Chapter 5 -- Subject Matter: Defining and Theorizing School Subjects
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> What then, do we mean by a study in the curriculum? What does it stand for? What fixes the place which it occupies in the school work? What furnishes it its end? What gives it its limitations? By what standard do we measure its value? (Dewey 1897/1972: 167)

1. Introduction

The most basic curriculum question is what should count as knowledge. There are perennial debates over curriculum content, typically ideological debate over what version of history, cultural values, and "nation" will count. Most recently, government policy focus on the production of new scientific expertise for globalised, knowledge economies have led to calls for changes in science curriculum. This has been spurred by international comparative studies of student achievement, such as PISA and TIMMS. As in the post-Sputnik era, there is a renewed doctrine of disciplinarity, with members of the scientific, academic and business community arguing for a stronger, more explicit links between the school curriculum and what are construed as basic facts, concepts and principles of disciplinary knowledge. This chapter is a review of foundational arguments around the relationship of subject matter and "disciplinary knowledge". As such, it is an intervention in the current debate over curriculum content.

Curriculum settlements depend upon which versions of knowledge as subject matter are selected, classified and framed, and, ultimately, translated into realized versions of knowledge, skill, competence and intellectual work. The problem can be seen variously as one of epistemology, phenomenology, discourse theory, sociology or as a key problematic of human development and cognition. It can be construed as a textual issue—contingent upon linguistic and semiotic systems of representation that constitute media of instruction, modes of cognition and social relations. It can be seen as principally entailing scientific, cultural or aesthetic discrimination, judgment and distinction.

The constitution of subject matter is normative and prescriptive, insofar as school knowledge is a bid to shape human intellect and subjectivity. Definition and selection of knowledge necessarily entails a priori selection of meta-disciplinary standpoints, however implicit or explicit. The making explicit of the very stratum of presuppositions underlying curriculum development is indeed the principal rationale for the field of "curriculum theory" (Pinar, 1982). On a practical basis, subject matter is mediated by teachers and students in face-to-face classroom practice into an "enacted curriculum" (Zumwalt, 1988) or the "curriculum-in-use" (Decastell, Luke & Luke, 1989). In theory and practice, then, curriculum entails the normative selection, classification and framing of knowledge from the archive of human knowledge. That is, all curriculum by definition constitutes a "selective tradition" (Apple, 1990) of cultural canon and memory, scientific truth, method and knowledge, and aesthetic artifacts and performances. Bids to take matters of selection as either a fundamentalist reproduction of literal 'basics', the pursuit of self-evident truth, or logical and organic extensions of disciplinary knowledge aside—

the foundational philosophic, epistemological and cultural challenges of curriculum theory provide the only possible grounding for the ostensibly practical tasks of curriculum development, implementation and practice, despite the increasing tendency of curriculum policy-makers and bureaucrats to proceed without, and in cases deliberately in the face of, curriculum theory (Luke, 2005b).

In this chapter, we review and explore key issues in the classification and conceptualization of knowledge, different foundational grounds and main lines of thinking for the selection and transformation of knowledge into subject matter. We build our exploration of the "generic" meanings of subject matter upon the works of Francis Schrag and Walter Doyle in Jackson's <u>Handbook</u>. [1]Like Schrag, we view the concept of subject matter as entailing different ways of classifying and conceiving knowledge that are by definition epistemological and teleological, methodological and interpretive, cultural and political. We examine major knowledge classification schemes, using these as conceptual maps for our discussion of subject matter. We frame our discussion following three levels of curriculum making identified by Doyle: the <u>institutional</u> level (the public policy nexus of schooling, learners, culture, and society), the <u>programmatic</u> level (the syllabus construction of school subjects or courses of studies for classroom use), and the <u>classroom</u> level (teachers' and students' mediation of curriculum, field or disciplinary knowledge). This allows us to pursue a key theme only partially explored in Jackson's *Handbook*: the formation of school subjects as distinctively educational means and ends.

We begin by describing major philosophic approaches to classifying and conceptualizing knowledge. We then examine and compare different curriculum models and explanatory frameworks for the construction of school subjects. Our focus is on Shulman and associates' conceptualization of teachers' subject matter knowledge, Deng's (2007a) work concerning the subject matter of a school science subject, and the approach to school knowledge of the German *Didaktik* tradition. In this way, the chapter traverses conceptual, discursive and practical mediations of subject matter. We conclude with the case that the renewed focus on disciplinary knowledge in current debates may fail to recognize the unique characteristics of subject matter as a distinctively educational phenomenon.

<u>2. Classifying and conceptualizing knowledge</u>

What are the different kinds of knowledge? What are the different ways of conceiving or conceptualizing knowledge? These <u>epistemological</u> questions prefigure any discussion of subject matter. In this section we briefly examine several knowledge classification schemes which have been influential in curriculum discourse and practice.[2]

The classification of human knowledge into fields of study has been a scholarly and educational endeavor since the emergence of literate culture in the fourth century, BCE (Ong, 1959). This can be traced to Aristotle's organization of the disciplines into

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[1] In Jackson's (1992) <u>Handbook of Research on Curriculum</u> there are ten chapters devoted to specific curriculum content areas (e.g., mathematics, science, and social studies). Most of these chapters, however, focus on the formation, organization and structures of curriculum, without treating subject matter as an issue of inquiry.

[2] For a more detailed and comprehensive discussion of knowledge classification schemes, we refer readers to the chapter "conceptions of knowledge" by Schrag (1992) in Jackson's <u>Handbook</u>.

three major groups: the <u>theoretical</u>, the <u>practical</u>, and the <u>productive</u>. Theoretical disciplines included mathematics, natural sciences, and metaphysics. Practical disciplines consisted of ethics, politics, and human conduct. The productive disciplines were the fine arts, the applied arts, and engineering. This parsing of knowledge into different fields was premised on the assumption, contra Platonic dialectics, that different domains of human inquiry yielded distinctive truths, affiliated ways of knowing, procedures of inquiry and representational codes (cf. McKeon, 1947). In the nineteenth century Auguste Comte proposed a positivist classification scheme that supplanted Aristotle's. His <u>positive hierarchy</u> prioritized mathematics as the natural logic governing governing all fields. This was followed, in order, by physics, chemistry, biology, and social sciences (Cassirer, 1950). The logical positivist organization of knowledge, Schwab (1964) observed, has become "the most tyrannical and unexamined curriculum principles" and continues to drive curriculum sequences in secondary schools across the US, the UK, Europe and Asia. It is the basis for the relative allocations of value to different school subjects in senior secondary examination, matriculation and certification systems in many Commonwealth and postcolonial states.

These categorical divisions were translated into three groups of disciplines in universities: natural sciences, social sciences, and humanities (Machlup, 1980). Each field is affiliated with different hierarchical relationships of power within the academy (Bourdieu, 1992). In this way, schools and universities structurally reproduce hierarchical knowledge/power relationships based on the categorical grids of logical positivism. The valorization of scientific knowledge is being reinvented and reinterpreted in the corporatization of university funding, structure and power (Graham, Luke & Luke, in press), particularly in a post 9/11 environment that has refocused on the production of competitive expertise in the new biosciences, digital communications and business. In the new geopolitical economy, Sputnik is upon us again.

There are, of course, powerful contradictions here. At once, knowledge which Aristotle would have considered "practical" and "productive" realms tends to be reframed as if it were "theoretical" (Schwab, 1964) in bids for the legitimacy of applied fields (e.g., the melding of arts and digital technologies into "creative industries"). At the same time, the new political economies of "knowledge societies" have tended to devalue those theoretical elements of "pure science" that appear to lack practical translation into commodities and strategic economic advantage (e.g., the closure of physics departments). Nonetheless, the logical positivist hierarchical organization of knowledge, as we will show here, is deeply embedded in contemporary discourse on subject matter. In secondary schools, it constitutes a "cognitive architecture" (Teese, 2002) that differentially values specific fields and capacities in the rewarding of stratified educational credentials and outcomes. There is, therefore, a need to look at alternative classifications of knowledge that relocate and revalue knowledge in the practical, informal, and experiential realms of human experience, a longstanding claim of feminists, indigenous educators and critical race theorists (see the chapters on "Curriculum in Context", this volume). [3]

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[3] While this is hardly a new or original enterprise--current curriculum debates in schools and universities over which subjects will count, for whom, and with what intellectual, material and discursive consequences are fundamentally predicated upon presuppositions about the hierarchical stratification of knowledge and subject matter.

Gilbert Ryle (1949) distinguished between <u>knowing that</u> and <u>knowing how</u>. The former can be enabled by the kind of propositional, theoretical, or formal knowledge that derives from discipline, and the latter involves the use of practical knowledge embodied in human practice and actions. Similarly, Pears (1971) made a tripartite distinction among (a) propositional knowledge, (b) knowledge of how to do things, and (c) knowledge by acquaintance. The first two categories parallel Ryle's, and the last category refers to what we learn from everday experience with objects and events, including firsthand and commonsense knowledge (cf. DeCerteau, 1986). In this regard, "knowing by acquaintance" tends to resemble experiential knowledge based on everyday problem-identification and solution described in the social interactionist models of Dewey (1916) and Mead (1932). Further, Michael Polányi (1964, 1966) used the term <u>tacit knowledge</u> to capture a special kind of knowing embedded in practice, arguing that we can occasionally know more than we can tell. In his early work on European attempts to "order" the world through discourse, Foucault (1972) distinguished between what discourses of practice and discourses on practice, between the classifications deployed in practice, and those that are used to name and frame these and other domains in more formal theoretical taxonomies.

Three conceptions of knowledge can be derived from the above disciplinary and epistemological classification schemes. First, there is a <u>disciplinary</u> conception of knowledge that construes human knowledge in terms of canonical academic knowledge contained in various intellectual disciplines. This is associated with what Aristotle (1941, Book IV) characterized as <u>episteme</u>, formal knowledge for purposes of understanding and explaining the world. Testing the validity of knowledge is a primary concern of disciplinary inquiry. Knowledge is here conceived of as a corpus of facts, concepts, and ideas which has been formulated and verified through the logical and discursive procedures of discourse communities (Schwab, 1964, 1978). Bourdieu (1990) refers to these as "systems of objectification", institutionally legitimated ways of rationalizing and ordering the world under study. These in turn yield distinctive "grids of specification" (Foucault, 1977): namings ordered in hierarchical rank, category and taxonomy that in effect populate and constitute worlds.

Second, there is a <u>practical</u> conception of knowledge that construes knowledge in terms of knowing what to do in practices and actions, with an emphasis on the application of knowledge to practical and sociocultural problems. Narrowly conceived, knowing what to do in practice involves knowing a set of procedures that may require mastery of artifact and technology (Cole, 1996). This can range from an embodied activity, such as riding a bicycle, or a more explicitly cognate activity, such as reading a book or running software. These constitute and require procedural knowledge. However, practical knowledge cannot be reduced to merely knowing a set of procedures or skills; it involves making choices and actions based upon deliberate decisions, the meta-cognitive strategies that feature in learning theories and the kinds of embodied knowledge that feature in sociological models of "habitus" (Bourdieu, 1990). Aristotle characterized this knowing as "phronesis", standing for practical wisdom centered upon the contingent world of action (Aristotle, 1941, Book VI). In contrast to episteme, one is less concerned with testing the validity of knowledge than with evaluating the usefulness of knowledge in light of the results of everyday actions. In practical realms, knowledge is viewed as the means of facilitating the solving of socio-practical problems; it is valued in terms of

guides or "scripts" (Cole, 1996) for action, social experience and everyday practice. Reflexively, we could argue that all practices, now matter how apparently habituated and mundane, taken together constitute particular cultural "logics of practice", coherent systems of exchange and value (Bourdieu, 1990).

Third, there is an experiential conception of knowledge, focusing on the social and cognitive, dispositional and practical elements entailed in making sense of the phenomena of everyday life. Whereas the disciplinary conception emphasizes knowledge as a final product or consummation of human knowing which has been set apart from ordinary affairs of life, this conception locates knowledge in the realm of ordinary human experience. According to Dewey (1916), knowledge and ideas emerge only from situations in which the learners had to draw them out of experiences that had meaning and importance to them. In this sense, knowledge cannot be separated from the knower and affiliated forms of meaning, both theoretically and practically construed. In his early epistemological theory, Dewey attempted to describe the dialectical reciprocity and co-dependency expressed in subject/object, actor/environment relations (Dewey & Bentley, 1949). In later formulations, Dewey (1934) viewed both education and art as the products of organism/environment disequilibria, whereby the identification and solution of problems generated a movement from "inchoate" to "choate" experience. By this pragmatist account, knowledge is an ongoing construction of meaning by social actors in relationships of exchange with their bio-social environments. In its later symbolic interactionist version (Mead, 1932), it contingent upon the availability of linguistic and semiotic, interactional and social behavioral resources.

The above three alternative notions of knowledge—disciplinary, practical, and experiential—constitute analytically distinctive, though not practically separate, modes of human knowing. There are, of course, other ways of conceptualizing knowledge or ways of knowing. In the eighty-fourth yearbook of the National Society for the Study of Education, Learning and Teaching the Ways of Knowing, ways of knowing are conceptualized in terms of scientific, practical, interpersonal, and aesthetic modes (Eisner, 1985). In Frankfurt School sociology, Marxian ideology theory is developed into a recognition that "knowledge" is never ideologically and socioculturally neutral or disinterested and necessarily reflects historically located and performed "human interests" (Habermas, 1982). In feminist and postcolonial theory, knowledge formation is explained in terms of historically located and gendered "standpoint", as always the product of identifiable class, gender and racialized relationships of power (e.g., Harding, 1989; Smith, 2002). These alternative critical conceptions of knowledge and competing bids over what will count as curricular knowledge, in addition to the aforementioned Western disciplinary and scientific approaches feature in Chapters in this handbook on curriculum and critical theory, multiculturalism and indigenous education.

Given that so much of western philosophy and social sciences has been devoted to the diversity, uses and consequences of knowledge formation—it would be theoretically naïve for curriculum practice to institutionally embrace a singular approach to knowledge to the exclusion of others. Set in the context of contemporary secular educational systems based upon democratic principles, curriculum theory and practice begins from a pluralist premise about the diversity of knowledge, historical and epistemological framings of knowledge, weighing and debating the concrete educational consequences of each for different communities and cultures. Knowledge, discourse and curriculum have material

educational effects and consequences, ranging from the forms of cognition and "discipline" and how these are realised in everyday life, to their actual exchange value in educational attainment, credentialing, work and civic life.

Validity claims aside, once operationalized in the institutional domains of education, bids to define knowledge mark out a concrete linkage between epistemology and identifiable particular cultural and social, political and economic standpoints. That is, all theories of knowledge and claims to know are historically and culturally situated: "How a society selects, classifies, distributes, transmits and evaluates the educational knowledge it considers to be public reflects both the distribution of power and the principles of social control" (Bernstein, 1977, p. 85). Accordingly, a socio-political approach construes knowledge as historical, material and discourse construction, reflecting interests, power, and ideologies that underlie relations between individuals and between groups. The sociology of knowledge focuses on how formations and classifications of knowledge are produced in historical and cultural, social and economic context, ideologies arising from political economic and state structures (Whitty, 1989). In this regard, any formations of subject matter can be taken as acts of power, as bids for the reproduction of particular knowledge and the exclusion or marginalization of others with effects including, inter alia, the stratification of educationally produced capital (Bourdieu & Passeron, 1990): the educational construction of differing kinds of knowing, speaking and acting human subjects.

3. Curriculum perspectives on subject matter

What knowledge is of most worth? What kinds of knowledge should be included and excluded? These are normative questions that teachers, curriculum theorists and curriculum policymakers ask when engaged in curriculum making, especially at the institutional level. Their responses to these questions depend on their theoretical orientations and perspectives, and, indeed, their ideological and cultural investments in the educational enterprise. At the heart of these are different teleologies of schooling, culture and society. In this section, we briefly identify four historical curriculum orientations: academic rationalism, social efficiency, humanism, and social reconstructionism. All have continued salience in ongoing curriculum policy debates over the purposes of schooling and curriculum content. We also describe "critical" perspectives on subject matter or school knowledge derived from the new sociology of education and Frankfurt school critical theory.

Academic rationalism: This tradition underscores the importance of the transmission of disciplinary knowledge for the development of the intellectual capacity of students and for the maintenance or reproduction of culture. Academic disciplines or organized fields of study are viewed as the authoritative sources from which curriculum content is derived. At its core is a disciplinary conception of knowledge, and subject matter consists of a canonical body of disciplinary knowledge, technique, and ways of knowing (Eisner & Vallance, 1974; McNeil, 1996). This subjects academic rationalism to the instability and paradigm wars within and between disciplinary fields. Since disciplines are necessarily in historical transition and flux, influenced not only by internal problems of science but as well by complex external social and economic forces, it is

increasingly the case that school subjects become sites for contestation between contending disciplinary paradigms.[4]

Social efficiency: This orientation emphasizes the importance of preparing future citizens with the requisite skills, knowledge, and capital for economic and social productivity. The construction of the school curriculum, therefore, is largely driven by statements about the production of human capital. Even where it may entail traditional subject field knowledge, the functional and utilitarian value of knowledge becomes predominant in this orientation, as evidenced both in the post-Sputnik calls for scientific expertise and current calls for educational responses to the new economies. Subject matter consists primarily of knowledge and skills justified by reference to occupation, profession and vocation. With the transition from industrial to postindustrial economies, there is on-going redefinition of which applied disciplines (e.g., engineering, accounting, and marketing, among others) are the primary sources from which subject matter is derived (Kliebard, 1992). In this model subject matter can entail taxonomies of skills, competences and practices that might have demonstrable transfer to social and economic contexts of work, consumption, leisure and everyday life.

Humanism: Liberal humanist approaches to curriculum conceive of individual learners as the central factor in determining what constitutes the subject matter (Eisner and Vallance, 1974). A school is a place for fostering personal development, self-actualization, innovation and creativity, with disciplinarity knowledge relevant insofar as it mirrors a process of universal phylo/ontogenetic development (e.g., Egan, 1986). Humanistic educators embrace an experiential notion of knowledge, viewing subject matter as a series of developmentally arrayed activities which can provide learners with "intrinsically rewarding experiences that contribute to personal liberation and development" (McNeil, 1996, p. 6). The development of a humanistic curriculum requires drawing upon a wide range of resources of knowledge and experience which could contribute to the pursuit of individual freedom, expression of interest, forms of self-realization and individual emancipation.

Social reconstructionism: This orientation stresses sociocultural contexts over individual difference and needs in curriculum making, construing education as a means of social reform and reconstruction (Eisner & Vallance, 1977; McNeil, 1996). The making of social reconstructionist curriculum is based upon an examination of social contexts, social issues and futures, with the purpose of helping individuals reconstruct their own analyses, standpoints, and actions. Like humanistic educators, social reconstructionists conceive of subject matter in terms of activity structures, with the purpose of providing students with meaningful learning experiences that might generate social agency. They emphasize alternative ways of knowing, and the need to bring to bear a wide array of sources of experience and knowledge on designing and planning those activities (McNeil, 1996).

While social reconstructionism has its basis in philosophical pragmatism and symbolic interactionism, the "critical" perspective embedded in social reconstructivist orientation draws strongly from Frankfurt School critical theory. Starting with a socio-

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[4] The historical development of the English education curriculum in the US and UK, for example, has been strongly driven by changes in paradigms of literacy criticism and analysis: moving variously from neoclassicist models of literary study to the New Criticism of the postwar period, to current approaches to cultural and media studies (see, for example, articles in Research in the Teaching of English).

political conception of the relationship of knowledge to human interests, school knowledge is seen to be differentially constructed around dominant ideologies and discourses, with stratified transmission for different social classes and cultural groups. In this way, here are strong linkages between how subject matter is classified and framed in the school curriculum and the patterns of social inequality and distribution of power in the wider society (Apple, 1990; Bernstein, 1973; Bourdieu & Passeron, 1990).

The template above defines subject matter variously: 1) as disciplinary knowledge; 2) as practical or instrumental knowledge and skills; 2) as learning activities; 3) as learning experience, and 4) as socio-cultural action. In addition, it shows that programmatic versions of cultural knowledge (in all of their contending forms), the learner, and the society are entailed in the constitution of subject matter. Our view is that the task of curriculum theory is to problematicize and foreground different claims on the formations of subject matter, understand their epistemological bases, their teleological assumptions about the purpose of schooling and education, to identify whose and which versions of knowledge, practice and experience are entailed, and to understand the educational and intellectual, social and cultural bases and consequences of these particular selections.

The above curriculum orientations are rather useful for understanding what counts as subject matter at the <u>institutional</u> level. They are concerned with the normative, ideological bases for the selection and formulation of knowledge for the school curriculum. However, they tell us little about how different kinds of knowledge are selected and transformed into curricula-as-programs (i.e., school subjects) to be used by teachers in schools. What constitutes the subject matter at the <u>programmatic</u> level needs to be analyzed by looking at stated curriculum theories and doctrines concerning the construction of school subjects—which remain central building blocks of the curriculum.

In what follows, we turn to four instances which take on the challenge of defining and conceptualizing subject matter at the programmatic level: John Dewey's <u>logical-psychological distinction</u>, the <u>Tyler Rationale</u>, <u>the disciplinary doctrine</u>, and <u>Science for All</u>. Each of these cases exemplifies a distinctive way of thinking about how to construct a school subject, and each in turn frame the current curriculum policy choices in different terms. We use them here to show how foundational approaches to knowledge are put to work in curriculum studies.

4. <u>Theorizing school subjects: Dewey and Tyler</u>

Dewey viewed subject matter as a distinctive and specialized domain of experience for learners. His conception of subject matter is conceived through the formation of a school subject which requires relating the three factors—specialized knowledge, learners, and society—together in a <u>dialectic</u> fashion, with respect to the educative process. At the heart of his theorizing is a logical-psychological distinction.

The distinction was introduced in "The psychological aspect of the school curriculum" (1897/1972), the theoretical basis for the curriculum of the Laboratory School. The logical-psychological distinction arose in his critique of the dualistic presupposition—a presupposition that construed the subject matter, on the one hand, as determined by the logic of academic discipline, and pedagogical method, on the other hand, as determined by the psychologic of the individual:

We must take into account the distinction between a study as a logical whole and the same study considered as a psychological whole. From the logical standpoint, the study is the body or system of facts which are regarded as valid, and which are held together by certain internal principles of relation and explanation. The logical standpoint assumes the facts to be already discovered, already sorted out, classified, and systematized. ….From the psychological standpoint, we are concerned with the study as a mode or form of living individual experience. Geography is not only a set of facts and principles, which may be classified and discussed by themselves; it is also a way in which some actual individual feels and thinks the world. It must be the latter before it can become the former. It becomes the former only as the culmination or completed outgrowth of the latter. (Dewey, 1897/1972, p. 168)

"A study as a logical whole" stands for the academic discipline and "the same study as a psychological whole" the school subject. [5] Whereas the academic discipline is developed with primary reference to the end product of academic inquiry, the school subject is formulated in a way that takes into account the experience and way of thinking of the immature learner. Whereas the academic discipline is viewed as the "culmination" or "completed outgrowth" of the school subject, the school subject provides the avenue for the acquisition of the academic discipline.

Yet the school subject, not the academic discipline, is the operational unit that defines the intellectual and cognate substance of school curriculum. The primary concern of education, according to Dewey, is "with the subject as a special mode of personal experience for children, rather than the discipline as a body of wrought-out facts and scientifically tested principles" (p. 169). For example, Dewey pointed out that geography to the child is not and cannot be what it is to scholars who write academic papers on geography. "With the child, instruction must take the standpoint not of the accomplished results, but of the crude beginnings." (p. 169). Geography teaching, therefore, presupposes the formation of the school subject of geography as a distinct mode of developmental experience to the child. Dewey wrote:

We must discover what there is lying within the child's present sphere of experience…which deserves to be called geographical. It is not the question of how to teach the child geography, but first of all the question what geography is for the child. (p. 169)

The formation of a school subject, therefore, requires addressing an array of fundamental curriculum – not disciplinary - questions. Three basic aspects or dimensions of subject matter can be identified. First, subject matter needs to be

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[5] This is both an epistemological and methodological claim: that known cannot be known independently of a specific knower (Bentley & Dewey, 1922). It is also a sociological claim: that there is no field or corpus or canonical set of procedures independent of a community of human subjects who know and construct that field (Bourdieu, 1992).

derived from the current experience of the learner. "Anything which can be called a study, whether arithmetic, history, geography, or one of the natural sciences, must be derived from materials which at the outset fall within the scope of ordinary experience" (Dewey, 1938/1998, pp. 86-87). Second, subject matter needs to be selected and formulated in a way that ensures "the progressive development of what is already experienced into a fuller and richer and also more organized form" (p. 87). That is, it will stand in increasing levels of ideational, technical and linguistic complexity. Accordingly, subject matter takes on various forms. The primary form concerns "power to do," which is developed through manipulating physical objects and observing social phenomena. This is gradually enlarged, deepened, and refined through communication and discourse. It leads to the development of what has been acquired into a progressively richer and more organized form—a form that progressively approximates, but remains distinctive from, the subject matter of an academic discipline (Dewey, 1916/1966). Third, the selection and organization of subject matter must be centered upon the social nature of life in and out of the school (Dewey 1938/1998). To this end, occupation, community life, work, social relations, and everyday problems are viewed as an organizing principle for the school curriculum (Dewey, 1902/1990).

Dewey's approach attempted to reconcile the aforementioned curriculum traditions—academic rationalism and humanism—or what he termed the "old" and "new" education (Jackson, 1992). The conceptualization mirrors his commitment to the traditions of social efficiency and social reconstruction as well. The formation of subject knowledge thereby becomes the nexus of the disciplinary, the practical, and the experiential.

However, these are not without teleological and practical limitations. Why must disciplinary knowledge be taken as the endpoint of curriculum and instruction? There are areas of expertise (e.g., media and communications, arts, etc.) that exist outside of traditional disciplines and do not have established institutional fields in the academy and university. Furthermore, what of the ideological, institutional and political investments and consequences of particular formations of subject matter?

In spite of these limitations, the Deweyan approach sets the ground for modern constructivism. It construes knowledge as emerging from experiences and activities rather than being pre-specified and decontextualised, a stark contrast to competing disciplinary and behaviourist explanations. Yet it acknowledges the importance of guidance and direction provided by specialized knowledge in the process of constructing knowledge by learners—a point which tends to be overlooked by radical constructivists.[6] Dewey's contribution is his attempt to reconcile the three key factors—specialized knowledge, learners, and society. This establishes the distinctively educational character of a school subject (Tanner & Tanner, 1995).

Ralph Tyler's conceptualises subject matter in <u>Basic Principles of Curriculum and Instruction</u> (Tyler, 1949). The text was intended to be a working framework used by curriculum developers and teachers in their deliberative thinking about the development of a curriculum or a course of study. Beginning from an educational philosophy of social efficiency, the rationale revolves around four central questions:

1. What educational purposes should the school seek to attain?

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[6] See, for example, Confrey (1990) and Glaserfeld (1991).

2. What educational experiences can be provided that are likely to attain these purposes?
3. How can these educational experiences be effectively organized?
4. How can we determine whether these purposes are being attained?

Formulating explicit educational objectives is viewed as a prelude to the planning and development of an effective and appropriate curriculum. It is also the first principle of the rationale, upon which all other steps are contingent. The objectives are formulated through the following three sources: (1) studies of the learners themselves, (2) studies of contemporary life outside the school, and (3) suggestions from subject specialists. Through this, Tyler believes that the rationale duly encompasses three curriculum orientations: humanism, social efficiency, and academic rationalism.

Educational objectives are viewed as the central framework for the formation of a school subject. The objectives are largely behavioral, and each contains "both the kind of behavior to be developed in the student and the content or area of life in which this behavior is to operate" (Tyler, 1949, p. 46-47). They specify what students need to know and be able to do in particular areas. Subject matter consists of a body of facts, concepts, values, and techniques which are selected, organized and sequenced in a way that centers upon the predetermined objectives. Furthermore, the objectives serve as the standard against which the curriculum is assessed. Therefore, the selection and organization of subject matter is conceived around not only the behavioral objectives but also the evaluation mechanisms aligned to the objectives.

Like Dewey, Tyler believes that the learner, the society, and specialized knowledge are three key factors in the formation of school subjects. Yet while Dewey synthesized these to argue for a distinct epistemological status of subject matter, Tyler treated them as semi-autonomous sources for the generation of outcomes. This had the effect of separating curriculum *qua* outcomes from a view of the broader educative process (Kliebard, 1970). Whereas Dewey's solution was to construct a school subject that triangulates the three factors to constitute what would aim to be a distinctively educational process, Tyler's model provided the grounds for a generic technical selection and construction process.

Tyler as well did not attend to the larger social, political, and ideological context in which knowledge is selected, formulated, and organized. Subject matter was taken as a given and as good in itself. As a result, he neglected to analyze the interaction between subject matter and political, social, economic, and cultural forces which exerted powerful influences over the selection and organization of subject matter (Lincoln, 1992).

The Tyler Rationale has exerted a rather powerful influence on the thinking of educators and curriculum scholars through the postwar-era (Goodlad, 1969). It informs current debates over the new postindustrial curriculum settlement, where the discourse of "outcomes" (e.g., generic, transportable skills for the new 'knowledge' economies) is typical in national and regional curriculum discourses. The rationale, indeed, sets a distinctive theme for American curriculum traditions, acting as the lynchpin for the technocratic model that dominated American schools to this day (Luke, 2004). The main task of curriculum is to deliver a body of "objectified" information, concepts, and skills which can be specified in advance, by means of a set of orderly steps such as needs analysis, objective writing, content selection, implementation, assessment and evaluation (Westbury, 2000). Educational institutions, in turn, are held accountable for this "service

delivery" via quantifiable achievements of students on standardized measures. In consequence, and despite the subsequent development of alternative curriculum theories and development models, key epistemological, psychological, pedagogical, cultural and political questions continue to be deferred under the assumption, *pace* Tyler, that neutral, consensually-derived statements of outcomes are the common building blocks of any programmatic approach to curriculum.

5. Theorizing school subjects: the doctrine of disciplinarity

The doctrine of disciplinarity holds that subject matter should be derived from, and organized according to, canonical academic disciplines. It is well represented by the structure-of-the-discipline approach advocated by Bruner and Schwab in the US and the forms of knowledge approach by Peters and Hirst in the UK in the 1960s and 1970s. Underlying these approaches is a common premise that the structures of academic disciplines should determine the nature and organization of academic knowledge. While Bruner, Schwab, Peters and Hirst hold different notions of structures, they all define subject matter in terms of concepts, principles, methods, techniques, and habits of mind derived from academic disciplines.

Bruner's (1960) The Process of Education became a foundational statement for the US curriculum reform movement in the 1960s, focused on development of the intellectual capacity of student. The movement was driven by the (post-Sputnik) call for scientific and technological expertise to assure US geopolitical and economic dominance. For Bruner, school subjects and academic disciplines were fundamentally continuous because "intellectual activity anywhere is the same, whether at the frontier of knowledge or in a third-grade classroom" (p. 14). He defined structure in terms of the fundamental disciplinary ideas, concepts, and relationships: "Grasping the structure of a subject is understanding it in a way that permits many other things to be related to it meaningfully (p. 7)." By this account, a school subject is the translation of the academic discipline in relation to the cognitive development of the learner. The academic discipline provides an essential starting point and a necessary framework for the translation. This work is to be done by subject matter experts and psychologists (see Deng [2007b], for a detailed discussion).

Schwab (1964) offered a broader and more elaborated structuralism. He characterized the problem of the structure of the disciplines in terms of the organization of the disciplines, the substantive structure and the syntactic structure of each discipline. He wrote:

> …three different sets of problems constitute the general problem of the structure of the disciplines. First there is the problem of the organization of the disciplines: how many there are; what they are; and how they relate to one another. Second, there is the problem of the substantive conceptual structures used by each discipline. Third, there is the problem of the syntax of each discipline: what its cannons of evidence and proof are and how well they can be applied. (p. 14)

Solutions to the first set of problems determine what school subjects constitute the school curriculum, their categorical and hierarchical relations. The second and third sets of problems concern the ideational and methodological aspects of a discipline (Schwab,

1978). All are "necessary in some part and degree within the curriculum, as elements of what we teach" (Schwab, 1962, p. 163). Unlike Bruner, Schwab emphasizes the understanding of learners, instead of the academic discipline, as an essential starting point for the translation. Further, he recognizes that the distinctive rules of development, organization and formation of disciplinary knowledge (i.e., the "syntax") may vary and present distinctive educational challenges. For Schwab, translation requires the collaborative deliberation of classroom teachers, subject matter experts, and curriculum specialists, with practical and eclectic treatment of a variety of curriculum factors in a particular context (see Deng, 2007b).

Like Bruner, Hirst and Peters (1970) argued that "the central objectives of education are developments of mind" (pp. 63-64). These objectives are better achieved by the pursuit of "forms of knowledge" – a notion that implies what Schwab meant by the structure of the disciplines. According to Hirst (1964), there are seven forms of knowledge: the scientific, the mathematical, the religious, the moral, the historical/sociological, and the aesthetic. These seven forms of knowledge follow in general outline the traditional groups of academic disciplines from Aristotle to Comte. Each of these seven forms has four distinguishing structural features:

1. Each form of knowledge has "certain central concepts that are peculiar in character to the form."
2. "In a given form of knowledge these and other concepts…form a network of possible relationships in which experience can be understood. As a result this form has a distinctive logical structure."
3. A form of knowledge, "by virtue of its particular terms and logic, has expressions or statements…that in some way or other…are testable against experience."
4. "The forms have developed particular techniques and skills for exploring experience and testing their distinctive expressions." (pp. 128-129)

The first two features correspond to Schwab's substantive aspect of structure, and the last two features the syntactic aspect. Hirst puts it succinctly: school subjects are "indisputably logically cohesive disciplines" (Hirst, 1967, p. 44; cf. Peters, 1965). Academic disciplines are created and systematically defined by communities of scholars, residing in university departments. These are then translated for use as school subjects—a position held by many Deans of science in current curriculum debates over US science education.

The notion of disciplinary structure is loaded with conceptual problems. It is disputable that all academic disciplines have a conceptual structure, in terms of a unified body of concepts and interrelationships (Phillips, 1987). Yet to separate the conceptual (substantive) and methodological (syntactic) aspects of knowledge may be artificial. Furthermore, there is a tendency to reify a formal and frozen abstraction of knowledge, synchronically captured. This simply ignores or, at best, brackets, the dynamics of paradigm change, shift and crisis, and the more general diachronic processes of knowledge evolution and development. [7]

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[7] It is beyond the scope of this chapter to provide a detailed discussion of the conceptual problems associated with the notion. Interested readers are generally referred to the works of Phillips (1978) and Scilling (1986).

There are serious problems in the doctrine of disciplinarity for curriculum studies. By delimiting the subject matter to disciplinary knowledge, the doctrine fails to recognize or, at best, appropriate other kinds, sources and modes of knowledge (e.g., practical knowledge, tacit knowledge, and commonsense knowledge; local community knowledges, received wisdom, oral narrative, and certainly, non-dominant cultural knowledges, rituals and practices). As a result, the disciplinary doctrine promotes "knowledge purity and abstraction at the expense of practical application and relevance to the life of the learner" (Tanner & Tanner, 1995, p. 437). The point of departure for defining subject matter consists primarily in an analysis of the nature and organization of knowledge in academic disciplines. What counts as subject matter is treated as if it were fundamentally an epistemic rather than a normative and ethical issue (Schilling, 1986). Questions of what and how students should learn are subordinated to the integrity of the discipline. Hence, Tanner and Tanner (1995) argue that disiplinarity "emphasized knowledge specialism to the neglect of general education and democratic citizenship, and failed to address the deepest social problems" (p. 437).

This disciplinary conceptualization of school subjects is largely situated within the tradition of analytic philosophy. Yet "school subjects are the most quintessential of social and political constructions" (Goodson & Marsh, 1996, p. 1). Further, the hegemony of disciplinarity, its truth claims and rituals, is deeply interwoven with questions of ideology, privilege, and power, as feminist and sociological work on scientific inquiry demonstrates (e.g., Harding, 1996; Bourdieu, 1991).We will return to these issues as we further challenge this doctrine in its current forms.

6. An alternative to disciplinarity

Science for All, developed by Australian science educator Peter Fensham (1985), became a focus for international curriculum development in the late 1980s and 1990s. [8] It offered a viable alternative to the then dominant disciplinary doctrine. *Science for All* calls for a vision of school science for all students as scientifically-literate citizens. Subject matter is derived from various sources in addition to academic disciplines. Science for All requires "a broader knowledge base from which to draw its knowledge of worth than single disciplinary sciences can provide" (Fensham, 2004, p. 158). Furthermore, the subject matter is selected and formulated with close reference to personal and societal needs and in the light of certain pedagogical concerns. The characteristics of this school science include:

(a) It should involve content that has immediate and obvious personal and social relevance to the learners. That is, it ought to begin as an extension of what the learners already know from their experience prior to schooling.
(b) Its learning objectives (practical skills and knowledge) should have criteria of achievement that most learners can realize at some level.
(c) Its broad themes, topics or sections should constantly be visible to elucidate the component parts of the learning.

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[8] For example, there are "Science for All Americans" and "Science for All Canadians." In the UK the theme was spelled out in the document Public Understanding of Science by the Royal Society of London (Fensham, 1992).

(d) Its pedagogy should exploit the demonstration and practical modes that are inherent to much science and also to the cultural learning that occurs prior to and outside schooling.

(e) The learning of practical and cognitive skills should flow naturally from the relevant and meaningful nature of science topics rather than be themselves a primary focus of the learning.

(f) Its assessment should recognize both the prior knowledge that the learners have of scientific phenomena and their subsequent achievements in all the various sorts of criteria for learning that make up the curriculum. (Fensham, 1985, p. 426)

Broadly construed, subject matter includes the following categories: (i) knowledge, (ii) application of knowledge, (iii) skills, (iv) process skills, (v) problem-solving, (vi) science traits and attitudes, (vii) applications of science and technology, (vii) personal and social needs, (ix) the evolution of scientific knowledge, and (x) boundaries and limitations of science (Fensham, 1985). In this approach, various notions of knowledge—disciplinary, practical, and experiential—are brought to bear.

The selection and formulation of content thus takes better account of Dewey's triad: learner, society, and specialized knowledge. To varying degrees, it reflects a commitment to the traditions of humanism, social efficiency, academic rationalism and, to a certain extent, social reconstructionism. The "socio-scientific situations and issues now confronting citizens," argues Fensham (2004), "are not confined within disciplinary boundaries." "Citizens need to," he continues, "appreciate the relationships between knowledge in sciences and other knowledge, as well as how the sciences coordinate their knowledge in application to these situations" (p. 159). This stands in sharp contrast with the disciplinary doctrine which construes each school science subject as a discrete disciplinary area.

Of course, Science for All needs to be situated in its specific political economic and cultural context as well. It arose in the context of the adoption by Australian commonwealth and state systems of more progressive, student-centred educational philosophies in the 1980s and 1990s, under successive national and state Labor governments. It has been instrumental in the development of national science education standards in the 1990s, notably in the US, the UK, Canada and Australia. It also dovetailed well with postwar human capital models and more recent calls for technological competitiveness. Collins (1998) and Kirst and Bird (1997) discuss the historical and current contexts at length.

We have discussed four distinctive ways of conceptualizing the subject matter at the programmatic level, including Dewey's logical-psychological distinction, the Tyler Rationale, the disciplinary doctrine, and Fensham's Science for All. We now turn to the meanings of subject matter at the classroom level by looking at Shulman and associates' conceptualization of teachers' subject matter knowledge and two alternative conceptual frameworks for looking at subject matter.

7. Teachers' subject matter knowledge and disciplinarity

Lee Shulman and associates at Stanford characterized subject matter as a "missing paradigm" and argued for a fresh way of approaching subject matter with a strong focus on teacher knowledge (Shulman, 1986a & b, 1987; Wilson, Shulman & Richert, 1987).

Over the last two decades, their conceptualization has provided the basis for empirical studies on teachers' subject matter knowledge across curriculum content areas. However, the doctrine of disciplinarity remains embedded in this work.

Shulman and colleagues argue that teachers need to have three types of subject matter knowledge, <u>content knowledge</u>, <u>pedagogical content knowledge (PCK)</u>, and <u>curricular knowledge</u>. Content knowledge includes knowledge of the <u>substantive</u> and <u>syntactic structures</u> of the academic discipline—as in Schwab (1964). This knowledge was later on further differentiated to include four sub-components: (1) content knowledge (the 'stuff' of a discipline), (2) substantive knowledge (knowledge of the explanatory framework or paradigms of a discipline), (3) syntactic knowledge (knowledge of the ways in which new knowledge is generated in a discipline), and (4) beliefs about the subject matter – feelings and orientations toward the subject matter (Grossman, Wilson, & Shulman, 1989). Note here the grounding in formal academic disciplines and fields.

"Pedagogical content knowledge" enables the teacher "to transform the content knowledge he or she possesses into forms that are pedagogically powerful and yet adaptive to the variations in ability and background presented by students" (Shulman, 1987, p. 15). This knowledge entails mastery of pedagogical representations and instructional strategies, and of students' pre-conceptions with respect to particular curriculum topics at particular grade levels (Shulman, 1986). Curricular knowledge is an understanding of curricular and instructional materials available for teaching a subject at various grade levels.

Their models rests upon two assumptions which, together, ascribe retain the centrality of academic discipline in determining what constitutes subject matter. First, academic disciplines provide the primary source of school subjects. Scholarship in content disciplines provide "the knowledge, understanding, skills, and disposition that are to be learned by school students" (Shulman, 1987, pp. 8-9). Second, teachers necessarily <u>transform</u> knowledge of discipline into a pedagogical form that caters to the varied interests, backgrounds and capacities of students.[9] This notion of transformation, Doyle (1992) observed, allows teachers to "eventually lift the curriculum away from texts and materials to give it independent existence" (p. 499). The focus is on the content "as a discipline with its own rules and demands, but also as a medium for engaging students' interests and values" (p. 499). In other words, the subject matter of the academic discipline is transformed into the subject matter of a school subject, aiming at a degree of fidelity of representation of the former.

The above two assumptions stand in contrast what Dewey's view. As noted, for Dewey, subject matter needs to be derived from materials within the range of students' experience <u>rather than</u> the academic discipline per se. While the notion of transformation

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[9] This assumption seems to be mostly relevant to beginning secondary school teachers. In fact, Shulman et al.'s conceptualization was developed in the context of, and informed by, their research project "Knowledge Growth in Teaching," with a central focus on how a novice secondary school teacher <u>transforms</u> his or her previously learned content knowledge of the academic discipline into a form that is suitable for classroom teaching (Shulman, 1986, 1987; Wilson, Shulman, & Richert, 1987). The assumption, however, could be rather problematic for elementary school teaching because of the significant difference between the elementary school curriculum and academic disciplines. Leinhardt et al.(1991) argue that the subject matter knowledge needed for teaching elementary school mathematics is "the knowledge that a teacher needs to have or use in the course of teaching a particular school-level curriculum," rather than "the knowledge of advanced topics that a mathematician might have" (p. 88).

bears a resemblance to Dewey's psychologizing the subject matter, there remain crucial differences. For Dewey, psychologizing requires starting from and building upon a careful analysis of the experience of learners, rather than the concepts or syntax of discipline. This makes the psychologization of subject matter a <u>curricular</u> task par excellence, with the primary concern for the construction of a curriculum as a whole. It is not a <u>pedagogical</u> adjunct that privileges the integrity of discipline. Transformation, as characterized by Shulman and associates, is primarily a pedagogical task concerning the teaching of a few topics or units within the school curriculum (see Deng, 2006). To point out these two differences is to question the claim that the model is grounded in Dewey's original fomulation.[10]

As noted, Shulman and associates directly employed Schwab's two notions "substantive structure" and "syntactic structure" to characterize the subject matter of the academic discipline. [11] Like Schwab, Shulman and associates believe that the subject matter of the school subject needs to be derived from the subject matter of academic discipline, including conceptual and methodological components. However, while Schwab who views transformation or translation as a curricular task requiring the collaboration of various talents including teachers, subject matter experts, curriculum specialists - Shulman and colleagues construe transformation as primarily a pedagogical task undertaken by individual teachers (Deng, 2007b).

The notion of transformation also bears a resemblance to Bruner's (1966) notion of <u>conversion</u>. According to Bruner, the subject matter of the academic discipline needs to be <u>converted</u> to modes of representation that align with the three distinctive stages in intellectual development, the <u>enactive</u>, the <u>iconic</u>, and the <u>symbolic</u>. At the same time, this conversion needs to be faithful to the basic ideas that constitute the structure of the discipline, and to developmental capacity of the learner. However, unlike Shulman and associates but like Schwab, Bruner holds conversion as fundamentally a curricular task that cannot be accomplished by classroom teachers alone (Deng, 2007b).

Our view is that the doctrine of disciplinarity continues to dominate reconceptualizations of subject matter. It was well reflected in the research program around "teaching for understanding" represented by the works of Magdalene Lampert, Deborah Ball, and their colleagues at Michigan State University—works that examined the challenge of classroom practice that taught not only the basic ideas but also ways of knowing or thinking embedded in academic disciplines. [12] It was central to Harvard's <u>Project Zero</u>, which attempted to develop a "disciplinary curriculum" in which students could be led progressively toward sophisticated disciplinary understanding.[13] It was also embraced in the program <u>Fostering Communities of Learners (FCL)</u> first developed by Joe Campione and Ann Brown, with the primary purpose to design an environment that could engage students think deeply about the "big ideas" in academic disciplines. [14] Finally, work in discourse analysis and functional linguistics has explored the varied and distinctive technical registers, genres and discourse practices of different scientific and

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[10] For this claim, see Ball (1988), Mark (1990), Wilson, Shulman, & Richert (1987).

[11] They seem to have overlooked the conceptual issues surrounding the two notions mentioned in section 2. For a detailed discussion concerning those conceptual issues, see Phillips (1987, 1988).

[12] See, for example, Ball (1993); Lampert (1990); and Heaton (2000).

[13] See, for example, Gardner & Boix-Mansilla (1994) and Perkins & Blythe (1994).

[14] See Brown & Campione (1990); Brown (1997); among others.

academic fields (e.g., Lemke, 1982; Halliday & Martin, 1995), arguing for pedagogies that provide explicit and direct knowledge of textual features and affiliated disciplinary orientations.

The above programs or projects, indeed, share many of the characteristics of the work examining content pedagogy by cognitive scientists in the 1980s. Doyle (1992) characterized this work as follows:

> ...the emphasis in this work is largely pedagogical, rather than curricular. In most cases only small pieces of content are selected for attention...with little attention to the curriculum context in which the pieces fit. Moreover, content is usually taken to mean discipline rather than school subject. Issues of content (mathematics, science, social studies), in other words, are viewed almost exclusively as matters within the academic disciplines rather than within the school curriculum. Thus, little mention is made of the goals and functions of schools which frame content decisions or, importantly, of the transformations of content that have occurred as it is incorporated into school curriculum. (p. 498)

In short, across these significant research and development projects there has been a strong tendency to construe the subject matter of a school subject in terms of the basic ideas, methods, and ways of knowing or thinking embedded in an academic discipline. Yet what is involved in generating and knowing subject matter of the school curriculum in the classroom has been neglected.

Researchers and curriculum policy-makers alike continue to unproblematically link academic disciplines to school subjects. As noted across this handbook (see Nieto et al. Chapter xx; Deyhle et al., Chapter xx, this volume), they underplay the significance of alternative cultural concepts of knowledge and epistemological standpoints. They tend to view defining and conceptualizing the subject matter as if were merely a logical and epistemological rather than a normative and socio-political phenomenon. Bethany Rogers (1997) identified four problems with this position:

> Problem 1: Disciplines don't factor in the child's experience. The degree to which learners shape knowledge for themselves must be somehow be acknowledged in the design of curriculum. Even if the disciplines do constitute the best articulations of what we know about the world, students (especially early in their development) may need to begin at a point other than the very specific and sophisticated demarcations embodied in the disciplinary framework….
>
> Problem 2: Disciplines are neither constant nor coherent. We commonly accept the notion that disciplines are the dominant repositories and categories of what is known, without stopping to think that such categories are man-made, socio-political entities. The truth is that disciplines are changing and dynamic entities….
>
> Problem 3: Disciplines are one source of knowledge in contemporary society. Much of the works without strict adherence to disciplinary frameworks. Disciplinarians tend to shape our conceptions of the social

and natural world, but so do professionals – those who are experts in various fields of knowledge not always represented in the university – and our experiences. The disciplines themselves should play an important role in shaping curriculum, but they are not the only authority….

Problem 4: Disciplines are often confused with subject matters…Use of the term 'discipline' is common—but thoughtful examination of what it means in schools is not. As they appear in most traditional schools, the disciplines are eviscerated of their animating qualities, yet many teachers and parents believe that their children are coming into contact with 'the disciplines' and all that those bodies of knowledge have to offer…. (pp. 692-699).

The critique of academic disciplines as artefactual, produced by socio-culturally and historically situated human subjects is central to the last two decades of feminist, postcolonial and postmodern theory. The general critique of science as discourse and "grand narrative" emerged from Lyotard's (1986) "report on knowledge" to the Social Science and Humanities Research Council of Canada. Describing the "postmodern condition", Lyotard argued that while the traditional fields of humanities and 'hard' sciences were positioned hierarchically (pace Comte), a binary relationship reinforced by the distinctive narrative Eurocentric histories of technology and capital. Further, he argued that the "truths" of science and of literary texts were affiliated with different expository and narrative claims, with the former privileged since the Enlightenment. This remains a principal feature of the "modernist" assumptions underlying all approaches to the disciplinary doctrine to curriculum: that real truths about the biosocial world are the exclusive purview of the levels of technicality and exposition featuring in the "hard sciences." Harding (1996), Harraway (1998) and others have examined the gendered assumptions underlying several strands of dominant Western science, examining both biological and social science constructions of gender, society, and the human subject. Indigenous and critical multicultural educators also argue that the force of Eurocentric discipline and discourse has served purposes of economic and political colonization, and indeed, set the conditions for cultural genocide, environmental degradation, and language loss (Smith, 2000).

Further, the conflation of school subjects and academic disciplines can be challenged in the light of sociological and socio-historical scholarship concerning the formation of school subjects (e.g., Popkewitz, 1992). As stated previously, school subjects themselves are not neutral or value-free entities; they are social and political constructions and have variable discourse features. How knowledge is selected, organized, and transformed into the subject matter of a school subject, further, are forms of social, cultural and economic reproduction. By this account, the framing and transmission of academic disciplines into school subjects necessarily leads to a social stratification of differential cognitive and discursive resources (Apple, 1990) and the production of different modes of biopower and discipline (Popkewitz, 1990). The linking of school subjects to academic disciplines further, legitimates and reproduces canonical divisions of knowledge, reflecting and reproducing the relative power and privileges of those communities with investments in particular 'sciences' and 'arts' (Goodson 1985,

Goodson et al., 1998). In practice, we see this hierarchy reflected in credentialing practices, where the "stakes" and "value" affiliated with scientific and "high cultural" disciplinary knowledge trumps less traditional, canonical and more practical work. The reliance on academic disciplines as the "fountain" of school subjects in current academic discourse on teachers' specialized subject matter knowledge, Stengel (1997) argues, "privileges the interests and concerns of those who already won the position of intellectual" (p. 589). It entails drawing on and expressing the "disciplinary power" (Foucault 1977) of university academicians through the definition and production of school knowledge as scholarly knowledge. In these ways, the focus on curriculum as disciplinary knowledge may set the conditions for the institutional reproduction of differentiated "taste" and social class "distinction", producing different classes of authoritative knowers and speakers (Bourdieu, 1992).

However, the materialist and poststructuralist critique of school subjects does not in itself address those issues that Dewey showed us are <u>intrinsic</u> to the practical formation of a school subjects. Nor does it foreclose closer examination issues concerning the local educative experience of students of students in making the curriculum-in-use. To the point, it is the very idiosyncracy and local variability of the enacted curriculum that preludes strict disciplinary reproduction and enables the realization of school subjects as distinctive forms of knowledge.

The conflation of school subjects and academic disciplines can be further problematized with reference to the five possible relationships identified by Stengel (1996), each of which represents a curricular position:
1. Academic disciplines and school subjects are essentially continuous.
2. Academic disciplines and school subjects are basically discontinuous.
3. Academic disciplines and school subjects are different but related in one of the three ways:
    (a) academic discipline precedes school subject,
    (b) school subject precedes academic discipline, or
    (c) the relation between the two is dialectic.
Among the above five possible relationships, relationships 1 and 3(a) together represent the curricular positions embraced by Shulman and associates. Relationships 2, 3(b), and 3 (c) index three alternative curricular positions, each of which can be construed as a challenge for their curricular positions (Deng, 2007a; Stengel, 1997).

Our point here is that school subjects can be distinct entities that constitute an important area of curriculum inquiry. We conclude with brief introductions to two conceptual frameworks for analyzing the subject matter of a school subject—one developed by Deng and the other embedded in the German *Didaktik*'s tradition—both of which examine the subject matter of a school subject in its own right and construe it as having intrinsic educational value and significance.

8. <u>Knowing the subject matter of a school subject</u>
Deng's (2007a) framework was developed from his examination of the distinction between the subject matter of school physics and the subject matter of the discipline of physics, with reference to Dewey's logical-psychological distinction. The distinction between the two kinds of subject matter was substantiated by empirical evidences concerning the difference between the key ideas in school physics and the key ideas in

the academic discipline of physics, concerning the topics of <u>color</u>, <u>the speed of light</u>, and <u>light interference</u>. Based upon the examination, Deng argued that the subject matter of school physics, rather than the subject matter of the discipline of physics, lies at the heart of secondary school physics teaching. He argued further that knowing the subject matter of school physics involves knowing five intersecting aspects or dimensions: the <u>logical</u> (concerning the basic concepts and principles to be taught), the <u>epistemological</u> (concerning how we know and how knowledge comes to reach its present refined form), the <u>psychological</u> (concerning how the concepts and principles could be developed out of the interest, experience, and prior knowledge of students), the <u>pedagogical</u> (concerning the effective ways of representing and reformulating concepts and principles), and the <u>sociocultural</u> (concerning how knowledge relates to and interacts with society, technology, and culture). These categories amount to an elaboration of Dewey's original triad. These issues, however, have escaped the attention of many researchers who rely exclusively on the academic discipline as an essential framework for defining and delineating what to be taught in school.

A second alternative conceptual framework for analyzing the subject matter of a school subject is provided by the German *Didaktik* tradition. While the dominant tradition of curriculum theory in the English-speaking world is concerned primarily with curriculum development at the institutional and programmatic levels, the *Didaktik* tradition is centered upon curriculum making at the classroom level (Westbury, 2000). In contrast to the US and some other countries, Germany has a well-articulated state curriculum framework, the *Lehrplan*, that lays out the prescribed curriculum content for classroom teaching. However, within that curriculum framework teachers have high levels of professional autonomy to develop their approaches to subject matter. They are viewed as the key to realizing the educative potential of subject matter, as "interpreted and given life" by teachers. Teachers are "normatively directed" by the concept of *Bildung* concerning the formation of the mind and habit of the learners, and by conducting *Didadktik* analysis (Wesbury, 2000).

The tradition attributes tremendous importance to curriculum making in classrooms, in terms of lesson preparation which is viewed as "the place where the interactive relationship between theory and practice fundamental to all education, the interplay between experience and reflection, must be concretized in the form of reflective decisions for planning instruction and learning" (Klafki, 2000, pp. 142-143). The main purpose of lesson preparation is to design opportunities for students to make "fruitful encounters" with the subject matter of the school curriculum. In contrast to the kind of instructional preparation captured in the concept of pedagogical content knowledge largely concerned with the "how" (i.e., the search for effective ways of representing and reformulating the content) - lesson planning in *Didaktik* is preoccupied fundamentally with the "what" (i.e., the nature, aspects and formative value of the subject matter to be acquire.

Teachers are expected to work closely with the subject matter of the curriculum <u>rather than</u> the subject matter of the academic discipline. This kind of subject matter is called "contents of education (*Bildungsinhalte*)," which is the result of special selection and formulation of cultural traditions for educational purposes. It is conceived as something with formative potential, educational value and significance. It contains "educational substance (*bildungsgehalt*)" which requires *Didakitik* analysis to bring out

and unpack. Through conducting *Didakitik* analysis, teachers discern the "formative value" and identify "pedagogically crucial elements" within their specific classroom contexts. To this end, teachers are asked to consider subject matter from the perspective of *bildung*, asking questions concerning what it can and should signify to the students, and how students can experience this significance.

They ask five general questions when conducting *Didaktik* analysis during unit and lesson preparation, with respect to a particular topic, concept, issue, or theme in the curriculum, with the overriding concern for the formative potential of the subject matter:

1. What wider or general sense or reality does this content exemplify and open up to the learner? What basic phenomena or fundamental principle, what law, criterion, problem, method, technique, or attitude can be grasped by dealing with this content as an "example"?

2. What significance does the content in question, or the experience, knowledge, ability, or skill, to be acquired through this topic, already possess in the minds of the children in my class? What significance should it have from a pedagogical point of view?

3. What constitutes the topic's significance for the children's future?

4. How is the content structured (which has been placed in a specifically pedagogical perspective by questions I, II, and III)?

5. What are the special cases, phenomena, situations, experiments, persons, elements of aesthetic experience, and so forth, in terms of which the structure of the content in question can become interesting, stimulating, approachable, conceivable, or vivid for children of the stage of development of this class? a) What facts, phenomena, situations, experiments, controversies, etc., i.e. what intuitions, are appropriate to induce the child to ask questions directed at the essence and structure of the content in question? b) What pictures, hints, situations, observations, accounts, experiments, models, etc., are appropriate in helping children to answer as independently as possible, their questions directed at the essentials of the matter? c) What situations and tasks are appropriate for helping students grasp the principle of the content by means of the example of an elementary "case", and to apply and practice it so that it will be of real benefit to them? (152-155)

These questions also provide working framework widely used in the pre-service and in-service teacher education programs in Germany.

Didaktik provides teachers with a way of thinking about the subject matter essential to their classroom practice that is largely absent in the American curriculum tradition (Westbury, 2000), and increasingly under threat both by policy pushes for a return to disciplinarity and an emphasis on the central prescription and performance monitoring of classroom practice (Luke, 2004). The Anglo-American curriculum framework discussed here operates from a binary approach to questions 4 and 5 respectively, which are mostly pedagogical in orientation. Those questions in 1, 2, and 3, which are largely curricular in focus, have received relatively less attention (Fensham, 2001, 2004).

9. Conclusion: getting beyond disciplinarity

The selection and organization of subject matter is one of the most basic, ubiquitious and central moments of curriculum formation. Yet for state curriculum bureaucracies and school systems, it is amongst the least overtly theorized practices. This is in part due to the highly politicized nature of school knowledge, with pressures on systems from university academics, employers, and parents' groups continually scrutinizing and critiquing "content." Hence, curriculum settlements are acts of ideological compromise and political consensus: Change in subjects offered to students is taken as a matter of political peril and caution. Disruptions and reconsiderations of the hierarchical status, value and power of different subjects in school and university, in matriculation and examination are avoided at all costs. Cyclical debates over subject content in areas like History, English and Biology are waged by the press, legislators and community over whose versions of ideology and values will count.

In the current policy context, there are ongoing tensions between disciplinarity and interdisciplinarity, between cross-curricular and within subject skill and knowledge as systems embark on curriculum reform in relation to renewed calls for new kinds of human capital in the face of shifting demographics and cultures (Luke, Graham, Weir, Sanderson & Voncina, 2007). Yet in the US, the UK and Australian curriculum debates, there is a strong, almost anachronistic move towards a reassertion of the doctrine of disciplinarity—with university deans, professors, and public intellectuals increasingly involved in bids to control and name the "contents" of science, mathematics and other school subjects. Further, while we agree that critique of the ideological and cultural suppositions of such models is important—it cannot in and of itself resolve the matter of what can and should count as a "curriculum subject." This will require the task of philosophic and educational reconstruction called for by Dewey.

We have here attempted to take the argument back to its historical roots and foundational assumptions. At the institutional level, what counts as subject matter is connected with the normative, ideological bases for the selection and formulation of knowledge for the school curriculum. At the programmatic level, what constitutes the subject matter has to do with a translation of the institutional curriculum into school subjects for school and classroom use – an industrial, professional and political economic contingency. At the classroom level, the meanings of subject matter are determined and shaped by a teacher's interpretation of the subject matter of a school subject in relation to an understanding of the learner, his or her cultural milieux, dominant media and modes of representation and discourse in classrooms, and the local pedagogical possibilities a particular classroom context. These institutional, programmatic, and classroom meanings of subject matter together constitute an enacted curriculum and, for students, knowledge of an intellectual field. That field, we have argued here, is constituted by school subjects, not academic disciplines per se. School subjects are uniquely purpose-built educational enterprises, designed with and through an educational imagination towards educative ends. These include but are not limited to the generation of any particular field-based knowledge.

What constitutes the subject matter of a school subject remains an important issue of curriculum theory and inquiry. Three related areas of curriculum inquiry and research can be identified with respect to the three levels of curriculum making. One concerns the institutional selection and classification of subject matter, which requires serious attention not just to the state of the art of disciplinary knowledge, but centrally to

curriculum theories of the interplay between schooling, culture and society. The second area pertains to the programmatic meanings of subject matter, an understanding of which needs to be informed and enhanced by curriculum models and representational systems for the construction of school subjects or programs. The third area concerns the classroom meaning of subject matter, an understanding of which requires close attention to the quotidian reconstructions of knowledge undertaken in teachers and students everyday interactional and discoursive work.

As the essays across this Handbook demonstrate—the historical grounds for curriculum are at a significant historical point of transition, pushed and pulled not just by the emergence of new fields of knowledge and disciplinary paradigm shift – but as well by overtly ideological political and economic demands upon schooling and teachers, and dramatically contending visions of the purpose and function of education (Luke, 2005b). What this means is that all three of Dewey's triadic variables are in need of close empirical re-inspection and new species of theory. The very "logic" and hierarchy of disciplinary fields is in transition, as evidenced by the ongoing debates over the structure, governance and functions of the universities and, more generally, the arts and sciences (Graham, Luke & Luke, in press). The digitalization of knowledge has contributed to the rapid proliferation of new fields of inquiry, an explosion of the archive of human knowledge, and unprecedented forms of criticism, analysis and exchange over ideas. At the same time, the "psychologic" of learners is in transition: with new approaches to learning, new learning sites and cultures, new forms of subjectivity and identity, and quite literally, new forms of cognition emerging as students engage with world cultures, digital technologies and multimodal systems of representation (New London Group, 1996). These new educational phenomenon—as distinctive as those facing Dewey at the height of expansion of urban, industrial capitalism—are evidence of the emergent "social" logics of cultural and economic globalisation, new forms of capital and discourse exchange, and everyday social relations.

What will count as subject matter in these new curriculum contexts? How should school subjects be constructed as a response to the changes? What is involved in knowing the subject matter for classroom teaching within the context of curricular changes? Discipline matters—but how and in what ways it can and should shape school knowledge requires a broader reconstructive educational analysis and curriculum theory.

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