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Multiliteracies as Transdisciplinarity Curriculum Practice

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Abstract

This study builds on and contributes to work around Multiliteracies approaches to literacy education. Although multiliteracies has been well-theorised in recent years, few studies have researched the practical aspects of developing a curriculum of multiliteracies where students engage in transformed practice through multimodal design. This presentation demonstrates multiliteracies as a transdisciplinary curriculum practice, drawing on data from a 3-year study in an urban middle school in the United States. The data moves the field of literacy research forward by describing how students move beyond engaging in critique to multimodal design of a variety of school and media texts. Employing Bourdieusian concepts of social capital and academic field, the struggles around learning to inhabit certain school discourses are explored. The study elaborates the implications for educational research and teacher education.

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Reconsidering Disciplinarity

Disciplines as social organized structures of knowledge production are historical and future oriented social fields with conventions and standards to evaluate and arbitrate. They conserve and change; none are the same and some may differ radically in how they function. Etymologically, the word, discipline, means both to teach and to learn (Hoskins and Macve, 1986, p. 106 cited in Shumway and Messer-Davidow, 1991, p. 202). Modern disciplines are not arbitrary ‘administrative categories,’ but cosmopolitan communities of practice (p. 208). Understanding disciplines as social practices can help relate the disciplinary organization of knowledge to other social practices (p. 211). Disciplinary knowledge in the sciences and humanities in representing the world also intervene in it (Fuller, 1988). A discipline has “an agenda, an attitude, and a language” (Shumway and Messer-Davidow, 1991, p. 219).

Disciplinary conventions and standards are frequently described as continuative and defensive mechanisms, which form boundaries or borders that must be negotiated. The permeability of these boundaries denotes key differences among disciplines. Borders make working within disciplinary boundaries “intelligible because it is held against something it is not” (Stewart, 1989, p. 10). The trope of moving across disciplinary boundaries constructs a static conception of disciplinarity. It “fail[s] to allow for either changing aims and actions *within* a discipline or overlapping aims and actions among disciplines.” This “two-dimensional” metaphor “fail[s] to describe adequately the role of language” (Lyon, 1992, p. 682). Bourdieu’s notion of dynamic and contested social fields, employing his operational metaphors of game and market, may be a productive alternative to the notion of disciplinary borders and boundaries (Bourdieu, Chamboredon, & Passeron, 1991). A consequence of proposed reappraisal of disciplinarity and the of the complex relations among academic fields and school subjects may improved curricular and pedagogical theorizing (Scheffler 1991; Stengel, 1997)

Rehabilitating disciplinarity brings into question aspects of interdisciplinary curricular theorizing. It challenges interdisciplinarity’s pedagogic assumption that knowledge is a *thing*—which it exists outside of the interactions and contexts that create it. This assumption, we argue, underlies theme-based interdisciplinary instruction, in which students learn different bits of information, but are left on their own to make sense of these bits. This information too often appears to be separate from its own formation, from its use and applications. Contrast this with Foucault’s notion of knowledge as practice in his study of medical discourse: “What one must characterize and individualize is the coexistence of these dispersed and heterogeneous statements; the system that governs their division, the degree to which they depend upon one another, the way in which they interlock or exclude one another, the transformation that they undergo, and the play of their location, arrangement, and replacement” (Foucault, 1972). For curriculum theory and practice, Foucault’s argument implies that knowledge should be conceptualised in terms of its disciplinary productive power to represent and intervene in the world. Interdisciplinary school work often fail to front the production of knowledge, because while students produced engaging and effective texts and learned some interesting and important facts, they often have little sense of the ways to organize these facts—the knowledge necessary to design and create productions that work as public documents.

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Reconsidering Interdisciplinarity

Dewey argued that the structure of the disciplines should not dictate curriculum and that learning should be experiential. As a consequence, interdisciplinarity became a hallmark of early progressive curricular reforms, such as Kilpatrick's "Project Method." Klein (1994, p. 4) provides a history of the emergence of interdisciplinarity in curriculum theorizing; concluding that, while much schooling continues to rely on subject specialization to construct different forms of knowledge and skills, progressive educators have employed the concept in interdisciplinarity to contest overspecialization in subject areas and the transmission of information over understanding and problem solving. Additionally, interdisciplinarity is credited in developing students' affective as well as their cognitive abilities, respecting student diversity, broadening students' facility with wider texts and genres, encouraging their creativity, and promoting their awareness of and response to social, political, and ethical issues. In most cases, interdisciplinarity stresses the requirement for a plurality of disciplinary approaches in problem solving, in making connections within and between disciplines, and in preparing students for social futures in an increasingly complex world which cannot be addressed by disciplines taught in isolation (Stark & Lattuca, 1997, p. 352-355).

Interdisciplinarity has been variously defined as borrowing across disciplines, collaborative problem solving, bridge building, theoretical synthesizing, and the development of new fields in overlapping areas study (Klein, 1990). This conceptual imprecision is reflected in how other terms associated with interdisciplinarity have been applied. Inter-, multi-, trans-, and cross-disciplinary descriptors are employed to describe a wide spectrum of curriculum planning (Scott, 1979). Some distinction can be made among interdisciplinary and cross-disciplinary, multi-disciplinary, and trans-disciplinary teaching. "Crossdisciplinary . . . refers to efforts to view one discipline from the perspective of another, often subordinating the phenomena from one discipline to the other" (Klein & Doty, 1994, p.4). A multidisciplinary approach associate previously separate subject areas, but does little integration among them. But these terms are often used in common to redefine the relation between specialization in one discipline and common work across disciplines "Interdisciplinary teaching depends not so much on the existence of several disciplines as it depends on the existence of a point of view toward the subject matter and toward knowledge in general" (Glasgow, 1997, p. xxiv). Frequently, then, interdisciplinary curriculum is organized around a topic, issue, period, institution, or place, focusing on a theme rather than a particular body of knowledge or skill and on collaborative teaching.

Pragmatically problem oriented, interdisciplinary professional schools, specific focus areas, minors, and general education programs are well established in tertiary education. Secondary and primary education, similarly chafe at disciplinarity's straightjacket, evident in timetables and isolated classroom teaching. Over the past several decades, curriculum standards have increasingly relied on notions of interdisciplinarity to shift the goals of teaching and learning to the understanding the processes, the appreciation of social implications, and the development of communicative capacities. Along with these standards new forms of assessment have been developed and tried. Researchers and teachers often pair interdisciplinarity with curricular and school reform efforts to counter disciplinary overspecialization and the fragmentation of knowledge. Frequently this work is situated

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within binaristic debates; for example, teachers and researchers conjoin interdisciplinarity with child-centered pedagogy and traditional disciplinarity with teacher-centered curriculum.

Given interdisciplinarity's appeal, it is important to note problems associated with interdisciplinary teaching and learning. These are generally associated with what Klein calls the 'disciplinary paradox' (Klein, 1990), "one the one hand, the fragmentation of knowledge into the disciplines leads to the necessity for interdisciplinary approaches, yet, on the other hand, interdisciplinary approaches to knowledge can only receive an epistemic justification for knowledge claims" (Petrie, 1992, p. 305). Interdisciplinarity faces the 'burden of comprehension' with the disciplines marshaled to study a particular phenomena and the additional responsibility of maintaining intra and inter-disciplinary standards and confidence (Klein, 1990). Fish (1989) argues that it is impossible to 'inhabit' one disciplinary field at a time (p. 21). Knowledge production is inherently local; texts must constantly be 'imported' to do interdisciplinary work (p. 19). They carry signs of their discipline of origin. Consequently, interdisciplinary tasks require 'information' or 'techniques' taken from existing disciplines or reconstructed in some new or expanded discipline (21).

Critics of interdisciplinary pedagogy have argued that discipline-based standards are weakened by interdisciplinary approaches. Students need to be introduced to disciplinary practices and concepts before they can make interdisciplinary connections. Further, disadvantaged students' unfamiliarity with discipline-centered discourses is often overlooked in interdisciplinary education. Wineburg and Grossman's (2000) work points to these issues: "What tends to happen with such curricula is that disciplines become storehouses containing topics for classroom activities; typically, however, only one part of the disciplinary storehouse is raided while another is systematically ignored. ... [T]he 'disciplined' part of the disciplinary tends to fall away, leaving a body of information without the tools for evaluating its quality or warrant." Further, while narrow discipline-focused learning in school does not often apply to specific real world problems; interdisciplinary situation-based problem solving may not lead to generalisable applications (Petrie, 1992, 326). Given such an epistemological limitation, "The only solution would seem to try to construct some transdisciplinary notion of knowledge that encompasses all the disciplines and their specific methodologies and provides an overall epistemic justification for knowledge claims" (Petrie, p. 305).

If this is the case, we suggest that disciplines be re-examined as lenses for reading the world-- different ways of knowing that are ideological in terms of their particular objects, meanings, and values-- and resources that foster but also shape students' learning. The notion of pedagogical transdisciplinarity may provide an overarching framework of meaning to thematically related disciplines (Davis, 1995; Kockelmans, 1979).

Epistemological and Pedagogical Transdisciplinarity

Transdisciplinarity attempts to provide an overarching framework of meaning to the disciplines (Wineburg and Grossman, 2000; Davis, 1995; Petrie, 1992; Kockelmans, 1979). Epistemologically, transdisciplinarity's attraction has lain in the desire for the meaningful integration of knowledge and has been associated with general systems theory, and philosophical questions about the nature of understanding (Petrie, 1992; Klein (1994). Jantsch (1992), who called for a qualitatively different approach to disciplinarity, is often

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credited with the term. CIRET, the International Centre for Transdisciplinary Research, under the direction of Basarab Nicolescu, was founded in 1994; since then, four conferences have been held. Similarly the Academy of Transdisciplinary Education & Research (ACTER) was founded at the University of Texas to “create an environment for global collaborative efforts in transdisciplinary education, research and training and to facilitate the development of transdisciplinary programs and processes (Ertas, 2000). Yanz (2006) review of transdisciplinary theorizing to date notes that there is variation (some of it seemingly contradictory and subject to Klein’s paradox) in how the term has been described and applied in projects. But, he notes that the general argument for transdisciplinarity runs:

It is not enough to simply encourage disciplinary cooperation without an intellectual framework, and an epistemology that direct this. It is not enough to simply hold onto the twin goals of efficiency and progress, and find ways that disciplines can mine the resources of other disciplines to achieve their goals. And, it is not enough to predetermine the nature of conversation between disciplines by establishing an over-arching “meta-discipline.” What is needed is a way of preserving the particularity of disciplinary knowledge, while at the same time finding the underlying rationality. (Yanz, 2006, p. 4)

While the substantive proportion of transdisciplinary theorizing has been in tertiary education and research, transdisciplinarity in curriculum design is entering primary and secondary educational practice. Klien (1994) notes that Swiss primary schools have had a long history of transdisciplinary learning in environmental studies. Perhaps the largest transdisciplinary project so far has been the Queensland New Basics Project in Australia. The heart of this curricular innovation, Rich Tasks, is described as transdisciplinary in nature (Luke, et al, 2000). Currently UNESCO’s Education for Sustainable Development Program links changes in ways of thinking about the challenges and changes facing the world using “transdisciplinary and inter-sectoral approaches.”

Pedagogical transdisciplinarity respects disciplinary commitments to different understandings about the kinds of knowledge that are most valued, what it means to know something, what subject positions are enacted in the pedagogical exchange, and what vision of social relations is privileged. Pedagogy is about subject formation. It is an intervention in the lives of subjects and in the spaces they inhabit. Curriculum and instruction access linguistic and literate markets which represent social spaces that regulate particular forms of capital (Luke, 1995, 2001). The intellectual field as a whole constructs particular dispositions and habitus. Students within each school subject face established structures of expectations and are positioned within various contexts of chance and possibility, shaping their interactions with teachers and texts (Albright, Walsh, & Purohit, 2007). Pedagogies that are only vaguely aware of how practitioners and students as subjects are incorporated, “enfleshed” in some discourse every time they speak and act (and how discourse is disciplinary (Gee, 1990)) may not be as effective in helping students understand the values and conventions of capital accumulation available in school subjects, disciplines, and related fields. Intersections within the intellectual field and related disciplines are formed in conflicts over academic rigor, theoretical versus practical knowledge, research versus pedagogy, etc. Bourdieu notes that there is often an unacknowledged or misrecognized complicity in accepting the rules of the game in fields (Bourdieu, Chamboredon, & Passeron, 1991, p. 45). Too often, students,

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being initiated into various texts and text practices, are constructed somatically in this presupposed acceptance.

Given its potential for reconceptualising educational theory in practice in such areas as curriculum design, policy-informed educational research, and teacher education We now provide examples from work done in a small public middle school in New York City's Chinatown, a Singaporean educational research centre, and a teacher-education faculty in Melbourne, Australia which we feel illustrate the utility of this concept.

Three Examples of Transdisciplinarity

New York:

Albright, Walsh and Purohit (2006, 2007) describe curricular examples of transdisciplinarity from a small public middle school in New York City's Chinatown. Their collaborative professional development project researched literacy and pedagogical practices with groups of sixty eighth grade students, most of them first or second-generation immigrants from China. Over three years, these two teachers and university researcher tracked, using classroom and meeting field observations, shared readings, collections of student work, and student interviews, their inquiry into disciplinary structures as a central part of an 8th grade English, social studies, maths curriculum. The project's findings demonstrate how a transdisciplinary curriculum promotes students' learning through textual analysis, discussion, re-representation, and production of texts with particular awareness to language and disciplinary norms about knowledge production, authority and representation using discourse-analytic strategies taught across school subjects. This research concluded that, as 'artful actors within semiotic systems,' these students were able to meld disciplinary knowledge with the strategic employment of multimodal design (The New London Group, 2000), adapted to the particular discursive demands of a variety of academic tasks (Newman, 2003). As teachers and researchers, the open-ended set of transdisciplinary semiotic analytic tools encouraged student engagement with representational tasks connecting their personal IT expertise with valued school genres. The recognition of the generative value of students' contexts and personal literacy practices needs to be framed within understanding the disciplined nature of knowledge and practice.

Informed by multiliteracies (The New London Group, 1996; Cope & Kalantzis, 2000) theorizing, Albright, Walsh & Purohit, (2006, 2007) describe a transdisciplinary pedagogy which emphasizes the importance of critical language skills and social semiotics. Moje and O'Brien's (2001) collection of case studies is also useful in connecting critical multiliteracies work with transdisciplinarity. As Luke (2001) notes in the Forward, some of the studies demonstrate how taking up new practices helps students engage with and contest disciplinary language, practice, and ideology. He writes that students live in economies and cultures that are "complex, multiple, and characterized by rapid change, uncertainty, and complexity. The teaching of [multi] literacy is an introduction to semiotic economy where identities, artifacts, texts, and tokens are exchanged in predictable and unpredictable ways" (p. xiii). Related curriculum theorizing helps connect multiliteracies and transdisciplinarity. Morgan (1997) points out that instruction "tend[s] to de-emphasize the positions of students as subject to discourses and knowledge and the power these produce" (p. 110).

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Consequently, disciplines can be read as being constituted in part by literate practices that have different kinds of discursive power and demanding multiple classroom approaches.

Albright, Walsh and Purohit (2007, p. 103) provide a table that shows how certain kinds of critique might enable students' competency for design. Drawing heavily on systemic functional linguistics (Fairclough, 1995a; Halliday, 1994; Martin & Veel, 1998) to think about grammars for facilitating design and production, work in systemics can inform visual critique and design, emphasizing text production and social uses (Kress & vanLeeuwen, 1996, 2001). In visual work, systemics connects to genre-based transdisciplinary curriculum (Kamler, 2001; J. Lemke, 2000; Unsworth, 2001), as students look at the relationship between grammars and the construction of different texts within and among disciplines. Students used multimodal and intertextual understandings of texts ideas from systemics to analyze, critique and then redesign texts thereby contesting/questioning their production and consumption (Fairclough, 1995b; Kress & vanLeeuwen, 2001; J. L. Lemke, 2004; Peim, 1993).

Albright, Walsh and Purohit (2007) also provide several examples from science and humanities lessons illustrating students learning similar strategies for approaching and analysing texts across the disciplines. For instance, in science class they learned to distinguish environmentalist, narrative writing from "neutral" scientific writing, while in social studies they were looking at the construction of different views of history through the narratives in the text. After explicit instruction in the reading of images through the grammar of visual design (Kress & van Leeuwen, 1996)—specifically the significance of participants/circumstances, vectors, color, perspective, and framing—students became proficient in appraising how visual representations worked differently in science and history.

Albright, Walsh and Purohit (2007) introduced students to aspects of critical semiotics. To connect the work in different disciplines, they cobbled together analytical strategies and approaches for purposes of "critique" and "design." Techniques such as reading strategies that make up "critique" are connected with "design" in the curriculum, as students applied these strategies to their own productions, taking into consideration, for example, ideas about genre and audience. They conceptualize design as an integral part of transdisciplinary multiliteracies work. In a transdisciplinary curriculum, design can be a way of assessing and understanding students' critical reading. The New London Group's explanation is helpful: "The notion of Design recognizes the iterative nature of meaning-making, drawing on Available Designs to create patterns of meaning that are more or less predictable in their contexts. . . . It is also important to stress that listening as well as speaking, and reading as well as writing, are productive activities, forms of Designing" (The New London Group, 1996, p.22). In a curriculum that privileges the role of language and discourse in shaping the school subject, the measure of students' work is really in their design of various texts—encompassing a variety of spoken and written discourses. That students are incredibly creative, able to draw on diverse uses of language in order to create cultural "productions," is a foundation of cultural studies and media studies work in education (Buckingham & Sefton-Green, 1994; Willis & Jones, 1990). The usefulness of the multiliteracies notion of "design" is that it makes the idea of production relevant for work in school subjects that might not seem on the surface to be related to popular culture.

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Albright, Walsh and Purohit (2006, 2007) illustrate how design work took students from critiquing other texts to using that critique for the purpose of what the New London Group calls re-design (1996). Re-design reflected the textual work students had been doing with visual techniques across the disciplines. Multiliteracies as a theoretical framework connects this concept of re-Design to “transformed practice”: “transfer in meaning making practice, which puts the transformed meaning (the Redesigned) to work in other contexts or cultural sites” (The New London Group, 1996, p. 35). As an example, they narrate how a group of students designed a website as a part of a competition (the *ThinkQuest Challenge* <http://www.tqnyc.org/NYC030395/>); in this website they worked with modes of analysis and critique they had used in school social studies (the Available Designs). These students took the Available Designs that they had learned from working with school texts, and particular ways of thinking about social history, but they put them to work in a new, web-based context (Walsh, 2007). For instance, they re-located popular musicians (like Naz and Eminem) within discourses of protest in social history. Another example Albright, Walsh and Purohit (2006, 2007) cite comes from an earth science activity in which students designed graphs to represent different interpretations of experimental data about the heating and cooling rates of sand and water. Negotiating how to represent evidence graphically in a way that could make a certain point—and often students were trying to re-design the data to uphold the science concept of specific heat—students took up modes of discourse and argumentation specific to science as an academic field.

The design of the website and the science graphs to represent sand and water cooling both display students’ differential discursive resources as embodied cultural capital, in differing academic fields (Luke, 1995). In the case of the website design, the construction of the website is mediated by students’ available capital and illustrates the laws of conversion of capital within and across different social fields (Walsh, 2007). As Albright, Walsh and Purohit worked with students, the cultural capital students acquired—skills and dispositions—and its recognition brought out the significance of linkages between habitus, capital, life trajectory, and field. This is an example of the range and complexity of possible social fields the students could participate in, and the interrelationships between cultural, economic, social, and symbolic capital. In the case of their students’ analysis of temperature data, the range of possible social fields is more constrained. The ways the students were able to make generalizations, create data sets, and explain data analysis in the context of a classroom discussion about specific heat and climate are useful discursive practice in the field of academic science and applied mathematics. At the same time, these discursive practices are related to reading popular science and quasi-science texts, but in those situations the ideology of science as a separate field with a certain “mystique” around it (Lemke, 1993) further complicates the connection between school and academic fields.

In conclusion, Albright, Walsh and Purohit felt that while developing students’ critical practices that work across disciplines made sense on a theoretical level and opened up new ways of looking at curriculum, several areas of difficulty became evident. These difficulties in understanding reflected students’ uneven transitions to understanding school subjects in relation to academic field, and to using critique and design strategies in ways that reflect the unique demands of different subject areas. Learning to do transdisciplinary design, as a shift in a student’s habitus or academic dispositions, is not an easy process and contests available

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ways of thinking about knowledge. Therefore, understanding the workings of habit and academic field are central to a transdisciplinary multiliteracies curriculum. Albright, Walsh, and Purohit (2007) learned to pay particular attention not only to the way strategies can be used in similar ways across the disciplines, but to the ways texts structures and reading practices differ from one subject to the next.

While their adolescent students showed that they did not always translate critique into an understanding of how authority, persuasion, or argumentation operates differently from one subject to the next, they are confident in transdisciplinarity's potential for developing students' learning of disciplinary knowledge and discourse. "Developing an appropriate metalanguage to enable explicit discussion of these meaning-making resources by teachers and students" (Unsworth, 2006, p. 55) allow students to analyze, discuss, re-create and produce texts with particular awareness of language and ideology, using strategies taught across disciplines.

Singapore:

Since its foundation in 2003, research teams in the Centre for Research in Pedagogy and Practice (CRPP), National Institute of Education, Singapore, have conducted both large- and small-scale studies designed to describe and systematically improve, through evidence-based interventions, classroom pedagogies and practices that are in line with the Ministry of Education's evolving policies and curricula initiatives. Key findings, to date, (Luke, Freebody, Lau & Gopinathan, (2005); *CRPP's Core Report for 2005* (2006) not only illustrate the complex and diverse nature of the Centre's projects, but also highlight the challenges faced by practitioners in linking research activity to building teachers' and schools' capacity for innovation.

This comprehensive quantitative and qualitative baseline is currently being used to develop CRPP's second 5-year research and pedagogical innovation plan as well as providing evidence to guide the Ministry of Education ongoing policy and curriculum reviews. CRPP's findings to date show both limited disciplinarity and transdisciplinarity in Singaporean classroom, having weak focus on conceptual depth (advanced concepts), procedural skills, knowledge manipulation and application (including problem solving), generation of knowledge new to students, knowledge criticism and evaluation, and limited "weaving" across levels of knowledge, where knowledge is strongly classified in separate subjects. For example, a study of over 1200 lessons from Singaporean primary 5 and secondary 3 classrooms conducted in 2004 and 2005 using a neo-Bloomian taxonomy of knowledge developed by Anderson and Krathwohl (2001), revealed that across all subjects, pedagogy in Singapore incorporates a strong focus on transmission and memorisation of factual knowledge and development of basic skills but that it has a limited focus on conceptual depth, knowledge manipulation/application, interpretation, problem solving and knowledge criticism. In addition, knowledge is strongly classified in separate subjects (Table 2) and tied to the pedagogical authority of the teacher.

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Table 1. Disciplinarity of Knowledge in P5 and S3

Knowledge Classification	P5 (0-3)	S3 (0-3)
Depth of Knowledge		
Basic/Fact/Rote	2.4	2.3
Procedural/How To	0.7	1.1
Advanced Concept	0.1	0.2
Knowledge Manipulation		
Reproduction	2.3	2.1
Interpretation	0.6	0.7
Application	0.4	0.5
Generation of Knowledge New to Students	0.1	0.2
Knowledge Criticism		
Truth	2.6	2.5
Comparison	0.2	0.3
Critique	0.1	0.2

(Hogan, 2007, p. 9)

Table 2. The Classification of Knowledge: Disciplinarity/Transdisciplinarity

Disciplinarity	Mean (n = 1189) (0-3)	Standard Deviation
Single Subject	2.86	0.4
Several Subjects	0.09	0.3
Integrated Project Work	0.04	0.2

(Hogan, 2007, p. 10)

Table 3 reports the mean scores for disciplinarity across subjects. The significant variation was found across subjects has led CRPP researchers to conclude that “pedagogical innovation strategies need to address the domain-specific features of disciplinarity and design strategies accordingly” (Hogan, 2007, p. 9).

Table 3: Mean Scores: Disciplinarity by Subject: Secondary 3

Mean Score	Science (n=93)	Maths (n=129)	English (n=121)	Social Studies (n=99)	Tamil (n=81)	Malay (n=66)	Chinese (n=69)
Depth of Knowledge							
Basic/Rote	2.50	1.67	2.14	2.68	1.79	2.69	2.69
Procedural/ How To	1.26	2.02	1.16	0.57	0.14	0.32	0.47
Advanced Concept	0.51	0.12	0.13	0.30	0.07	0.04	0.05
Knowledge Manipulation							

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Reproduction	2.49	2.52	1.60	1.85	1.54	2.36	2.60
Interpretation	1.20	0.29	0.82	0.89	0.73	0.70	0.44
Application	0.77	0.70	0.65	0.35	0.08	0.19	0.42
Generation of Knowledge New to Students	0.22	0.13	0.17	0.26	0.01	0.10	0.01
Knowledge Criticism							
Truth	2.78	2.94	2.22	2.33	1.48	2.48	2.82
Comparison	0.61	0.19	0.27	0.56	0.18	0.27	0.26
Critique	0.32	0.11	0.15	0.27	0.05	0.09	0.01

(Hogan, 2007, p. 10)

Self-reported content knowledge (CK) and pedagogical content knowledge (PCK) of a sample of 2,457 teachers in 49 schools were higher in Maths than in Science or English (Table 4). “Important deficits in PCK among primary school teachers, especially in English and Science” are suggested as the mean scores for PCK are significantly lower than they are for CK in all three subjects, and followed the same hierarchical arrangement (Hogan, 2007, p 10). PCK is likely to be a linear function of CK because the correlation between CK and PCK in all three subjects is very high, averaging about .75.

Table 4: Content Knowledge (CK) and Pedagogical Content Knowledge (PCK) for Primary School English, Maths and Science

	English (Scale: 1-6)		Maths (Scale: 1-6)		Science (Scale: 1-6)	
	Mean	SD	Mean	SD	Mean	SD
CK	4.01	.72	4.93	.84	4.15	.89
PCK	3.89	.73	4.48	.84	3.96	.85
Correlation	.75		.71		.78	
n (teachers)	801		840		816	
n (schools)	49		49		49	
average number of teachers per school	16.3		17.1		16.6	

(Hogan, 2007, p. 11)

These results suggested to CRPP’s research team concluded “a substantial deepening of the disciplinary of domain-specific knowledge in the *enacted* curriculum, including greater provision of student opportunity to master disciplinary and transdisciplinary knowledge” was a significant challenge to curriculum development in Singapore (Hogan, 2007, p. 11).

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Having reviewed recent accounts of the cognitive, dispositional, normative and social demands of 21st century institutional environments, including those focused on contemporary labour markets and work-places, which underscore the importance of disciplinary and transdisciplinary understandings, skills, values and dispositions and given both the educational and broader economic benefits of a strongly disciplinary and transdisciplinary curriculum, CRPP has made specific and strong recommendations that Singapore make a substantial commitment to enhancing the disciplinary and transdisciplinary qualities of the enacted curriculum for all students and for all students equally. These include recommendations involving enhancing the prescribed curriculum, developing appropriate standards of performance, improving professional development, increased opportunities for transdisciplinary work, increased opportunities for instructional innovation through a partial decoupling of instruction and high stakes assessment, and the organization of the school as a professional learning community focused on the development and delivery of rich and reflective pedagogies, among others (Hogan et al, 2007).

Specifically, in its new research cycle, CRPP has proposed a multi-disciplinary and transdisciplinary research programme, *Curriculum 2020: Disciplinarity, Knowledge and 21st Century Skills and Literacies*. Drawing on an unusually broad range of expertise from academic departments and outside consultants, the proposed program is designed to focus on curriculum development with a particular emphasis on epistemology and the disciplinarity of knowledge and school subjects and transdisciplinarity and theories of knowledge production (Hogan et al, 2007).

Melbourne, Australia:

The authors also report on a teacher education course redeveloped to include transdisciplinary planning and teaching. Pre-service primary education students were taught how different disciplines have their own particular literacy, specialized language, ways of putting language together and ways of using language to describe, reflect on and analyse the world. The course content focused on the development of each pre-service teacher's personal theory of literacy teaching and learning by addressing how to use listening, speaking, reading/viewing, writing, design and other modes of representing to promote learning. A basic premise of the course accepts the argument that what students require beyond learning to read and critique texts is a critical understanding of how such texts operate in the social fields where they are used. The course explored the implications of literacy in its multiple forms (e.g., print, visual, digital) through demonstrations of effective literacy planning. Finally, the course highlighted how the literacy practices of different disciplines (society and environment, maths, science and the arts) include the particular literacy of the discipline and they ways students use literacy to learn. Given students taking this unit are generally in their final year of university, before entering the teaching profession, emphasis was also directed towards professional resources, professional associations, publishers and distributors, web-based resources and support networks available to beginning teachers.

The course, the *literacy teacher, the profession and the community* highlighted how the literacy practices of different disciplines (society and environment, maths, science and the arts) include the particular literacy of the discipline and they ways students use literacy to learn.

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The idea that literacy involves more than learning the basic 'skills' associated with reading and writing was the first hurdle for these pre-service teachers. As the course progressed, they came to understand that literacy is a social practice that includes reading/viewing, writing, speaking, listening and designing to think, create, question and communicate in a range of situations for various purposes. This included understanding and using particular patterns of language to decode and express meaning. Through overt instruction, students came to understand that different learning areas (arts, science, humanities) use text features and language structures differently. Explicitly teaching this to these pre-service teachers helped them understand that to learn subject area content, their future students (as well as themselves) would also need to learn subject area literacies.

The course first introduced the pre-service teachers to the idea that different disciplines include specialised vocabulary and terminology. For example the arts included such terms as dramatic tension, harmonic structure, typography and stage left while science included terms/nominalizations such as plate tectonics, osmosis and metamorphosis and the humanities relied on language such as freedom, citizen and power. Pre-service teachers then explored transdisciplinary planning and teaching that included being responsible for ensuring their future students:

- Learn the literacy specific to each learning area
- Learn to understand and use the relevant structures and features of language in each learning area
- Support students to succeed in the kinds of speaking, listening, reading/viewing, writing/designing necessary in each learning area
- Teach students to use language differently depending on their audience
- Help students obtain information from a range of subject-specific texts and teach them strategies to do this for themselves (they will need these skills to be successful in secondary school)
- Acknowledge students' own literacies and use this as a bridge to help them acquire Standard Australian English
- Adopt a critical view of the curriculum and determine enduring understandings (based on standards)
- Teach students to critically analyse texts and the curriculum (Critical Literacy)

This approach to planning and instruction forced the pre-service teachers to become aware themselves of the text types learned in the different subject areas and to understand that these would then become the kinds of texts their future students would need to produce/design in order for them to more fully assess their students' knowledge across the different disciplines.

An additional focus of the course (an assignment as well), required pre-service teachers to assess disciplinary literacy demands implicit in curriculum standards, teaching programs, learning activities and outcomes documents. Pre-service students were required to extract a standard from a state document, design learning activities from the extract and then identify the specific aspect of literacy which would be involved in undertaking the activity as well as how they would support students in their literacy learning. Within this assignment (See

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Appendix 1) they were required to incorporate a framework for identifying literacy adopted from the work of Dumbleton and Lountain (2003). This framework was a seven-step plan where they identified texts used and produced, vocabulary and terminology, language use; processes need to learn literacy, processes needed to demonstrate literacy learning and social and cultural understandings. They then applied the Understanding by Design curricular framework (McTighe & Wiggins, 2000) for designing curriculum units, performance assessments and instruction to deepen the cognitive depth of their plans.

The pre-service students reflected that transdisciplinary teaching included appreciating particular disciplines' texts and associated literacy practices and the ways in which students use literacy to learn. They stated having the ability to identify these literacy practices made it possible to explicitly address them in planning and teaching. This suggests that when primary and secondary students are taught about these literacy practices in a transdisciplinary way, they are able to engage with, and achieve success in, the content and processes of different disciplines when they later enter the field as teaching professionals.

Educational or scientific importance of the study

The concept of pedagogical transdisciplinarity provides an alternative to understand the teaching and construction of disciplinary knowledge in productive and principled ways. Pedagogical transdisciplinarity is appropriate for curriculum design, policy-informed educational research and teacher education purposes. The growing interest in and successful application of transdisciplinarity theorizing and applications justifies reconsidering how to avoid subject overspecialization and transmission over understanding.

Appendix 1: Assignment 2 *Curriculum and Literacy Planning*

Backward Design Plan Assignment

Introduction

Introduction

Literacy is essential to the learning process and to the demonstration of learning outcomes in all areas of the curriculum. Although some literacy practices are common across the curriculum, different learning areas (Science, the Humanities & Arts) have particular ways of thinking about and representing the world, which is evidenced in specialised vocabulary and terminology, texts and ways of using texts, and associated literacy teaching and learning processes. In these different learning areas, students need to learn how to comprehend, produce/design and critique a range of literacy practices and a range of different text types (oral, print, visual, digital). As young professionals entering the community of primary teaching, it is essential you recognize the role literacy plays in all areas of learning and to understand how to explicitly teach students how to meet the literacy demands of different learning areas you will be responsible to teach.

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In planning for literacy, this assignment is essentially about *design* where you (1) plan a sequence for curriculum and (2) take steps to program for literacy within your curriculum planning.

This task has been designed to help you understand and engage with the idea of backward design (Wiggins & MCTighe, 1998) to plan learning experiences and your literacy instruction. In this case the literacy planning will revolve around a framework that views literacy as having a range of components that reflects the interconnections between texts, language and social and cultural understandings.

Towards this end, the assignment requires you to demonstrate that you have closely examined the “backward design process” *and* identified the literacy demands of either Science, the Humanities, or Arts in terms of texts, language, processes for teaching and learning literacy and social and cultural understandings (primarily in the upper primary years).

Tutorials will be used to teach, discuss and apply the backward design process in terms of identifying desired results, determining acceptable evidence, and planning learning and instruction. Additionally, tutorials will be used to plan and program for the literacy demands of the learning area in all modes (listening, speaking, reading/viewing and writing).

The Task

You are required to work in a collaborative team of four to five students to use backward design in planning a sequence for curriculum, then utilize a pragmatic framework for locating and responding to a range of literacy demands which confront students in either Science, the Humanities, or Arts and then plan for the literacy development of students by establishing a clear teaching focus in relation to a chosen topic or unit of work.

Directions:

In this assignment, you will provide (1) a description of your class (you can draw on one class from one student’s last practicum), (2) a description of your desired results (what you want your students to know, understand, and be able to do), and (3) a plan for assessing student knowledge, understanding, skills, and abilities.

You will need to develop this plan for your classroom as a whole -- this is not the same as listing student goals and objectives from standards. Rather, it is a road map to your overall instructional plan.

1. Class Description:

First, you will need to describe your class.

2. Desired Result

Next, describe what you want your students to learn this year.

Consider, for example:

- By the end of the year, what students should know and be able to do? (Look at content standards and benchmarks)

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- What is worthy of student understanding? (Don't include everything you think you would like to "cover." Consider what is really important knowledge and skills.)
- What understandings do you think should endure for long after your class is over? (What are the big ideas around which you will shape your curriculum and the really important understandings you want your students to walk away with.)
- What literacy practices will student have to master to prove they have meet your "desired results?"

3. Assessment Plan:

Finally, you will need to determine what evidence you will use to verify that students have achieved each of the desired results (each thing that you want students to be able to know, understand, or be able to do).

- You must list and clearly identify how you will assess each desired result. Each piece of evidence you list should include a complete description and/or a sample copy of your instrument. For example, it will not be sufficient to simply state "by observation." If you wish to use observation, you need to indicate what specifically you will be observing for, how often you will be observing, who will conduct the observations, how the observations will be recorded, and how they will be evaluated.
- Among the types of evidence you list, you must use at least three classroom-based assessment instruments, including at least two different types of criterion-referenced data collection instruments (i.e. checklists/matrices, rating scales, rubrics, or curriculum-based assessments).

References

- Albright, J., Walsh, C. S. & Purohit, K. D. (2007). "Towards a Theory of Practice: Critical Transdisciplinary Multiliteracies" with C. S. In *Research on Sociocultural Influences on Motivation and Learning, Volume 7, Standards in Education*. Charlotte, NC: Information Age Publishing Inc.
- Albright, J., Walsh, C. S. & Purohit, K. D. (2006), "Hybridity, Globalization and Literacy Education in the Context of NYC's Chinatown". *Pedagogies: An International Journal* (Vol. 1, No. 4, 2006)
- Bourdieu, P., Chamboredon, J., & Passeron, J. T. (1991). *The craft of sociology: Epistemological preliminaries*. New York: Walter de Gruyter.
- Bourdieu, P., & Wacquant, L. (1992). *An invitation to reflexive sociology*. Chicago: University of Chicago Press.
- Davis, J. R. (1995). *Interdisciplinary courses and team teaching: New arrangements for learning*. Phoenix: Oryx Press.
- Ertas, A. (2000). "The academy of transdisciplinary education and research center" (ACTER). *Transactions of the SDPS* 2000, 4, 4, (December). pp. 13-19. from <http://www.sdpsnet.org/journals/vol4-4/academy-2.pdf>, accessed February 1, 2007.

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Albright & Walsh

Fish, S. (1989). "Being interdisciplinary is so very hard to do." *Profession* 89. New York: MLA. pp. 15-22.

Fuller, S. (1988). *Social Epistemology*. Bloomington: Indiana University Press.

Hogan, D. et al. (2007). Proposal for Funding for NIE's Educational RD&I Program for the Years 2008-2012. Internal Document. National Institute of Education, Singapore.

Jantsch, E. (1972). "Towards Interdisciplinarity and Transdisciplinarity in Education and Innovation." In *Interdisciplinarity: Problems of teaching and research in universities*. pp. 97-121. Paris: OECD.

Janz, Bruce B. "Transdisciplinarity as a model of post-disciplinarity." University of Central Florida. 26 October 2006. from <http://pegasus.cc.ucf.edu/~janzb/papers/transdisciplinarity.pdf>, accessed February 1, 2007.

Klien, J. T. (1990). *Interdisciplinarity: History, Theory, and Practice*. Detroit: Wayne State Press.

Klein, J. T., & Doty, W. G. (Eds.). (1994). *Interdisciplinary studies today*. San Francisco: Jossey-Bass.

Kockelmans, J. J. (1979). *Interdisciplinarity and higher education*. University Park: The Pennsylvania State University Press.

Luke, A. (1995). When literacy might (not) make a difference: Folk theories and cultural Capital: When Literacy Might (not) Make A Difference: Folk Theories and Cultural Capital. Paper presented at the American Educational Research Association Annual Meeting, San Francisco, CA. Paper presented at the American Educational Research Association Annual Meeting, San Francisco, CA.

Luke, A., Matters, G., Herschell, P., Grace, N., Barrett, R., & Land, R. (2000): New basics project technical paper. Brisbane, Education Queensland, from <http://education.qld.gov.au/corporate/newbasics/html/tnbf.html>, accessed February 1, 2007.

Luke, A. (2001). Forward. In E. B. Moje & D. G. O'Brien (Eds.), *Constructions of literacy: Studies of teaching and learning in and out of secondary schools* (pp. ix-xiii). Mahwah, NJ: Lawrence Erlbaum.

Lyon, A. (1992), "Interdisciplinarity: Giving up territory." *College English*, 54, 6, (October). pp. 681-693.

Luke, A. et al, (2005). *Towards Research-Based Innovation and Reform: Singapore Schooling in Transition*. CRPP Research Report Series. Centre for Research and Practice, National Institute of Education. Nanyang Technological University.

Luke, A. and Hogan, D. (2005). Redesigning What Counts as Evidence in Educational Policy: The Singapore Model. In J. Ozuga, T. Sheldon T. and Popkewitz. (Eds). *World Yearbook Education 2006: Education and Policy* (World Yearbook of Education). pp 170-184. Dordrecht: Kluwer.

Newman, M. (2003). *The designs of academic literacy: A multiliteracies examination of academic achievement*. Westport, CT: Bergen & Garvey.

Petrie, H. G. (1992). "Interdisciplinary education: Are we faced with insurmountable opportunities?" *Review of Research in Education*. 18. pp. 299-333.

Scott, R. L. (1979). Personal and institutional problems encountered in being interdisciplinary. In J. Kockelmans (Ed.), *Interdisciplinarity and higher education* (pp. 306-327). University Park: The Pennsylvania State University Press.

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Presented November 30, 2009 AARE Conference, Canberra

Albright & Walsh

Scheffler, I. (1991). Basic mathematical skills. In Scheffler, I. (Ed.). In praise of the cognitive emotions and other essays in the philosophy of education. New York: Routledge.

Shumway, D. R. & Messer-Davidow, E. (1991) "Disciplinarily: An introduction." *Poetics Today*, 12, 2 (Summer). pp. 201-225.

Stark, J. S., & Lattuca, L. R. (1997). *Shaping the college curriculum: Academic plans in action*. Boston: Allyn and Bacon.

Stewart, S. (1989). "The Interdiction." *Profession* 89. New York: MLA. pp. 10-14.

Stengel, B. S. (1997) 'Academic discipline' and 'school subject': Contestable curricular concepts. *Curriculum Studies*, 29, 5. 585-602.

UNESCO's Education for Sustainable Development Program, from

<http://www.unescobkk.org/index.php?id=4237>, accessed February 1, 2007.

Wineburg, S., & Grossman, P. (2000). *Interdisciplinary curriculum: Challenges to implementation*. New York: Teachers College Press.

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Table 5: Connection of Critique to Design

Transdisciplinary Work	Critique Examples	Design Examples
Critical language work, for example: -nominalization -modality and mood -collocations -ordering	In science, students looked at the use of collocations in texts about penguins. They moved from language analysis to a consideration of how language is used in different science genres.	In humanities, students did argumentative writing about historical events (such as Japanese internment), using nominalization and modality to produce effective academic writing.
Investigating genres and intertextuality, for example: -gaps and silences -construction of authority -register and modality -degree of nominalization -cultural production of texts	In social studies, students considered the gaps and silences in texts around Chinese immigration and exclusionary legislation.	In science, students drew on understandings of position and vectors to design water cycle diagrams. Through these diagrams, students communicated positions about water resource use, through their choices of information, placement of processes, use of size and color, and organization of vectors.
Visual and media grammars, such as: -vectors and positioning in visual texts -anchoring; relation of visuals to print texts	In social studies, students represented ways of reading propaganda from the Spanish-American War. They analyzed the use of vectors and placement of participants in the posters to front certain ideas of war and position the viewer.	In science, students adapted PowerPoint presentations about plate tectonics to interactive, non-linear websites that could be navigated by readers.
Multimodal work	In humanities and science, students investigated the ways in which textbooks, like online sites, invite particular ways to navigate, and thereby generate particular narratives and ways of reading.	In social studies, students wrote history textbook chapters about Chinese immigration history and racism. Responding to readings from common history texts, they integrated photos, images, and print texts to create paper and online chapters/sites that were critical of dominant representations of the Chinese experience in the United States.

Albright, J. Walsh, C. S. & Purohit, K. (2007). "Towards a Theory of Practice: Critical Transdisciplinary Multiliteracies." In *Research on Sociocultural Influences on Motivation and Learning, 7, Standards in Education*. pp 93-115. Charlotte, NC: Information Age Publishing Inc.