

# A Global Curriculum: Design technology in the International Baccalaureate

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## Abstract

This paper places the Design Technology curriculum of the International Baccalaureate Organization (IBO) in an historical and international context of global education. It seems paradoxical that in a postmodern era of respect for local and national cultures and educational systems, a curriculum could thrive that represents the antithesis of this by proposing that the same curriculum is appropriate for all students in all societies. The relevant structures of the IB and the nature of Design Technology will be described in order to enable judgements about its role and to explain its increasing popularity.

## Key words

design, technology, global, International Baccalaureate

## Colonization

After the second world war, pressure was felt by colonial countries such as Britain and France to grant independence to their colonial dependencies. These colonies presented a skewed picture of development. Technologies that served the purposes of the colonizers had been developed and the public service to support basic administration was established. Indigenous health, education and basic infrastructure was very limited. In many countries, missions played a significant role in the provision of the basic services of education and health to the indigenous populations, but of course they also had their own colonizing agenda.

The rise of these independent states in the 1960s and 1970s saw the deconstruction of the carefully manufactured grand narratives of colonialism in many nations (Bernstein, 2000). In some instances this was a battle (literally), in others, the changes represented by the developing international postcolonial framework were recognized as inevitable and the transition was peaceful. But either way, the pre-colonial social modes were generally destroyed in the process of colonization. Land ownership, attitudes toward technology, traditional authority structures and both the content and methodology of education were perverted.

The departure of the colonizers was rarely a passage of smooth transition, and consequently the little good will that remained between the countries was not a solid basis on which development could proceed. These newly independent countries did not have the capacity to produce the technological innovations necessary for development, and so they looked to the industrialized countries for assistance. There developed an initial optimism that technology could be transferred from more developed countries, and so third world countries would not have to 'reinvent the wheel' of development, but could rapidly move to a sustainable industrial and technological basis. The World Bank and the United Nations were particularly influenced by this argument and consequently supported many programs of technology transfer.

However by the 1970s, a more sceptical view of the role of technology transfer was developing (Bridgstock et al, 1998). The imported technology was often framed within a Western conception of development, quite naturally of course from the exporting country, but also from the developing country. Because of the nature of the colonial educational system, the leaders in government, administration, education and industry of the post independent countries were those who had proceeded through the western system of education, and retained the elitist embedded notions of a 'proper' education which provided little reference to the local social, economic or cultural context. The consequent lack of focus on local problems and needs resulted in the transfer of much inappropriate technology. Third world countries were often overcharged for the technology transferred from developed countries (Vaitos, 1973), it created few local jobs, was capital intensive, frequently resulted in significant unemployment in agriculture and industry (ILO, 1971; Marsden, 1973) and became a mode through which dependence and subordination could be maintained (Harrison, 1983), despite the demise of formal colonialism.

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A significant and enduring critique of these failures was provided by Schumacher (1973) who proposed as an alternative the idea of 'intermediate technology' – something between advanced western technology which had proved inappropriate, and indigenous technology which was not productive enough to generate higher incomes. Many successfully developmental technologies were established as an outcome of this philosophy, for example biogas production and brick making in many countries.

While not receiving significant attention in postcolonial discourses, this story of technological development in once-colonial countries is significant. The representation of intermediate technology as a form of 'de-linking' (Bridgstock et al, 1998) from developed countries and thereby challenging the dependency relationship established through colonization is an important narrative.

The modernist focus on the development of the 'grand narratives' (Boyne & Rattansi, 1990) through the export of educational systems by powerful nations prevailed up to the 1960s. The colonial powers used education as a tool in the armoury of colonialism, and its export, including the total package of teachers, curriculum and texts, was designed to promulgate the metanarrative form of civilizing culture perceived to be utopian at that time.

The imposition of a predetermined form of utopian culture was not only attempted through education, of course. This modernist focus permeated the government and civil services, had a particular affinity with religious organizations, and coincided with the enterprising objectives of industry and technology. Religious missions became an embedded part of the front line assault on the indigenous populations, and the transfer of inappropriate technology and education both developed then reinforced the existence of colonial dependence. In many instances, even after national independence, technological and educational dependence extended colonialism through a reliance on the provider of the technology for repairs, parts and servicing and education for teachers and curriculum, as notions of technology and education transfer were retained as the most expeditious route toward technological development.

The type of dependence generated through colonial structures was in many instances replicated or reinforced through the international aid agency system which was particularly active in the post colonial period immediately following independence. In the rush to confirm the belief that education and technology transfer represented a shortcut to the technological development that had lapsed or at best been haphazard during colonization, aid agencies organized importation of technologies. Technology education was a part of this belief. For example immediately following independence in Zimbabwe, US Aid played a significant role in the development of new educational institutions, shipping in everything from the building materials for the classrooms, machinery for training and chalk for instruction. But when the chalk ran out and the machines needed new parts, the power relationship with the US moved from aid dependence to commercial dependence, and quickly proved unsustainable.

The thesis of this paper is that the narrative of educational transfer, technology education in particular, in some respects mirrors that of technology transfer. Colonial education, like technology, was limited and self serving. However, in the story of postcolonial technology education there has been no awakening to inappropriateness, no educational equivalent to 'intermediate technology' and so there has developed the danger of the perpetuation of western domination through education. Despite the critiques that postcolonialism and postmodernism have provided, the forces of globalization seem set to further entrench a form of educational dependence.

## **Postcolonialism, Postmodernism and Globalization**

As with many such terms, 'postcolonial' has about as many meanings as there are books on the topic, but generally refers to the interactions between European nations and the societies they colonized. It is estimated that the countries of Europe dominated more than 85% of the rest of the world by the time of World War 1 (Bahri, nd). This significant control and consequent fall of international power structures has a notable legacy of current influence, despite the very divergent experiences of both the colonizers and the colonized. For example the United States is not generally perceived to be a postcolonial country, but its displacement of native American populations and

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its incursions into other parts of the world may be seen as forms of colonization. In this paper the term is used in its broadest sense.

Postcolonialism coincided with the rise of postmodernism in western society. Although also fraught with battles over definition, a general tenant of postmodernism is the existence of an antecedent practice that laid claim to a certain exclusivity of insight, which is rejected (Appiah, 2000). In its place is the foundational principle that there is no universal knowledge, but only that which is developed within conditions of specific cultural and social formations.

Similarly, postcolonialism is an analysis of the antecedent discourse through which the West has asserted its hegemony over the rest of the world, and in its place is supportive of practices which resist colonialism, not only in the historical sense but also in a more contemporary resistance of social and capitalistic domination.

Postmodernism does not signify a new era nor a complete break with the past. It is rather the name that was given to the changes produced when several old certainties began to be questioned, one of relevance to this paper being colonialism. It is not an attempt to elevate the local at the expense of a critique of the global, but a mutual and concurrent reorganization of the local and the global (Hall, 1996).

There also appears to be an intricate relationship between postcolonial discourses and globalization (Yiu-wai, 2004), and the relationship gives rise to the question: is postcolonial discourse becoming less relevant in an age of globalization? If the postcolonial is interpreted as having a focus on contemporary forces of oppression and domination that operate in the world today (Young, 1995), then recent waves of anti-globalization would seem to indicate that it has a continuing role. The extent to which anti-World Bank and anti-World Trade Organization demonstrations are encompassed within a postcolonial discourse indicates its broadening role encompassing perceived oppression and domination in all forms.

In its broadest sense, globalization refers to recent significant changes that have occurred in the

international economy and their effects. These include the demise of communist states and the spread of capitalism, the increasing mobility of capital, labour and goods and services, acceptance of market forces, new international divisions of labour and a diminished role for the state. These factors have resulted in an homogenization of production, consumption and cultural values across the world (UN, 1995).

Globalization could be perceived as the next chapter in a process of exploitation which began in the colonial period and continues the sublimation and domination of the third world, with colonial nations such as England, France and Spain being supported or replaced by powerful global corporations, supported by international agencies such as the World Trade Organization (Raghavan, 1997). Alternatively, the positive aspects of globalization include the spread of liberal democracy and the decline of authoritarian regimes, and a developing interconnectedness of the global community.

Postmodern critiques of the relevance and usefulness of colonial education have been scathing, and yet the globalization of education continues. For example the translation of the US Standards for Technological Literacy in other countries, the influence of the UK Design and Technology National Curriculum in many countries and the adoption of the University of Cambridge and the International Baccalaureate Organization curriculum in schools and countries around the world. Technology education is not immune to the forces of globalization.

## Rationalism

Some perceive postmodernism and postcolonialism as similar perspectives in which both seek to understand societies in terms of knowledge power (Scholte, 2005); in this sense Dirlík (1994) characterises post colonialism as a child of postmodernism. For example Foucault (1970), as a proponent of postmodernism, suggests that each historical era is characterized by a particular form of knowledge. Postmodernists attribute a form of rationalism as the dominant knowledge framework in society, emphasizing the subordination of nature to human control, objectivist science and instrumentalist efficiency. The valuing of such a discourse ferments societies wherein economic growth, technological

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control and bureaucratic surveillance provide the basis for globalization. An aspect of globalization then becomes the imposition of western rationalism on all cultures.

Scholte (2005, p. 150) describes this rationalism as having four main features through which it promotes globalization. First, it is secularist and does not acknowledge transcendent and divine forces. Second it is anthropocentric and seeks to understand reality in terms of human interests. Third is a science focus which understands the world through incontrovertible truths which are discoverable through the application of objective research. Finally it is instrumentalist and values the efficient solution to immediate problems.

So rationalism, as the basis of globalization, seeks to dominate natural forces for human purposes to promote capitalist production and economic efficiency. Prior to what is generally perceived to be the current globalization movement, a form of rationalism was internationalized through colonialism and informal imperialism.

## Technology Education

In the context of technology education, forms of rationalism could be explicated in a number of ways. During colonial times, the modernist approach could be characterized by the representation of technology education as modern woodwork and metalwork, regardless of significant indigenous technologies related to construction (thatch and mudbrick) or hunting or food preservation or appropriate agricultural technologies. This type of rationalist approach was related to notions of progress, and the determination of a single path toward what was clearly a western conception of progress which had resulted in the superiority of the north (Ullrich, 1993).

The emergence of rationalist knowledge, as an aspect of globalization (Castells, 1998) clashes with the developing postmodern notion of cultural respect and regional independence. As a counterpoint to this force, van Wyk (2002) proposes Indigenous (Technological) Knowledge Systems (IKS) as a framework within which diverse learners may construct knowledge from multiple perspectives which are meaningful to them. Van Wyk presents IKS as a critical framework rather than a term with definitive

meaning, which seeks to be inclusive and transformative. This focus is supported by Keirl (2003) in his call for technology education to adopt a critical and creational approach to knowledge development, placing students at the centre of learning and so provide the opportunity to refute what is perceived to be the undesirable aspects of globalization.

An analysis of two significant aspects of the development of technology education in the US epitomizes the demise of modernism. The curriculum ideas which came to be known as the Jackson's Mill Curriculum theory identified four universal technical systems: communication, construction, manufacturing, and transportation - technical systems that are basic to every society (Hales & Snyder, 1981). The notion of 'universal' was that the systems were timeless and had existed since the beginning of technology, and that they were spacious and existed in every country. In a post colonial era we would view this type of theory of a universal narrative as very modernist and rational. Rational because of the view of knowledge as nonterritorial: truth which has been revealed by an objective process is valid for everyone, any where at any time (Scholte, 2005, p.151).

This type of proclamation can be contrasted with the more recent development of the US Standards for Technological Literacy (STL) where no such proclamation is made. Despite the international agenda of the International Technology Education Association, the STL (ITEA, 2000) are quite explicit in their orientation to the US. The Foreword and the Preface to the STL relate the standards to the context of 'US society' and 'K-12 classrooms in America' (viii), a theme that continues throughout the document. The absence of claims to international applicability are consistent with a postmodern approach which values 'mini narratives' and a respect for situational developments which make no claim to universality (Klages, 1997).

## Global Curriculum

A continuing phenomena which may seem inconsistent in a postmodern international education environment is the existence of international curriculum organizations, which, by their very role, imply that there is a universal curriculum applicable to

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all regardless of national or regional culture or history. International curricula are in some ways the educational equivalent of multinational globalization through their ignorance of the local and the homogenization of set values.

As Schostak (2000: 48) argued 'there can be no grand narrative concerning what is good for all. Standardization to create the curriculum is patently absurd in a context of change that is so fast, so diverse and so technologically and culturally creative'. A global curriculum would seem to align more with a colonial than postmodern environment through the promotion of totalizing forms of western knowledge. Even worse (author's bias) is that the recipients pay a significant amount of money for the curriculum, sometimes from a national budget which is invariably stretched. Those who can afford the significant costs of adopting an internationally recognized curriculum are often those who least need it as a tool of development and an entrée into international educational equivalence.

However, the adoption of international curriculum is rapidly increasing around the globe. The two main international organizations are the University of Cambridge International Examinations (CIE) and the International Baccalaureate Organization (IBO). These are both expanding at the annual rate of about 13%. The main reasons for this are directly related to globalization. The forces of globalization encourage the acquisition of educational qualifications that are both internationally acceptable and transferable. Allied with this is a developing mistrust of locally developed educational curriculum, particularly in the USA. These forces tend to conspire against both a postmodern critique of global developments and a valuing of local culture. This paper will focus on an examination of the IBO Design Technology curriculum.

## **International Baccalaureate Design Technology**

The IB consists of three programs: primary years, middle years and the diploma. These three programs integrate with each other but are also stand alone, so many secondary schools for example will follow a state or national curriculum in the lower levels and then adopt the Diploma Program for the final years.

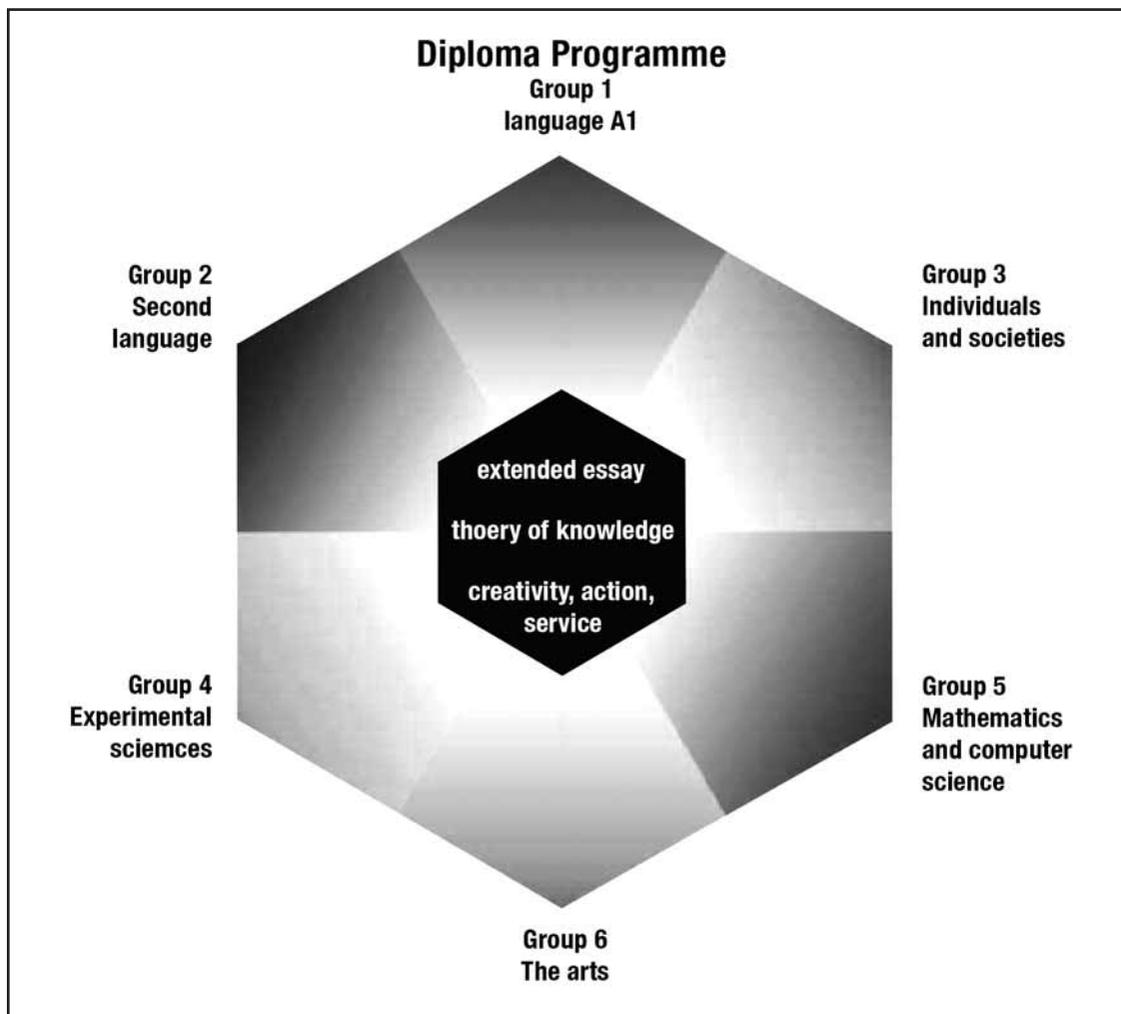
There are six groups of subjects in the diploma, this

hexagon arrangement as it is called is represented in Figure 1. Design Technology sits in the Group 4 Science subjects; a somewhat uncomfortable home historically, as elements of Design Technology have been constrained to fit with the better established science structures. For example it has been confusing to differentiate between the design process and the scientific method, and the Design Technology projects have included science like 'experiments' rather than more appropriate Design Technology activities. However in the most recent syllabus revision, while Design Technology remains in Group 4, increased latitude has been provided for it to promote characteristics which are not strictly scientific, for example by developing unique aims and objectives.

An International Baccalaureate Diploma is awarded by the International Baccalaureate Organization (IBO) to students aged 16-19 who complete a prescribed two year course of study. Students study six subjects selected from the hexagon group. Normally three subjects are studied at higher level (240 teaching hours each) and three at standard level (150 teaching hours each). In addition each student studies a core curriculum of an Extended Essay; Theory of Knowledge (ToK); and Creativity, Action and Service (CAS). The extended essay has a prescribed limit of 4,000 words. It offers the opportunity to investigate a topic of individual interest, and acquaints students with the independent research and writing skills expected at university. The interdisciplinary ToK course is designed to provide coherence to the curriculum by exploring the nature of knowledge across disciplines and encouraging an appreciation of other cultural perspectives. Design Technology students, for example, may examine the nature of technological knowledge, its development and use. Participation in the school's CAS programme encourages students to be involved in artistic pursuits, sports and community service work, thus fostering students' awareness and appreciation of life outside the academic arena. Assessment of the TOK and Extended Essays is conducted and overseen by teachers and then marked externally by examiners, and becomes part of the grade award for Diploma students.

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Figure 1. Diploma Program Hexagon Organization.



The IBO states that: *'the curriculum represents the best from many different countries rather than the exported national system of any one. Our challenging Diploma Programme assessment is recognized by the world's leading universities. We maintain our high standards by actively training and supporting teachers, and by authorizing and evaluating IB World Schools'. International mindedness is encouraged, and 'to do this, we believe that students must first develop an understanding of their own cultural and national identity. All IB*

*students learn a second language and the skills to live and work with others internationally – essential for life in the 21st century... We encourage community service because we believe that there is more to learning than academic studies alone' (IBO, nd).*

The IB Diploma program continues to be implemented in an increasing number of schools each year, mainly in English, but increasingly also in French and Spanish. In 2006, 72,170 candidates registered in 1,443 schools across 115 countries.

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The top four countries with the highest number of candidates were, in order, the United States, Canada, United Kingdom and Mexico. Subjects are examined in both May and November to suit the two main types of academic year organizations. Design Technology is a small subject compared with the mainstream sciences, having 508 candidates in the May 2006 examinations (718 in May 2007), compared with Biology (21,489) and Chemistry (13,788). The number of candidates registering with the IB has grown by 10-13% each year for the last 10 years, and the number doing Design Technology has increased by an average of 37% annually between 2004 - 2006.

The reasons for schools adopting the IB vary, but the main reason is the provision of an internationally accepted pre-university certification that is reputable and transferable. Transferability is more important for international schools, who may have a large number of itinerant students from many countries, and reputability is more important for other schools. The most significant recent growth in numbers of diploma candidates has been in the United States. Possible reasons for this include the absence of a national (and in many areas state) curriculum, the well publicized concern for falling standards and the government's 'No Child Left Behind' policy.

The Design Technology syllabus has recently been revised as part of the IB's seven year cycle of curriculum revision. This new syllabus will be available to schools in 2007 and will be first examined in 2009; it is this revised syllabus that will be described in this paper. Students can study at Standard Level (SL) or Higher Level (HL), the latter involving the study of more topics in greater depth. Students can study Design Technology at SL with no previous experience in the subject, but study at HL requires some previous experience, either through the IB Middle Years Program, a relevant subject at GCSE or a relevant national curriculum or school based subject.

Design Technology consists of the seven core areas of Design process, Product innovation, Green design, Materials, Product development, Product design, and Innovation (65 teaching hours). In addition, students studying at Higher Level (HL) study Energy, Structures, Mechanical design, Advanced manufacturing techniques and Sustainable development (49 teaching hours). Students then choose one area to study in depth from the five options of Textiles, Food Science and Technology, Electronic Product Design, CAD-CAM and Human Factors Design, for an additional 30 (SL) or 45 (HL) hours. This structure is summarized in Table 1.

IBO Design Technology			
Core (Standard Level)		Higher Level	
Topics	Hours	Topics	Hours
Design process	10	Energy	9
Product innovation	7	Structures	10
Green design	9	Mechanical design	8
Material	17	Advanced manufacturing techniques	10
Product development	11	Sustainable development	12
Product design	5	<b>Options (SL/HL)</b>	
Evaluation	6	Food science and technology	30/45
<b>Practical work (SL and HL)</b>		Electronic product design	30/45
Investigations	30	CAD/CAM	30/45
Design project	41	Textiles	30/45
Group 4 project	10	Human factors design	30/45

Table 1. Subject areas in Design Technology.

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So of the 240 teaching hours for HL students, 159 hours represent theory and is assessed through three examination papers, and 81 hours are internally assessed through a design project and a group project. Of the examinations, Paper 1 consists of 30 multiple choice questions (40 for HL); Paper 2 includes a data based question, short answer questions and an extended response question; and Paper 3 consists of short answer and extended response questions covering the five options. This assessment structure is summarized in Table 2.

The practical work is worth 36% of the final assessment and is internally assessed against set criteria and externally moderated by the IBO. The assessment criteria are in the areas of planning, research, development, evaluation, manipulative skills and personal skills. It consists of an interdisciplinary group project in which students from all the Group 4 subjects work together to analyse a common topic or problem. The investigations are short or long term activities that teachers design in order to deliver content and support the project. The design project is expected to unify all aspects of the course and is the mechanism through which much of the content is taught.

The IBO implements a rigorous assessment process in order to ensure standards remain high, the assessment criteria are standardized and the aims and objectives are achieved. These processes include the external moderation of the internally assessed project work. A sample of the examinations are double marked in order to develop moderation factors which

are applied to markers to ensure comparability, and markers whose moderation factors are outside of a set range have their papers remarked. Grade award processes involve the distribution the raw marks across the grade levels according to set criteria resulting in criterion rather than norm-referenced final marks.

A consistent criticism of the Design Technology syllabus, from teachers of national Design and Technology curricula, has been that not enough of the practical component of students' work is considered in the assessment structures. This figure of 36% was not changed in this last curriculum review, and allows teachers to present a significantly theoretical approach to technology if they so desire, which is not encouraged in the recognition of Design Technology as a very practical subject, but is nevertheless possible. The perception that it is more difficult to manage international moderation processes on practical work than it is on examination scripts may be one reason for this practical-theoretical balance.

Institutional support for teachers is provided in two main ways. The five regional IB offices manage the school applications to join the IB and also provide training for teachers. This training is in the form of workshops which are delivered periodically and at different levels depending on the experience of the teachers. Teacher resources are also provided on the Online Curriculum Centre. This is a particularly important resource for Design Technology because the syllabus is unique and unlike any other Design and Technology syllabus around the world, and also

Design Technology Assessment Specifications				
Component	Standard Level		Higher Level	
	Weight %	Hours	Weight %	Hours
Paper 1	20	0.75	20	1
Paper 2	24	1	24	1.75
Paper 3	20	1	20	1.25
Investigations and Group Project	18	27	18	40
Design project	18	28	18	41

Table 2. Design Technology Assessment Structure.

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because the relatively small numbers of candidates taking Design Technology do not provide the economies of scale necessary for the publication of dedicated print based resources.

The IB Design Technology diploma program is consciously designed to focus on individual, social and environmental issues in a global context. This is achieved, for example through a consideration of the following topic areas: invention and innovation, people and markets, principles and strategies of green design, life cycle analyses, clean manufacturing, appropriate technology, sustainable development, sustainable building design, genetically modified food, global standards, smart houses, sustainable textile industries, digital humans and designing for pleasure.

## Discussion

This discourse is valid in the context of notions of postmodernism, rationalism and globalization. The application of a postmodern critique to an international curriculum has a predictably negative outcome. The aspects of postmodernism that value the local and critique the global and the rational will inevitably reject a curriculum that has been designed for use in any country regardless of its stage of development or the nature of its local culture.

The IBO Design Technology syllabus, an international curriculum, represents a dominant narrative of technology education which has the potential to force people from a broad range of different cultures into an educationally dependent relationship. Its representation of a rationalist form of knowledge seems a counterpoint to postmodern notions of respect for cultural and technological diversity.

However, the Design Technology syllabus does provide the opportunity to address a range of global technology issues and consider developments and impacts at the local and personal level, so providing some scope for attention to local technological, economic and cultural concerns.

While it does present a defined narrative for the study of technology, it does so with a postmodern and enquiry bias which pays mutual attention to both the local context and impinging global developments, and to this extent would seem to provide an appropriate

framework for the development of technology education. This is complemented with the TOK and CAS aspects of the broader diploma program which have direct local application, and so provide an opportunity to value the local context.

It is difficult to envisage the prevalence of a postmodern technology education discourse in the face of an embedded rationality which both supports and is supported through strengthening globalization. The various structures of capitalism, state and international regulation and formal politics, and the need for global recognition represent a powerful combination of forces.

Consequently, one could argue that the syllabus is not oppressive in forcing people into a dependency relationship because its subscription is a matter of free choice. Alternatively, it could also be argued that the forces of globalization (for academic credibility and transferability) are such that they cannot be resisted, and so the individuals and schools who purchase the IBO diploma are not exercising free will in selecting a relevant narrative of technology education, but responding to forces beyond their control.

In defence of the IBO, it does indicate an awareness of the need to reflect a broad postmodern perspective by stating that the criteria for international education include the need to:

- develop citizens of the world – culture, language and learning to live together;
- build and reinforce students' sense of identity and cultural awareness;
- foster students' recognition and development of universal human values;
- stimulate curiosity and inquiry in order to foster a spirit of discovery and enjoyment of learning;
- equip students with the skills to learn and to acquire knowledge, individually or collaboratively; and to apply these skills and knowledge accordingly across a broad range of areas;
- provide international content while responding to local requirements and interests;
- encourage diversity and flexibility in pedagogical approaches;
- provide appropriate forms of assessment and international benchmarking (IBO, 2002).

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While declaring my vested interest in the IBO Design Technology program as Chief Examiner, I conclude that if the forces of globalization are such that states or schools or individuals require an end of secondary qualification that is meaningful, of a high standard and internationally transferable, then the IBO Design Technology syllabus represents a moderate and considered path through the conflicting tensions of postmodernism, rationalism and globalization.

## References

Appiah, K. A. (2000) Is the post- in postmodernism the post- in postcolonial? In D. Brydon (Ed), *Postcolonialism: critical concepts in literary and cultural studies*. London: Routledge.

Bahri, Deepika. Introduction to Post colonial Studies. Retrieved August 24, 2006 from [www.english.emory.edu/Bahri/Intro.html](http://www.english.emory.edu/Bahri/Intro.html)

Bernstein, H. (2000) Colonialism, capitalism, development. In A. Thomas (Ed.), *Poverty and development into the 21st century*, 241-270. Milton Keynes: Oxford University Press.

Boyne, R., & Rattansi, A. (1990) The theory and politics of postmodernism: by way of an introduction. In A. Rattansi (Ed.), *An introduction to post modernism and society*. London: Macmillan.

Bridgstock, M., Burch, D., Forge, J., Laurent, D. and Lowe, I. (1998) *Science, Technology and Society*. Cambridge: Cambridge University Press.

Cambridge International Examinations. Retrieved on August 28 2006 from [www.cie.org.uk](http://www.cie.org.uk)

Castells, M. (1998) *End of Millennium*. London: Blackwell Publishers.

Dirlik, A. (1994) The postcolonial aura: Third world criticism in the age of global capitalism. In P. Mongia (Ed.) *Contemporary Postcolonial Theory*, 294-319. London: Arnold.

Dirlik, A. (1997) *The postcolonial aura: third world criticism in the age of global capitalism*. Boulder: Westview Press.

Foucault, M. (1970) *The Order of Things*. London: Tavistock

Gandhi, L. (1998) *Postcolonial theory*. Sydney: Allen & Unwin.

Hales, J. & Snyder, J. (1981) *Jackson's Mill industrial arts curriculum theory*. Charleston: West Virginia Department of Education.

Hall, S. (1996) The West and the Rest: Discourse and power. In S. Hall, D. Held, D. Hubert, and K. Thompson (Eds.) *Modernity: An introduction to modern societies*. Malden, MA: Blackwell

Harrison, P. (1983) *The Third World tomorrow*. Hammondsouth: Penguin.

International Baccalaureate Organization. Retrieved on August 30, 2006 from [www.ibo.org/](http://www.ibo.org/)

International Baccalaureate Organization (2002) *A basis for practice: the Diploma Programme*. Geneva: Author.

International Labour Organization (ILO) (1977) *Matching employment opportunities and expectations: a program of action for Ceylon*. Geneva: United Nations.

International Technology Education Association, (2000) *Standards for Technological Literacy*. Virginia: Author.

Keirl, S. (2003) Globalisation on the go: implications for Design and Technology education @2003. *DATA International Research Conference Proceedings*. Wellesbourne: Design and Technology Association.

Klages, M. (1997) *Postmodernism*. Retrieved 15 March, 2005, from [www.colorado.edu/English/ENGL2012Klages/pomo.html](http://www.colorado.edu/English/ENGL2012Klages/pomo.html)

Lomba, A. (1998) *Colonialism/postcolonialism*. NewYork: Routledge.

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Marsden, K. (1973) Progressive technologies for developing countries. In R. Jolly, E. de KaDesign Technology, H. Singer & F. Wilson (Eds), *Third world employment*. Harmondsworth: Penguin.

Raghavan, C. (1997) *WTO Conference: How the developing countries lost out*. Third World Resurgence, 77-78.

Scholte, J. (2005) *Globalization*. NewYork: Palgrave Macmillan.

Schostak, J. (2000) Developing under developing circumstances: the personal and social development and students and the process of schooling. In H. Altrichter & J. Elliot (Eds), *Images of educational change*. Philadelphia: Open University Press.

Schumacher, E. (1973) *Small is beautiful*. London: Blond and Briggs.

Ullrich, O. (1993). Technology. In W. Sachs (Ed.), *The development dictionary: a guide to knowledge as power*, 275-287. Johannesburg: Witwatersrand Univeristy Press.

United Nations (UN) (1995) *States of disarray: the social effects of globalization*. Geneva: united Nations Research Institute for Social Development.

Vaitsos, C. (1973) Patents revisited: their function in developing countries. In C. Cooper (Ed) *Science technology and development*. London: Frank Cass and Co.

Van Wyk, J. (2002) Indigenous knowledge systems: implications for natural science and technology teaching and learning. *South African Journal of Education*, 22(4).

Yiu-wai, Chu. (2004) Postcolonial discourse in the age of globalization. In Allen Chun (Ed), *Globalization*. New York: Berghahn Books.

Young, Robert. (1995) *Colonial desire: hybridity in theory, culture and race*. London: Routledge.

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