

# Pathways towards sustainability through higher education

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## Abstract

**Purpose** – The aim of this paper is to contribute to aligning higher education towards meeting the challenge of global sustainability.

**Design/methodology/approach** – The barriers to sustainability are juxtaposed against the resources, responsibilities and potential of higher education. Ideas from several models and from within several disciplines are integrated to construct a framework through the challenges can be examined and then translated into learning outcomes, expressed as graduate attributes.

**Findings** – The focus of education for global sustainability has been on encouraging consumers to modify patterns of resource consumption and waste management. However, there are some significant limitations to relying on consumer action. Future professionals, involved in managing resources or designing options from which consumers make choices, are in a much better position for influencing how social, cultural and environmental resources are used. To actualise this potential requires that higher education curricula offer experiences which develop graduate attributes of self-efficacy, capacity for effective advocacy and interdisciplinary collaboration, as well as raise awareness of social and moral responsibilities associated with professional practice.

**Research limitations/implications** – For higher education to contribute towards achieving sustainability requires support of the whole institution, and considerable professional development of staff to help them appreciate how they can lead the next generation to global sustainability. The next stage of the research into the role of higher education in building a sustainable society should focus on how these objectives can be achieved.

**Originality/value** – Considerable research has been dedicated to describing the urgent and intractable nature of the problems facing the global community and, to some extent, the need for higher education to engage with these problems. This paper takes the next step by presenting some guidelines for designing curricula to develop graduate attributes required for this work.

**Keywords** Curriculum development, Higher education, Consumers, Graduates, Sustainable development

**Paper type** General review

## Introduction

We are living in a rapidly changing and less predictable global system. Consumption patterns, once a consequence of local factors, are now influenced by less visible and more remote economic, technological, social, political and environmental drivers. In many ways, the far reaching effects of local actions can be attributed to technology that has enabled the fast transformation of resources, transfer of energy and information. The increasing affluence and growing expectations for personal comfort and convenience in the developed world have led to consumption patterns that are unsustainable, degrading the global resource base and the quality of the physical and social environments. Citizens in less developed countries are often the victims of this exploitation. These trends have generated much discussion and debate about social justice, and have provided a strong incentive for scientific innovation to deal with



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emerging problems. Simplistically, it can be argued that sustainability will be achieved when all consumers can make choices to conserve, to minimise damage and to maximise benefit. Based on this approach, government policies in many countries have placed only limited emphasis on challenging producers to review the ways they manufacture, package and distribute products. Rather, emphasis has been placed on changing consumer behaviour, specifically consumption patterns and waste management. The solution seems simple, yet there is no evidence of substantial progress towards achieving sustainable states on a global scale. The explanation for lack of success is complex and the solution may lie elsewhere.

After examining the barriers to taking action to promote sustainability from a consumer perspective, this paper outlines some key elements of a framework for a potentially effective and long-term approach through the higher education sector.

### **Barriers to achieving sustainability: a challenging concept**

The problem of developing a more sustainable society is complex. At the heart of this complexity is the lack of understanding of the concept of sustainability as a basis for goal-setting. In 1987, the World Commission on Environment and Development defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” (World Commission on Environment and Development, 1991, p. 87). This statement represented a landmark, alluding to factors beyond those related to the condition of the physical environment, traditionally the focus of discussion around sustainability. Emerging from the Earth Summit in Rio De Janeiro in 1992 was a formal recognition of the significant relationship between ecology and economy, articulated in 27 principles (United Nations, 1995). By 1997, sustainable development was seen as dependent on “economic development, social development and environmental protection” (Von Schomberg, 2002, p. 3), later interpreted as the triple bottom line for assessing the impact of consumption (Elkington, 1997).

### **Barriers to achieving sustainability: limitations of technological solutions**

Over the past few decades, research has maintained a strong focus on measuring change in the physical environment. In particular, efforts have been directed at quantifying climate change, with particular emphasis on measuring global warming and greenhouse gas emissions. It has led to the Kyoto Treaty, to which many nations are signatories. Another important area for research has been the development and application of technologies to significantly reduce energy consumption (Van Der Wal and Noorman, 1998). Such technologies are designed to reduce resource consumption and pollution, while they maintain living standards. Use of these new technologies may be encouraged by economic incentives, such as cost savings due to greater fuel efficiency, or by government regulation with penalties for non-compliance with standards, such as in building design.

The problem with relying on technological fixes is that there are many situations where they are yet to be developed to reverse unsustainable rates of resource consumption or pollution. This explains why many believe that efforts have concentrated too much on making changes through the use of new, “clean” technologies (Von Schomberg, 2002). More importantly, there are many requirements for sustainability, such as stable social structures (Lowe, 2002a), for which there are

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unlikely to be technological solutions. More efficient, cleaner production technologies are only part of the solution.

### **Barriers to achieving sustainability: limitations of traditional regulatory approaches**

Regulation also has many limitations. While organisations such as the WTO play a significant role in regulating international commerce to protect the environment of all nations, the strong regional, national or global regulatory frameworks required to control the use and design of a product or service may be considered by many societies as impinging on civil liberties, or conflicting with the ideals of capitalism. Such regulation may be seen as introducing unnecessary costs, which may not be equitably shared by individuals, the community or commercial sectors involved.

### **Barriers to achieving sustainability: limitations of traditional economic approaches**

Based on conventional economic paradigms, consumers are seen as rational individuals prepared to pay a monetary price for goods and services they need to achieve satisfaction. Yet, exchange of money is “useless” for monitoring sustainability of systems because it does not correspond to the ecological flow of materials and energy, which is unidirectional and mostly irreversible (Rees, 2002). If individuals do not see themselves as part of a larger group sharing resources, then price will remain the dominant determinant of choice, rather than concerns about long term impact on social systems or the environment. From the perspective of government and the commercial sector, the short-term commercial profitability or “success” of some products and services on the market may even discourage investment in developing more sustainable alternatives.

### **Barriers to achieving sustainability: limitations of a consumer based approach**

Environmental degradation has been attributed to “careless individual and household behaviour” (Marcoux, 1999, p. 4), suggesting an alternative focus for strategies to promote sustainability. The multi-function role of the household means that changing behaviour could potentially lead to effective management of resources. Noorman *et al.* (1998) introduced the concept of “household metabolism” as a practical way of understanding the global impact of local, daily consumer activity. Drawing from the ecological sciences, this concept can be applied to households to describe the flow of materials and energy. According to this model, the failure to recognise the importance of the household as a “social decision-making unit” represents a loss of countless opportunities to change behaviour and achieve sustainability.

The consumer focused approach to achieving sustainability relies on individuals making informed and responsible decisions. Contemporary consumers would be regularly required to choose a product, for instance, according to the biodegradability of packaging, or whether its regular consumption might protect health. This assumes a certain standard of competence on the part of consumers as well as motivation to make sustainable choices. Consumers may be reluctant to make changes towards more sustainable consumption, for instance, because they feel that their individual decisions will not have a significant impact, particularly in the long-term.

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Assigning responsibility for important decisions to disaffected individuals is unlikely to bring about the major changes required to achieve sustainability.

More importantly, moves towards sustainability through a household based approach assumes that consumers have access to the relevant and reliable scientific information, interpreted in ways that they can apply to everyday situations. It also assumes that more sustainable options are available to consumers. The following discussion explains why these assumptions may not be valid.

### **Barriers to achieving sustainability: lack of accessibility of information for decision-making**

Decisions can only be fully informed when consumers are aware of the resources and energy used in production and supply. Often the scientific information is not readily available. For instance, making truly informed decisions about food requires knowledge of some aspects of the management of land, water, energy, labour and other resources used for production. Food is becoming increasingly complex, and ingredients sourced more widely so that it “has become more anonymous and its production more distant from the average consumer (in industrialised societies) than perhaps ever in human history” (Monk, 1999, p. 209). Consumers do not know the producers or understand the processing or recognise the ingredients involved in the products they regularly purchase, even though the brand name may be familiar. Terms such as “imported” are inadequate when using the origin of the ingredients as a criterion for choice. Because they have grown up even more remote from production regions than previous generations, younger people find it “especially hard... to make connections between the food they eat, local agriculture, the environment, and the local economy” (Harmon, 2002, p. 244). Yet, cumulatively this information is essential if consumers are to be able to influence resource consumption rates.

Manufacturing foods which increase risks to health with regular consumption is an unsustainable practice. A coordinated campaign of rejection of these products by consumers may be a powerful way to influence commercial and political processes because “(c)onsumers provide economic demand for food and therefore have much collective control over the food system” (Harmon, 2002, p. 242). There is some evidence to support this claim. Boycotting genetically modified products, or supporting organic food production chains, represent significant examples where consumers have influenced their food supply (Monk, 1999). However, these examples are exceptions rather than reflecting usual trends. It is difficult to imagine how to create opportunities for democratic participation by consumers in the decisions made by enormous multinational companies mass producing food.

The challenge of providing information to consumers is evident when examining the impact of one familiar initiative. Food labelling regulation has been developed with a view to better informing the consumer, so that decisions can be made to protect personal resources such as income and health. In most countries, it can be argued that food labelling legislation reflects a responsible attitude of government and that compliance represents responsible behaviour on the part of food producers. However, many consumers do not fully understand the food label. Using it as a tool to guide food choice requires integration of any graphic symbols, health claims, an ingredients list and a nutrition information panel. Adding to the complexity, decisions about label design may be guided by objectives related to aesthetics, style or marketing effectiveness,

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rather than to developing consumer understanding. Communicating information about complex issues such as the sustainability of production presents an even greater challenge through this medium (De Boer, 2003).

### **Barriers to achieving sustainability: limits to reliability of information for decision-making**

Scientific facts may appear as reliable for use in decision-making by consumers. However, the derivation of these facts is subject to the processes of collecting and interpreting evidence, and influenced by established conventions and expectations of researchers. Careers are made and kudos derived through discovering new scientific knowledge. As such, empirical science is not value free, with “vested interests... driving the research agenda” (Lowe, 2002b, p. 6). Such interests may compromise the reliability of the information needed by consumers to make decisions in the interests of themselves, their communities or the broader environment.

The processes through which science is filtered for the public influences its reliability. Generally, information about products and services delivered through the media are prepared by public relations or marketing teams. By no means does this filtering lead to a systematic and balanced presentation of all the facts needed to make informed decisions. Even claims such as “biodegradable”, which potentially could be scientifically verified, can be variously applied and then widely interpreted by consumers and even be misleading (Cude, 1993). In many instances, consumers receive information which has been selected by stakeholders for its potential to encourage purchase, to improve the public image of a company, or perhaps for political reasons, rather than for its contribution towards providing a balanced perspective.

There are many examples where scientific facts have been debunked or substantially revised after adventitious events, further research and even through uncovering fraud. The complexities of scientific phenomena inevitably mean that there is always some level of uncertainty about the facts which describe them. Lowe (2002b) explains that it is this uncertainty which makes science vulnerable to the values and assumptions of those involved in its interpretation. Essentially, there are always likely to be limits to the reliability of information for the purpose of decision-making by consumers.

### **Barriers to achieving sustainability: limits to human information processing capabilities**

It is necessary to consider the cognitive processes involved to fully understand the notion of informed decision-making. Along with many other theories, various information processing models have been used to explain how new information is acquired and organised by individuals. Essentially, information received through the senses enters the sensory memory. The processing system involves many steps in which the information is manipulated in the short-term memory, and encoded in preparation for long-term storage. The encoding is dependent on perceptions of the quality or value or reliability of the information, and even the sensory pathways through which it has been perceived. An individual’s sensory acuity, as well as education, experience, values, attitudes and beliefs, may influence perception. This means that consumers will selectively respond to segments of information, depending on personal capabilities and circumstance and interests, or even the medium through which the information is channelled.

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For some input, cognitive processing is limited and decisions are apparently intuitive. Other information received may be stored in the long-term memory to become part of the file through which an individual sorts when weighing the options in the process of decision making. An individual's stage of cognitive development is an important variable which will determine the speed of processing, the number of information bits processed in a given time, whether the information is stored, and the storage capacity. This model indicates the complexity, and explains the unpredictability and individual nature of the decision-making process.

Considering the cognitive effort required to search through an extensive data base of relevant stored information and evaluate the relative importance of each bit of information, it is understandable that individuals will often simplify the process by choosing particular decision-making strategies (Niva and Timonen, 2001). Frequently selecting household food supplies at the point of sale in the supermarket would be a daunting task if consumers were to weigh up all the options when deciding on each product. Choosing products according to brand names is an example of a strategy which may simplify the process. The choice is a balance between the cognitive effort they are prepared to make, and their perceptions of the implications of making the wrong decision. This type of decision-making may not necessarily lead to choices which contribute to global sustainability.

Research has highlighted the influence of situational factors on the decision making process (Payne *et al.*, 1993), with the information environment a dominant factor. In a consumption-based culture, its impact is all-pervasive so that information segments compete for consumer attention. Consumers may receive a vast number of messages via a variety of communication pathways at any one time, potentially overwhelming the human processing system. Rather than due to lack of motivation, failure to store information in the long-term memory may also be due to its inconsistencies with the established knowledge base. So even if information is reliable and accessible, the human information processing system may limit the capacity of individual consumers to make the complex decisions required for sustainability.

### **Barriers to achieving sustainability: balancing individual vs universal rights**

Cultural context determines the meaning and value attached to products and services, and so, influences consumer decision-making. For instance, the different choices consumers make to protect their health depend on their conceptions of good health and the value they attach to health. Even the act of consumption is value laden when individuals make choices to satisfy more than their basic needs. This means that efforts to promote global sustainability must extend beyond the consumer and culturally homogeneous communities to broader frameworks, which embrace a universal set of human values. The right to life, health, employment and freedom are enshrined in the thirty articles of the 1948 Universal Declaration of Human Rights (United Nations, 1998), with secondary rights arising from these, such as the right to nutrition to maintain health (Brundtland, 1999). If protecting individual health relies on exploiting resources to the extent that others are denied the opportunity, then it is unsustainable. So global sustainability is dependent on assuring the rights of many, possibly at the expense of some individuals, and the challenge of balancing these constitutes another significant barrier to achieving sustainability.

The complexity, lack of accessibility or the unreliability of information available for decision-making, and the limits of human capabilities to use it efficiently, all contribute to the inadequacies of the individualistic, consumer centric approach to sustainability. For a sustainable society, it is essential to acknowledge the individual as a part of many social and cultural groups, so this calls for a whole systems approach. The following discussion outlines the many reasons why the higher education sector could be a valuable resource in this process.

### **Higher education: a resource for sustainability**

An approach based on consumer action relies on individuals with motivations, competencies and access to information which enables them to make choices which do not degrade or deplete resources in the physical, cultural and social domains. It also relies on sustainable choices being available. Recognising the barriers facing consumers to making sustainable choices shifts the focus to the training of professionals who manage the resources, educate the public or design the options from which choices are made. The institution of higher education is where these professionals are trained. In fact, many argue that the higher education sector bears a significant responsibility for sustainability by virtue of its influence on society and academic freedom to explore ideas (Davies *et al.*, 2003; International Association of Universities (IAU), 2006; Sherren, 2006). This provides a strong justification for investing in this social institution as an agent to bring about change.

The Consultation on Sustainable Development in Prague in 2003 acknowledged the failure of higher education sector to produce graduates with the skills, motivation and knowledge to address the problems emerging in the work towards sustainability (IAU, 2006). In particular, the recognition that most world leaders had completed tertiary studies is strong evidence that the education which empowered did not encourage the aspirations or develop the capabilities required for sustainability.

The higher education sector is a complex realm, involving students, academics and administrators, and their diverse attitudes, skills, experiences and knowledge, and programs of study which traditionally transform students into graduates who assume responsibilities in society. So, curricula delivered within this sector should derive directly from the needs of the society that it serves. As such, there are many challenges facing higher education if it is to actualise its potential for contributing to sustainability.

### **The challenges for higher education: promoting diversity**

Generally, tertiary students represent a population with the intellectual capability to assimilate the many dimensions of the concept of sustainability. They are at a formative stage when they can be encouraged to experiment with ideas to find creative solutions to problems in their chosen field of work. However, opportunities to develop this capability are likely to vary for different degree programs due to the type of students they attract. For instance, applicants for a Consumer Science program in the UK come with a wide-range of academic backgrounds (Byrne, 2001) so, as a group, already have opportunities to practice meeting the challenges of working from a multi-disciplinary perspective. This diversity is not usually evident in disciplines, such as medicine, engineering and law, where students are trained for practice based on traditional concepts and long-established conventions. The importance attached to meeting targets for recruiting students from diverse ethnic or economic backgrounds

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and other indicators of alternative social experience by some universities may be seen as a positive first step towards producing graduates capable of contributing to sustainability.

### **The challenges for higher education: understanding the concept of sustainability**

The public misunderstanding and ambivalence about the term “sustainability” extends to the higher education sector (Schriberg, 2002; Thomas, 2004b), with few opportunities to challenge the assumption by academics and the university community that environmental science is the only place for studies about sustainable development (Reid and Petocz, 2005). According to Sherren (2006), this amounts to an academic focus on understanding the environment, rather than the way humans interact with it. So, even programs with an environmental focus are typically mono-disciplinary, rather than multi- or inter-disciplinary (Thomas, 2004a). This may not be obvious because the “flexibility (of sustainability and related terms)... allows for comfortable use in meaningless rhetoric” (Sherren, 2006, p. 401), potentially masking an inability or reluctance to really teach principles of sustainability in this sector.

### **The challenges for higher education: redesigning curricula**

It is important to consider the practicality of developing programs of study which can actually prepare graduates with the necessary knowledge and values, a capacity for critical thinking and the motivation to deal with the multitude of diverse problems associated with non-sustainable states.

Teaching in the higher education sector involves the transfer of knowledge organised in units called subjects or courses. Although a subject can be considered as “a resource... to educate for sustainability” (Institute of Environmental Studies, 1999, p. 6), traditionally it derives from a single discipline. Because sustainability depends on ways natural and social systems interact, studies in a single discipline cannot provide the opportunities to learn how to devise practical and effective ways of overcoming the barriers to achieving sustainability. Even if the program of study includes subjects from different disciplines, the challenge for undergraduate students to integrate the acquired knowledge is considerable. For higher education to “play a crucial role in building the knowledge, skills and attitudes for a sustainable future,” Clugston (2002, p. 13) recommends developing curricula based on concepts related to sustainability, rather than the traditional set of concepts associated with each discipline. This would require a complete revision of policy and practice in the higher education sector.

At present there are a few university programs designed to educate students to adopt an interdisciplinary approach to understanding and solving problems. There are even a few programs which directly relate to the notion of interdisciplinary cooperation and social justice, training graduates for practice focused on promoting healthy individuals, societies and environments. Some programs involve the study of household and broader scale resource consumption. However, with the obvious exceptions in some environmental science and engineering programs (Thomas, 2004a), there are many science based programs which do not include even a token reference to sustainability. Applying the traditional scientific method promoted in these disciplines is unlikely to produce solutions to the poorly defined, dynamic and “messy” problems to be overcome (Potschin and Haines-Young, 2006).

In a review of initiatives in the tertiary sector, Thomas (2004a) reports on the lack of information, incentives, experience, interest or financial resources for sustainability education within the university community. Lacked of shared vision across the university, and conflicting values of various sectors within the tertiary infrastructure, can also counter initiatives (Davies *et al.*, 2003). Effectively, these factors leave a void rather than an opportunity for constructive collaboration, recognised as essential for integrating concepts of sustainability across the curriculum. Given the daunting task of changing the higher education institutions (Thomas, 2004b), developing new curriculum models may be a more effective approach. Potentially, there are many sources of ideas which could contribute to the new curricula. Drawing ideas from several models and paradigms, guidelines which form a framework for the design of curricula to meet the challenges of sustainability, are outlined in the following section.

### **Ideas for curriculum design: Social Cognitive Theory**

Social Cognitive Theory (Bandura, 1992), a synthesis of ideas from associationist and cognitive theories, contributes to understanding the relationships between individual behaviour and environments. Given the importance of understanding interactions at the human-environment interface, this knowledge seems particularly relevant to sustainability education.

According to Bandura, “outcome expectations”, a person’s belief that a given behaviour will lead to a particular outcome, and “personal efficacy”, a person’s belief that they can undertake that particular behaviour, combine in the concept of self-efficacy (Mumaw *et al.*, 1995). Individuals’ perceptions of their own capability to carry out an action are learnt from various sources and relate to their personal experiences of success on prior occasions, their observations of others, their psychological and physiological states. A high level of self-efficacy means a degree of autonomy and self-determinism, attributes recognised as important outcomes of higher education for sustainability (Wals and Jickling, 2002).

Bandura has long advocated the importance of self-efficacy as a powerful predictor of behaviour and performance because it determines an individual’s initial decision to execute the behaviour, the effort expended and persistence in the face of adversity when pursuing the outcome. Motivation, persistence and confidence of success are important attributes in individuals, given the challenges they face in working towards sustainability. To develop self-efficacy in students, curricula should include hypothetical or real problem solving exercises, structured with appropriate levels of professional and peer support to assure positive outcomes (Smith, 1995). This support might be provided through a mentoring relationship with teachers in a ‘project-learning’ approach which encourages greater risk taking and independence (Byrne, 2001).

### **Ideas for curriculum design: Boyer model of scholarship**

The Boyer model of scholarship (Boyer, 1990) provides another theoretical basis to guide the design of curricula to educate individuals for sustainability. Scholarship is a key concept of this model, and requires an inclusive view of the human condition, which emerges when knowledge is acquired through the processes of discovery and integration. There are strong parallels with sustainability education.

According to Boyer (1990), scholarly research focuses on pressing human problems. Certainly this describes the urgent and intractable problems associated

with non-sustainable states. The scholarship of discovery refers to disciplined inquiry, and requires an openness to ideas from less familiar fields on the part of students and academics, corresponding directly with the demands facing those working towards sustainability. To demonstrate the scholarship of integration requires a capacity to recognise the potential for linkages and synergies between disciplines and fields of research, and to be able to form new insights as a consequence. Being able to integrate ideas to establish new insights is a process which is widely recognised as essential for responding to the challenge of achieving sustainability.

Applying the ideas of Boyer directly to tertiary education, Smith (1995, p. 363) claims that education should allow students to develop their capacity “to go beyond their own interests... to build bridges between areas of specialisation... and to apply their knowledge to life.” Setting these goals as learning outcomes provides a focus for the education of graduates for practice within multidisciplinary frameworks, a requirement for working towards sustainability.

### **Ideas for curriculum design: responsibilities of the global citizen**

Adopting a global perspective is essential if higher education is to decide effective ways to respond to unsustainable patterns of consumption. From a global perspective, important objectives of education include the development of an appreciation of the concept of conservation, a respect for indigenous peoples and their culture, a knowledge of the state of the natural environment, an understanding of global dynamics, and the protection of routes of transmission of culture, knowledge and skills to future generations (McGregor, 1998). The question is how these objectives can be translated into graduate attributes.

As part of a proposal for citizenship education, McGregor (1999) describes three components which together could orient individuals to global realities. The civil component embraces community involvement, including contributions toward community development and learning through community participation. The political component involves skills such as conflict resolution and decision-making, as well as opportunities to acquire the breadth of knowledge to enable an effective role in public life. Teaching to promote acceptance of social and moral responsibilities is another important component of citizenship education. By integrating these components, individuals can “see that their consuming role is linked to their role as a socially responsible citizen” (McGregor, 1999, p. 208). There are many parallels here with the ideas proposed by Sherren (2006), as a basis for the design of higher education for sustainability.

The complexity of the information required and the barriers to accessing it disempowers consumers motivated to choose sustainable options. To achieve an equitable balance in negotiations with stakeholders in a global environment may require professionals who can adopt an advocacy role on behalf of their clients. Adopting a global perspective means that higher education must offer students the opportunities to learn the effective communication and negotiation skills required for this role.

Professionals need to reflect on their own knowledge and awareness of global issues. This is important if they are to recognise how their contributions in public forums affect consumers’ decisions, such as in comments they make to the media, in textbooks and the commercial, community or government policies they write.

This means that it is important to educate students to recognise their personal values, recognise conflicting values, then revise them so that sustainability becomes a priority when formulating solutions to human problems. Values education is probably more effective in higher education because it involves individuals at a stage when they have accumulated some life experience and gained some maturity. In one study, role play was used effectively to raise university students' awareness of their own values and how these values influence the decisions they make (Crompton *et al.*, 2002). However, even with a well planned approach and mission, there are many challenges for higher education in implementing effective values education (Muijen, 2004). This may be one of the more significant barriers to reorienting higher education as a resource for sustainability.

### **Ideas for curriculum design: sustainability science**

Developing a new discipline is one way to overcome the constraints of working within traditional disciplinary domains (McMichael *et al.*, 2003). Researchers at Harvard University proposed the development of the field of sustainability science, which is characterised by an integration of ecological and social processes at the local and global levels, with an overall aim of achieving sustainability (Kates *et al.*, 2000). Consistent with the Boyer Principles, it is based on the idea that scientific research is undertaken as real problems are being addressed, allowing for emergence of innovative solutions. Decisions are based on knowledge constructed through a conventional scientific approach which provides the facts, as well as "more informal, cultural knowing" (O'Riordan, 2004, p. 32), so involve value judgements (Dobson, 2004).

In interpreting the principles and objectives of sustainability science for higher education curricula, students would be trained to seek validated and balanced scientific information about the effects of interaction of society and the environment, have opportunities to formulate responses to unsustainable patterns of consumption, to test and revise them. Graduates trained in this way would recognise the needs and interests of all stakeholders and seek to empower them with reliable, understandable and objective information required for effective participation in the processes of decision-making. Through their studies, they need to develop an awareness that any action involves uncertainties and risks with moral and ethical implications which must be acknowledged in the decision-making process.

The value of integrating the principles of sustainability science into the framework for higher education curricula is that it brings together "scholarship and practice, global and local perspectives, and disciplines..." (Clark and Dixon, 2003, p. 8060). Although it remains far from being recognised widely as an integral or legitimate discipline, it provides a focal point to which the efforts in many fields can converge to address the complex issues arising when working towards sustainability. In the conclusion following, these diverse ideas are integrated to form guidelines for curriculum design.

### **Conclusion**

Approaches to sustainability which have relied solely on changing consumer behaviour have not been successful because individuals do not have access to reliable and understandable scientific information, nor the skills or resources to apply the information in everyday decision-making. Information is often unreliable due to

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different interests driving its construction and interpretation, and due to the influence of the wide variety of sources through which it is disseminated. The limitations of the human processing system for dealing with an overwhelming amount of information add to the problem of providing useful and balanced information in the public domain.

Traditional education has not provided the training for graduates to work towards developing solutions to the new and complex world problems emerging. These problems are multi-dimensional and cannot be addressed by a specific application of conventional scientific, economic or social theory. So, while sustainability is dependent on proactive responses from consumers, they need to be guided by professionals with an understanding of emerging problems, and a commitment to reversing unsustainable trends. Through their work in government, industry and communities, these new graduates will enable consumers, individually and collectively, to deal with the threats to the environment, and to social and economic stability in the twenty-first century.

Higher education, as the training ground for professionals, plays a central role in this process. To meet this challenge requires that learning experiences in higher education are restructured. It requires teaching by academics from many disciplines who collaborate to share ideas and make new connections within a flexible and dynamic theoretical base. It also requires them to work beyond their own areas of specialisation to supervise students' work across disciplines. Tertiary students need opportunities to explore the relevance of concepts such as sustainability to their proposed field of professional practice. They need to recognise the importance of their role as graduates in empowering their clients with knowledge and skills to address local problems which threaten future wellbeing. They need opportunities to make contributions to resolving real world dilemmas, with appropriate adaptations for the learners and the learning setting, in place of standard assessment tasks. To meet the challenges such tasks present, strategies to develop self-efficacy and advocacy skills in students need to be developed and tested.

Higher education must develop the capacity in graduates to prioritise actions after balancing all the social, environmental and economic costs and benefits. So, the curriculum should include experiences which lead to a greater awareness of social and moral responsibilities. In particular, greater self-awareness of personal value systems and a willingness to revise them is required to prepare graduates for work towards sustainability.

Finally, there is an imperative for every academic to consider how their area of expertise relates to other disciplines and how their teaching could contribute to developing graduate attributes necessary for work towards sustainability. This requires support of the whole institution, and possibly considerable professional development of staff to help them appreciate how they can actualise the potential of higher education to lead the next generation to global sustainability

## References

- Bandura, A. (1992), "Social cognitive theory", in Vasta, R. (Ed.), *Six Theories of Child Development*, JAI, Greenwich, CT, pp. 1-60.
- Boyer, E. (1990), *Scholarship Reconsidered: Priorities of the Professoriate*, Carnegie Foundation for the Advancement of Teaching, Stanford, CA.
- Brundtland, G.H. (1999), *Nutrition Health and Human Rights World Health Organization ACC/SCN Symposium: The Substance and Politics of a Human Rights Approach to Food &*

*Nutrition Policies and Programmes*, available at: [www.searo.who.int/dgmsgsgs/12\\_04\\_99.htm](http://www.searo.who.int/dgmsgsgs/12_04_99.htm) (accessed April 1, 2007).

- Byrne, M. (2001), "Factors involved in the learning of consumer studies", *International Journal of Consumer Studies*, Vol. 25 No. 4, pp. 322-30.
- Clark, W. and Dixon, N. (2003), "Sustainability science: the emerging research program", *Proceedings of the National Academy of Sciences of the United States of America: Science and Technology for Sustainable Development Special Feature*, Vol. 100, pp. 8059-61.
- Clugston, R. (2002), "Introduction", in Filho, W. (Ed.), *Teaching Sustainability at Universities*, Peter Lang, Frankfurt.
- Crompton, S., Roy, R. and Caird, S. (2002), "Household ecological footprinting for active distance learning and challenge of personal lifestyles", *International Journal of Sustainability in Higher Education*, Vol. 3 No. 4, pp. 313-24.
- Cude, B. (1993), "Consumer perceptions of environmental marketing claims: an exploratory study", *Journal of Consumer Studies and Home Economics*, Vol. 17, pp. 207-25.
- Davies, S., Edmister, J., Sullivan, K. and West, C. (2003), "Educating sustainable societies for the twenty-first century", *International Journal of Sustainability in Higher Education*, Vol. 4 No. 2, pp. 169-79.
- De Boer, J. (2003), "Sustainability labelling schemes: the logic of their claims and their functions for stakeholders", *Business Strategy and the Environment*, Vol. 12 No. 4, pp. 254-64.
- Dobson, A. (2004), "Economic behaviour: value and values", in Scott, W. and Gough, S. (Eds), *Key Issues in Sustainable Development and Learning*, RoutledgeFalmer, New York, NY.
- Elkington, J. (1997), *Cannibals with Forks: The Triple Bottom Line of the 21st Century*, New Society Publishers, Gabriola Island/Stony Creek, CT.
- Harmon, A. (2002), "Teaching sustainability using the food system as a model", in Filho, W.L. (Ed.), *Teaching Sustainability at Universities*, Peter Lang Europaischer Verlag der Wissenschaften, Frankfurt, pp. 239-49.
- Institute of Environmental Studies (1999), *Education for Sustainability*, UNSW Publishing and Printing Services, Sydney.
- International Association of Universities (2006), "IAU Conference: Education for a Sustainable Future. Conference General Report", available at: [www.unesco.org/iau/sd/sd\\_confprague.html](http://www.unesco.org/iau/sd/sd_confprague.html) (accessed December 12, 2006).
- Kates, R., Clark, W., Corell, R., Hall, M., Jaeger, C., Lowe, I., McCarthy, J., Schnellhuber, H., Bolin, B., Cdicson, N., Faucheux, S., Gallopin, G., Gruebler, A., Huntley, B., Jäger, J., Joha, N., Kasperson, R., Mabogunje, A., Matson, P., Mooney, H., Moore, B., O'Riordan, T. and Svedin, U. (2000), *Sustainability Science. Research Centre and Assessment Systems for Sustainability. Environment and Natural Resources Program*, John F. Kennedy School of Government, Harvard University, MA.
- Lowe, I. (2002a), "Social behaviour: incentives for sustainability. Plenary proceedings of CRC coast to coast conference proceedings", available at: [www.coastal.crc.org.au/coast2coast2002/proceedings/Plenary/Social-behaviour-incentives.pdf](http://www.coastal.crc.org.au/coast2coast2002/proceedings/Plenary/Social-behaviour-incentives.pdf) (accessed March 1, 2007).
- Lowe, I. (2002b), "The complexities of communicating science", *Australian Universities Review*, Vol. 45 No. 2, pp. 3-6.
- McGregor, S.L.T. (1998), "Towards developing a global perspective in the field of consumer studies", *Journal of Consumer Studies and Home Economics*, Vol. 23 No. 4, pp. 207-11.
- McGregor, S.L.T. (1999), "Towards a rationale for integrating consumer and citizenship education", *Journal Consumer Studies & Home Economics*, Vol. 23 No. 4, pp. 207-11.

- McMichael, A., Butler, C. and Folks, C. (2003), "New visions for addressing sustainability", *Science*, Vol. 302, pp. 1919-20.
- Marcoux, A. (1999), *Population and Environmental Change: from Linkages to Policy Issues Sustainable Development Department, Food and Agriculture Organisation of the United Nations*, available at: [www.fao.org/sd/wpdirect/WPre0089.htm](http://www.fao.org/sd/wpdirect/WPre0089.htm) (accessed March 1, 2007).
- Monk, A. (1999), "Participation in food industry technologies in the age of sustainabilities", in Martin, B. (Ed.), *Technology and Public Participation*, Science and Technology Studies, University of Wollongong, Wollongong, pp. 209-30.
- Muijen, H. (2004), "Integrating value education and sustainable development into a Dutch university curriculum", *International Journal of Sustainability in Higher Education*, Vol. 5 No. 1, pp. 21-32.
- Mumaw, C.R., Sugawara, A.I. and Pestle, R. (1995), "Teacher efficacy and past experiences as contributors to the global attitudes and practices among vocational home economics teachers", *Family and Consumer Sciences Research Journal*, Vol. 24 No. 1, pp. 92-109.
- Niva, M. and Timonen, P. (2001), "The role of consumers in product-oriented environment policy: Can the consumer be the driving force for environmental improvements?", *International Journal of Consumer Studies*, Vol. 25 No. 4, pp. 331-8.
- Noorman, K.J., Biesiot, W. and Uiterkamp, A.J.M. (1998), "Household metabolism in the context of sustainability and environmental quality", in Noorman, K.J. and Uiterkamp, T.S. (Eds), *Green households? Domestic Consumers, Environment and Sustainability*, Earthscan Publications Ltd, London.
- O'Riordan, T. (2004), "Vignette 2.1 Education for sustainability", in Scott, W. and Gough, S. (Eds), *Key Issues in Sustainable Development and Learning*, RoutledgeFalmer, New York, NY.
- Payne, J.W., Bettman, J.R. and Johnson, E.J. (1993), *The Adaptive Decision Maker*, Cambridge University Press, New York, NY.
- Potschin, M. and Haines-Young, R. (2006), "Rio + 10, sustainability science and landscape ecology", available at: [www.elsevier.com/locate/landurdplan](http://www.elsevier.com/locate/landurdplan) (accessed January 2006).
- Rees, W. (2002), "Our ecological footprints: tracking the progress towards sustainability", available at: [www.emiaa.org.au/ReesENV2002.htm](http://www.emiaa.org.au/ReesENV2002.htm) (accessed May 2003).
- Reid, A. and Petocz, P. (2005), "The UN decade for sustainable development: What does it mean for higher education?", HERDSA 2005 Conference Proceedings, available at: [http://conference.herdsa.org.au/2005/pdf/refereed/paper\\_087.pdf](http://conference.herdsa.org.au/2005/pdf/refereed/paper_087.pdf) (accessed March 1, 2007).
- Schriberg, M. (2002), "Institutional assessment tools for sustainability in higher education: strengths, weaknesses and implications for practice and theory", *Higher Education Policy*, Vol. 15, pp. 153-67.
- Sherren, K. (2006), "Core issues: reflections on sustainability in Australian University coursework programs", *International Journal of Sustainability in Higher Education*, Vol. 7 No. 4, pp. 400-13.
- Smith, F.M. (1995), "Assessment of student outcomes in home economics higher education", *Family and Consumer Sciences Research Journal*, Vol. 23 No. 4, pp. 347-67.
- Thomas, I. (2004a), "Sustainability in tertiary curricula: What is stopping it happening?", *International Journal of Sustainability in Higher Education*, Vol. 5 No. 1, pp. 33-47.
- Thomas, I. (2004b), "Where is the green curricula, or sustainability education, in Australian Universities", *Journal of the Victorian Association for Environmental Education*, Vol. 27 No. 1, pp. 17-18.

- United Nations (1995), *Report of the United Nations Conference on the Human Environment Stockholm, 5-16 June 1972*, available at: [www.un.org/documents/ga/conf151/aconf15126-lannex1.htm](http://www.un.org/documents/ga/conf151/aconf15126-lannex1.htm) (accessed March 1, 2007).
- United Nations (1998), *Fiftieth Anniversary of the Declaration of Human Rights*, available at: [www.un.org/rights/50/decla.htm](http://www.un.org/rights/50/decla.htm) (accessed March 1 2007).
- Van Der Wal, J. and Noorman, K. (1998), "Analysis of household metabolic flows", in Noorman, K.J. and Uiterkamp, T.S. (Eds), *Green Households? Domestic Consumers, Environment and Sustainability*, Earthscan Publications Ltd, London.
- Von Schomberg, R. (2002), "The objective of sustainable development: are we any closer?", Foresight, Working Papers Series No. 1, available at: [ftp://ftp.cordis.europa.eu/pub/foresight/docs/fores\\_wp\\_0210.pdf](ftp://ftp.cordis.europa.eu/pub/foresight/docs/fores_wp_0210.pdf) (accessed March 1, 2007).
- Wals, A. and Jickling, B. (2002), "Sustainability in higher education: from doublethink and newspeak to critical thinking and meaningful learning", *International Journal of Sustainability in Higher Education*, Vol. 3 No. 3, pp. 221-32.
- World Commission on Environment and Development (1991), *Our Common Future*, Oxford University Press, Melbourne.

#### **Further reading**

- Nordstrom, H. and Vaughan, S. (1999), "WTO special studies: trade and environment", available at: [www.wto.org/English/tratop\\_e/envir\\_e/environment.pdf](http://www.wto.org/English/tratop_e/envir_e/environment.pdf) (accessed April 1, 2004).
- Swart, R.J., Raskin, P. and Robinson, J. (2004), "The problem of the future: sustainability science and scenario analysis", *Global Environmental Change*, Vol. 14, pp. 137-46.
- Trigwell, K. and Yasukawa, K. (1999), "Learning in a graduate attributes-based engineering course", HERDSA Annual International Conference 12-15 July, available at: [www.herdsa.org.au/branches/vic/Cornerstones/pdf/Trigwell.PDF](http://www.herdsa.org.au/branches/vic/Cornerstones/pdf/Trigwell.PDF) (accessed March 1, 2007).

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