fall.

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[67] http://www.ccde.umb.edu/certificates/cct/index.html.
[68] http://www.cct.umb.edu/online.html

III.E Leadership in Regular Service

During my years in the GCOE, faculty members have had to respond to a high turnover of administrators and staff, to early retirement schemes that increased service expectations on those remaining, and to Accreditation reviews and regulation changes from the Department of Education that entail extensive revisions and documentation of procedures, practices, and syllabi. These challenges set a premium on organization when undertaking the service on College committees; efficient organization has been characteristic of my contributions on search committees and personnel reviews and as chair of the GCOE Academic Affairs and Curriculum Committee (2000-2 and 2005-)[69] and College Personnel Committee (CPC) in 2003.

My work chairing the CPC—my most difficult College assignment—can be characterized also by principles mentioned earlier—probing what had been left unarticulated; transparency and inclusiveness; and documentation for institutional learning—as well as by the principle of taking care for colleagues' reputations when disputes arise, especially colleagues coming up for or currently under review. At the time three faculty members were to be reviewed for promotion to full professor (two of them CPC members) and past practice for participation in such CPC-level reviews had not been consistent or codified. The eventual outcome was the Senate reconstituted the CPC mid-year so that only full professors served on the reviews of candidates for promotion to full professor. This move did not reflect my advice to the Senate chair and was not smooth in its implementation so the affair seems to have eclipsed my work in the months I was CPC chair. With the wish that the quality of that leadership not be discounted, let me draw attention to: a) the attachments to my 2003-4 Annual Faculty review, which document the careful consultation I undertook; and b) the draft of principles regarding participation in reviews that I derived from such consultation, which could still help regularize CPC reviews (Appendix D).[70]

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[69] See website I established for procedures, relevant forms, and minutes, linked to http://www.gcoe.umb.edu/councils/senate/index.htm. Alternative access: http://www.cct.umb.edu/AACC.html

[70] This and other non-confidential material can also be viewed through links to http://www.faculty.umb.edu/pjt/cpcextra.html

III.F Service and Institutional Development in relation to College of Education Indicators of Excellence in service

Most of the items under this category are well covered by the sections above (and are illustrated by documentation on the websites listed in the accompanying footnotes), but section IV.A of Annual Faculty Reviews and the few footnotes below should be consulted for additional detail.

Indicators of Excellence in service

Service activities are evaluated primarily along two dimensions:

- the level of professional competence or expertise required for its performance;
- the effectiveness of the service, which includes the scope and significance of the service to the welfare of the college, the profession, and/or the community, as well as its impact on the development of the institution.[71]

Contributions relative to service are expected:

- to be balanced between activities that can be classified as internal and external to the College
- to show coherence
- if in an administrative role, to show how attention to program/department/college and student or community needs and concerns have shaped the administrative unit's policies, practices, and procedures

Service may include:

a. administration at any level
b. service on department, college, or university committees with distinctions between one's role as chair or member
c. service to student organizations
d. service to any public or private counseling or educational institution
e. consultation or service to government or other public interest groups[72]
f. service to professional organizations
g. direct community organizing and development
h. presentations to schools, organizations and institutions that enhance the profession
i. consultations within the institutions
j. developing and implementing partnerships with schools, school districts and agencies.

Evidence of serving as a model and mentor to students, faculty, and colleagues[73]

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[71] I co-organized the site visit and proposal submission for the Ford Foundation that secured a pilot grant that led the next year to a full grant of $350,000 to establish the New England Center for Inclusive Teaching.

[72] Invited speaker to May 2005 in-house American Civil Liberties Union Conference on "Predicting Behavior: New Frontiers in Genetics and Neuroscience and Their Implications for Civil Liberties."

[73] See especially the interdisciplinary science and environmental education initiatives (sect. III.A), the systematic formulation and use of an AQUAD plan for the CCT Program (sect. III.

IV. Integration of Research, Teaching, and Service

Coherence of scholarship and integration with teaching and service
Coherence is a key dimension of presenting and understanding a faculty member's scholarly work -- How does the candidate see coherent threads of meaning and impact in his or her scholarship and how does she or he reflect on her or his contribution to important issues and the current state of knowledge in his or her field(s)? How does she or he, if appropriate, integrate her or his scholarship with teaching and service?

My book, *Unruly Complexity: Ecology, Interpretation, Engagement*, develops a framework for the integration of research—in science and interpretation of science in its social context[74] —with teaching and service—in the form of critical reflection on concepts and practice by researchers and students.[75] Indeed, the framework is made clear in the last chapter, which builds explicitly from an approach to teaching interdisciplinary students. The opportunity and challenge of fostering the reflective practice of the diverse adults who come through the CCT Program has given me sufficient experience and confidence to push further in putting that framework into *practice* with diverse researchers.[76] This integration of research, teaching, and service has led, in particular, to my establishing the **New England Workshop on Science and Social Change** (NewSSC), an umbrella under which to organize

> innovative, interaction-intensive workshops designed to facilitate discussion, teaching innovation, and longer-term collaboration among faculty and graduate students who teach and write about interactions between scientific developments and social change.[77]

The prospectus of NewSSC, which is evolving in response to evaluations and reviews of funding proposals, provides the following overview:

B), the support role I have played as Nina Greenwald takes the lead in outreach and recruitment for CCT (sect. III. C), the initiation of a Reflective Practitioners' Support Group (sect. III.D), and the articulation of principles that turn service into institutional development (introduction to sect. III). See also the implementation of an exit self-assessment for graduating students (sect. II.A & note 30), the indicators of modeling and mentoring as a Teacher and Advisor (sect. II. C), and the Workshops listed in Appendix C.

[74] Parts I and II of the book

[75] Part III of the book; see this statement, sect. I.A

[76] See Appendix C.

[77] http://www.stv.umb.edu/newssc.html

> Participants will be sought from the various areas of Science and Technology Studies, the sciences, and science education and—with an eye to training "interdisciplinarians"—will include graduate students as well as more experienced scholars.
>
> Participants will be expected to submit new syllabi and curriculum units (primarily for college-level courses) or outreach activities (e.g., hosting a citizen forum on a science-based controversy) related to their workshop's topic within six months of its completion. These will be made available as in an expanding compilation of Online Resources for Science-in-Society Education and Outreach.
>
> Formative (during the process) and summative (after the fact) evaluations of the workshops will provide a basis for developing the workshop experience from one year to the next and for establishing a model of workshops that can be repeated, evolve in response to evaluations, and be adapted by participants.[78]

The first workshops in Spring 2004 and 2005 addressed topics in line with my new research (see sect. I.B): " Complexities of environment and development in the Age of DNA" and "How complexities of the social environment shape the ways that society makes use of knowledge about 'genetic' conditions." Detailed evaluations of both workshops (available online[79]) convey the process and outcomes of the workshops, but let me share my favorite comments from participants in 2004:

> "For me the great strength of the workshop was that it enabled a relaxed mind and therefore playfulness and creativity. It takes some courage to go with this set up because the program is open and the progress develops in the making."
>
> "The workshop diminished my skepticism and personal reluctance; once here, I participated, and had moments of surprise and recognition that validated these approaches for me."
>
> "Many, many workshops are dysfunctional—this one wasn't."

An advisory group has formed to help plan and secure funding for proposed workshops for Spring 2006 and 2007 in the area of "Ecological Research and the Complexities of Participation in Social and Environmental Change." I have also included a Fall 2006 workshop as part of an NSF proposal for research on issues about heterogeneity and biological determinism (see sect. I.B). Let us now see whether NSF reviewers support such integration of research, teaching, and institutional development!

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[78] ibid. See Background, Rationale, and Means of Evaluation for four specific objectives.
[79] http://www.stv.umb.edu/newssc04eval.html,
http://www.stv.umb.edu/newssc04eval2.html,
http://www.stv.umb.edu/newssc05eval.html

Appendix A. CCT Syntheses completed since Fall 2001

(Items marked ** included in the packet for internal reviewers)

Peter Taylor as major advisor [35]

Joelle Barton Nims	tales of gen x nothing: A synthesis of theory and practice
Shelly Billingsley	Evaluating Different Forms of E-Learning
Andrea Brenner	Collaborative Insight: Fostering Communication Between Designers and Their Clients
Jeffrey Bretsch	Have Your π and Eat it Too! Using a course website to facilitate student-centered learning and improve the effectiveness of the high school mathematics experience
Kathleen Bullock	Teaching Economics In United States History: One Teacher Shares Some Lessons
**Susan Butler	A Teller's Tale: Joining The Circle -- A Discussion of Process in The Writing of a Novel for Young Adults
Michael Cartledge	Three Workshops For Teachers of Math in The Intermediate Grades; Communication, Content, and Kinetic Activities
**Suzanne Clark	Building and Sustaining Connectedness to One's Musical Creativity and Spirit
James E. Clements	Capturing the Dance: Producing the Live Dance Performance of '128' For Video
**Nicholas Conlin	From Teaching to Writing: The Creation of a Reader Intended to Support a Focus on Communication and the Cognitive Needs of the Learner in Spanish Classrooms
**Paul Dobbs	How Would Artists Design CBIR? Facilitating Collaboration to Develop Content-Based Image Retrieval on an Art-School Campus
John Duff	Reorienting College Student Affairs Activities to Emphasize Student Learning Through Experiential Approaches
Dory Fish	Finding Meaning Through Writing: A Personal Journey Into Writing Development Through Writing Workshops, Personal Experimentation, and Finding The Balance to Create Ideal Writing Environments and Communities With Elementary School Students
Mary Frangie	My CCT Guidebook: Keeping The Critical and Creative Thinking Momentum Alive
Jeanne Hammond	Facilitating a Learning Work Environment Through Teamwork Strategies: One Nurse Manager's Journey
Barbara A. Huscher	The Process Of Creating An Information Public Presentation: A Speech On Comprehensive Sexuality Education
Jane Kenefick	The Use of Dialogue in Education: Research, Implementation and Personal/Professional Evaluation
John Lewis	Learning, Teaching and Brain Research: Insights From Current Research That May Affirm Teaching and Learning Strategies
Robert Lingley	Bureaucracy: An Original Creative Project
Mary Moniz	Tools For The Architect of Whole School Change: A Handbook of Information and Strategies
**Melissa Moynihan	Developing My Knowledge and Experiential Understanding Towards a Creative Contribution to Work & Family / Life Balance
Tamami Nakashima	A Plan for a Community Education Center in Japan
Benjamin Okafor	Personal Experience and Professional Development Through Critical and Creative Thinking
Laura Rancatore	A Commitment For Change

Michael Ruf	New representations of Afro-Americans in films: an analysis of 'Do the right thing' and 'Eve's Bayou' following the framework of Stuart Hall
Kristen Rushworth	Narrative Inquiry: Conversations That Reinforce My Commitment To Inquiry Based Learning
Maryann Scheufele	My favorite pastime becomes a career possibility (Reading and story telling for children)
Scott Seiler	A case for implementing an electronic document managament system (EDMS)
Danielle Shylit	The Colorsong Prophecy: Using Gardner's Theory of Multiple Intelligences to Develop Hero Archetypes for a Young Adult Fictional Fantasy Series Aimed at Promoting a Mythology of Nonviolence
Davis Sweet	Teaching Critical Thinking as a Late-Life Career Change
Kathleen Walsh	Embracing Systems Thinking and the Dialogue Process Within My Classroom
Brooke Wentzel	Acknowledging Alternate Realities by Being Responsible for Our Own
**Luanne Witkowski	Basic Training: Inspiring Institutional Change in Higher Education in the Fine and Professional Arts Through Wholistic Practice and Sustainability Education
**Roanna Yangco	Creating Inner and Outer Sacred Space: An Adult Learner Program's Wholistic Approach to Supporting Low-Income Women Who Have Been Impacted by Violence
Srijula Yongstar	From "Listening Together" to "Thinking Together": The Use of Thai Radio to Promote Creative Thinking

PT as reader/second advisor [12]

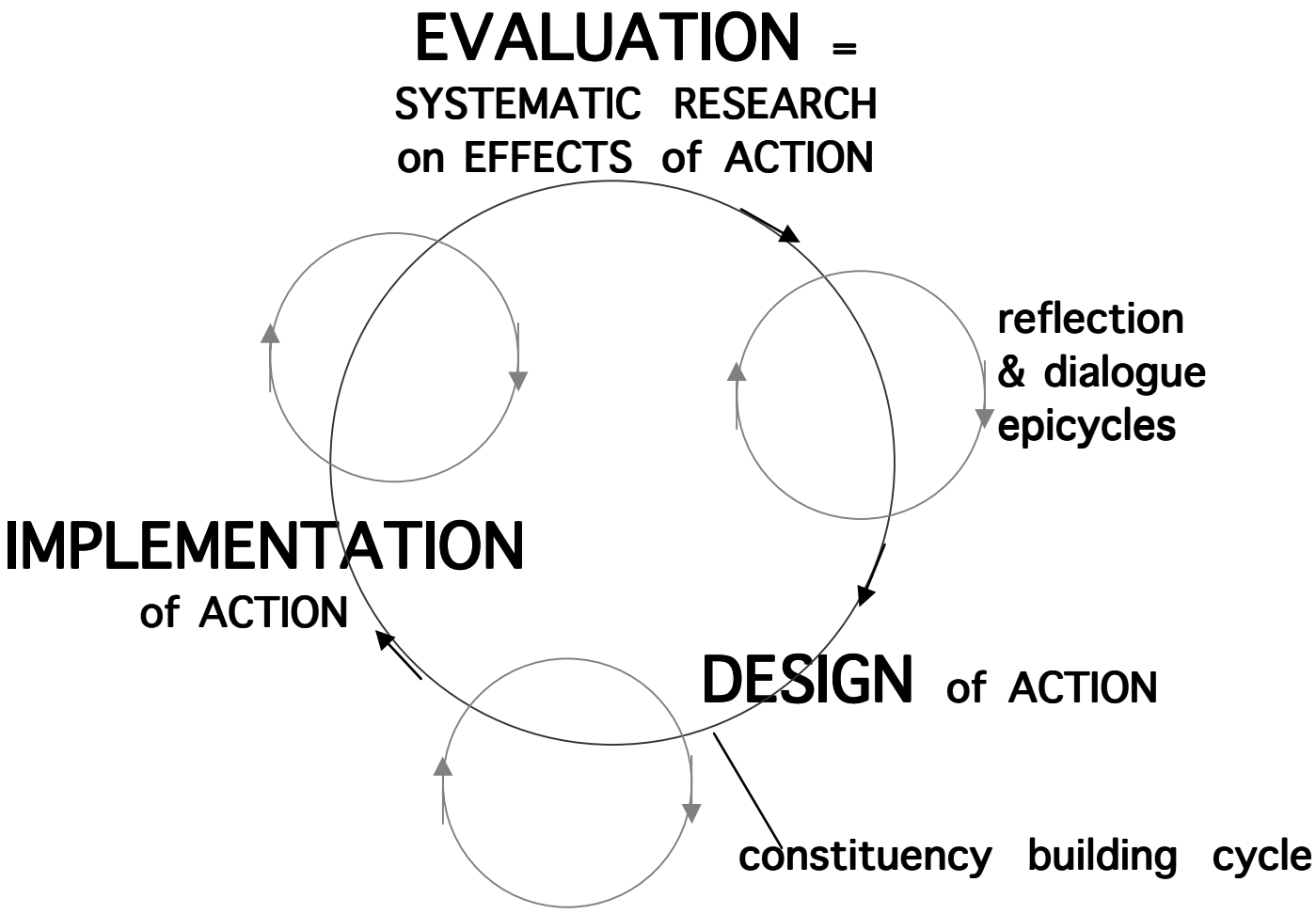
Robert Blackler	Using Students' Own Ideas to Change How They Understand Energy: A Teacher's Evolution Towards Conceptual Change Teaching
Pin-Yu Chen	Cognitive Science Models And Analogies To Support Music Education That Incorporates Multiple Tonal Systems
Senait Fesseha	...And There Was Light. On Becoming a Writer: A Reflective Journey
ElizaBeth Garcia	Developing Intrapersonal Synergy though Dialogue and Expressive Writing: Implications for Education and Living
Kristen Hanks	Creating a Life of Art: a Personal Journey Towards Creative Freedom
Matthew Jans	Dynamic Systems Theory and Human Development: A Cognitive Journey Through Intellectual State Space
Linda Jeffrey	Hands-on: Lessons for ESL adults
**Kyle Lindholm	Doodles to Drawings: The Creative Process of Drawing & Thinking for Cartooning
Meghann McNiff	Critical and Creative Thinking Reflections of an Adventure in Career Changing
Michelle K. Morgan	Personal Evolution: Reflections on a Journey to Self-Understanding
Nancy Sheehan	Helping Middle School-Age Girls Understand the Value Of Participating in Physical Education Programs Through Critical and Creative Thinking
Barbara Wickwire	Finding Voice: Turning Fragments Into Stories -- Teaching Memoir to Enhance the Journey of the Non-Confident Student

Note: All but 2 of the other 18 syntheses completed since Fall 2001 took their initial shape during the pre-synthesis, Practicum course, taught by PT.

Appendix B. CYCLES and EPICYCLES of ACTION RESEARCH

for EDUCATIONAL, ORGANIZATIONAL, PROFESSIONAL and PERSONAL CHANGE

Peter Taylor 4/03



TOOLS introduced in CrCrTh 693

Evaluation: Critical Incident Questionnaire, Research based on KNF(HYW), Evaluation Clock, Basic logic of statistical analysis, Feedback in form of appreciation + something to be developed

Reflection: Freewriting, KNF(HYW), Focused Conversation, Supportive listening, Strategic Personal Planning, Historical scan

Dialogue: Small group process, Focused Conversation, Jig-saw discussion of readings, Historical scan

Design of Action: Strategic Participatory Planning

Implementation: --[not part of the course]

Action Research is evaluation, constituency building, reflection and dialogue that helps you get actions designed and implemented and take stock of the outcomes. Actions can be construed broadly to include policies, procedures, curricular changes, and personal changes.

Evaluation is systematic study of the effects of any actions implemented (including actions taken before you got involved or in another setting). You use the results of evaluations to design new or revised actions and to convince others to implement equivalent actions in other settings. Sometimes evaluation involves exploratory research—trying to work out what aspect of the situation warrants action in the view of some potential constituency—and sometimes it is tightly focused to establish the specific effect of a specific action. Indeed, an oscillation between opening out and focusing in runs through Action Research.

Constituency building involves identifying, convincing and enlisting a constituency to implement actions that respect the resources—possibly limited—that they have. Constituency building can involve facilitation of "stakeholder" participation in the initial evaluation and design of actions, which brings about investment in their implementation. (If the actions are personal changes and the constituency is yourself, you can still facilitate your own evaluation and design process to ensure your investment in the actions.) Constituency building is helped by succinct presentations to a potential constituency of action proposals and the research that supports them.
Constituency building begins with oneself. In order to contribute effectively to change, you need to be engaged yourself—to have your head and heart together. You need to pay attention to what help you need to get engaged and stay so.

Reflection and dialogue are needed for ongoing revision of your research focus and design of actions and for drawing more people into your constituency. Through reflection and dialogue you can check that the research you undertake is related to possible actions and constituencies. You can also check that the actions and constituency building you pursue are supported by the research.

All these processes continue during the design and implementation of actions, but these are not the focus of CrCrTh 693.

Appendix C. Workshops for Faculty Colleagues and Teachers (since 1999)

Critical Thinking and Reflective Practice, especially in Science		
Changing Life Working Group	Spring 1999	Monthly meetings allowed participants "to share insights, experience, experiments, struggles, and plans about influencing science and environmental education, popularization, and citizen activism." This initiative evolved into a series of summer workshops (below*).
Honors Faculty Development Workshop for Massachusetts Board of Higher Education	June 1999	"Critical Thinking"
Science-In-Society, Society-In-Science	July 1999	One-day event; see evaluation at http://www.cct.umb.edu/workshop99eval.html
Workshops for UMB Center for Improvement of Teaching	April & October 2000	"Critical Incidents in Teaching"
Workshop for "How does nature speak?" project, Finland	May 2000	Leading advanced environmental studies graduate students to prepare and revise their contributions to the How Does Nature Speak anthology through extensive individual reflection and exploration of connections through writing and small group discussions.
New Directions in Science Education and Society	July 2000	Four 2-day workshops offered through UMass Boston Continuing Education
Helping each other to foster critical thinking about biology and society" & "...about environment, science, and society"	July 2000 & 2001*	Two intensive weekend workshops for college educators; see http://www.faculty.umb.edu/pjt/pp2.html and http://www.faculty.umb.edu/pjt//helping01.html
Thinktank for Community-college teachers of critical thinking	2000-2002	Organized for CCT graduates and associates "to explore issues of interest to each of us in our quest to promote effective thinking and problem solving in our professional lives and communities" and "to consider ways to share the results of our explorations with wider audiences."
Workshop at Center for Excellence in Teaching and Writing, Oregon State University	Feb. 2001	"Fostering critical thinking through attention to the inter- and intrapersonal"
Workshops for Eisenhower Prof. Development Program in the South River/South Coastal Watershed	May & Nov. 2001	"Building a Professional development Learning Community," and "Developing Unit Plans for Inquiry- and Problem-based Learning"
Teaching History, Philosophy, and Social Studies of Biology	July 2001	Pre-conference workshop before 2001 meetings of the International Society for History, Philosophy, and Social Studies of Biology; see http://www.faculty.umb.edu/pjt/ished01.html
Prof. Development Workshop for Arlington School District	Nov. 2001	"Problem-based learning in secondary schools"

University of Coimbra symposium on "Research and the University," Portugal	January 2002	Keynote address & workshop for graduate students
Teaching with Media Workshop, UMB & Workshop for Departmental colleagues as MEET educational technology fellow	April & Dec. 2002	"Yes, computers could do that, but *why* would you want them to? (Towards guidelines about specific situations and specific ways in which specific technologies are of significant pedagogical benefit)" http://www.faculty.umb.edu/pjt/etguidelines.html
Session for the UMB Center for Improvement of Teaching	April 2002	New Directions in Fostering Critical Thinking
Session at BioQuest workshop on Teaching College Biology, Beloit College	June 2002	"Opening up the social dimensions of biocomplexity through case studies and ill-defined problems"
Education for Sustainability	Spring 2003	Faculty & graduate student curriculum development workshops at UMass Boston; see http://www.cct.umb.edu/efscurrdev.html.
Two sessions for Watershed-Integrated Sciences Partnership at UMB	April & June 2003	"Reflection, dialogue, and organization as parts of taking initiative to build a professional development learning community" "On being a reflective educator"
Middle East Environmental Futures Project, Brown University	July 2003	Invited Facilitator/Participant
Inter-college Faculty Seminar in Humanities and Science at UMB	Spring 2004, 2005	"Social uses of 'genetic' knowledge," and "Disease and difference;" see http://www.stv.umb.edu/ISHS.html.
New England Workshop on Science and Social Change (NewSSC)	May 2004, April 2005	An initiative "to facilitate discussion and longer-term collaboration among college faculty who teach and write about interactions between scientific developments and social change," see http://www.stv.umb.edu/newssc.html, including evaluations of both workshops.
Global Perspectives Curriculum Development Project, Mt. Mary College	May-Sept. 2004	Workshop leader & consultant for science faculty
Other Topics		
Workshop for International Association of Facilitators, Toronto	April 2000	"Alternating between teacher and facilitator"
Ford Foundation Site Visit before awarding UMB a grant for the New England Center for Inclusive Teaching	May 2002	Co-organizer of site visit and organizer of session of vignettes to convey a diverse sample of ways that faculty members have extended their diversity-enhancing CIT experiences through new "inclusion" initiatives both here at UMB and in collaborations with schools and colleges across the region.
Workshop for Departmental	Dec.	"A minimal set of tools to handle my office-on-the-

colleagues as MEET educational technology fellow	2002	computer and enhance teaching/learning interactions in a sustainable way" http://www.faculty.umb.edu/pjt/virtualoffice.html
Session on "Teaching with instructional technology" at UMB "Teaching for Transformation" conference	January 2003	"Using Acrobat to make PDF compilations" http://www.faculty.umb.edu/pjt/ PDFcompilation.html

Appendix D GUIDELINES FOR PARTICIPATION IN CPC REVIEWS

Draft 11/6/03, prepared by CPC chair on the basis of by-laws, past practice, and consultations
Discussion of the Guidelines is on the agenda for the CPC when it next meets. If approved they will be forwarded to the Senate for the record and for codification where needed in by-law changes.

1. Representation. CPC is elected by faculty according to the by-laws of the College senate to represent the faculty. Vacancies are filled by the Senate chair following by-law 6.13.

2. Participation in reviews. Discussion and voting on CPC reviews are undertaken by all CPC members not ruled out by other guidelines. The work of drafting CPC reviews is distributed as evenly among CPC members as possible, taking into account CPC members' participation in Ad hoc (Departmental) level reviews. Voting members sign off on the final wording of the review.

3. Independence. Although each level of review for a candidate is informed by the reviews at lower levels, the CPC review is conducted by CPC members who have not participated in a lower level review for the candidate according to the College criteria. Issues about participation in and conduct of the reviews (e.g. election of CPC chair) are determined by the CPC once it has been elected as a standing committee of the Senate to represent the faculty.

4. No conflict of interest. The Provost prefers that candidates for promotion not serve on the CPC during the year of their review.[1]

5. Rank. The Provost is working towards an ideal in which only full professors review candidates for promotion to full professor, but it is acceptable for associate professors to participate and vote provided there are at least as many full professors as associate professors on the review (emails from Assoc. Provost Langley to CPC chair, 2/24/03 and 10/7/03).[2] The Provost asks the CPC to consult with the Provost's office about associate professor participation each time the issue arises.

6. Institutional memory. Participation in Discussion and Voting on CPC reviews provides experience (especially about standards) that feeds into subsequent contributions to personnel reviews.

7. Size of review panels. The Provost's preference is for at least five people voting on each review so that "No single member's vote can give the appearance of a substantial division of opinion" (University guidelines, affirmed by Assoc. Provost Langley 10/7/03).

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[1] The rationale is that working together with colleagues on a committee makes it harder for the colleagues to act in judgement of them. When this advice was received from the Assoc. Provost, the two 2003-4 candidates on the CPC stepped aside. They had already asked to recuse themselves from the reviews of the candidates for promotion to full professor and were not eligible to serve in the remaining CPC review (because they were serving at the Ad hoc level.)

[2] In making this ruling, Assoc. Provost Langley explicitly placed it above two other alternatives:
1. CPC review panels (subcommittees) consisting of associate professors and full professors, with only the full professors voting.
2. CPC review panels consisting only of full professors, but smaller than the recommended size of five.
The CPC has not yet met to discuss whether to accept the Provost's advice or request that he accepts that the GCOE CPC operates one of the two alternatives. The participation of associate professors is not without precedent at UMB or in the GCOE.