Engaging people in environmentally sustainable behaviours using interactive Virtual Reality: a conceptual framework

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Abstract

Per capita, Australia has the highest rate of greenhouse gas emissions in the industrialised world (Turton & Hamilton, 2002). As such, it is increasingly recognised that engaging Australians in environmentally sustainable practices and behaviours is central to reducing greenhouse gas emissions for a sustainable future. This paper proposes a conceptual framework for engaging people in environmentally sustainable everyday behaviours using interactive Virtual Reality (VR). First, it provides a framework through which to understand the elements necessary for the long-term uptake of environmentally sustainable behaviours. It then considers how an active participatory engagement model is suited to addressing these issues. Finally, it articulates the approach required by facilitators as well as the role of VR in facilitating communication about environmentally sustainable behaviour change between people in small group settings.

Introduction

Reducing Australia's greenhouse gas emissions and water consumption have become key government priorities in recent years. While there are a number of strategies and initiatives that address these issues at a broad level, it is often difficult to encourage or achieve environmental sustainability at the level of everyday practice, whether this be in the home, the workplace or other settings. Due to the highly contextualised nature of behaviours and practices in everyday life, one size fits all solutions are inadequate to address the complexities of everyday behaviour and encourage the change required for achieving long-term environmental sustainability (Maitney, 2000). This paper proposes a conceptual framework for engaging people in environmentally sustainable behaviour change through active participatory engagement using Virtual Reality (VR) as a communication facilitator in this process. First, we consider the nature of behaviour change and draw together literature and findings about the conditions under which long-term environmentally sustainable behaviour change is likely. We propose an integrated model that consists of four broad elements that influence environmental behaviour change including values, awareness, trial, evaluation and how these relate to the long-term uptake of pro-environmental behaviour. We then briefly consider three different engagement models that may be invoked to address an issue such as this and argue that an active participatory engagement approach provides the *means* most suited to achieving the *purpose* of environmentally sustainable behaviour change. Finally, we re-visit the elements of environmental behaviour change and consider how these relate to an active participatory engagement process that acknowledges the purpose of engagement, the role of the facilitators and the use of VR as a communication resource in an active participatory small group context.

Promoting Environmentally Sustainable Behaviour

In the pursuit for environmental sustainability, the need to adopt environmentally sustainable behaviours in relation to energy and water consumption is increasingly recognised. According to Macnaghten (2003), how people perceive the 'environment' and 'environmental issues' has changed from a broad concept to that of a personal one. He proposes that in the 1960s and 1970s the environment was seen in broad, global terms with environmental problems identified on this abstract level (e.g. global warming, rainforest destruction). However, as a result of globalisation and an increasing emphasis on the individual in society, the environment has gained meaning on a more personal level. Consequently, environmental issues have come to be seen as personal issues 'in here' rather than external issues 'out there' (Macnaghten, 2003, p.69). This has led research and interventions to focus increasingly on the role of people's behaviours and attitudes in environmental conservation (Lofstedt, 1993, p.3).

While many people today may ostensibly value the environment and promote environmental conservation, these beliefs are often contradicted by everyday behaviours that contribute to increasing environmental degradation and the over-consumption of non-renewable resources. This apparent 'value-action' gap is largely attributable to the taken-for-granted and often pre-reflective nature of everyday practices and behaviours (O'Donoghue & Lotz-Sisitka, 2000). The fact that everyday behaviours seldom involve conscious reflection means that their environmental consequences are often surmounted by the practical 'task at hand'. In this respect, environmental goals and values can be seen, in a practical sense, to be habitually traded-off in the course of everyday activities that are shaped essentially by indoctrinated behaviours rather than informed reflection or choice (Von Borgstede & Biel, 2001). Subsequently, understanding and targeting the realm of everyday practice is essential for achieving behaviour change oriented to environmental sustainability.

In order to do this effectively, sustainable behaviour change can be conceptualised as involving four integrated elements including values, awareness, trial and evaluation with the overarching purpose of achieving the long-term uptake of environmentally sustainable behaviour.

Model: Integrated elements of environmental behaviour change:

VALUES	⇔	AWARENESS
⇕	UPTAKE	⇕
EVALUATION	⇔	TRIAL
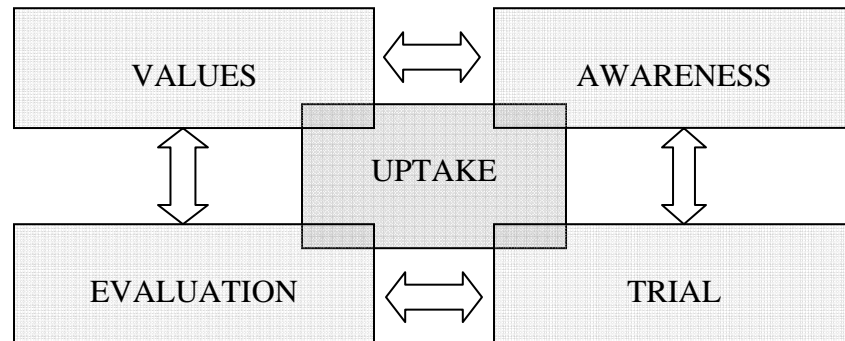
VALUES

When speaking of environmental problems and behavioural solutions it may be tempting to assume that values refer exclusively to the realm of the natural environment. That is, people must value the natural environment for behaviour change to occur. While this may be true to some extent, the fact that many people support environmental sustainability yet do not reinforce this through their actions suggests that 'values' and indeed, the 'environment', need to be re-conceptualised with respect to the everyday realm. As Macnaghten (2003, p.75) states, "…there are *many different* 'environments' each connected to people's particular concerns, priorities, social relationships and responsibilities". In other words, natural environment values are reflexively organised in relation to other values that may be more or less relevant in different contexts. For example, Von Borgstede & Biel (2001) undertook a study of employees at Goteborg University to investigate the factors influencing an employee's willingness to behave in an environmentally friendly way. It was found that behaviour is context dependent and people are likely to behave within social norms depending on how they

interpret the situation (Von Borgstede & Biel, 2001). How people experience the environment as 'meaningful' to themselves should not, therefore, be seen in terms of a monolithic or static value set. Rather, environmental values are contingent on everyday social experiences and contexts where they may be continuously and pre-reflectively renegotiated from one setting to the next.

AWARENESS

Awareness is central to the relationship between values and practice, no matter how environmentally-friendly the former may be in any given context. Some people may be aware of environmental issues yet not know the effect certain behaviours would have on these issues. In their study on university students' environmental behaviour, Marcell, Agyeman and Rappaport (2004, p.177) found that not knowing or misunderstanding the consequences of certain behaviours can impede the adoption of environmentally sustainable practices. These misunderstandings are often due to the invisible consequences of pro- or anti-environmental behaviour. Hence, if people can *see how* simple, everyday behaviours can have a positive impact on the environment then they will be more likely to engage in pro-environmental behaviour (Marcell et al, 2004). An example of environmental savings that can be achieved through simple everyday practices is demonstrated by the Commonwealth Department of Public Prosecutions. In this case, department offices situated in a high-rise building in Sydney's CBD were able to achieve a four star energy rating simply by staff turning off computers, office equipment and lights when not needed (Sustainable Energy Development Authority, 2000, p.27).   Therefore, awareness that connects environmental concerns to practices on the personal level is necessary for the promotion of pro-environmental behaviour.

TRIAL

While values and awareness provide important conditions for the adoption of environmentally sustainable behaviours, trialing new practices is obviously essential for their long term uptake. Maiteny (2002) proposes the transition into new behaviours can be made through experiential learning. He explains that "experience is more likely to motivate imperatives to break environmentally damaging behaviours (or 'bad habits') in everyday life that arise from within persons. Intellectual activity alone is less likely to trigger this" (Maiteny, 2002, p.304). However, like values, the realm of experience is complex and just as pleading on moral reasoning alone is unlikely to effect pro-environmental behaviour change, neither is it likely that directing or encouraging people to trial different behaviours will be effective in isolation. Both internal (individual, psychological and social) and external (institutional, economic) barriers may restrict trialing new behaviours that are consistent with environmental concerns (Kollmuss and Agyeman in Marcell, 2004, p.171). Internal barriers include people's inability to see how to adapt broader issues of environmental concerns to their everyday practices or lacking motivation for change. As mentioned previously, the element of awareness can help with this by allowing people to see how their behaviour can result in positive environmental outcomes. External barriers to trialing behavioural change derive from the physical limitations. As Jelsma (2003) points out, machines and devices can hinder environmentally sustainable practices. Consequently he suggests that effective behaviour change may require re-designing the 'material landscape' so that materials encourage or dictate more environmentally sustainable behaviour. These barriers highlight the salience of ensuring that symbolic and material environments are supportive of behaviour change so that trialing pro-environmental practices 'make sense' to people in a practical context.

EVALUATION

The final component necessary for the long-term uptake of environmentally sustainable behaviour is evaluation – and, necessarily, evaluation that behaviour

change is indeed desirable and worthwhile in the long run. While people may well trial certain practices, it is the outcome and assessment of these trials that will dictate whether long-term behaviour change will occur. In this light, it is important to note that evaluation may often be complex and take place on a 'practical' level rather than an exclusively intellectual one. Inevitably, evaluation will involve a re-negotiation of values, awareness and trialed behaviours relative to the context, including the priorities associated with any given 'task-at-hand'. For the sake of weighing up environmental consequences with other values and activities, this phase is often complicated by the fact that the effects of behaviour (pro- or anti-environmental) can often be 'invisible' (Lofstedt, 1993). Hence, the comfort and ease associated with 'old habits' may prevail over the task of breaking these habits due simply to immediate practical efficiency rather than any informed assessment of their consequences – environmental or otherwise. By making the 'invisible' more 'visible' can potentially provide another factor that can be integrated into this phase. Providing visible signs of electricity or water use could also result in competition among people. Competition can act as an incentive to motivate behaviour change (Marcell et al, 2004, p.185). Other incentives, including financial, personal or social may also influence the evaluation of behaviour. Evaluation will involve a number of practical, contextual and suppositional considerations that may support or impede the long-term uptake of environmentally sustainable behaviours.

UPTAKE

Effective behaviour change will result in the long-term uptake of the proposed behaviour. To achieve this purpose, values, awareness, trial and evaluation need to be integrated in process of behaviour change. Considering these elements will ensure behaviour change is based on meaningful experience. If behaviour change is not based on meaningful experience for the person involved then it is likely to be "'skin deep', temporary and prone to revert back to old habits'" (Maiteny, 2002, p.1). The process of behaviour change is on-going and

involves a continual re-negotiation of values as they relate to the particular context, awareness of how behaviour within this context can contribute to environmentally sustainable behaviour, trialing this behaviour within everyday practices and evaluation of these practices in light of present values within that context.

Active Participatory Engagement for environmentally sustainable behaviour change

One of the central conceptual problems with the notion of 'active participation' in the context of environmental sustainability is the interchangeable use of the term 'active participation' to refer to both a participatory engagement process and participation in environmentally sustainable practices. This often leads to a situation where the *purpose* – active participation in environmentally sustainable practices – becomes confused with the *means* – engaging people in environmental sustainability using an active participatory engagement process. While the goal is certainly important, it is the *means* that will ultimately determine whether that goal is achieved. The tendency to confuse the goal with the means is, to some extent, confounded by the fact that much of the literature on 'active participation' as an engagement model is oriented to addressing broad issues of democratic citizen involvement in policy-making.   Stemming from Arnstein's Ladder of Participation (Collins, 2004), a range of comparable 'hierarchies of participation' have emerged that focus on involving citizens in policy and decisions that may affect their lives (for example, Middlesbrough Partnership; Wombat Community Forest Management Project; Queensland Government Community Engagement Get Involved Website; IAP2 Spectrum for Public Participation).   For the sake of simplicity, all of these reflect, either in more complex or simplified forms, the Organisation for Economic Co-operation and Development's model of community engagement that incorporates three levels of engagement:

- **Information**–a one-way relationship in which government produces and delivers information for use by citizens. It covers both "passive" access to information upon demand by citizens and "active" measures by government to disseminate information to citizens.
- **Consultation**–a two-way relationship in which citizens provide feedback to government. It is based on the prior definition by government of the issue on which citizen's views are being sought and requires the provision of information.
- **Active participation**–a relationship based on partnership with government in which citizens actively engage in the policymaking process. It acknowledges a role for citizens in proposing policy options and shaping the policy dialogue, although the responsibility for the final decision or policy formulation rests with government.

(OECD, 2001)

Despite their inclination to policy development issues, these levels of engagement can also be applied to issues associated with behaviour change. Given the five components of behaviour change outlined above, it is immediately clear that the isolated provision of information cannot achieve long-term behaviour change. In short, this 'awareness-raising' technique falls short of facilitating value-change relative to different contexts, provides limited means to 'see' the environmental effects of behaviour, may only promote trial if it so happens that the information strikes a cord with existing values or provides incentives in light of the existing context, and provides limited capacity for evaluation of trialed behaviours. Under these conditions, the long-term uptake of environmentally sustainable behaviours is unlikely, except perhaps by a random few. Consultation provides another possible approach to address issues of environmentally sustainable behaviour change. However, while consultation may provide some informed insight into strategies and initiatives that may motivate behaviour change, it is limited in its capacity to address these issues as it removes participants' responsibility for their own behaviour.

In comparison with information and consultation models, an active participatory model stands as the most appropriate method to address the five components of environmental behaviour change. An active participatory approach enables

participants to identify, discuss and negotiate values, consider and assess expert information in a contextually and practically significant way, identify and trial and evaluate new practices in a manner that is receptive to the practical context. However, while this active form of engagement may be recognised, *in principle,* as the most appropriate means to address issues associated with environmentally sustainable behaviour change, carrying out an engagement process that truly involves the active participation of all participants requires more than the simple assertion that an active participatory model will or has been invoked. Therefore, we now turn to consider some facilitation strategies combined with the capabilities of VR that will encourage and enhance active participatory engagement oriented to environmentally sustainable practices.

Conceptualising Active Participatory Engagement using Virtual Reality

Previous research has recognised the potential for VR to facilitate communication between stakeholders about a number of issues pertaining to urban design and sustainability more generally. Virtual Reality in its most basic sense describes some form of 3-Dimensional computer-generated environment, which allows 'real time' random interaction from a viewer or multiple views. While games are potentially the most popular application of VR, it is also becoming increasingly popular as a means to present and market large-scale urban developments.   In this respect, VR's capacity to allow 'fly-throughs' of proposed developments and enable developments to be viewed from different view-points (birds-eye, street view, etc.) is particularly advantageous in comparison with the traditional use of 2-Dimensional plans and 3-dimensional static models. As yet, however, the use of VR for the purposes of engagement has been limited.

In principle, VR provides a non-technical platform enabling stakeholders in an engagement process to explore ideas, obtain relevant background information (Lofstedt, 1993), establish mutual knowledge (Hunter, 2002), share ideas and develop shared meaning (Cuthbert, 2002) – all necessary for engagement oriented to identifying and generating sustainable outcomes. Its features including the capacity to represent familiar contexts, provide a 3 dimensional 'unfolding perspective' of the environment, make 'real-time' changes to the environment and produce text-base responses to questions, all have the potential to enhance communicative and decision-making processes in active participatory setting. However, while VR has the potential and capacity to facilitate active participatory engagement, it must also be recognised that it is not the technology itself that will permit or restrict active participation. To date, VR has been used primarily as a presentation or information tool for urban design, often representing an 'ideal' proposed built form without reference to any social context. This popular use of VR technology acts as a warning to those interested in using VR as a communication *facilitator* rather than an information *provider.* The use of VR with respect to an issue such as environmentally sustainable behaviour change therefore runs the risk of its being invoked as a sophisticated education tool rather than a tool designed to facilitate engagement about contextually significant environmental practices. For this reason, it is essential to conceptualise how VR can facilitate the process of engagement – *the means* – rather than the outcome – *the purpose.* In this light, the role of the people who plan and facilitate the engagement process, including group facilitators who lead discussion, technicians who operate the technology and those who program it must be recognised as playing a more salient role than the technology itself. It is these people who are responsible for using and applying VR in a manner that is authentic and supportive of active participatory engagement.

At this point, therefore, it is possible to identify three layers relevant to the engagement process. The first involves the purpose (environmentally sustainable behaviour change), the second involves the approach to

engagement (the role of those who plan and facilitate engagement) and the third involves the resources used during the engagement (in this case, the role of VR).   All of these layers must be recognised as different, yet inter-related and must be integrated appropriately in the conceptualisation and course of the engagement process.   This involves further consideration of the relationship between purpose and means.   While on the one hand, they should not be confused, on the other hand, they must be recognised as mutually dependent – without each other, they would remain purely theoretical constructs with no practical outcomes.   In this case, the long-term uptake of environmentally sustainable behaviour change acts as the central *purpose* with the four elements of behaviour change outlined above providing a guide to the factors that need to be addressed through the *means.*   While the overarching means can be identified as active participatory engagement the approach and resources adopted can be conceptualised and broken down in a manner that is sensitive and conducive to the purpose.   This involves articulating how the principles of active participatory engagement, with respect to both the role of people and resources, can be applied in relation to addressing the five components of environmental behaviour change.   Therefore, it is pertinent to re-visit these five components and begin to identify strategies for engagement and the complementary capabilities of VR that can be applied within an active participatory framework.

VALUES

While in line with the purpose of engagement, the optimum outcome would be for participants to develop values consistent with environmental sustainability. The highly contextualised nature of people's value systems means that engagement facilitators (including all people involved with the planning, facilitation and resource development associated with the engagement process) must seek to understand how value systems operate within the practical context of participants' lives.   This may involve exploring different contexts and typical behaviours of participants within these, encouraging reflection on the values or

priorities that currently inform these behaviours, and the flexible identification of incentives that may promote or resist change, regardless of whether these reflect the 'moral high ground' of environmental sustainability. VR can provide a useful tool for facilitators and participants to develop a shared understanding of how values and context are inter-related and to discuss how values may be reorganised or new values integrated into the relevant context. In the first instance, providing a virtual environment that can realistically reflect the relevant physical environment such as the home or workplace, participants are provided with an instrument to better explain and discuss with others how their values are associated with activities within that physical context. Furthermore, VR's capacity to make 'real-time' changes to the environment provide some opportunity to manipulate the physical environment to better reflect participants' perspectives, add in elements that may influence values or behaviours that have not been included in the original VR environment and/or incorporate certain social scenarios or indicators of such (for example, representations of people) that normatively or authoritatively influence the values and subsequent behaviours applied under certain conditions. Further potential includes the incorporation of a ranking system to reflect how different values such as need, efficiency, financial, environmental and normative compliance are ranked in relation to different physical features and social scenarios that characterise the context at different times. This can enable participants and facilitators to identify, visualise and plausibly renegotiate values in the course of the unfolding discussion. Therefore, the combination of open and flexible facilitation with the capabilities of VR can provide a platform for the identification and negotiation of values in a manner that is both context sensitive and conducive to active participatory engagement.

AWARENESS

While awareness-raising strategies and the provision of information should not define the engagement process, the incorporation of relevant factual information is an important component of the active participatory process. In this respect,

facilitators must be appropriately informed with regard to the environmental impacts of certain behaviours as well as other possible consequences such as financial and perceived social impacts. However, it is equally important to be open and accepting of participants interpretation of those 'facts' and accounts of how certain impacts may be traded-off against others, particularly in light of relevant value systems. VR can aid in raising awareness of how broader issues of environmental sustainability connect with individual behaviours and practices in a way that enables facilitators to avoid taking on an educational role. The capacity of VR to record and display at least the environmental and financial impacts of simple behaviours provides a means for participants to virtually experiment with behavioural changes and assess how and the degree to which current and potential practices will influence the impacts produced. This has a number of advantages in the context of active participatory engagement. First, it enables facilitators to assume roles that are seen by participants as flexible and open rather than educational and/or authoritative through having to be the 'providers' of environmental information, morally laden by a sustainability ethic. Participants, provided they trust the information produced by the technology, can essentially become their own educators through queries and experimentation. This leads to the second advantage of VR in this context whereby participants can initiate experiential learning and evaluation of behaviours, commonly undertaken through the trial and evaluation phases of behaviour change, at an earlier stage. In other words, participants can see *how,* in a virtual context that reflects a familiar environment, simple behaviours can produce negative or positive environmental and/or economic outcomes and discuss in light of this, the social impacts or trade-offs that may result in relation to these. Closely related to this is the third advantage of the use of VR derives from the capacity for participants to identify the material or symbolic barriers to the trial or uptake of sustainable behaviours and to some extent manipulate these experimentally within the context represented by the VR environment. In these respects, VR invoked as a communication facilitator, provides a platform for discussion and

decision-making with regard to actual trials that may be possible and practical in a given context.

TRIAL

Of course, active participatory engagement does not begin and end within the small group context where facilitators and the VR environment are present and most likely the focus of attention. While VR can allow virtual trials to take place in the small group context, achieving the purpose of the engagement – the uptake of sustainable practices - relies inherently on translation of the decisions made by the group or individuals into practice. Here, it is important to ensure that the engagement does not begin and end with the small group setting. The continuance of experiential learning and the capacity to see the effects of behaviours in the everyday context are essential for the process of trialing and evaluating new behaviours. A range of strategies can be utlised to encourage the continuation of the engagement process in this respect. First, facilitators should ideally be contactable during this phase to answer questions, receive feedback or updates from participants and to assist with any problem-solving activities that may become relevant during the trial phase. Second, it is advantageous to provide feedback to participants during this phase. Ideally, feedback should be oriented to the perspectives of and decisions made by participants in the small group setting. For example, feedback may be required in relation to a particular goal set by participants, the incentives identified as relevant for behaviour change, an expressed desire for the continued visualisation of impacts or the like. How feedback is provided may require innovative solutions and these may also be devised by participants. The role of VR in this setting may be more or less significant depending on the outcomes of the small group session and participants' access to technology, however some possibilities can be identified in combination with other technologies. For example, if conditions allow for energy and/or water consumption to be metered and monitored, feedback can be provided through incorporating an environmental and/or financial impact notification system into desktop computers

such as metaphoric exaggerated environmental outcomes or numerical reporting of energy/water consumption or their environmental and economic impacts. This can allow people to see in 'real-time', or slightly 'delayed time', *how* their changed behaviours are influencing their energy or water use and related impacts. Another possibility involves enabling user access to the VR environment allowing participants to record and highlight problem areas, trialed behaviours and their advantages and disadvantages, material needs, symbolic barriers and the like. In this way, participants may be encouraged to reflect on their practices and identify possible barriers and solutions in a practical context.

EVALUATION

Using feedback strategies can enable evaluation throughout the trial period, reinforcing the integrated nature of environmentally sustainable behaviour change. However, while ongoing evaluation occurring in conjunction with trials is a significant element of the behaviour change process, in the course of active participatory engagement, a second small group facilitated session can further assist with the evaluation process and the on-going process of trial, uptake and maintenance of environmentally sustainable practices. During this phase, facilitators must again remain open and flexible to participants' perspectives about new or changed, values, behaviours, trials and subsequent evaluations. At this stage of the process, participants are likely to have become more conscious and aware of how their everyday values and priorities interact and are traded off in the course of everyday behaviours and practices. As such, VR can again provide a useful tool for the articulation of these issues. In a similar way that it can be applied in the initiation of the engagement process, it can be utilised to facilitate communication and discussion about the evaluation of trialed behaviours, generation of further context-sensitive possibilities and strategies for environmental behaviour change. Furthermore, through its capacity to enable participants to visualise certain aspects of the problem at hand in the context of a

setting relevant to their lives, may provide a more powerful reminder of the outcomes of the engagement process.

CONCLUSION

Active participatory engagement is an on-going process that involves the continual re-negotiation of values and evaluation of trialed behaviours. While the overarching purpose of the engagement is to achieve environmentally sustainable practices, this cannot be seen as a simple goal that once reached, completes the process. Instead, as values and contexts change so too will the need to modify and re-evaluate new trialed behaviour. In small group settings, facilitation that stays true to active participatory engagement and the appropriate use of VR can facilitate this process by providing a means through which to understand and negotiate values, increase awareness, experimentally trial certain behaviours and evaluate these behaviours through virtual representation of their impacts. Furthermore, extending the engagement process into the realm of practice through providing opportunities for participants to provide and receive feedback can enhance the likelihood of the long-term uptake of environmentally sustainable behaviours.

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