Sustainable Communities, Sustainable Environments: *The contribution of Science and Technology Education*

David B. Zandvliet
Simon Fraser University

Darrell L. Fisher (Eds.)
Curtin University of Technology

SENSE PUBLISHERS
ROTTERDAM / TAIPEI

A C.I.P. record for this book is available from the Library of Congress.

Paperback ISBN 978-90-8790-059-5
Hardback ISBN 978-90-8790-060-1

Published by: Sense Publishers,
P.O. Box 21858, 3001 AW Rotterdam, The Netherlands
http://www.sensepublishers.com

Printed on acid-free paper

TABLE OF CONTENTS

FOREWORD

Sustainable Communities, Sustainable Environments? What is enacted when we engage with these ideas? *Sustainability* is a term increasingly used to describe the broader purpose and goal for education as we move further into the UN declared Decade of Education for Sustainable Development (UNDESD). This book provides a variety of international perspectives from the traditional fields of science and technology education as teachers (primary through tertiary), teacher educators, and academic researchers engage with this topic. The book provides a collection of new works which will help to describe for educators, what it is we develop, and what it is we sustain when we engage in *education* for *sustainable development* (ESD).

The structure of this book is also very much eclectic in that we do not try to answer these questions here, instead we pose sustainability as a question which in itself may be wholly unanswerable. The realities of sustainable practices lie in the multiplicity of contexts where these may (or may not) be practised. Each chapter in this book then, provides insight into a particular view and practice of sustainability that may be congruent with, or directly in opposition to other views presented here. This is quite deliberate on the part of the editors as when we worked with authors, we sought to expand the topic to include many perspectives on sustainability rather than narrow the focus to only a few. The result is a collection of works which we hope will inspire dialogue, critique and further inquiry into a role for the future of education: safeguarding the inherent qualities of community *and* environment.

David B. Zandvliet

and

Darrell Fisher

STEPHEN QUINTON, DARRELL FISHER, HEINZ DREHER
AND PAUL HOUGHTON

CHAPTER 10

Creating Sustainable Online Learning Environments for Mature Age People

INTRODUCTION

The current reality is that we live in a complex world where too often the response to managing complexity has been to bring together every available piece of information in an attempt to describe every aspect of the subject at hand. As we see it, the problem with this approach is that the passive, almost naive approaches of the past disguise the true nature of any online subject which too often is accompanied by inappropriate navigation, poor interface design and linear delivery strategies. These tendencies in online design needlessly complicate the delivery of any subject material in that it fails to deliver a coherent set of ideas that are tailored to users' needs and inhibits the free flow of timely interaction with other users. Most web sites fall into this category and as a result the use of the web as a tool for dealing with complex issues such as professional learning and innovation has not been successful.

Complex issues have always existed but are rarely dealt with in a manner that fully recognises and addresses multiple levels of complexity. With today's technologies, we have a unique opportunity to address this need. For example, navigational approaches no longer need to be constrained by over-extended simplistic mechanisms like hierarchies. Consistent with good teaching and learning practices, different points of view could be generated and sustained in order to fully explore issues, which in turn points to a need for more advanced filtering and focussing strategies. Most important, a learner-centric approach to knowledge construction is required that encourages and enhances human capabilities to filter, explore, expand, interpret and discuss ideas and information through collaboration and engagement in communal-based activities that are aimed at deriving a common understanding on an area of interest.

The application of information and communications technologies (ICT) to create a learning and innovation framework for mature age people must approach the issues to be resolved from a new perspective, dealing with complexity in a way that will provide for their unique needs and preferences. Ultimately, this environment must bridge the gaps between what a community of interest needs to know and what they currently know in a way that satisfies the goals of all

Zandvliet, D. and Fisher, D. (Eds.), Sustainable communities, sustainable environments: The contribution of science and technology education, 115–130.

participants. Knowledge-oriented learning environments that assist in managing the complexity and speed of change that is occurring in today's world must also support innovation, learning and human experience in ways that bring together:

- **People** – communities, collaboration and individual interaction
- **Information** – granularity, re-use and dynamic generation
- **Relationships** – openness, accessibility and integration, and
- **Standards** – the world of the Internet, XML and web open source.

As will be shown in the pages to follow, there are many issues and preferences to be addressed when considering the design of a sustainable online environment for mature age people that will promote the exchange of ideas and knowledge and provide an intuitive framework for learning. This is a difficult challenge that will take some time to reach full potential, but nevertheless it is a task that must be viewed as a systemic problem that necessitates a fresh, holistic approach to dealing with the inherent complexity and the evolutionary nature of devising sustainable online learning environments. The key factors that must be considered include the need for:

- opportunities to engage in focussed innovation
- motivation to create new knowledge that is evidence-based
- skills for testing the validity of new knowledge
- the means to transfer knowledge into actual practice; and
- the capacity to participate in establishing a community-based knowledge creation environment that reflects the real and changing needs of mature age learners.

This chapter outlines a collaborative research project that aims to devise an online design model which is tailored to the specific needs of mature age people. By understanding their learning preferences, needs and requirements, we argue it is possible to provide opportunities for learning and innovation that will improve the quality, variety and relevance of learning for this emerging and increasingly important sector of society. The project outcomes will result in the application of new methodologies and approaches to the effective implementation of complex, intelligent learning solutions. The developmental cycle undertaken to date forms the primary focus of the discussions to follow.

MATURE AGE LEARNERS

The need for mature age workers to remain productive in the workplace has emerged as a crucial issue for both government and education. The ageing population and an ongoing decline in population growth has led to a call to encourage the growing proportion of older people to not only continue working past the normal retirement age, but also to adapt to the recurrent demands made by employers for new and innovative vocational skills. This in turn has placed pressure on current government and education sectors to establish more effective

and innovative strategies for addressing the skills and workforce requirements of employers. To date, little research has been conducted on the specific needs and preferences, or the development of effective teaching and learning models for mature age learners and workers. Some information exists, however for the most part it has been derived from more generic research projects. Even more critical to furthering our understanding of their needs and preferences is the limited availability of information on the effectiveness of online teaching and learning strategies for mature age groups.

Dewar (1999, pp. 4 -5) compiled a comprehensive selection of adult learning principles from a number of sources. While most represent the authors' experiences as adult learners, other factors have been included as they raise interesting questions that can guide our thinking on the design of an online forum for mature age learners:

- increasing and maintaining a sense of self-esteem and pleasure are strong secondary motivators for engaging in learning activities (Zemke, 1988)
- new knowledge has to be integrated with previous knowledge; that means active learner participation (Zemke, 1988)
- adult learning must be problem and experience centred (Gibb, 1960 as quoted in Brookfield, 1986)
- effective adult learning entails an active search for meaning in which new tasks are somehow related to earlier activities. Prior learning experiences have the potential to enhance or interfere with new learning (Knox, 1977 as quoted in Brookfield, 1986).
- a certain degree of arousal is necessary for learning to occur, whereas stress acts as a major block to learning (Brundage & MacKeracher, 1980)
- collaborative modes of teaching and learning will enhance the self-concepts of those involved and result in more meaningful and effective learning (Brundage & MacKeracher, 1980)
- adults will generally learn best in an atmosphere that is non-threatening and supportive of experimentation and in which different learning styles are recognised (Smith, 1982)
- adult learning is facilitated when the learner's representation and interpretation of his/her own experience are accepted as valid, acknowledged as an essential aspect influencing change, and respected as a potential resource for learning (Brundage & MacKeracher, 1980)
- adults experience anxiety and ambivalence in their orientation to learning (Smith, 1982)
- adult learning is facilitated when teaching activities do not demand finalised, correct answers and closure; express a tolerance for uncertainty, inconsistency, and diversity; and promote both question-asking and -answering, problem-finding and problem-solving (Brundage & MacKeracher, 1980)

- adult skill learning is facilitated when individual learners can assess their own skills and strategies to discover inadequacies or limitations for themselves (Brundage & MacKeracher, 1980)
- adult learning is facilitated when the teacher can give up some control over teaching processes and planning activities and can share these with learners (Brundage & MacKeracher, 1980)

Artess (2003) argues that given we are concerned with how adults learn, then we might fare better by examining the research on why adults do not learn or as she correctly points out, the 'barriers to learning'. Artess further explains that as teachers, our planning and preparation strategies need to account for a broad range of potential inhibitors. Although the barriers to learning identified by Artess appear to provide a list of negative characteristics, we are encouraged to consider the following as prompts for the initial assessment of students' needs, rather than as absolute categories.

- low self esteem
- lack of confidence
- low or uncertain motivation
- inattentiveness or lack of attendance/participation
- poor listening skills
- under-developed study skills
- anxiety or fear or insecurity
- incomplete prior knowledge/poor entry qualifications
- previous experience of failure/difficulty in learning
- social separation
- domestic, financial or personal worries
- low expectations of self
- unrealistic expectations of self
- unwillingness to ask for help
- physical or health conditions mental health conditions
- specific learning difficulties

Cantor (1992, p. 39) points out that adults experience different barriers to learning from children some of which might include for example:

- many other responsibilities (families, careers, social commitments)
- lack of time
- lack of money
- lack of child care
- scheduling problems
- transportation problems
- insufficient confidence
- having to learn, if told by boss, but not interested or ready

Artess (2003) also emphasises that adult students are unlikely to begin learning at exactly the same level of understanding and so teachers must cultivate learning from differential starting points. The differences may not be fully evident until the programme is well underway. Also, the author notes that mature age students tend to progress along many different dimensions simultaneously (the academic, the social, the personal and the economic) and it is therefore likely that they will value their learning experiences in different ways. As Artess observes, other writers such as McGivney, 1999 and Sargant, 2000 have observed that confidence building is a pre-requisite to effective learning and that successful progression can often be hindered by a lack of confidence.

In describing the main differences in learning styles between adult learners and children, Blackmore (1996) refers to Knowles theory of andragogy (adult learning) which is an attempt to differentiate the way adults learn from the way children learn. As Blackmore discovered, there are a number of assumptions that can be made based on this theory as outlined by Cantor (1992, 36-37) and Cranton (1992, pp. 13-14, 49):

- adults are autonomous and self-directed
- adults are goal oriented
- adults are relevancy oriented (problem centred)--they need to know why they are learning something
- adults are practical and problem-solvers
- adults have accumulated life experiences

Kearsley (1996) summarises what this means to instructional designers and lecturers in practical terms: "andragogy means that instruction for adults needs to focus more on the process and less on the content being taught. Strategies such as case studies, role playing, simulations, and self-evaluations are most useful". Finally, Cantor's (1992, pp. 37-38) observations on what motivates adult learners provides further direction for this project in that he notes how the factors that typically motivate adults to learn are different to that of children as indicated for example by a preference to:

- make or maintain social relationships
- meet external expectations such as a work related need to upgrade their skills
- learn to better serve others
- secure professional advancement
- escape daily routine and seek out stimulating activities
- pursue personal interests.

THE MATURE AGE LEARNING JOURNEY

A report produced by the Australian National Training Authority (2005 pp 3 - 5) advanced the concept of a 'mature worker learning journey' that is broken down into four vertical components: trigger, deliberation, learning and work. Each of the

four phases represents a key step in the learning cycle of mature age persons (see Figure 10.1).

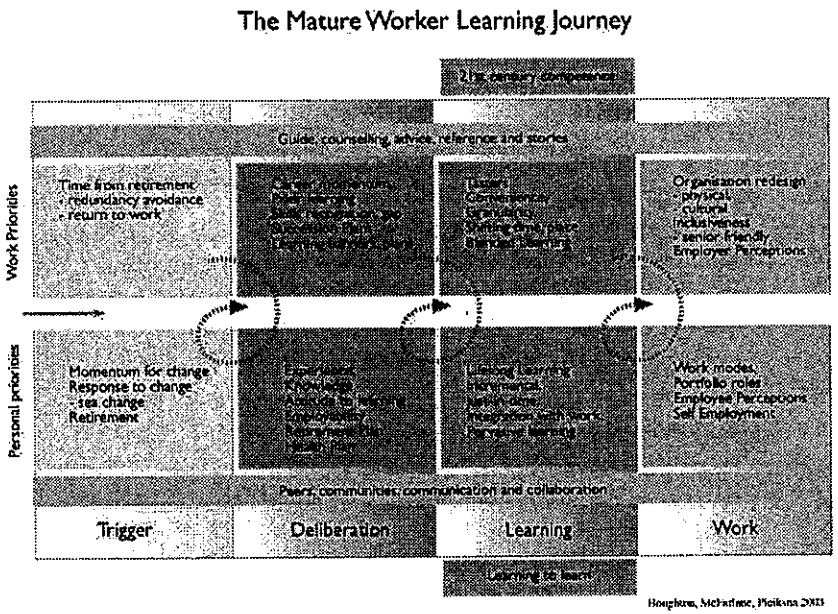

Figure 10.1. Learning journey for mature age workers.

- **The trigger phase** refers to events that occur in a mature age persons' personal or professional life that stimulates deliberation (the next phase) about possibilities that may result in vocational study. Professional priorities that act as triggers may range from contemplation of retirement in the near future through to a desire to return to the workforce after retirement. Personal priorities may include adapting to changes in technology, the desire to radically redirect one's life through a 'sea change' or a desire to stay abreast of shifting management practices.
- **The deliberation phase** relates to the reflective thinking processes and planning that mature age workers often engage in before they act. Mature age workers will confront one or many issues, considering perhaps the extent to which training might strengthen their job prospects following retrenchment, the type of training that might best suit their professional and personal lifestyle and the extent to which they might gain recognition for prior learning. This phase is a time of reflection during which mature age workers make an informed decision about whether or not training is going to benefit them sufficiently to warrant the commitment of time and effort.

- The next phase, **the learning phase**, is where deliberation is transformed into action. A decision to engage in education and training has been made been and now the mature age person brings to bear their personal and professional priorities to access the training content and modes that meets their needs. Participants will look at issues such as convenience, availability of short 'taster' courses, training with a stronger social element and peer support theme and/or more flexible delivery modes such as 'just in time' and incremental learning.
- The final phase, **the work phase**, represents the period during which the mature age worker applies his or her new skills in the workplace and, in many cases, seeks further opportunities for education and training. A wide range of variables can impact during this stage and, for many mature age workers, difficulties will be encountered as they attempt to challenge long-held stereotypes amongst employers about older workers and the relative value of investing in their skill base.

Underpinning all four phases is a clear imperative to provide:

1. Support and guidance amongst mature age workers. Research has shown that mature age workers prefer learning environments that incorporate the active participation of a guide who is capable of assisting them to customise their education and training to meet their individual needs.
2. Facilitate peer interaction. Mature aged workers tend to prefer learning mechanisms that connect them with their peers (thus fostering deeper learning experiences through discussion-based interactions) and places them directly in touch with instructors (to allow for deeper questioning and more individualised attention).

Taking into account all factors and underlying priorities outlined earlier then combining them with an understanding of the four phases of the mature age journey brings us much closer to determining the best model(s) for delivering learning (on and offline) to this demographic. Accommodating their needs and preferences will make education and training a more attractive option thus facilitating greater uptake and creating a stronger guarantee of successful outcomes for those who move from deliberation to learning. Mature age persons seek flexibility, evident value-add, access to information about education and training options and interaction with their peers and instructor(s). All these factors represent key themes for any successful online learning venture that is aimed at addressing the needs of mature age people. The member-centric model described in the pages to follow represents one such attempt undertaken by this team.

THE MEMBER CENTRIC MODEL

One model that was devised to allow for the flexibility needed by mature age learners is where the contribution is spread throughout the membership (member centric – communal model) to permit the emergence of issues from more active

and focused discussions. This model is particularly suited to a learning and innovation environment in that it is more sustainable because any member can contribute to varying extents as new inspirations arise. This advantage is one of the strengths of weblogs. A blog, which is an abbreviation of weblog, is a tool that is used by individuals to put forward a point of view on a regular basis. The contributors can be experts or individuals with experience and knowledge of an issue or subject area. The necessary elements for a blogspace, the term for a distributed contribution environment that utilises a blog metaphor to generate sustainable community dynamics, must reflect these characteristics. Thus, the member-centric model represents an entirely different approach from that of the more traditional centralised contribution model, a consequence of which was to undertake a major re-think on the tools needed to support it. This is because the modes of interaction that occur within this space can differ depending on role, topic and even the timing of a discussion. The blogspace combines the tools and functions to bring the possibility of a member-based contribution environment to life.

The member-centric approach to a community blogspace means that a number of tools must be made available to all members as well as specialist tools for designated members. These tools must be based on a familiar metaphor to ensure they will be intuitive to use. In this case, the folder metaphor is used to organise content and a drop-down menu allows access to relevant templates and to display various types of content. This feature referred to as a dashboard, is accessible from any part of the site, but members are only permitted access their own personal dashboards. A simple dashboard model is provided in Figure 10.2.

A differentiated authoring environment allows the tools available to each member to differ if necessary so that all members have access to the content types and authoring tools that match their needs. Information about the content 'folders' is also displayed in the dashboard so that members can easily manage the content in terms of avoiding duplication, culling old material or re-organising existing content. The space is therefore comprised of a set of tools that assist each community member to establish the necessary functionality to customise environments so that they are more member-centric and allow for the increasing sophistication in the way members relate and work with one another. This is the first step towards using the community to filter information and to identify issues of priority. As it may be daunting for some members to be given access to too many tools, a subset of tools can be made available until members gain confidence in using the environment. A mock-up of a simple dashboard showing these functionalities is provided in Figure 10.3. In this instance, an administrator has been given access to a wide range of tools.

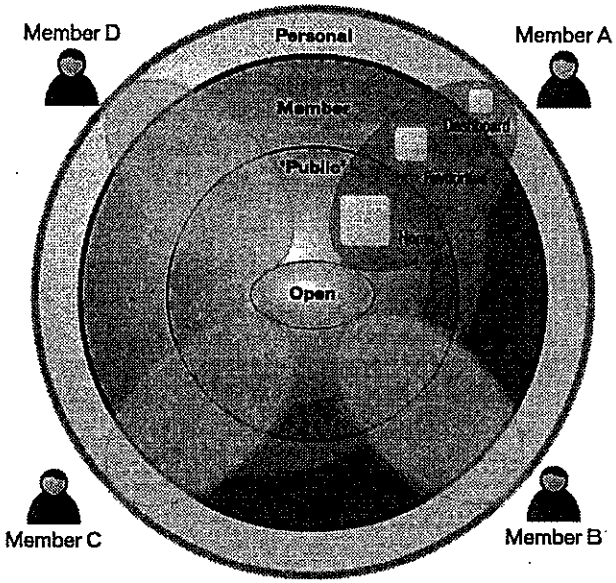

Figure 10.2. The Member-based Dashboard model.

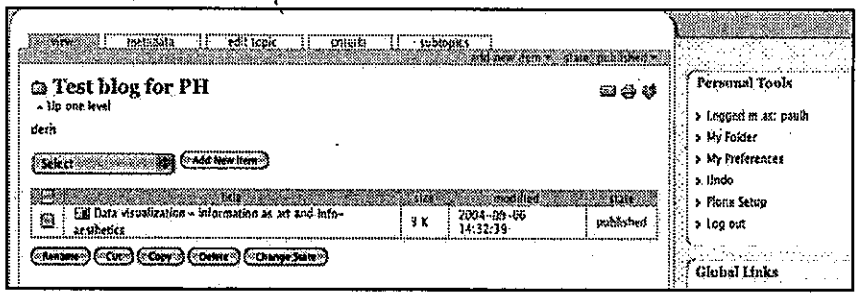

Figure 10.3. Mock-up of a simple Dashboard interface.

One of the key benefits of the member-centric model is the capacity for the community to begin the process of filtering relevant content that may be of use to the community as a whole or even to a subset of that community. This activity is in effect a process of attenuation where the more relevant material is identified and quickly distributed to members who share similar interests. In this way, the members become a critical part of the information distribution and filtering processes. A mechanism to assist in facilitating this process was developed based on the familiar idea of favourites or bookmarks commonly used in web browsers. As a member finds content, blog entries, files or even another member's home

page, there is the capacity to add each item of interest to their favourites section which in turn is made accessible to others (and the 'public' if required). This feature allows not only the individual member to achieve more efficient use of the space, but also provides a communal benefit. As members congregate around issues, they can more quickly debate and resolve issues by referring to one another's chosen favourites, thus filtering and focussing information to encourage continued debate. Each personal view of favourites now includes access to personal tools as shown in Figure 10.4.

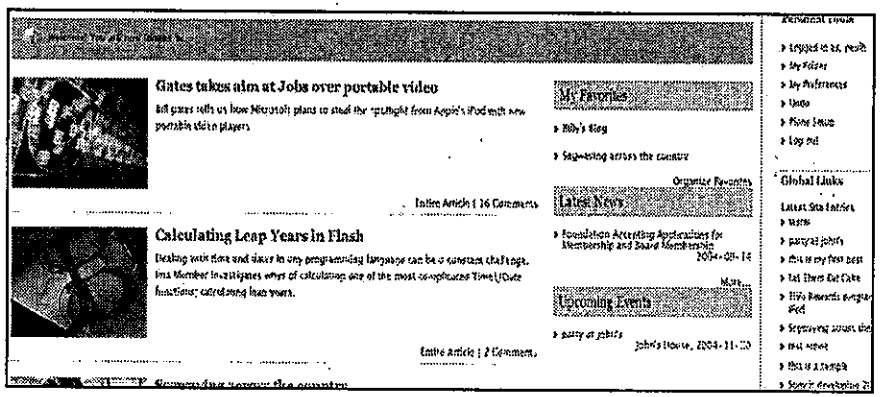

Figure 10.4. A member's personal view of favourites.

The idea of every member having a home page addresses the issue of the reluctance of some members to openly enter into discussions. The member-centric environment is one where each member can share their personal thoughts as they feel comfortable by choosing when to publish them. The member's page displays the member's photograph, a brief biography, published articles, and statistics on their contributions. Each member's display will be available to every other member and if they wish, one member can add another member's home page to their favourites for quick reference. A measure of 'how many people have someone in their favourites' is also a measure of the contribution value of members involved in each activity.

The choice of using the open (public) space is one that is made by the community itself and is largely dictated by the nature of the interest the community is pursuing. The reason for this arrangement is that there will be some content that is useful for attracting new members such as information for the broader 'public' on progress, or resolution, or even just a snapshot of information that may be useful to non-members.

All members have access to both other member's homes and the open space but there is a choice as to whether the non-members can see member homes. The use of the open space can also be tailored to the requirements of different members or communities. The view a member receives of the open space could include information that he or she may want to be accessed everywhere such as their

favourites. A non-member viewing this page would not see any favourites unless the member published them. This option is governed by defined roles.

If required, the capacity to add new members, allocate roles and track contribution is also important to the smooth running of a community. Again there are choices. If the community so agreed, new members can add themselves. If there is some entry requirement then member applications can be routed to other members for approval, and so on. This capacity to manage members is also built into the space.

SETTING THE CONTEXT FOR THE NEXT ITERATION

A model for content creation and blogging (member-centric) that is not dependent on central resources (or enthusiasm) has proved to be more appropriate to the aims of the project and has allowed the interests of each community to form and evolve as new issues emerged and increased in complexity. Although different yet developed around similar functionalities to that of previous models, the tools that supported the member-centric approach needed to be enhanced in line with the membership model rather than the community model. The logic for developing such a model can also be found in the broader concept of community evolution that is based on a staged progression from a formative community established by individuals as they connect to others, through to a highly collaborative environment that leverages the knowledge of each individual and evolves into a learning community.

The current (member-centric) site was initially established as a research forum for the project team members. By using this site it was hoped that a framework for developing the mature age prototype site would emerge. However, a numbers of problems have occurred in encouraging effective use of the site:

- it has been rarely used by the project team members
- the investment in time required in gaining familiarity with the site has proven to be a barrier
- access to and use of the site has not been convenient – it is another 'task' that requires the use of an alternative tool set
- the tools provided in the website are not always readily available and immediately apparent in their use
- overall, the site is not intuitive in its design and provides little direction as to what is available, what can be achieved, what to do next ,and how to it.

In response to the issues outlined above, a series of meetings and a workshop were convened to progress the project to a new level of development that would ensure the site remains viable and will continue to improve as our understanding of the needs of mature age people increases. After extensive discussions to resolve the identified issues and concerns, it was agreed that motivation was key factor – there must exist a perceived need to undertake a task or activity. The aim therefore, is to design a new model for engaging communities of practitioners that also facilitates automatic documentation of all project activities for future reference and analysis.

First, it was agreed that a fluid interface is required where a new task begins with a blank slate which can then be populated by the objects (tools and layout features) that the user considers to be relevant to the task at hand. A floating 'ring of functions' that surrounds the workspace could assist the user to focus on a 'seed idea' from which the innovation process may germinate. Secondly, rather than utilise the online workspace for all activities, it was considered more productive to use familiar tools such as email and MSWord to carry out the preliminary discussions and negotiations that take place in the context of normal human interactions. Once consensus has been reached as to a useful direction or topic or activity, a specialised button can be made available via email to all project members that either invokes an existing workspace or generates a new workspace.

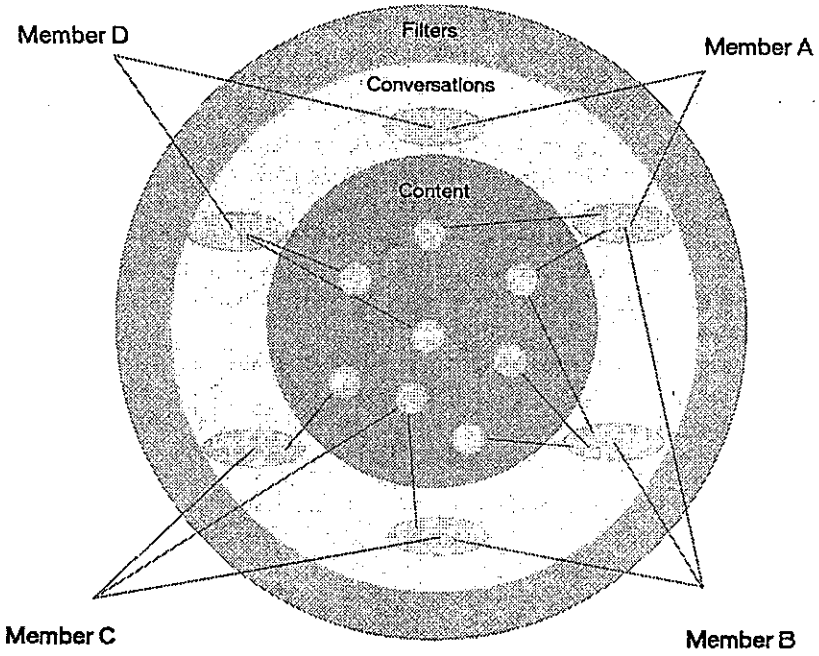

Figure 10.5. The Conversation Model.

The difficulties experienced with the evolved research space led to the development of a new model that not only encompassed many of the elements of the previous models, but assembled them in a way that would overcome the problems encountered in the first iterations. A new focus was conceived that would lessen the steep learning curve required by participants and shift the emphasis from member contributions using the member-centric model to an emphasis on a enabling an expanding number of 'conversations' that can take the form of weblogs, written articles and papers, research analyses and findings, and discussions. All of these examples are viewed as catalysts that enrich the discourse

process and allow all members to contribute by using other conversations (or aspects thereof) to stimulate ongoing discussion rather than requiring them to make 'cold', often tentative contributions. This design approach, referred to as the conversation-centric or exploratory model, which is illustrated in Figure 10.5.

The conversation-centric model permits the alignment of content with the conversations that take place so that users can be assisted to identify and explore various themes and topics of interest utilising filtering mechanisms such as metatags. Content is added as text, images, movies or sound files through the conversation interface by authorised users. The metatags are added on publication to provide useful descriptions of the object after which discussion around any of these content 'objects' is enabled.

Members interact through conversations, some of which will be featured on the site portal, others will form the basis of themes that are supplemented by other resources while some will be not relevant and archived for future use. Filters allow members to view only those conversations that are relevant to their focus of interest, for example only those conversations that are based on certain themes, or perhaps only the most recent conversations are of interest. Figure 10.6 shows the availability of the most recent conversations.

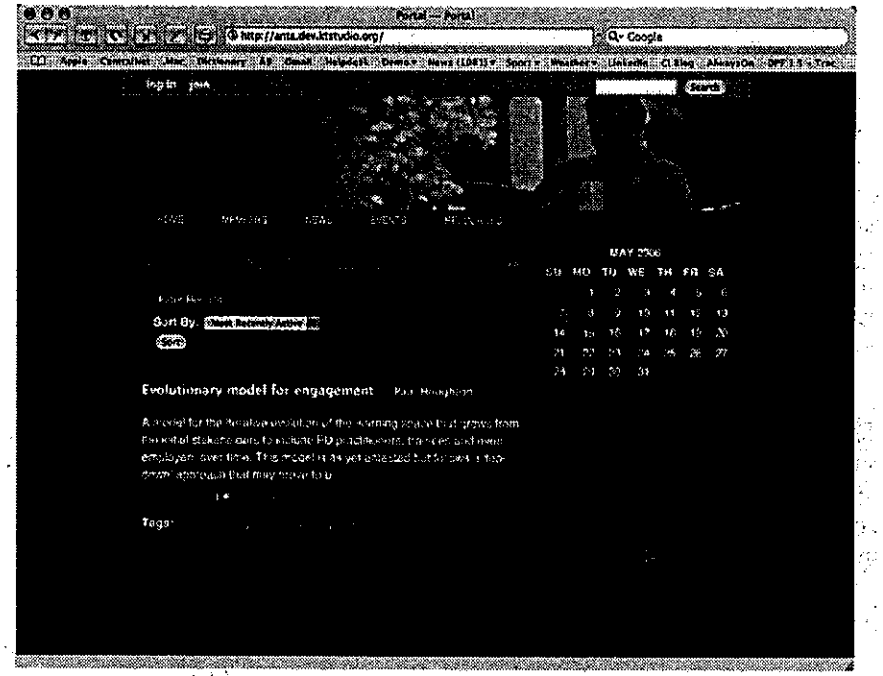

Figure 10.6. Entries for the most recent conversations.

Members can choose to form into one of two categories: those who contribute to the conversations and those that contribute resources as well as conversations. As

new themes emerge, the task of moderation and resource management will be allocated to theme 'champions'. Thus, it is the dynamic nature of the emerging conversations that is a primary focus and use of the site, not the static reference material or content. For example, reference material can be referred to during conversations, or members can be alerted to conversations, or members can subscribe to conversations or themes using Really Simple Syndication (RSS). Figure 10.7 illustrates the 'Edit Conversation' interface.

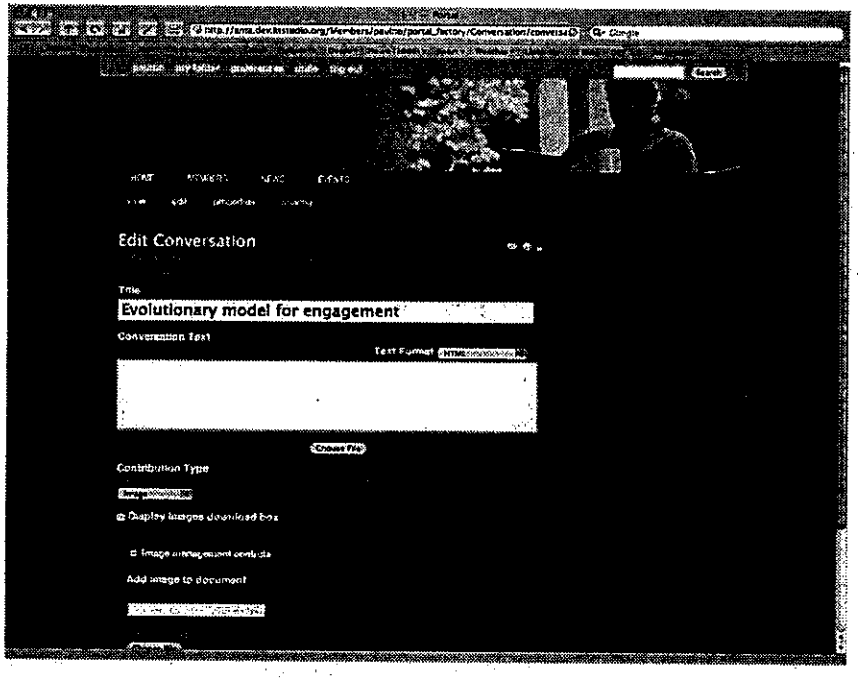

Figure 10.7. The edit conversation interface

The conversation-centric model has now been implemented using some of the software developed from the earlier iterations of the research space, but as indicated beforehand, comprises several newly developed features. Over the coming months, the community of interested practitioners will employ a variety of means to discuss and debate the merits of the intended approach and also seek opportunities for future projects that can focus on specific aspects of this model. As the number of related projects expands, each will inform the broader debate and contribute to the design of the research space, which in turn will eventually contribute to shaping the various dimensions of the final Mature Age prototype solution.

CONCLUSIONS

The organic nature of how collaborative working spaces are used to generate active discussions, creativity and innovation will lead to the development of ideas that will naturally improve through a rigorous cycle of research, prototyping and systematic feedback from mature age people who will be introduced to the project as the research progresses. Once completed, the final version will evolve as an action research tool for all future inquiry and development.

For the full potential of the new conversation-centric framework to be realised, many of the elements that make up the framework must be supported by new forms of technology and tools that respond to the needs of different knowledge domains, community processes and the many different points of view and needs of the mature age community which must always remain the central focus of this work.

The Mature Age project represents a unique opportunity to use these tools and concepts to develop a professional community for practising teachers that will become both self-sustaining and highly effective in its capacity to foster innovation and learning. The technologies to be used must support all aspects of this community and also support the evolution of the community as outlined in the preceding pages. This means that the use of networks in ways that make the richness of the content and human interactions that make communities work must be reflected in the supporting technology environment.

The traditional approach to publishing information, whether it is digital or analogue, will no longer meet these needs. What is required is a dynamic and adaptive environment that can simultaneously meet the requirements of many different situations appropriately. A 'one size fits all' approach will no longer work and this project (along with several others) will lead to the establishment of a dynamic and evolving knowledge space that employs emerging Internet technologies to support the growth of communities of creative practice. Although to date a variety of technologies have been used to support the evolution of different online communities in line with their changing needs, there has also been a number of limitations and constraints in these environments which have been identified by the communities themselves and/or by observers of the process.

In order for the next phase of development to progress, several related projects are currently underway from which it will be possible to refine the continued evolution of the online communities concept and to address previous shortcomings. At this stage, the implications for the next stage of the Mature Age project are that the management and evolution of the communities of interest will be devolved to the communities themselves, relieving the pressure on centralised resources to sustain both the quality of the content and the nature of the interactions. It will also shift the emphasis of the technology environment to better support the dynamics of the mature age community. This strategy will better facilitate community dynamics in ways that are consistent with the community evolution model and encourage the development of sustainable online communities that take advantage of metaphors such as the blog space and virtual conferences in order to provide a learning environment that encourages community innovation and creativity. The technology environment must reflect these features and also adapt to meet the needs of

individuals whilst at the same time support all aspects of the collective community dynamics.

REFERENCES

Artess, J. (2003). How adults really learn– or what we think we know about how they learn! *MMU Learning and Teaching in Action, 2* (2), Summer.

Australian National Training Authority (ANTA). (2005). *Mature learners online - Summary discussion paper*. Canberra: Australian National Training Authority. pp 3 – 5.

Blackmore, J. (1996). *Pedagogy: Learning styles* [Online]. Available: WWW Ref. <http://www.associatedcolleges-tc.org/cotf/COTFX/materials/smeaton-styleslearningnotes.doc>

Brookfield, S. (1986). *Understanding and facilitating adult learning*. San Francisco: Jossey-Bass.

Brundage, D. and MacKeracher, D. (1980). *Adult learning principles and their application to program planning*. Toronto: The Minister of Education.

Cantor, J. A. (1992). *Delivering instruction to adult learners*. Toronto: Wall & Emerson. pp 36 – 37 & 39.

Cranton, P. (1992). *Working with adult learners*. Toronto: Wall & Emerson.

Dewar, T. (1999). *Adult learning online* [Online]. Available: WWW Ref. <http://www.cybercorp.net/~tammy/lo/oned2.html pp 4 -5>.

Kearsley, G. (1996). *Andragogy (M. Knowles)*. Washington DC: George Washington University. http://gwis2.circ.gwu.edu:80/~kearsley/knowles.html

McGivney, V. (1999). *Informal learning in the community: A trigger for change and development*. Leicester: NIACE.

Sargant, N. (2000). *The learning divide revisited: A report on the findings of a UK-wide survey on adult participation in education and learning*, Leicester, NIACE.

Smith, Robert (1990) *Learning to learn across the lifespan*. San Francisco: Jossey-Bass.

Zemke, R. and Zemke, S. (1988). 30 Things we know for sure about adult learning. *Training*, July. 57 - 61.

Stephen Quinton, Darrell Fisher and Heinz Dreher
Curtin University of Technology, Australia

Paul Houghton
Central TAFE, Western Australia

ROWENA SCOTT

CHAPTER 11

Evaluating a Professional Learning in Shark Bay, Western Australia

BACKGROUND

One of the eight goals of the United Nations (UN) is to ensure environmental sustainability, in particular, to integrate the principles of sustainable development into policies and programs in individual countries. Specifically how this goal is to be achieved is probably the question in many of our minds and most likely spurs us on in our own work. Integrating the principles of sustainable development is probably one of the goals of each of the authors of this book. As an educator, I see that to achieve this, it is our responsibility to educate communities about how to build and maintain sustainable environments. Surely education, including raising public awareness, is often the key to promoting households and communities to make essential behavior changes to help each nation toward a sustainable future.

From 2005, the UN has declared a *Decade on Education for Sustainable Development*. Improving sustainable economic growth by improving the quality and skills of the future workforce may be seen by educators as starting with educating teachers to teach from a sustainable environment perspective. Through formal education in schools, we reach out to and through communities. Education programs are not only to raise awareness. Education programs can initiate change in people's behaviour towards their environment. Hopefully destructive behaviours can be modified to ensure sustainability of our environment. Yet, as formal educators in schools, teachers may choose not to teach directly about the local environment. Unless they understand what education for sustainable development (ESD) is, teachers themselves may not understand enough about sustainable development to find it important enough to plan into their curriculum. Many teachers may not know enough of the concepts to be able to integrate ideas of sustainable development across their curricula. It should not be assumed either that all teachers know how to engage their students in environmental education or have the time and facilities to engage their students in environmental education. Similarly, teacher educator programs may not include specific teaching on environment education to our future teachers. How best can we inspire teachers in schools to build sustainable communities of learners interested and informed about sustainable environments? Who should be responsible for this education?

Zandvliet, D. and Fisher, D. (Eds.), Sustainable communities, sustainable environments: The contribution of science and technology education, 131–141.