

# *Talk, text, and knowledge in cumulative, integrated learning: A response to 'intellectual challenge'*



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*"An accumulation of historical facts is no more a science than a pile of bricks is a house."  
(J. Henri Poincaré, 1895, cited in Scribner, 1963)*

## **Introduction**

In this paper we address the key issue on which this edition is focused – intellectual challenge – in light of Poincaré's concern with understanding bodies of knowledge – how, over time, they are structured, acted upon, built, and theorised in educational settings. We make the case for reinstating the teaching of knowledge, including knowledge about language, at the forefront of considerations of educational practice and policy, and, more specifically, of teaching and researching language and literacy.

Through this discussion we attempt to contribute to the line of effort represented by contributions to this edition. The authors have taken seriously the fact that the proportion of students from a widening range of language backgrounds other than the medium of instruction in schools in Australia, as in many countries, continues to rise. This presents challenges to educators, and these authors point to fidelity to the intellectual substance and coherence of syllabus contents as the foremost of those challenges. We focus here in particular on extending the two major messages we take from the papers collected in this edition: the need for a clearer articulation, first, of a disciplinary-based understanding of knowledge, and second, of the relation between curriculum knowledge and the language of that curriculum knowledge, as shown in teachers' knowledge of the nature of language and of how to intertwine the teaching of language with teaching of curriculum knowledge.

Australian language and literacy educators, including those whose work appears in this edition, have attained international recognition for the advances they have made in articulating and studying the challenges and opportunities involved in serving all students' language and literacy needs in rapid-change, multilingual environments (e.g., Cope & Kalantzis, 2000; Derewianka & Khan, 2001; Gibbons, 2002; 2006; Gray, 2007). In aiming to extend that view in this paper, we argue: (i) that there is a case for a redirection of focus onto the issue

of intellectual challenge; (ii) that the sense of urgency associated with this redirection relates to the loss of a strong conception of knowledge (Bereiter & Scardamalia, 2003); (iii) that disciplinary-based language and literacy education is critical, in that questions concerning language and literacy development through the school years are, at base, issues that require some coherent conceptualisation of how it is that each discipline/curriculum domain puts language and literacy resources to work in distinctive ways.

### *The problem*

In many countries, the last 30 years or so have seen the institutions that traditionally provided initial teacher preparation reconfigured into university faculties of Education. The accompanying redirection of theorising, research, practice, and training gradually drew attention away from the distinctiveness of curricular domains, and from the tradition of sourcing teacher preparation largely from guild knowledge, mentoring, and supervision. The move has been toward accounts of educational practice based on the 'informing' social sciences, with an evidence base drawn increasingly from social science research. These disciplines gradually reworked educational problems into topics amenable to their own conceptual and methodological *métiers*. Topics such as 'learning,' 'literacy,' 'numeracy,' 'comprehension,' 'memory,' 'motivation' and 'power relations' came to sideline problems relating to disciplinary variations. The nature of 'learning' (rather than 'learning *this*') became a centre of gravity for the organisation of both teacher preparation and research.

More recently, branches of cultural studies and critical theory have informed education, and focused in part on the diversity of the students now served by school systems that had been firmly built on assumptions of the monocultural and monolingual status of learners. Here the social and cultural nature of 'the learner' (rather than 'the learner faced with *this*') became an additional centre of gravity in educational practice. The psychologically-informed emphasis on the processes of learning has seen knowledge sidelined by a focus on knowing; the influence of cultural studies and critical theory has sidelined knowledge through a focus on knowers.

Nowhere have these excisions of knowledge cut more deeply than with respect to knowledge about language and communication, sets of understandings that we would imagine could have seriously informed the study of what was being learned by learners learning. As Christie has regularly documented (e.g., 1993), the rich traditions of grammar and rhetoric inherited from the Greeks and Romans were abandoned by twentieth-century educators to the point where several countries, including Australia, all but removed linguistically-informed knowledge about language and communication from the curricula of schools and teacher education programs. Where it survived in teacher education, generally as a form of educational, applied linguistics, it has generally done so in a 'bits and pieces' curriculum, drawing here and there

on fragments of one theory of language or another. One result has been the preparation of teachers and students with few coherent resources for talking in an informed way about their language. In this edition both Hammond and Schleppegrell have described some productive ways in which this situation can be systematically addressed, but in part what their work demonstrates most graphically is that, more than any other discipline area, knowledge of language has been ‘disappeared’ as an object of educational study.

With knowledge left out of the picture, debates have vacillated between ‘traditional’ pedagogies (‘teacher-centred’, ‘transmissionist’, ‘content-focused’, etc.) and ‘progressive’ or ‘constructivist’ pedagogies (‘student-centred’, ‘process-focused’, etc.). These discourses are conventionally cast as deeply oppositional, but in fact share both a tendency to offer solutions that are generalised across all subject areas, and a shared neglect of the potential significance of differences in the disciplines on which core curriculum areas are based.

For curriculum developers, the issues went even deeper. In recasting learners and learning, many social scientists, particularly in cultural studies, actively articulated challenges to the organisation, and even the organisability, of knowledge into disciplinary formations. The notion of disciplinarity became somewhat passé. The clarity and durability of disciplinary boundaries were questioned, and the relationship of such knowledge bases to the social lives of contemporary citizen-workers, especially young Net-Gen learners, was critiqued (Leonardo, 2004). Disciplines were viewed as historical conventions based on arbitrary regulations that stifle creativity, change, innovation, and the free play of free minds (Maton, 2000). More favoured was the development of accounts of teaching and learning that focus on differences among learners, which, as with most contemporary theories of learning, were agnostic on the matter of knowledge.

In this paper we try to frame considerations of language and literacy, and of the education of students with first languages other than English, within these ideas about the history of how and why knowledge has become close to invisible in our theoretical and research efforts in teaching and learning. In particular we build on the observations of contributors to this edition to refocus language and literacy educators on knowledge and disciplinarity, to see the challenges facing teachers of students for whom the language of instruction is not the first language as a specially visible display of a much broader set of problems arising from the lack of a common vocabulary for theorising knowledge and disciplinarity.

### *Discipline-specific language and literacy resources*

Various traditions in the philosophies of science and knowledge (e.g., Goldman, 2002; MacDonald, 1994; Shapin, 1995) allow us to view the knowledge settings of school work as sites of acculturation of novitiates in cognitive and

semiotic practices. These novitiates, we argue, are organised around some notion of a ‘discipline’ (Christie & Martin, 2007; Freebody & Muspratt, 2007). How best to organise knowledge is the focus of ongoing debate between educators and the stakeholders, of education. It has also resurfaced in such apparently non-philosophical settings as the production of Digital Knowledge Organisation Systems and Metadata Ontologies for use in machine-artificial intelligence (e.g., Sowa, 1999).

Disciplines can be understood as social fields of practice comprising both relatively formal structures of knowledge and practices, and actors who share interests and norms (whether explicit or tacit) of knowledge production and communication. Historians of knowledge who have documented the distinctiveness of the disciplines and their implications for good practice in education, point to how they have evolved historically to provide different kinds of answers to perennial human questions about the world and human experience. Each discipline, so this argument goes, has developed norms that are applied to the question of how it is that human experience can be converted into knowledge, and how that knowledge can be appropriately disseminated.

In one sense, then, disciplines are underpinned by agreements (which, of course, change over time and are always open to contestation) about how to address particular kinds of knowledge problems. They can be seen as more or less coherent answers to questions such as: *What counts as evidence? What counts as reliability? What counts as a way of disputing evidence or reliability? What is a Fact, and what an Opinion, and what is the relative significance of each? In summary, what counts as a ‘right’ answer and a ‘right’ way of getting to one, sufficient that we can know, and act on our knowledge?* Disciplines group clusters of facts and understandings (bricks and buildings, in Poincaré’s terms) and people who are attracted to similar answers to these questions (architects, builders, tenants). Further, for many ‘social realist’ thinkers these norms are more than historical conventions: Disciplines are seen to be based on differences in their objects of study. The issue at hand and the questions being asked about it help shape the ways the thought and research proceed, and tentative answers are evaluated. The architecture of each building is thereby also shaped by the ground it is built upon.

In educational settings these norms have often been translated into rules, leading to some characterisations of discipline-based programs as intellectually restrictive. But revisionist historians of knowledge have questioned this apparently ‘easy’ correlation of disciplinarity with deterministic learning. Anderson and Valente, for instance, emphasised that a discipline embodies a productive interplay between the constraining force of knowledge development, on the one hand, and the distinctive arena for enhanced intellectual agency that each knowledge domain offers: “the term ‘discipline’ captures the sense of a dual mandate, carrying a sense of practical regimen into an economy of conceptual enterprise” (2002, p. 4). It is this interplay of regimen

and enterprise, between epistemological constraint and insightful agency, that is the platform on which genuine conceptual innovation and progress can be made. Without this, some have argued, societies suffer from ‘historical amnesia’ (Moore & Maton, 2001), in which ideas are simply recycled, and where each generation is presented with the same puzzles, half-truths, and confusions as their intellectual ancestors (MacDonald, 1994). To put it bluntly, without the regimen we cannot tell a new idea from a good new idea from a sustainable good new idea; nor can we effectively transpose an idea from one discipline into another or into an inter-disciplinary setting because we cannot act on how one discipline’s regimen-enterprise interplay productively articulates with that of another.

So how to characterise disciplinary variation? MacDonald (1994) has offered one vantage point. She expanded on the relationship between human understanding and the evolution of disciplines in her study of academic writing across university discipline areas. She found that the disciplines differ on five major continuums:

1. in their identification of a central puzzle – a key topic (from compact to diffuse);
2. in the functions they serve in a society’s need to base action on knowledge (from explanation to interpretation);
3. in the main cultural work afforded by the knowledge (from advocacy of position to strictly production of knowledge);
4. in the way they focus on the current state of knowledge and debate rather than on the phenomenon/problem at hand (from conceptually-driven to textually-driven); and
5. in the extent to which the criteria for knowledge production are explicated (from explicit to implicit epistemic self-consciousness).

We can see how the features of texts and the demands of writing would be shaped according to a discipline’s position on each of these dimensions. The various ways the regimen-enterprise interplay works to test for truth value, display reliability, relate the general to the particular, scrutinise and challenge, manage the proliferation of interpretations of key findings, and so on, all have implications for how that discipline does its reading and writing business.

This is the strong form of this argument: that each discipline has its own distinctive set of preferred genres, ways of inter-relating and co-interpreting language and other modalities (Lemke, 1998), register combinations, ways of co-ordinating knowledge in language and image, ways of using abstraction and technicality, and so on – to summarise: its own take on the uses of literacy. This form of the argument speaks directly to the call in this edition, especially from Hammond’s and Gibbons’ papers, for a clearer sense of what constitutes intellectual challenge among curriculum developers, teachers, teacher educators and students, along with a clearer sense of the relationship

between intellectual challenge and language and literacy. Without such an understanding of what is involved in disciplinary literacy, students will be offered only a series of discrete skills or ideas rather than the basis for building their understandings over time – nice bricks, no plans.

### *Some ways of seeing knowledge at work*

How are the operations of disciplinary-based, cumulative learning visible in classrooms? To address this question requires a means of capturing variations in the structurings of knowledge, and then seeing how these are realised through language and communication, including in classroom interactions. It also requires a means of talking about these issues that moves beyond the metaphorical, ill-defined language in which disciplinarity and knowledge is often discussed. Here we suggest three inter-related ways of addressing these requirements for educators with an interest in language and literacy education. These approaches are drawn from studies in the sociology of knowledge, applied linguistics, and interaction analysis, and together, we suggest, offer a means of considering the problem of knowledge and of intellectual challenge.

Sociologists of educational knowledge, especially Bernstein (e.g., 2000), have developed tools for systematically conceptualising the underlying principles that generate forms of knowledge and how they develop over time. He explored the characteristics of ‘hierarchical knowledge structures’ that build and integrate knowledge, and ‘horizontal knowledge structures’ in which new ideas are aggregated. In recent years sociologists of knowledge have developed these ideas to provide a means of analysing the implications of the contrasting epistemological bases of subject areas (Maton, 2007, in press; Moore 2007; Muller, 2001).

In this approach a key issue is the contrasting affordances offered by different forms of knowledge. Studies show that different knowledge structures tend to develop over time in different ways and lend themselves more readily to certain forms of pedagogy than to others. Particularly useful, to teachers as well as researchers, are three sets of concepts that identify cumulative, integrated learning and the structural and epistemological features of disciplinary knowledge that enable it to happen.

First, the ways in which understanding of disciplinary knowledge develops over time can be conceptualised in terms of *cumulative learning*, where knowledge builds over time by integrating and subsuming previous knowledge, and *segmented learning*, where new ideas or skills are accumulated alongside past knowledge (Maton, in press). This contrast analyses the structure of knowledge in terms of its relation to other educational and everyday knowledge, the sequencing of learning, and the hierarchical arrangement of knowledge through a curriculum.

Secondly, for cumulative learning to take place, students need to be able to transfer knowledge between contexts and to build knowledge over time.

*Semantic gravity* refers to the degree of context dependence of knowledge, and shapes the capacity of students to move between concrete examples and abstract principles that go beyond the specific context (Maton, in press). Where semantic gravity is strong, knowledge is likely to remain weighed down in its pedagogic context, disabling transfer. *Temporal portability* conceptualises the capacity for bringing knowledge from past educational or everyday contexts into the present, and from the present into future contexts, affording students the ability to revisit, redefine, and extend previously studied concepts in relation to new ideas.

Thirdly, the ways these features of knowledge enable cumulative learning differs depending on the discipline. Students are provided, explicitly or tacitly, with different procedures to follow and these embody principles that underpin each discipline's knowledge. *Legitimation codes* provide a means of analysing the principles that establish 'what matters' (Lamont & Maton, 2008; Maton 2000, 2007; Moore & Maton, 2001). 'What matters' may, for example, include the display of skills and procedures (*knowledge code*), or of attitudes and dispositions (*knower code*), or of both, as the basis of legitimate learning. The ways such issues themselves matter is highlighted by how teachers and students negotiate two key challenges to cumulative learning: 'code clashes,' when students' beliefs and practices embody contrasting measures of achievement to those required for success; and 'code shifts,' when the basis of achievement changes between tasks, lessons, or curriculum stages.

Recently these sociological concepts have been integrated with concepts from Systemic Functional Linguistics and Semiotics (SFL/S) to analyse both the epistemological and linguistic features of disciplinarity (Christie & Martin, 1997; Coffin, 2006; Wignell, 2007). The focus here has been on the differences between the everyday discourses that students could be assumed to control, and the specialised 'uncommonsense' knowledge of schooling (Halliday & Martin, 1993; Martin, 2007a, 2007b; Martin & Veel, 1998; Martin & Wodak, 2003; Schleppegrell, 2004, and see this edition).

SFL/S affords close readings of language and other communication modalities, principally analyses of genre analysis, technicality and abstraction, exchange structure and appraisal, information flow, and multimodality. Each of these dimensions bears on the relationship between disciplinarity, cumulative learning, and language and literacy.

*Genre analysis* inquires into the global organisation of lessons from discipline to discipline (Christie, 2002), how knowledge is built in each discipline's reading materials, and how students produce texts for assessment purposes. A focus on the powerful and prevalent genres of classroom interaction, pedagogic materials, and student writing (Martin & Rose, in press) allows us to scrutinise the convergences and complementarities among these across disciplines and year levels. It is through aspects of *technicality and abstraction* that the distinctive knowledge of each discipline is constructed, especially through

processes of nominalisation, and, more specifically, ideational metaphor (Halliday, 2004; Martin, 2007a, b). *Exchange structure and appraisal* refers to a level of analysis that concerns the discourse structures involved in interactive scaffolding of knowledge (Martin 1992, 1999). Appraisal analysis illuminates the ways in which the values of a discipline are transmitted, including the degrees of emotional support provided by teachers to foster learning (Martin, 1992; Martin & Rose, 2007; Martin & White, 2005; Ventola, 1987). *Information flow* provides a focus on the interplay of familiar and new information as discourse unfolds (Martin & Rose, 2003), including analysis of predictive and summative moves at local and global levels of interaction. Finally, *multimodality* analyses draw on well-developed innovations in the analysis of modalities other than language (Kress & van Leeuwen, 2006; Ogborn, Kress, Martins, & McGillicuddy, 1996). Of particular interest here are O'Halloran's (2006) work on disciplinary discourse, especially mathematics, and Unsworth's (2001, and in press) studies of language and image. These analyses orient to the distinctive combinations of language and other modalities of communication in different phases of knowledge construction across disciplines (formulae, tables, graphs, diagrams, drawings, photographs, video, artifacts, gesture, kinesics, facial expression, classroom organisation, and so on).

These social semiotic analyses can be usefully supplemented with an inquiry into the kinds of interactional exchanges that characterise disciplinary formations. From Interaction Analysis (IA, see Drew & Heritage, 1992; Schegloff, 2007) we can draw key analytic points concerning whether and how it is that teachers signal context, time, and the differences between commonsensical and disciplinary approaches to describing, explaining, and producing discourses about the phenomena of interest. In terms of these features, we can note that Johnston & Hayes (this issue) describe the standard scripts of classroom interaction that set limitations on innovation. Their key observation for our purposes is that these ritualized interactional 'safety zones' are focused on the regulatory/management demands of teaching; they are not responses to the epistemological demands of the curriculum. That is, knowledge-related innovation is often constrained by the routines of behaviour management.

Three forms of observable discipline-distinguishing activity that arise from previous research are summarised here: accountability markers, formulations, and shuttling.

Teachers use a variety of *accountability markers* to indicate the knowledge and processes that students will be held accountable for knowing, the salient and portable learnings potentially relevant to future classroom work or assessment, or to applications outside the classroom. These accountability markers tend to appear prior to, during, and after the elaboration/activity phase/s of lessons and units, and consist of both emphasising moves (e.g., repetitions, pitch variations, multiple illustrations) and explicit connecting moves (e.g., *remember last week we ...*). Discipline-distinguishing activity is evident as well in the

*formulations* made by teachers and students. ‘Formulation’ refers to talk that steps back from, interprets, explains, summarises, and frames talk occurring before or after (e.g., *so what we just did was ...*), reiterating, reframing, redirecting or repurposing attention and/or activity. Such formulations, almost always made by teachers, are most likely to be found: i) at the beginnings of units and lessons, ii) at the ends, iii) at those points at which there is evident trouble of some sort jeopardising progress, and iv) at those points where there is a major change of activity or work configuration (Freebody, Ludwig, & Gunn, 1995). Finally, *shuttling* refers to the ways in which teachers and students engage in movements back and forth, for example between levels of abstraction and technicality in vocabulary, concepts and relations, genre choices, interactional formats, and so on (Freebody & Tan, 2004; Gibbons, 2006; Hammond, 2006; Heap, 1997; McHoul & Watson, 1984). Shuttling may also be observed in the well-documented Initiation-Response-Evaluation (IRE) cycle in classroom talk, whereby teachers use the E component to modify students’ candidate answers, recasting the students’ words into more elaborated, abstract, technical, or retro- or pro-spectively relevant words, concepts, and connections, and thereby recasting students’ knowledge from here-and-now, common-sensical to portable, discipline-based (Hammond & Gibbons, 2005; Lee, 2007).

These approaches can point to directions from which educators may wish to inquire about their own practices, and the kinds of practices that their students appear to have acquired from their previous educational experiences. Is the ‘problem of knowledge,’ as students construe it, about cumulative learning? Or about performance on disconnected segments of information and procedure? How might these issues differ depending on ‘what matters’ in the subject area? How are they reflected through the feature of language or in classroom interactions? Above all, these approaches offer a means of being able to see knowledge and to analyse its structure and the ways that help shape other features of teaching and learning. They highlight the centrality of disciplinary literacy and interaction for students (Freebody, 2007): they need to learn the reading, writing, talking, and listening rules of the game for each subject area if they wish to succeed.

### ***Conclusions: Why this matters***

Disciplinary-based knowledge and literacy are the touchstones by which students’ work is evaluated and their subsequent pathways marked out. Further, each discipline has its own codes for success, its own forms of mediation, and students begin to confront those code variations in earnest in their middle school years. At issue here is the adequacy of accounts of teaching and learning, especially language and literacy learning, that overly on generic categories of practice and people. A particular issue for the authors here is the differentially detrimental effects of such knowledge-generic accounts on students for whom the language of textbooks and instruction is not a first language.

Notions of knowledge and knowledge acquisition are at the heart both of educational decisions about curriculum, assessment and pedagogy, and of a community's understanding of the contribution schooling makes to the lives of its members as workers and citizens. They are critical elements of a contract, which schooling embodies, between governments and societies. We have argued that, however valuable the contributions of the conventional social sciences have been to educational thought and practice, they have also made opaque key questions about knowledge and knowledge development, such that this contract is jeopardised (e.g., see Tytler, 2007, on the 'Science Education crisis' in Australia). The regularity of media attacks on fundamental aspects of schooling and the curriculum, such as the 'literacy wars' (Snyder, 2008), are one reflection of this jeopardy.

The structures of knowledge areas need to be central factors in educational decision-making. The teaching and learning of knowledge, and of the forms of language whose variations embody that knowledge, are defining features of education. To ignore knowledge is to diminish the promise, practices, and social, cultural and economic consequences of education. More specifically, to ignore the implications of different structurings of knowledge is to be satisfied with universalist solutions that will continue to fail some learners in some communities, workplaces, and societies.

Contributors to this edition have outlined the problem and the kinds of support that teachers need to be offered and need to offer one another. What seems clear from the pieces collected here is that the generic metaphors of "deep understanding", "higher-order thinking", and "personal constructions of knowledge" now need to be translated into more specific, actionable ways of talking about knowledge. To work toward new forms of pedagogical interventions with only generic 'learners' and 'processes of learning' in the mix, without a strong conception of knowledge, is to continue to offer language and literacy education that favours those students who arrive already equipped with the means of successfully decoding the requirements of different subject areas. As Freebody and Muspratt (2007, p. 48) concluded disciplinarity-based language and literacy capabilities provide "resources for gearing young people into an 'explicable' world beyond the touchstones of the tribe – commonsense and dogma" and a variety of orderly, coherent ways of "cutting beneath the surfaces of experience." To 'disappear' knowledge and the issue of disciplinary literacy is to deny that we should systematically introduce all students to the best available collections of intellectual resources. It is to refuse knowledge while deeming person and process sufficient for educational theory, practice, and policy. Students need intellectual resources that will shape their ways of thinking, seeing and being, that will stay with them and find use throughout their lives.

Serious community concern over schooling and curriculum are not unexpected when workplaces are rapidly evolving, and new kinds of

knowledge work are reshaping labour markets. It is simply not an adequate response to these circumstances to focus on benchmarking Australian education systems through international comparisons on tests of generic literacy and numeracy skills. But the motivation behind cumulative, integrated knowledge development relates to the development of an inquiring and proactive citizenry as well as of an effective, flexible labour force. It arises from a recognition of the economic, social, and cultural importance of an intellectually fluent and sure-footed citizenry in an increasingly demanding global setting. Challenges such as climate change call for more and even more capable environmental scientists; perhaps more critically in democratic societies such as Australia, they call for voters who understand the role of science (Lanchester, 2006), a discipline-aware populace that constitutes a more sophisticated 'lay' readership, better positioned to make personal, community, and political choices.

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