ISSUES IN INTEGRATIVE STUDIES
No. 28, pp. 28-68 (2010)

# FOLLOWING THE YELLOW BRICK ROAD:

## Interdisciplinary Practices in the Land of Oz

by

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***Abstract***: This article explores the history and development of interdisciplinarity within the Australian context. Conditions and circumstances for the emergence of interdisciplinary approaches are explored with discussion identifying how these approaches impact and shape national curriculum, teachers' practice and pedagogy. Policies, proposals, and debate are continuing to call for interdisciplinary practices that make the curricula relevant, significant and focused on the needs of all Australians for the present and in the future. Examples of interdisciplinary practices provide an overview of how interdisciplinarity is embedded within school structures and education discourse across Australia.

**Key words:** Interdisciplinarity, curriculum integration, teacher pedagogy, curriculum influences, interdisciplinary approaches.

## Introduction

In 2008, education ministers from every state and territory in Australia agreed on a national set of educational goals for young Australians. Their shared vision, published as the *Melbourne Declaration on Educational Goals for Young Australians* (Ministerial Council on Education, Employment and Youth Affairs – MCEETYA, 2008a), sets out two fundamental goals



of education: that it should "promote equity and excellence" and that "all young Australians [should] become successful learners, confident and creative individuals and active and informed citizens" (MCEETYA, 2008a, p. 7). Among these lofty aims can be found another – that of promoting interdisciplinary thinking. While somewhat dwarfed by the sheer volume of essential purposes of schooling, there is nonetheless a recognition that creating successful learners necessarily entails developing the ability to work across disciplines. This rhetoric reflects a growing body of thought in Australia that advocates an interdisciplinary approach to the organization of content, in tandem with more holistic, problem-solving pedagogies (for example, Cole, 2008; Wilson, 2002, 2007).

This movement for an interdisciplinary approach, as Reid (2006) and the Curriculum Corporation (2007) have identified, is not new in Australia. For much of the last century there have been intermittent calls for a curriculum which is more relevant and interconnected, and less compartmentalized along artificial disciplinary lines. As noted by Brennan (2002) and Skilbeck (2007), in recent decades the policy rhetoric of interdisciplinarity has been through various interpretations in both system-level curriculum reforms and in school-based pedagogical innovations. For a number of reasons, not least of which is the historical and political evolution of the many educational jurisdictions in Australia, the implementation of these innovations has not been uniform (Venville, Wallace, Rennie & Malone, 1999). In this article, we explore some of the various manifestations of interdisciplinarity in education systems and schools across Australia. In so doing, we ask three key questions: Firstly, what are the various drivers behind the push to interdisciplinarity in Australian education systems and schools? Secondly, how have these contrasting forces engendered different interpretations of interdisciplinarity and differing practical responses? Thirdly, what is the future of interdisciplinarity in Australia?

In order to appreciate the hows and whys of interdisciplinary practice in Australian schools, it is first necessary to understand the structure and governance of education and the various forces which shape curricula in this country. To this end, this article begins with an explanation of the Australian education system, the structure of schooling, and the organization of subject areas. This is then extended by a brief explanation of the newly proposed national curriculum, current teaching standards and pedagogy, and the history of Australian school curriculum which has brought us to this point. Definitions of interdisciplinary approaches as they are used in Australia with particular reference to the practices encountered in specific states and territories and the differing schooling sectors are examined followed

by a conclusion which draws together thoughts as to how Australia might proceed in interdisciplinarity.

## 1. Context

Australia is a multicultural society of approximately 21 million people, with the vast majority of its population settled in cities along the eastern seaboard (Australian Bureau of Statistics, 2008). Australia began its white history as six separate British colonies, which were renamed "states" at Federation in 1901 (Brady & Kennedy, 2007). Australia is now a federation of six states: Queensland, New South Wales, Victoria, South Australia, Western Australia, and Tasmania; and two mainland territories: Australian Capital Territory and the Northern Territory. Under the federal system, powers are divided between the central (federal) government and several regional (state and territory) governments. Australia also has a long and esteemed indigenous history dating back thousands of years (Heiss, 2002), which is beginning to be truly recognized and appreciated as seen through the incorporation of Aboriginal history and perspectives included in the curriculum of schools and higher education.

### *1.1 Governance of Education Systems in Australia*

Since Federation, roles and responsibilities of state/territory and central federal governments have been clearly delineated in specific areas of legislative power, now enshrined in the Constitution. In brief, the Commonwealth Government has responsibility for the majority of taxation as well as defense, immigration, foreign affairs, postal and telecommunications services and universities (Australian Government, 2009). The states retain legislative power over all other matters that occur within their borders, including police, hospitals, public transport and school education (Australian Government, 2009). This leaves the Commonwealth Government with no constitutional authority to pursue its agendas through the school curriculum.

The states' responsibility for schools includes providing the bulk of funding, and setting and managing the curriculum (Smith & Lovat, 2003). There is, however, some scope for federal intervention in what would otherwise be a state concern. Since the Whitlam government in the early 1970s, when the Commonwealth first began providing funding for non-government schools, successive Commonwealth governments have attempted to exert influence over what is taught in schools (Skilbeck, 2007). This influence has at times



been wrought through funding specific projects that serve the "national" interest. For example, Commonwealth financing is now linked to specific legislative requirements in relation to assessment and reporting (Brady & Kennedy, 2007). More recently, the Rudd government provided funding for all secondary schools in Australia to purchase laptop computers in a minimum ratio of 1:2 for students in Years 9 to 12 (Australian Labour Party, 2008). These funding initiatives give the federal government considerable leverage that is proving not insignificant.

The historical origins of these separate colonies and the resulting federal structure has led to the evolution of eight separate school educational jurisdictions. This political structure has inevitably resulted in a diverse range of school curricula. There are currently 11 main policy-making bodies—up to 34 when all additional organizations are included—developing curricula across the states and territories (Leech, 2008). As a consequence of this diversity, in senior secondary courses across Australia there are 27 different mathematics unit offerings, more than 20 different history unit offerings, and 18 different English unit offerings available (Matters & Masters, 2007). When it comes to final school-leaving examinations, Australia has 9 different senior secondary certificates—10, if the International Baccalaureate is included (Masters, 2006b; Clements, 2007)—as outlined in Table 1. In a country with the population less than that of many American states, this situation could be considered bordering on the ridiculous.

**Table 1**
**Current Australian Senior School Certificates**

| State/Territory | Senior School Certificate |
|---|---|
| ACT | ACT Year 12 Certificate |
| NSW | Higher School Certificate |
| NT | Northern Territory Certificate of Education * |
| QLD | Queensland Certificate of Education |
| SA | South Australian Certificate of Education |
| TAS | Tasmanian Certificate of Education |
| VIC | Victorian Certificate of Education<br>Victorian Certificate of Applied Learning |
| WA | Western Australian Certificate of Education |

* Based on procedures of the Senior Secondary Assessment Board of South Australia (Masters, 2006a)

## *1.2 Structure of Schools*

Overall, Australia's education system is based largely upon Anglo-Saxon traditions, especially the UK model which is the product of the influences of British colonization from 1788. Education covers the broad spectrum of early childhood, primary (or elementary), secondary, and tertiary education in the form of university, college or trade qualifications. Education is compulsory for all students from approximately 5 to 15 years of age although there are slight variations from state to state, with the leaving age now under national review and planned to be set at 17 years of age from 2010 (Angus, Olney & Ainley, 2008). Approximately 32% of the population is currently enrolled in compulsory education with declines to 26% in future enrollments predicted due to a declining birth rate (Hugo, 2000). An overview of schooling ages and divisions is provided in the following Table 2.

**Table 2**
**Comparison of Ages and Grading Across States and Territories**
(adapted from Pepper, 1998)

| States/ Territories | Primary School | Middle School | Secondary/ High School | College |
|---|---|---|---|---|
| **Australian Capital Territory** | Kindergarten to Year 6 | No | Years 7 to 10 | Years 11 to 12 |
| **New South Wales** | Kindergarten to Year 6 | No | Years 7 to 12 | No |
| **Northern Territory** | Transition to Year 6 | Years 7 to 9 | Years 10 to 12 | No |
| **Queensland** | Preparatory to Year 7 | No | Years 8 to 12 | No |
| **South Australia** | Reception to Year 7 | No | Years 8 to 12 | No |
| **Tasmania** | Preparatory to Year 6 | No | Years 7 to 10 | Years 11 to 12 |
| **Victoria** | Preparatory to Year 6 | No | Years 7 to 12 | No |
| **Western Australia** | Pre-Primary to Year 7 | No | Years 8 to 12 | No |



In most Australian schools, primary classes are generally formed on the basis of one classroom teacher for each group of children. Though contact with other teachers can occur throughout the school day, most children in primary schools in NSW are taught by their classroom teacher for the majority of the time (NSW Board of Studies, 1996). Increasingly, one or more of the "specialist" subjects (for example, physical education; music; science, or information communication technologies) are taught by someone other than the classroom generalist, often as a means to providing formal release from face-to-face teaching for the classroom teacher. In general, however, the primary teacher is responsible for delivering instruction across most or all curriculum areas (called Key Learning Areas or KLAs in some states). This structure allows teachers in primary schools to make links across disciplinary boundaries and to integrate generic skills and competencies. They are well situated to implement rich learning tasks based on real-world problems, which promote deep understanding and reduce unnecessary repetition across the curriculum. A number of these interdisciplinary practices are described in depth in Section 1.6.

Upon entering secondary school, students face a starkly contrasting environment. In most secondary schools, teachers tend to specialize in one or two teaching subjects. The high degree of subject specialization which teacher accreditation bodies insist on perpetuates this situation. The learner's day in secondary school is divided into anything from four to eight lessons or "periods," and students move from room to room, subject to subject and teacher to teacher. Endeavors to integrate content across subject boundaries in secondary schools therefore face logistical challenges due to the constraints of timetables and because "most secondary teachers have a much narrower focus in their teaching" (Killen, 2005, p. 91).

## *1.3 Organization of Subject Areas in Australia*

In most states and territories, the curriculum is essentially subject-based, comprising traditional academic disciplines that can be traced back to their British roots. The dominant structure of school space, timetables, and staffing, especially in secondary schools, still revolves around vertically integrated knowledge: the curriculum is organized into subjects or Key Learning Areas (KLAs), and professionals are organized into discipline-based departments (Bentley, 2002). It should be noted, however, that there is a growing movement towards middle schooling. This movement according to Brewer (1999) and Barratt (1998) challenges these vertically streamed structures by pursuing a more integrated curriculum model in the early stages of secondary education, similar to that of primary schools.

The Key Learning Areas (KLAs) are not all equally presented or timetabled in compulsory schooling with English and mathematics perceived as the cornerstone of education, especially in the early years of schooling (MCEETYA, 2008b). These two subjects therefore take up the majority of class time in both primary and the compulsory years of secondary schools. Other subjects mandated in state syllabi include science (in some states this includes technology); Studies of Society and Environments (SOSE or HSIE, which may include history, geography, and economics); creative and performing arts (in various combinations of dance, drama, music, visual arts, and media studies); personal development, health, physical education (PD/H/PE); Information and Communications Technology (ICT); and occasionally Languages Other Than English (LOTE). In addition to subject-specific content, numerous cross-curricular perspectives run across core KLAs in several states. These include aspects of ICT, indigenous perspectives, and values education, among others.

**Table 3**
**The Key Subjects in the Core Curriculum of Australian Schools**
(adapted from Brady & Kennedy, 2007)

| **Australia** | **NSW Primary** | **NSW Secondary** |
|---|---|---|
| English | English | English |
| Mathematics | Mathematics | Mathematics |
| Science | Science and Technology | Discrete disciplines, increasingly specialized post Year 10 |
| Studies of Society and the Environment (SOSE) | Human Society and Its Environment (HSIE) | Discrete disciplines, especially post Year 8 —e.g., History, Geography, Commerce |
| PE and Health | Personal Development, Health and Physical Education (PD/H/PE) | Personal Development, Health and Physical Education (PD/H/PE) |
| The Arts | Discrete disciplines: Dance, Drama, Music, and Visual Arts | Discrete disciplines |
| Languages Other than English (LOTE) | Individual school basis: non-core | Individual school basis: non-core |
| Technology | Science and Technology | Discrete disciplines, increasingly specialized post Year 8 |



Table 3 (preceding page) illustrates the most common compartmentalization of content into subjects and KLAs across Australia and in New South Wales (NSW). As has been outlined, there are regional variations, but the New South Wales model provides a general example of what can be found in Australian schools.

## 2. Conditions and Circumstances for the Emergence of Interdisciplinary Approaches

There has been an unprecedented rate of change in the 20th century which has impacted all aspects of life especially in areas of social, technological, and economic domains, accompanied by significant advancements due in part to a rapid knowledge explosion (Lingard, Hayes & Mills, 2003). In addition, there have been calls for reduction in the breadth of the curriculum, which many stakeholders have claimed results in an overcrowded curriculum (Froude, 2005). In this information-saturated world Ewbank (2007) suggests "it makes sense that old, content-driven concepts of curriculum need to be overhauled. There is simply so much 'stuff' out there, that it is unreasonable to expect any one person—student, parent or teacher—to master all of it" (p. 31). Hence, writers such as Wilson (2002) and Godhino (2007) argue curriculum must facilitate deep knowledge and understanding where the benefits of interdisciplinary studies could facilitate more meaningful and relevant learning. Therefore, for a curriculum for the 21st century to take account of these powerful past influences and embrace many of the current issues, it will need to respond to issues that are facing Australia and the world and also prepare students for a world that is unknown (Minnis & John-Steiner, 2005). Some of the current issues facing Australia and other nations that require a curriculum response are listed in Table 4 (next page).

It is now widely acknowledged that these broad issues and problems facing global societies are increasingly complex and interdependent (Klein, 2004). Working through these problems and others will depend on deep knowledge and understandings. The National Curriculum Board (2008) suggests then that emphasis should also be placed on the processes that encourage rigorous scientific investigation rather than simply focusing on content alone.

**Table 4**
**Current Issues Facing Australia Requiring a Curriculum Response**
*(adapted from Wilson, 2007) and Cole, 2008)*

| Current issue | Curriculum response needed |
|---|---|
| Global integration and international mobility | Students need to learn to work in multinational teams with a heightened awareness of other cultures and second language skills. |
| Globalisation of economies | Students need to have an understanding of world cultures specifically Asian countries such as China and India. |
| Reliance on international markets | Students need to have a global outlook and international competence. |
| Technological change and impact on demand for skills | Schooling needs to be delivered with a strong emphasis on technological skills and knowledge. |
| Concern about skills shortages in certain area such as mathematics, science and technology | The curriculum needs to ensure that students are undertaking these areas at high levels of competence. |
| Complex environmental, social and economic pressures. | Students need to know about these complexities, the effects of them and how to further global sustainability. |
| Increases in population diversity | Students will need to appreciate and respect other cultures than their own within society. |
| Australia's changing role and actions in the world , in particular the surrounding region | Students will need to learn about countries geographically closest to Australia and the ways in which Australia responds economically and, in some cases, in a military capacity. |
| A knowledge economy generating wealth and jobs | Students need to be able to identify problems, work in multidisciplinary teams, identify and manage solutions whilst communicating effectively. |

## *2.1 The National Curriculum*

The national curriculum movement in Australia is a joint initiative of the different states, territories and federal governments. It supports deep learning and general capabilities, and cross-discipline perspectives such as indigenous studies, sustainable patterns of living and Australia's engagement with Asia (Australian Curriculum, Assessment and Reporting Authority, 2010). The Australian Curriculum, Assessment and Reporting Authority has the charter to develop a national curriculum in specific subject areas, which could be viewed as working against interdisciplinary practices. However, pedagogy is not being mandated so schools and teachers will still be able to integrate across curriculum areas (National Curriculum Board, 2008).

The movement towards a national curriculum is not new, but more recently this pressure has grown with significant action from the federal government since 2003 (Watt, 2008). The pressure has shifted from focusing on establishing national consistency to introducing standards-based education through the implementation of proposed core curriculum across key learning areas. The emphasis is on essential content to be implemented through pedagogy centered in problem solving to develop analytical skills and critical thinking (Matters, 2007). Accordingly, the proposed national school curriculum takes account of Australia's position in the world by providing "flexible curriculum frameworks based on a rationale present disciplinary and interdisciplinary content attuned to stages of students' learning agreed through a consultative process" supported by effective capacity building of teachers in schools (Watt, 2008, p. 11). Hence, the national curriculum is placing the need for interdisciplinary practices firmly on the agenda.

The national pressure for control of education to produce a skilled and flexible workforce enabling Australia to compete in the global context has three distinct but inter-related prongs. These are:

a) national assessment and reporting structures from K-12 using a framework of standardized reporting tools from A-E;
b) control over content and skill development for teacher education and graduate teacher professional development that has defined teaching standards and is establishing a national body for continuous teacher accreditation; and
c) current plans to establish a national curriculum for the compulsory years of education for approximately 80% of the timetabled hours of content (Wilson, 2007).

Thus the federal government has in effect begun slowly to take control of education in Australia even though it is a state responsibility. Whether this is a welcome change in direction remains to be seen. In the future it is likely

to attract rigorous debate and opposition, but in its present form the change processes appear to be accepted and even welcomed by state governments and other key stakeholders in education. This positive response is evidenced with the recent release of the *Melbourne Declaration of the Educational Goals for Young Australians* in December (MCEETYA, 2008a) where Australia's state and territorial ministers of education made a collaborative statement that charters education across Australia for the next decade. This most recent set of educational goals has effectively become one of the drivers of interdisciplinary practices in Australia.

While planning and managing the curriculum remain the responsibility of states or territories, funding of education is shared between state and federal governments and is delivered according to goals, needs, and demographics. This situation has recently seen significant changes through a strong and determined drive towards a national curriculum that has been heralded by the implementation of compulsory national testing in literacy and numeracy across all education sectors in primary and secondary education. This has been accompanied by a shift towards a standardized core curriculum in English, mathematics, the sciences, and history (Australian Curriculum, Assessment and Reporting Authority, 2010) that will be planned, implemented, and assessed by the federal government. All states and territories must comply by 2011 if they want continued federal support and funding. As identified by Reid (2006), successive federal governments "have made it clear that they intend to use whatever means they have to pursue their version of national consistency, using financial muscle to get their way" (p. 55). This reform movement has not been without criticism. Writers such as Kennedy (2008) and Skilbeck (2007) argue a centralized curriculum is reductionist and does not meet the needs of students at a school-based level as the notion of "one size fits all" is farcical. Most of this argument lays claim that students "need a locally relevant and meaningful curriculum that will allow them to grow and develop as individuals and citizens" (Kennedy, 2008, p. 12).

Nevertheless, the key proposals for a national curriculum are currently being developed to do more than simply reconcile state and territory differences as this will have little impact on the need for a curriculum for the 21st century. Hence the national curriculum is not only concerned with core knowledge and skills to be learned by all students in the compulsory years of schooling but supports interdisciplinary study and the promotion of "big picture" general knowledge (Cole, 2007). The national curriculum also promotes global perspectives and seeks to build knowledge and skills that will help students to process complex ideas and information and apply



them to real-life situations. As determined by the National Curriculum Board (2008), this enables "multidisciplinary capabilities that draw on knowledge and skills from different disciplines and can be applied to new challenges, such as climate change, genetic engineering and understanding and managing cultural difference" (p. 5). Curriculum documents will include cross-curriculum learnings where "advisory groups will determine which cross-curriculum learnings are most appropriate and to what extent they should be taught" (Australian Curriculum, Assessment and Reporting Authority, 2010, p. 1). The national curriculum also plans to develop personal and interpersonal skills to sustain a healthy lifestyle and build positive relationships with others (Cole, 2008). This curriculum is not envisaged to consume all of a school's learning time, so school-based curricula focused on students' needs are still an important aspect. Thus there will be flexibility for local variations of teaching and learning which are able to adapt to the varying contexts across Australia.

However, change is often not so simple as it is conceived. Another argument that is gaining strength is concern over what is considered essential or core learning. Many teachers, particularly in secondary schools, are specifically trained in their subject area and find it very difficult to think or collaborate with other teachers beyond this frame of reference (Ewbank, 2007). Therefore any move towards a national curriculum will need enormous professional development of teachers towards adopting broader perspectives and helping them to work across disciplines in a collaborative manner. Regardless of this concern, the ministers of education across all states and territories have already made a commitment to the development of nationally consistent curricula that will set core content and achievement standards that are expected of all students and will form the basis for national testing and measurement programs (Reid, 2006).

## *2.2 Teaching Standards*

Coupled with the national curriculum movement are the developments of national teaching standards and accreditation processes for teachers including the formation of a framework for national pedagogy to guide teachers' practice (Dinham, Ingvarson & Kleinhenz, 2008). Research in the past decade has consistently reported that it is the teacher that makes the difference to student learning outcomes (Armstrong, 2004; Fullan, 2003, 2005; McInerney, 2004; Hattie, 2003; Zammit et al., 2007). In fact, Rowe (2003) argues "the quality of teaching and learning provision are by far

the most salient influences in students' cognitive, affective, and behavioral outcomes of schooling—regardless of their gender or backgrounds" (p. 1). As learning outcomes are attributed 55% to 60% to the teacher, 35% to the student and 5% to the school (Rowe, 2003), it is logical that strategic teacher professional learning has become the focus of governments and organizations involved in the initial training and continual education of teachers. The argument claims if you can improve the quality of teaching through building teacher capacity concerned with pedagogy, then student learning outcomes should also improve (Curriculum Corporation, 2007). Thus the focus on improving educational outcomes is firmly set on teachers and their practice.

Hence Australia, amongst other countries, has embarked upon establishing frameworks of practice, consisting of competencies that need to be demonstrated by teachers at varying times throughout their careers to maintain accreditation for teaching (Teaching Australia, 2008a). These frameworks which describe the nature of teachers' work are often arranged around broad domains of professional knowledge, professional practice, and professional commitment, as evidenced in NSW Institute of Teachers, Professional Teaching Standards (2004) (a state example of political determination in education). Attainment of these standards is to be demonstrated and documented by teachers at different stages of their careers, requiring teachers to continually engage in professional development activities in order to improve their professional knowledge and practice. Teachers are also expected to supply evidence of their achievements to a Teacher Accreditation Authority that will create processes to observe their teaching and examine their documentation. Thus "teacher registration and the accompanying moves to accredit teacher education courses are part of wider accountability movements to assure better teachers and schools and strengthen the quality and status of the teaching profession" (Ingvarson, Elliott, Kleinhenz, & McKenzie, 2006, p. 11).

## *2.3 Teachers and Pedagogy*

These political changes in directives from both state and national governments have occurred during a period of intense research regarding pedagogical innovations where much attention has been placed upon pedagogies to improve student learning outcomes. One example of this is Queensland's Productive Pedagogies framework, which has been described as "classroom strategies that teachers can use to focus instruction and improve student outcomes" (The State of Queensland, Department of



Education and Training, 2004a, p. 1). When planning learning experiences, teachers can review the pedagogies to see which are best suited to teaching the particular knowledges and skills involved. Hence several interpretations of interdisciplinarity, from a national policy-level push for cross-curricular key competencies and core curriculum to state system-based curricula that focus on mandatory learning outcomes for students and teaching standards for teachers, have impacted the current education milieu in Australia. This and other state pedagogic frameworks have culminated in the recommendation for the establishment of a national center for pedagogy for the enhancement of quality school education which will encompass three related and integrated elements of curriculum, pedagogy and assessment (Teaching Australia, 2008b). The goal of the national center is to make "a significant contribution to quality teaching, leading to increased student achievement and national productivity gains" (Teaching Australia, 2008b, p. 3). Once again, economic rationalism is at the heart of this movement as the federal government wants an educated and skilled workforce able to engage in the global economies as it is envisaged that enhanced learning outcomes will bring national benefits (Curriculum Standing Committee of National Education Professional Associations, 2007).

As a result of the numerous advances and changes in pedagogy, teacher education in Australia has repositioned itself, resulting in new programs designed so they "encompass the development of interdisciplinary teams" and "incorporate problem-based and investigative approaches and incorporate pedagogies that promote active learning" (Aspland, 2008, p. 188). With the implementation of the national curriculum, teacher education will also need to adopt a more national perspective, which will have implications for pre-service and graduate professional development at all levels. However as Kennedy (2008) warns us, it is not about a standardized curriculum; rather "it is teachers who make the difference in the lives of children and young people… Invest in creating highly educated, well motivated and highly valued teachers and the rest will follow" (p. 14).

Therefore the focus should not be on what is taught (the content) and why this should be included (rationale) but how it is taught (pedagogy), which is the lifeblood of teachers (Curriculum Corporation, 2007). The proposal for the establishment of a national center for pedagogy is an attempt by the federal government and other key stakeholders to promote greater collaboration among teachers. It is envisaged that a national center will improve the quality of teaching, through breaking down professional isolation by fostering learning communities within and between education

workplaces. This can be achieved by pooling the knowledge of professional organizations, bridging the theory-practice gap by assisting the work of teachers as researchers, and "providing the opportunity to bring expertise together in a way that benefits teaching across the country regardless of jurisdiction and teaching context" (Teaching Australia, 2008b, p. 10). It is in this arena that the need for interdisciplinarity focusing on problem-solving skills has been realized and will shape the changing curriculum over the next decade (Masters, Forster, Matters & Tognolini, 2006). The following section briefly reviews the history of interdisciplinary approaches in Australia.

## 3. The Evolution of Interdisciplinarity in Australia

There is a long history of attempts to build links across disciplines in schools in Australia. However support for, and implementation of, interdisciplinary initiatives has been varied and intermittent. The following section traces the roots of current practices, with a view to establishing how we ended up where we are today in terms of our interdisciplinary practices.

The question of "to integrate-or-not-to-integrate" is inextricably linked to the fundamental question of the purpose of education itself. Throughout Australia's white history, curriculum has constantly evolved to meet ever-changing views on the purposes of schooling. In the early years of the British colony, schooling was seen as beneficial for both the children and the colony. Initially, "its purpose was to curb and discipline individual students and then to curb and discipline the society itself" (Groundwater-Smith, Ewing & Le Cornu, 2003, p. 26). Early schools closely followed the three-level model inherited from our English roots. That is, children of the ruling classes had private tuition, and children of the middle classes attended private schools, with public and church schooling available for the children of the poor. Education was very much seen as "an agency to sort and distribute people into appropriate roles, including gender roles, occupational categories and life chances" (McBurney-Fry, 2002, p. 2). By and large, there was little change in the curriculum in Australian schools for the first 100 to 150 years of white settlement. Most of the time, teaching and learning comprised the rote learning of facts, with the teacher's role being to provide facts for pupils to recall. Generic skills such as thinking skills and problem-solving abilities had little place in schools, and there is little evidence of educators making explicit links between the discrete academic disciplines.

The first signs of change in Australian curricula occurred in the 1920s and



1930s (Brady & Kennedy, 2007). Early moves to reorganize the curriculum and classroom practice were strongly influenced by the American progressive education movement of the early 20th century (Columbia Encyclopedia, 2008). The first Australian section of the New Education Fellowship (NEF) was formed in 1937 and, through its conferences, Australian educators came into contact with the theories of progressive educators such as John Dewey, Thomas Hopkins, and Harold Rugg (Parry, 1998). At these early NEF conferences, these progressives "questioned the capacity of the traditional academic curriculum to deal effectively with the individuality of the child" (Parry, 1998, p. 79). It worth noting that interest in interdisciplinarity stemmed from the United States rather than Great Britain "since essentially it represented a challenge to the grammar school curriculum that Australian schools had inherited from their colonial past" (Brady & Kennedy, 2007, p. 86).

The Deweyian notion of a "democratic" education advocated units of work that are organized around a central theme which is related to the students' own interests, and within which concepts are applied from one discipline to another (McInerney, 2004). Similarly, Thomas Hopkins in 1932 advocated a curriculum organized around the needs of the learner and utilizing content from all areas, regardless of subject division (Wallace, Sheffield, Rennie & Venville, 2007). Parry (1998) cites Rugg as particularly influential, through the NEF, in urging Australian educators to focus on the "fusion" of the separate disciplines of history, geography and civics into social science, and on the adoption of teaching approaches that emphasized student-directed learning. These ideals helped to reshape curricula and by the late 1930s the first Australian experiments with integrated curriculum were underway. These early moves towards a more unified and relevant school curriculum can be seen as the foundation of many curriculum and pedagogical developments today (Wallace et al., 2007).

Though experimentation began in the 1930s, it was to be several decades before interdisciplinary practices became more widespread. Considerable educational change occurred in the years following World War II, as the expansion of schools caused by the post-war baby boom and increased migration led states to reshape the curriculum to meet changing needs (Reid, 2005). One of the most obvious manifestations of working across disciplinary lines was the merging of history, geography and civics education and the consequent formation of a new disciplinary field—social studies—which took place in most Australian states and territories from the 1940s to 1950s (Parry, 1998). This was viewed as both a more humanistic approach and a more effective way to prepare young people for the problems of living

in a rapidly changing, democratic world (Department of Education, Science & Training, 2002). These subjects remain as one KLA (Key Learning Area) across Australian primary schools today, most commonly known as Studies of Society and its Environment (SOSE) or Human Society and its Environment (HSIE).

The 1970s saw another era of experimentation in curriculum, school structures, and pedagogy. Alternative approaches proliferated, such as those developed by Montessori with its child-centered emphasis and stress on intellectual, social, emotional and spiritual development (Montessori Australia, 2009); Steiner with its focus on the whole development of the child (Hale & Maclean, 2004; Rudolph Steiner Schools of Australia, 2009); and the open-plan classroom. This experimentation coincided with the first practical moves towards a national approach to curriculum with the establishment of the National Schools Commission in 1973 (Reid, 2005). Many of these approaches advocated an interdisciplinary approach and, since that time, support for curriculum integration has continued to grow. As Klein (2006) has noted in the U.S. context, the term "curriculum integration" has since become a generic term to describe a variety of approaches that draw on more than one subject or discipline.

While the structure of schools remains largely dictated by school subjects, there have recently been concerted efforts by Australian educators to move towards more integrated approaches to the effect that in Australia today, several Commonwealth statements and state curriculum documents such as those of the Department of Education, Science and Training (2005) advocate an integrated approach to teaching and learning. In some states, and at some levels, there has been a considerable amount of innovation and activity. For example, there are middle school associations and annual conferences held to support more structural cross-curricular approaches. Many larger secondary schools have organized their lower secondary years into middle school structures engaging specific teams of teachers who work together across different subject areas in order to integrate key learnings and understandings. Integration is now a widely applied approach to the teaching of ICT, and a cross-curricular approach is apparent in such diverse areas as values, civics education, and indigenous perspectives. In some cases, integration of the curriculum has been accompanied by structural reforms such as the middle school movement, and/or by more student-focused and problem-based pedagogies such as rich learning tasks (Barratt, 1998).

At the level of classroom practice, however, there is wide variation in the implementation of curriculum integration. In secondary schools it is difficult



to find many examples of true interdisciplinary study, and in many primary schools the day remains divided into separate components, with little connection being made between disciplines. Yet in other primary schools and middle schools, the majority of the curriculum is organized thematically, encompassing several key learning areas within a theme (Groundwater-Smith, Ewing & Le Cornu, 2003).

In and around all this innovation, the question of whether "to integrate or not to integrate" remains contested particularly by the practitioners. There is an ongoing argument between those who advocate integrated teaching and those who are anxious to maintain the integrity of the discrete disciplines. One example of this debate revolves around the merits of integrating the traditional disciplines of history and geography into one KLA. At the secondary school level, there are particularly strong calls in defense of the discrete disciplines (for example, Venville, Wallace, Rennie & Malone, 2001). Another example revolves around whether disciplinary and interdisciplinary approaches are mutually exclusive—asking whether learners need to be secure within disciplines before they can successfully integrate knowledge beyond disciplinary borders. Overall, it is clear that interdisciplinarity features prominently in curriculum discourse in Australia today.

## 4. Current Definitions of Interdisciplinary Approaches in Australia

Youngblood (2007) argues that "no discipline is an island entire in itself" (p. 1) as each one overlaps, borrows or often travels on the same yellow brick road together with others. Nonetheless, as our history demonstrates, subjects have been compartmentalized and separated to ensure coverage in each area and depth of treatment. Calls for multi-, trans-, and inter-disciplinarity have elicited responses in Australia that vary according to school structures, state educational authorities, and national directives. As has been explained, initially the bridging disciplines such as the social sciences became one answer in Australia to acknowledging that subjects do overlap and have skills and knowledge in common (Youngblood, 2007). However, interdisciplinary studies since then have been about so much more. Interdisciplinary approaches are concerned with growth and change, challenging and disrupting, and current ways of thinking and acting. Interdisciplinary studies are about finding connections between the disciplines to forge new ways of thinking, not with the intent to bring out conflict between the disciplines but to encourage and foster respect for

what each has to offer (Cook-Sather & Shore, 2007). So, how might these interdisciplinary approaches to education be defined? A brief inventory of common understandings of such approaches with an introductory statement concerning how these are implemented in an Australian context is provided in the following section.

Multidisciplinarity appears to be the lowest level of integration (if one were to attempt to place differing interdisciplinary concepts on a continuum), and is generally defined as the drawing of connections across disciplines in a complementary manner. This may involve relating what is learned in one subject to another in such a way that the concepts reinforce each other, but the original disciplines remain intact (Klein, 2006). Jolly, Goos & Short (2004) assert that it is necessary to go beyond this level to do justice to education in context. As will be described in greater detail in the section describing current examples, the NSW Board of Studies seems to take this approach more commonly in answer to the need for cross-curricular approaches. New South Wales' state-based definition of cross-curricular teaching and learning is vague and lacks clear guidelines for how it should be addressed. This is evidenced by the cross-curricular directives given through the education board that merely require teachers to enhance connections across subject areas and transcend individual disciplines (NSW Board of Studies, 1996). Thematic approaches to curriculum have, over the years, been quite popular as a response to a call for integration particularly in the primary schools sector. This remains still within the multidisciplinarity approach to cross-curricular perspectives.

An alternative interdisciplinary approach—interdisciplinarity, as defined by the Organisation for Economic Co-operation and Development (OECD—allows for a range of interpretations: "… the interaction among two or more different disciplines. This interaction may range from simple communication of ideas to the mutual integration of organizing concepts, methodology, procedures, epistemology, terminology, data, and organization of research and education in a fairly large field" (Franks, Dale, Hindmarsh, Fellows, Buckridge & Cybinski, 2007, p. 170). The term interdisciplinarity in Australia is often used to describe a range of broad policy level initiatives aimed at drawing links across disciplinary boundaries. Examples of these include cross-curricular linkages where perspectives such as values education, literacy skills, understandings about indigenous peoples, and competencies are concerned with preparing students for the workforce.

The interdisciplinarity approach also changes the focus of the learning process where learning is more concerned with the strategies of problem



solving rather than the delivery of content. Disciplines are content focused creating domains, and these domains serve to guard territories and attitudes of dominance. Interdisciplinarity is not centered in content; rather critical thinking is at the core and a solution to a problem is viewed from many perspectives. This increases the relevancy of the disciplines and draws from a range of knowledge and processes. "By focusing on process and problem-solving rather than domain" (Youngblood, 2007, p. 5) connection and integration between disciplines are forged. Thus the formation of questions in interdisciplinary approaches is critical to problem solving and it allows students the opportunity to make new discoveries, design new methodologies and challenge "taken for granted" assumptions and traditional ways of knowing.

While interdisciplinarity has begun to appear in relation to more formal documents in school education, the term more commonly found in discussions of interdisciplinary practices in Australian schools is that of curriculum integration. As Lenoir, Larose and Geoffroy (2000) similarly found in Quebec, in Australia subject matter integration has largely replaced interdisciplinarity, at least at the level of school curriculum planning and teaching practices. The term interdisciplinarity, and indeed, integration, is used to refer to a range of educational structures and practices, and consequently has several meanings.

In Queensland, curriculum integration pursues the more problem- or inquiry-based method requiring students to solve problems and answer questions using all available content and processes in their repertoire. This type of integration appears to align itself more closely to that of interdisciplinarity defined by Youngblood (2007, p. 2) as "a relatively new form of problem-oriented critical thinking focusing on process rather than domain." Queensland's Rich Tasks (which will be explained more fully later) are mirrored by this definition of school interdisciplinarity provided by Lenoir, Larose and Geoffroy (2000):

> It [interdisciplinarity] is the interrelationship of two or more school disciplines exercised at the curricular, didactic, and pedagogical levels, leading to the establishment of links of complementarity, cooperation, interpenetration, or reciprocal actions among diverse aspects of the curriculum (study matter, concepts, learning methodologies, technical abilities, etc.) in order to promote the integration of learning and knowledge by the student. (p. 105)

These twin notions of curriculum planning and pedagogy can be seen in many interdisciplinary innovations in Australia, such that "interdisciplinary education at all levels intersects with innovative pedagogies that emphasize exploration and active involvement in the process of making meaning" (Klein, 2006, p. 15). True interdisciplinarity therefore re-conceptualizes the role of teacher and learner, where the teacher becomes more of a guide or a facilitator while students actively engage in cooperative learning and problem solving.

Within each state or territory, educational system, region and school there are variations of how curriculum integration/interdisciplinarity is conceptualized, practiced and evaluated. The following section illustrates various examples of curriculum integration practices currently employed in primary, middle and secondary schools.

## 5. Current Examples of Interdisciplinarity in Australian School Practice

Education authorities across Australia's states and territories currently support a range of initiatives that encourage integrated forms of curriculum. Summarizing briefly they are:

- the NSW Board of Studies provides teachers and parents with examples of integrated units, normally composed around a theme, through its online resources. (NSW Board of Studies, 2007a).
- Queensland's response has been the development of a number of cross-curricular Rich Tasks (part of the New Basics Project) as guides for teachers wishing to implement interdisciplinary learning in their classrooms (Matters, 2004).
- Victoria has developed cross-curricular learning differently, by assessing each learner's attainment of the Victorian Essential Learning Standards (VELS) in the four areas of Communication; Design, Creativity and Technology; Information and Communications Technology; and Thinking Processes (Victorian Department of Education and Early Childhood Development, 2006).
- Another significant direction is the middle school movement, which endeavors to provide a school structure and curriculum that is more appropriate to the cognitive and social/emotional needs of young adolescents. The middle school movement is more strongly evident in states such as Western Australia, Victoria and the Northern Territory where some middle schools are defined as a separate campus.



The following various examples of interdisciplinary approaches have been organized around the ages of school students, that is Kindergarten to Year 10, primary schools, middle schools, non-compulsory years in secondary schools, and teacher education.

### *5.1 Kindergarten to Year 10*

The Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) published *The Hobart Declaration on Schooling* in 1989, followed by the declaration from Adelaide in 1999 and more recently the Melbourne version (2008a) prioritizing key areas of content, skills and attitudes that needed to be addressed across subject areas in the compulsory years of schooling. In 1999, the Council required students to be knowledgeable about citizenship and civic life, be confident and productive using new technologies, have developed attitudes that reflect a concern for and stewardship of the environment, and the knowledge, skills and attitudes to maintain a healthy lifestyle. Furthermore, students completing their compulsory education, the Adelaide Declaration stated, should be socially just and have developed understandings around cultural diversity, in particular, a recognition of the value of our indigenous culture and an understanding of how reconciliation would enhance relationships between indigenous and non-indigenous Australians (MCEETYA, 1999). MCEETYA has not been prescriptive in how these areas should be addressed, but over the last 10 years each state has responded to these goals by integrating them across as many syllabi as possible and creating a list of generic skills that should be developed across all subject areas. Once the themes and priority areas have been incorporated into syllabi teachers have little choice but to include them in their planning and implement them in their classrooms.

Other policy directives have also required students in primary and secondary school systems to address particular "hot topics" (as determined by the government) and competencies addressed throughout students' development over the years. Most states and territories allow flexibility for these to be addressed across a number of key subject areas and anticipate a spiral gaining of knowledge and skills throughout a student's

progress from kindergarten to his/her final compulsory year of schooling (Year 10). The federal educational body, MCEETYA, instigated the Finn Report in 1991 which proposed six key competencies to be developed in all students over their years of schooling. These were later re-developed by the Mayer Committee, in 1992, into seven key competencies. The key competencies were expected to be integrated across the curriculum from the first compulsory year of schooling (Kindergarten/Prep/Reception) to the last (Year 10). The emphasis here has been on a set of skills that students in the Australian education system would develop and use in the workforce once employed. The key competencies are as follows:

a) collecting, analyzing and organizing information;
b) communicating ideas and information;
c) planning and organizing activities;
d) working with others and in teams;
e) using mathematical ideas and techniques;
f) solving problems; and
g) using technology (Australian Education Council, 1992, pp. 8-9).

As a result of the key competencies, school leaders and teachers have been constantly bombarded with a bewildering array of frameworks, each with its various notions of essential skills, knowledge and attitudes that must be taught to students. The call for a way to manage this overload has come from the on-the-ground practitioners and one response from state educational authorities has been to endorse curriculum integration strategies. The NSW Board of Studies (1996) explicitly cites the management of comprehensive programs as a rationale for curriculum integration encouraging schools and teachers to maximize overlapping of skills and content where possible.

The northeastern state of Queensland was one of the first educational systems in recent times to consider how deep learning could be promoted and curriculum connections could be made in the classroom. The Queensland School Reform Longitudinal Study (QSRLS) (Lingard et al., 2001) examined classroom practices from 975 lessons to investigate enhanced learning outcomes for students. The result was the framework Productive Pedagogy, based on the North American Authentic Pedagogy movement, in which four key dimensions were identified: a) intellectual quality, b) connectedness, c) supportive classroom environment, and d) recognition of difference. Each of these key areas could be broken down into



further aspects, some of which have particular relevance here. “Intellectual quality” comprises six key elements one of which, “deep understanding,” requires teachers to assist students in developing relatively systematic, integrated or holistic understandings. Elsewhere, the Productive Pedagogy framework claims that “connectedness” ensures that “students engage with real, practical or hypothetical problems which connect to the world beyond the classroom, which are not restricted by subject boundaries and which are linked to their prior knowledge” (The State of Queensland, Department of Education, Training and the Arts, 2004a. p. 3). This new pedagogical movement was instrumental in focusing teachers in Australia on a cross-disciplinary approach.

With the Productive Pedagogies, Queensland’s Department of Education and the Arts has subsequently devised “New Basics” and “Rich Tasks.” This initiative clarifies for teachers what needs to be taught, how it can be taught and what the students would show when successfully undertaking the tasks. The diagram below shows how the three strategies link together for Years 1-9 in Queensland schools:

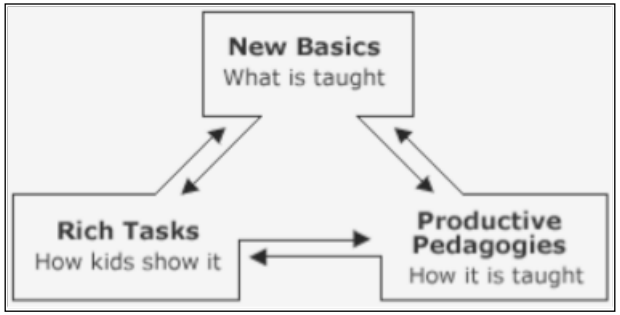


**Figure 1**. Queensland Curriculum, Assessment and Reporting Framework (The State of Queensland, Department of Education, Training and the Arts, 2004b).

Rich Tasks involve crossing interdisciplinary boundaries to create an authentic learning project that has problem solving at the center in a real-life situation. Rich Tasks are grouped together into suites and are delivered to students in three stages of their school life up until year 10. The categories to be studied are set up in the New Basics curriculum, and these have been tested in 38 schools in Queensland over a four-year period. The result is an official set of Rich Tasks for implementation across the curriculum with an extensive list of resources.

The response on-the-ground by teachers, students, and parents seems favorable as most schools that have offered Rich Tasks continue to do so and other schools previously uninvolved have begun to adopt the suites available. According to the evaluative report on Rich Tasks, there has been a shift by teachers towards fewer mandates of how Rich Tasks should be reported to stakeholders with a push towards "a more teacher-directed, decentralized standards validation process" (Education Queensland, 2006, p. 26).

An example of an integrated approach from Queensland, while not part of the Rich Task suites, provides ample opportunity to see how such an approach works in practice. The unit of work designed for a Year 8 group of girls at Fairholme College (Cottle, Hawken, Payze & Scott, 2008) is called "Construction" and focuses on an integrated approach to answering the question: "How is self and how is society constructed in various text types?" Students are required to work through different forms of construction: e.g., construction of identity, construction of texts, construction of gender, and so on through the subject areas of English and humanities. The students must use skills and content that derive from both disciplines to answer the principal question which has guided the investigation.

Queensland's response to quality learning and teaching examined effective ways of presenting the overcrowded curriculum that would encourage deep knowledge and understanding while making connections for students that transcended subject boundaries. In this way, Queensland's response in the New Basics Project reflects Klein's definition, that is: "Interdisciplinarity is neither a subject matter nor a body of content. It [interdisciplinarity] is a process for achieving an integrative synthesis, a process that usually begins with a problem, question, topic, or issue" (Klein, 1990, p. 188). Furthermore, Beane's student-centered model of curriculum integration (Dowden, 2007) where students do their own integrating as they attempt to answer a problem is also reflective of this Queensland approach.

In Victorian and Tasmanian schools the response to the inclusion of key national goals such as those stated in the Adelaide Declaration (1999) has been to create Essential Learning Standards (Victoria) or an Essential Learnings Framework (Tasmania). The similarity in titles of curriculum design aptly demonstrates a similarity in cross-disciplinary approaches. Both states endeavor to teach interdisciplinary learning strands such as Information Communication Technologies (ICTs) or thinking processes (reasoning, metacognition, reflection, and creativity) through a process-oriented method across the subjects. As the Victorian Curriculum and Assessment Authority (VCAA, 2007) explains:



> The Interdisciplinary Learning strand identifies a range of knowledge, skills and behaviours which cross disciplinary boundaries and are essential to ensuring students are prepared as active learners and problem-solvers for success at school and beyond. This strand focuses on ways of thinking, communicating, conceiving and realizing ideas and information. It assists students to develop the capacity to design, create and evaluate processes as a way of developing creativity and innovation. (p. 1)

Similarly, the Tasmanian Department of Education (2008b) states:

> Every teacher is a teacher of thinking. The skills of thinking are best taught explicitly, using the content, processes and skills of each curriculum area. Students also benefit from opportunities to demonstrate thinking across the curriculum, using ICTs and from schools building a culture of thinking in the school community. (p. 1).

The following diagram best shows how ICT and thinking cross discipline boundaries:

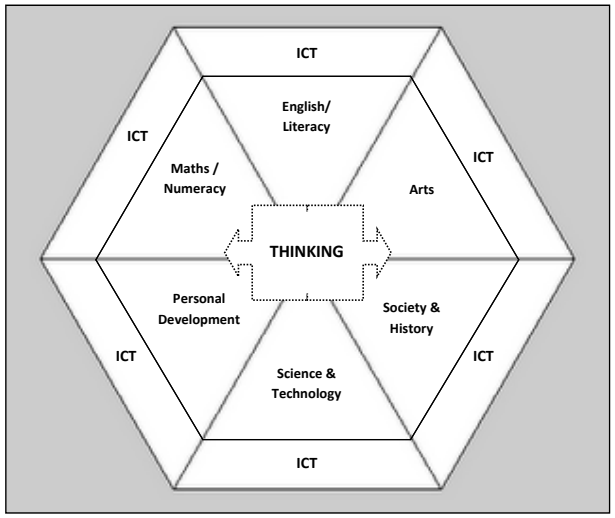


**Figure 2.** Tasmanian Curriculum Framework (Tasmanian Department of Education, 2008a).

Subject boundaries remain within these frameworks, but the thinking

processes and ICT skills are employed within each discipline, gaining different emphases according to the particular methods of each subject. These curriculum approaches appear to be good examples of double integration (Lenoir, et al., 2000) whereby students use cross-curricular learning processes to achieve a content-based result.

## *5.2 Primary Schools*

Australian schools take up curriculum integration far more in the primary sector than in secondary or university institutions. Primary school structures allow greater flexibility for interdisciplinary approaches. Most Australian primary schools have one teacher per class of approximately 25 to 30 students, and the day of lessons may be organized partly by the teacher. Certainly, Australian schools have guidelines as to how much time should be spent on certain subject areas, and there are school structures such as assemblies and specialist lessons with teachers of Languages Other Than English (LOTE) or music and the like, but by and large the Australian primary classroom has a flexibility that enables cross-disciplinary work to be undertaken. The state of NSW has taken up the curriculum integration gauntlet in a slightly different way from the other states described so far (New South Wales Board of Studies, 2007a)

Following the Productive Pedagogy model, New South Wales' Department of Education undertook its own research and built on Queensland's already existing foundation creating variations as it saw fit. The result is the NSW Department of Education and Training Quality Teaching Model (2003) that centered on three domains: a) intellectual quality; b) quality learning environment; and c) significance. Like Queensland's Productive Pedagogy framework intellectual quality contains six elements, one of which is "deep understanding," requiring students to make connections across discipline boundaries. The last domain, significance, features "knowledge integration" and requires teachers to present to students meaningful connections between different subject content. The NSW Board of Studies (2007b) in response to national goals, Key Competencies, and Quality Teaching introduced K-6 (Kindergarten to Year Six) Linkages as a means of enabling teachers to identify appropriate ways of integrating curriculum. The NSW Board of Studies (2007b) states that the six key purposes of the K-6 Linkages Project are to: 1) provide current information about curriculum integration; 2) assist teachers in their planning by identifying cross-curricular links; 3) enhance teaching and learning through the various syllabi; 4) present examples of best practice of curriculum integration; 5) provide work samples that give evidence of learning in more than one key learning area; and 6) provide teachers with advice on how generic outcomes can be used in relation to syllabus outcomes.



Hence, New South Wales' response has been to identify links within already existing syllabi for teachers to use within the subject structures of primary schools. Effectively, then, this represents the bridging of disciplines to which Klein (2006) and Youngblood (2007) refer. The NSW Board of Studies (1996) defines curriculum integration very generally as:

> the purposeful planning, by teachers, of strategies and learning experiences to facilitate and enhance learning across key learning areas. Curriculum integration also refers to the demonstration, by students, of knowledge and understandings, skills, and values and attitudes that transcend individual key learning areas. (p. 2)

The first part of the definition has been facilitated by the creation of Connected Outcome Groups (COGs) (NSW Department of Education and Training, 2008)—units of work that show how outcomes from separate subject areas can be brought together under a key theme. Sample unit pages are provided to schools for their use in making these connections across disciplines, and assessment criteria and tasks that integrate across the curriculum are given. An example of an integrated unit devised for students across four years of schooling is called "Perseverance." This unit is available for all teachers in NSW to download and use for their particular class. It incorporates outcomes from English; personal development, health and physical education (PDHPE); math; Human Society and its Environment (HSIE); and creative arts. Activities are integrated, and multiple outcomes are met during the course of one activity. Different subject contents are drawn into the unit only where they meaningfully apply to the theme of perseverance. For example, the content strand of "Data" from mathematics was used in conjunction with a PDHPE task of persevering with a circuit of training using particular repetitions of exercise within particular time frames. Results were recorded by students to show improvement over the week. Resources are provided, and student work samples allow teachers to see how assessment pieces may be measured across disciplinary boundaries. It is difficult to judge how widespread the use of these prepared units is across schools in New South Wales. In most cases the decision to use such resources would be at a school-based level where the scope and sequence

for primary outcomes are determined in an overview of the K-6 curriculum (NSW Department of Education and Training, 2008).

The second part of the definition of curriculum integration (NSW Board of Studies, 2007b) refers to the knowledge, skills, and attitudes that transcend disciplines and has much in common with the essential learning standards of Victoria and the essential learnings framework of Tasmania. These are facilitated by nine generic outcomes applicable in all subject areas. These generic outcomes address many of the National Goals (MCEETYA, 1989, 1999). There does not seem to have been a strong response with regard to this particular integration strategy in NSW; they are not even featured in the sample units of work placed available online for school use. This would suggest that cross-curricular processes have not been uniformly adopted in NSW, leaving integration to be more of an exercise in linking outcomes than a more meaningful cross-disciplinary approach.

It is important to note that learning strategies such as Gardner's Multiple Intelligences and thinking processes such as De Bono's Thinking Hats also play a part in integrating curriculum in many primary classrooms (Murdoch, 1998) as teachers have been able to easily identify how arranging learning tasks according to the Intelligences or Thinking Hats assists students in making connections across KLAs (Murdoch & Hornsby, 1997).

## *5.3 Middle Schools*

As a result of the federal government's investigation into middle schooling as a means of curriculum reform, the National Middle Years of Schooling Project (Barratt, 1998) became important in offering support and direction for K-12 schools wishing to restructure their middle years in a way that would be more supportive and transitional for students. A number of states took up this new form of organizational structure (though few did so across the board) allowing greater possibilities for pastoral care and curriculum integration (Murdoch, 2007). Each class worked with fewer teachers than their upper secondary counterparts with a crossover of subjects being taught by just one teacher. The change in staffing practices resulted in challenges to the rigidity of timetabling creating a more fluid approach to cross-disciplinary work. As Brady and Kennedy (2007) identify, this has not been a widespread state initiative but rather one where individual schools have seen the need and found the opportunity to make these changes. Two studies, one from Western Australia and one from Tasmania, will be briefly described to demonstrate how on-the-ground practitioners have approached interdisciplinary curriculum planning.



Wallace et al. (2007) report on two related studies concerning curriculum integration in Western Australia. The first study was conducted in 1996, but a follow-up study from 2004 for the purposes of currency will be examined here. The researchers interviewed six classroom teachers who coordinated integration projects at their schools and examined the different types of integration practices that they were using. Of the six, two teachers were using cross-curricular methods that resembled somewhat the linkages idea adopted by the NSW Board of Studies, that is, taking already existing subject syllabi and identifying appropriate links through outcomes. Three of the other teachers worked from a thematic approach drawing principally from one or two subject areas and linking to others where appropriate. The remaining teacher used integration to support the production of a doll's house, which was not unlike the problem-based approach of the Rich Tasks in Queensland's New Basics Project. Interestingly, the researchers added further commentary in 2006 in terms of what these same teachers were doing from an integration point of view. Of the six, two teachers were no longer so involved in integrative work, two were continuing at a similar level, and the remaining two had expanded their integrative projects to other classes and other topics. Wallace et al., (2007) report both enabling and disabling features that assisted these teachers with maintaining cross-disciplinary practices. Of the two teachers whose integrative projects had expanded, a committed and collegial staff were named as the first enabling condition. It would appear that the sustainability of cross-disciplinary practices may be less dependent on the type of integration than on the commitment of the staff to implement them.

## *5.4 Upper Secondary (Post Compulsory Schooling)*

As explained earlier, the last two years of high school in Australia are currently non-compulsory and focus primarily on the completion of an assessment process that assists students in gaining entry into universities and vocational education providers. The purpose of these two years then is to ensure that students are taught considerable content at a significant depth to prepare them for tertiary study. This influences the types of structures and teachers that can be selected for the teaching of such work. Subject disciplines are guarded carefully lest any form of integration should "water down" the strength of the content and processes. In a similar vein, key competencies and national goals are not applied to these final two years based upon the assumption that these will have been achieved in the compulsory years of

schooling. As noted by Groundwater-Smith, Brennan, McFadden, Mitchell & Munns (2009) it would be fair to say that at an upper secondary level the role of integration or cross-disciplinary teaching and learning is at a minimum.

## *5.5 Teacher Education*

Universities have traditionally been identified as places where students specialize in particular disciplines; universities are arranged physically, academically, and, as a result, socially around scholarly disciplines. Flagships, centers for excellence, and research teams have frequently led to interdisciplinary endeavors as a means of solving problems. However, it is the teacher education institutions which are of particular interest here as they model, prepare and educate school teachers in their profession. Universities and colleges involved in the process of preparing teachers for the classroom are possibly more able and willing to use interdisciplinary processes if the result creates greater understanding of teachers' work by the pre-service teachers (Aspland, 2008). Klein urges teacher education courses to educate pre-service teachers in this specific area: "Interdisciplinarity has become more central to knowledge. It must not be peripheral to teaching training at all points of the career life cycle. Subject training will remain crucial, but dual capacity is needed, based on an informed understanding of interdisciplinary contexts, definitions, curriculum design, pedagogy, and learning processes" (Klein, 2006, p. 16). There has not been a formal call from the Australian government to undertake interdisciplinarity, but teacher educators may see value in modeling what school systems will expect of the graduates. This has certainly been the case at one such university as will be detailed further in the next section.

The School of Education (NSW) from the Australian Catholic University in 1994 met with the local Catholic schools system (Parramatta Catholic Education Office) to devise better ways of training teachers for the profession. The result, after a series of meetings, was the creation of the Teaching and Learning Consortium (TLC) in which pre-service teachers participated in school-based immersion of two areas of their study: professional studies—teaching and classroom management; and curriculum studies—mathematics, and religious education. The outcome was an integrated approach to teacher education enabling pre-service teachers to gain an understanding about holistic learning and common processes and skills across these disciplines within the field in which they would eventually work. Figure 3 (on the following page) shows how this approach was devised.



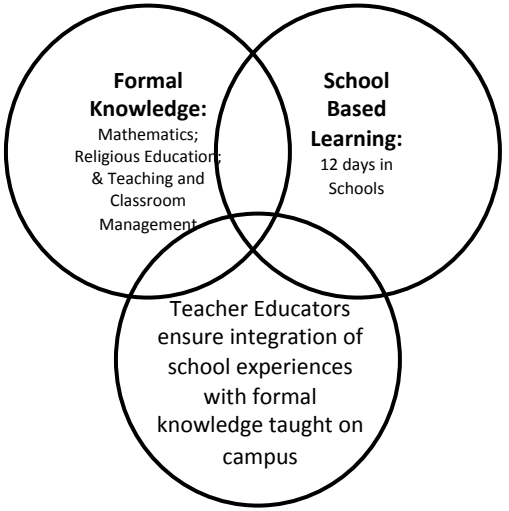


**Figure 3**. The Teaching and Learning Consortium Paradigm (adapted from Long, Moran, Harris & Ryan, 2007).

The Teaching and Learning Consortium works in the following way. Students work in teams of approximately four people on both campus and school sites. The teams are integrated into a school staff, observing and reflecting on teaching practice. It is unlike a typical teaching practicum in that the student teachers are not clinically supervised by a single teacher in a single class, but instead observe and assist in all classes across every subject in the school. A major component of student learning involves the design and trial of school-based projects which enrich students' own learning as well as benefit the staff and children at the school. Lecturers visit the schools weekly and assist the students further with making links between what they have seen and done with what they are learning on campus. The involvement of academics in this manner strengthens the "weak link between the practicum and the theoretical components" noted as a significant concern in *Top of the Class: Report on the Inquiry into Teacher Education (*House of Representatives Standing Committee on Education and Vocational Training, 2007, p. 71). One of the main goals of the program is to promote a more realistic and informed understanding of teaching and to link the theory learned at university to the school experiences in the field. A funded grant to conduct an evaluation in 2006 found that the TLC has enabled primary

teacher education students to learn about the teaching profession through learning experiences that integrate theoretical knowledge of curriculum and pedagogy with school-based experience. The integration aspect specifically provided students with an immersed and holistic experience preparing them for their vocation of the future.

## Conclusion: Where Are We on the Yellow Brick Road?

In Australia in the 21st century, there is a growing body of thought advocating a more interdisciplinary approach in schools and beyond. This push is coming from several directions. At the macro level, it is believed that interdisciplinary approaches will play a role in developing an Australian workforce that can compete in an increasingly global marketplace: The need for learners to solve increasingly complex world problems implies developing the ability to work across traditional disciplinary boundaries. At the micro level, many classroom practitioners and teachers' professional organizations view interdisciplinarity as a means to improve learning outcomes through the implementation of more learner-centered, problem-based pedagogies while managing the overcrowded curriculum.

These moves towards interdisciplinarity are not occurring in a vacuum: Australian curriculum is currently undergoing immense change, not least through federal intervention in the oversight and management of the curriculum and pedagogy which lie at the heart of every school. Some of these policy directions, such as the *Educational Goals for Young Australians*, are supportive of interdisciplinary approaches; others work against it. Conversely, the introduction of national testing and reporting frameworks and the linking of funding to the implementation of these measures are indirect but powerful forces shaping curriculum content and thereby the pedagogical processes teachers employ in their classrooms but do little to enhance opportunities for interdisciplinary linkages. Further nationwide initiatives, including the drive to establish a national curriculum, national frameworks for teacher accreditation, and plans to establish a national center for pedagogy, will continue to impact curriculum and teaching practice in the coming years.

Responses to these global and national pressures vary at federal, state, and classroom levels, reflecting widely ranging interpretations of interdisciplinarity. At the national level, interdisciplinarity is manifest through the development of broad national goals and process-oriented key competencies, which are absorbed to varying degrees in the compulsory years



of schooling. At the state level, responses range from the straightforward provision of cross-curricular directives and integrated units of work, through the development of process-oriented essential learnings to be embedded in teaching and assessment, to the development of innovative pedagogical frameworks centered around rich learning tasks and principles of deep learning and connectedness. Finally, at the level of school curriculum planning and classroom practice, individuals and groups of teachers employ interdisciplinary practices across the spectrum from identifying linkages through to developing integrated thematic units of work and ultimately to problem-solving in real-life contexts.

If Australia is to produce a curriculum that can meet the demands of a globalizing world, we face a challenge which requires all educational sectors at all levels to collaborate beyond what has been achieved in the past. As Cole (2007) proposes, the focus of education in Australia will create expectations that by the end of their school learning:

> young people will be expected to get along and work productively with others, draw inferences, interpret situations and information, identify problems and contribute to problem resolution, reflect on their circumstances, engage in thoughtful discussion, locate and absorb new ideas and knowledge, develop proposals and make presentations, provide feedback on performance and ideas and so on. (p. 11)

To attain this goal, Australia needs a curriculum that is founded on a clear rationale, that follows a process based on rigorous research and evidence, ensures adequate resources, and demonstrates impact on pedagogy, equity, and learning outcomes (Australian Curriculum Studies Association, 2006). Reforms should build upon current examples of effective practice such as the Productive Pedagogies, New Basics, and Quality Teaching frameworks.

As discussed previously, national and state policy goals and initiatives have been successfully taken up in many schools across Australia. Much innovation, however, remains dependent on the skills, energy, and commitment of individual teachers and schools engaged in ground-level curriculum and pedagogical reforms. As a result, the trend towards curriculum integration is patchy at best, and reform attempts do not always stand the test of time. In some cases, such as the middle school movement, reforms are supported by broader structural change. In others, such as secondary schools in general, a re-conceptualization of current curriculum content

and assessment practices will be required before there is an environment in which interdisciplinarity can flourish.

As this article has identified, curriculum integration and interdisciplinary practices are already embraced on a systemic level in Australia. Current national policies, proposals and debate support the implementation of interdisciplinary practices in ways that make the curriculum relevant, significant, and focused on the needs of young Australians now and into the future. A stronger focus on interdisciplinarity in school education will develop the potential of young Australians, ultimately enabling "Oz" to achieve stronger economic growth, improved stability, and a sustainable future.

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