MULTIMEDIA MODEL FOR SUPPORTING ABORIGINAL AND TORRES STRAIT ISLANDER HEALTH WORKERS IN PREVENTING COMMUNICABLE DISEASES

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Declaration

I declare that this thesis is my own account of my research and it does not contain material which has been accepted for the award of any other degree at any tertiary education institution; nor does it contain material previously published or written by any other person, except where due reference is made in the text of the thesis.

Faeka El Sayed

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DISSEMINATION OF THE FINDINGS

The research findings in this thesis have already been disseminated to, and published in, national and International journal and conferences throughout the evolution of this research. The following are articles that have been published, accepted, or are under review:

<u>**Journal:**</u>

El Sayed, Faeka and Soar, Jeffrey and Wang, Zoe (2010) *Developing a self-paced continuing training program for Aboriginal health workers - learning approach.* Aboriginal and Islander Health Worker Journal, 34 (4), pp. 28-31. ISSN 1037-3403

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El Sayed, Faeka and Soar, Jeffrey and Wang, Zoe (2012), *Formative Evaluation for an Interactive Multimedia Health Informatics CD-Rom for Aboriginal Health Workers,* Aboriginal and Islander Health Worker Journal, (In review) Submitted 23/04/2012

<u>**Conference:**</u>

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El Sayed, Faeka and Soar, Jeffrey and Wang, Zoe (2012) *Interactive multimedia health informatics CD-ROM for aboriginal health workers - formative evaluation ,* HIC 2012 health informatics- building a healthcare future through trusted information, 30 July-2 August, Sydney, accepted.

ABSTRACT

The health and well-being of people around the world depend critically on the performance of the health systems that serve them," Dr Gro Harlem Brundtland, Director-General, World Health Organization (Brundtland, 2000). This speech reflects the important role played by Aboriginal and Torres Strait Islander health workers in our health system. They are universally regarded as the main providers of primary health services to our Aboriginal and Torres Strait Islander communities, especially in remote and rural areas. The important work they do might be better supported through ongoing availability of health informatics programs in their practice locations, particularly those that encompass a culturally-appropriate multimedia model.

This study suggests the use of Information Technology, in the form of interactive multimedia self-paced learning methodology to develop system for a health informatics program delivery via a common multimedia storage drives CDROM/USB drive that can be used by Aboriginal and Torres Strait Islander health workers in their own work place. This assumption was assessed and explored through the design, development, and formative evaluation of an interactive multimedia health informatics CD-ROM program, entitled "Interactive Multimedia Health Program: Tuberculosis".

The theoretical framework for this study based on the empowerment and community participation theory as outlined in the Declaration of Alma-Ata, World Health Organization (WHO).

This thesis reports on a qualitative study which has explored gaps in the current Aboriginal and Torres Strait health workers' continuing education and professional development programs, and examined the need for new approach that differs from the traditional school-based 'face to face' approach; and rather advocates the need to deliver sustainable, efficient and cultural appropriate continuing education program for health workers.

The application of choice of a qualitative approach as a methodology for the study enables this assumption to be checked by testing this model against the ideas, experiences and recommendations of participants in the study; who have worked for many years in the field of the education and training of health workers of Aboriginal and Torres Strait Islander heritage.

The views of participants have been collected through a series of interviews and a review of the limited literature available in this field covering the following topic:

1) Aboriginal and Torres Strait Islander Australians history and health state with emphasis on the burden of communicable diseases, focusing particularly on Tuberculosis (TB);

2) Aboriginal and Torres Strait Islander health workers' history, role, challenges, education and training;

3) The potential for Information Technology to support health workers through the provision of self-paced health training programs as a tool for the delivery of multimedia information, and the future opportunity for the use of interactive multimedia technology in health care education;

4) Methodologies for multimedia model development and educational and systematic approach for multimedia model development;

5) Learning theories, principles and approaches;

6) Key factors that would impact model development, and

7) Australian Aboriginal learning approaches, values, and pedagogy.

This thesis adopts a research methodology is in the form of:
1) Qualitative semi-structured interviews with 10 various stakeholders from different backgrounds all are working in the field of Aboriginal and Torres Strait Islander health worker education. The research was supported by archival research, and then expanded to a study of the needs that exist for Aboriginal and Torres Strait Islander health workers in continuing their education and professional development. The author then searched for and analysed the techniques that might best address this need. Interviews were also conducted to identify the keys factors need to be considered in the development of an interactive multimedia informatics program to meet these needs.

2) Using a detailed approach to describe and review the process of preliminary model development entitled "Interactive Multimedia Health Program: Tuberculosis". The work begins with a review of relevant literature from the field of collaborative learning and multimedia, Tuberculosis, and Australian Aboriginal culture.

3) Employed the Likert Scale and open-ended questionnaire for the formative evaluation of the preliminary model through expert and peer review with 15 stakeholders in the fields of Aboriginal and Torres Strait Islander health workers' education, Information Technology.

The main themes that emerged from analysis of the data include those relevant to:

- Cultural appropriateness; Efficiency; Sustainability; The need for a unified government body;

- The need for greater coordination and consistency across The entire system of government agencies responsible for Aboriginal and Torres Strait Islander health workers and the management of their continuing education;

- The need to manage the gap between what health workers learned and what they did in their working lives;

- The need for better Information Technology tools; the ad hoc nature of workplace training to date; The need for relevant information; and The need for a business perspective.

The study highlights the effect of economic and cultural issues, and lack of coordination upon the development of a continuing education program for Aboriginal and Torres Strait Islander health workers. The finding of the study describes how issues such as cultural factors, learning aspects, computer literacy, availability of technological tools, and pre-existing knowledge of interactive multimedia principles are key factors in developing a CD-ROM model. Further, the findings point out the elements and cultural principles that are important to keep in mind when producing the model, such as cultural localisation, cultural context, cultural knowledge base, and oral cultural traditions for Aboriginal and Torres Strait Islander peoples. This premise has been tested and applied through the production of a detailed preliminary design for a culturally-appropriate multimedia model on CD-ROM, using Tuberculosis as a focus topic for the model, a copy of which find attached to this thesis.

In summary, the key findings are:

1. The identification of significant gaps in the current continuing professional development program for Aboriginal and Torres Strait Islander health workers. Three main issues in the current program were revealed: Lack of sustainability, co-ordination and consistency in Aboriginal and Torres Strait Islander health workers' continuing education and training; lack of efficiency of the current program and the presence of learning gaps between what health workers study and the tasks they perform. This inefficiency is an important factor in the struggle of health workers to fulfill their roles. There is also a lack of suitability and presence of a cultural gap in the current continuing education program; which is due to the lack of deep understanding of socio-cultural contexts in which health problems are constructed. This cultural gap is evident in the current program design which is concerned mainly with adding Aboriginal art and pictures without a deep look into cultural localisation, cultural contextualisation, cultural knowledge base, and their oral cultural background in the current program

The results presented here are indicative of the need for a different approach in order to deliver a sustainable, efficient and culturally-acceptable continuing development program. Using Information Technology is a promising new approach for closing this gap and in improving Aboriginal and Torres Strait Islander health workers' continuing professional development opportunities.

2. Identification of the methodology for the development of an interactive multimedia self-paced informatics health program, which is based on multi-disciplinary development methodologies, including educational and systematic approaches.

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3. This study recommends the adoption of socio-cultural and constructivist learning theories, with adult learning, population health, narrative, and medical education approaches incorporated into the development of the program.

4. It is further recommended that a systematic approach to creating a culturally-appropriate program for Aboriginal health workers needs to be full mindful of and respectful of cultural dimensions during the design process; and similarly there is a real need to provide a culturally-sensitive learning environment.

5. The most important key factors for the development of an interactive multimedia/culturally-appropriate health informatics model could be categorised under four main headings: cultural factors, Information Technology availability and literacy, learning aspects, and interactive multimedia factors. Cultural factors included cultural inclusivity, oral cultural, pre-existing knowledge, and Aboriginal learning styles. Interactive multimedia factors included the requirements for the process, fitting and design of the program.

6. Formative evaluation of the model confirmed the study hypothesis that interactive multimedia CD-ROM/USB drive health informatics could be used as an alternative material for updating Aboriginal and Torres Strait Islander health workers' knowledge.

The study outlines several applications of these findings, focusing on how an informatics interactive multimedia program could be made culturally relevant to Aboriginal and Torres Strait Islander health workers.

Also the thesis provides recommendations for policy development and further research:

- The need to provide more culturally and contextually appropriate continuing education programs for Aboriginal and Torres Strait Islander health workers.

- The need to empower Aboriginal and Torres Strait Islander health workers through their involvement in developing the strategy and program for their continuing education is crucial for any improvement in their education and to closing their triple divided gaps (Health, Education, and Digital).

- The development of a best practice model in Aboriginal and Torres Strait Islander education resources requires input from members of the target audience through their continuing evaluation; this helps ensure that the resource is culturally safe, applicable and appropriate to the target group.

- There is need for further research and study. Detailed recommendations are provided in Chapter 11.

Overview

The principle objective of this study is to create a pedagogical tool that combines on-screen text, graphics, animation, audio and video in a credible and culturally-appropriate environment. This objective is met through the development and presentation in the thesis of an interactive multimedia self-paced health informatics program, delivered on common multimedia storage drives including CD-ROM/USB drive, titled "Interactive Multimedia Health Program: Tuberculosis", that could be effective as a source of information for Aboriginal and Torres Strait Islander health workers, and could improve the workers' capacity to independently control their learning within an attractive learning environment, with scope to strengthen their capacity for the provision of quality healthcare delivery and health outcomes.

My interest in under taking this study emerged out after the historic national apology to Aboriginal Australian people. I had just moved from New Zealand to Australia with my family, and began reading about Aboriginal Australian history regarding colonisation and its impacts on their current social and health life. I feel that I would like to use my medical background and my Information Technology knowledge in a useful way, and I am hoping to be able to help Aboriginal people to close the gap between the health of Aboriginal and Torres Strait Islander communities and that of the rest of the country.

This thesis charts the development of culturally-appropriate software that was designed to assist in the continuing education of Aboriginal and Torres Strait Islander health workers.

The process was accompanied by an assessment of their current continuing education program, and a formative evaluation for the model. The end result is the development of a culturally-appropriate interactive multimedia on CD-ROM which accompanies this thesis.

In this study an early hypothesis was identified, namely that using interactive multimedia self-paced technology for Aboriginal and Torres Strait Islander health workers' continuing education could support them, and as a consequence, it is thought to have the potential for a positive impact upon improving the health of Aboriginal Australians.

At the beginning of the study an informal approach was made and a meeting was conducted with Aboriginal and Torres Strait Islander health workers' training organisation staff members and managers (Cunningham Centre), and Aboriginal Public health officers (communicable diseases) at the Darling Downs Public health Unit (Southern Regional Services).

The aims of those informal discussion was to discuss the research idea, gaining a broad understanding of the area of study by getting information about the current continuing Aboriginal and Torres Islander health workers education in general, and in particular, regarding Tuberculosis as a starting topic for the project. We gauged their interest as to whether or not the

topic of the study was relevant to them, and obtained their input into the study design and recruitment decision, and helpful advice was provided about different ways for advertising the project. The discussions also addressed the training organisation's perceived need for, and willingness to integrate, our proposed training program into their courses.

The research idea was very welcomed and supported by both organisations. The Darling Downs Public Health Unit (Communicable Diseases) provided a letter of recommendation for the research, and mentioned that the research was likely to be a valuable addition and contribution to programs and services provided by the involved organisation and their support for choosing Tuberculosis as a starting point for the project, Appendix (13.1).

The training organisation welcomed the idea of using Information Technology as an alternative methodology for delivering continuing education for Aboriginal and Torres Strait Islander health workers. Their main objection was that while Tuberculosis was common in north Queensland, but was not a significant health concern in South West Queensland, and they suggested the life style diseases of diabetes, obesity and cardiovascular disease might be appropriate starting topics for the project.

Documentary research was supported the opinion of the Darling Downs Public Health Unit's opinion that there was a lack of any health informatics program about Tuberculosis for Aboriginal health workers, whereas there were already many programs targeting lifestyle diseases.

Previous research has shown that there is inadequate continuing professional development for Aboriginal and Torres Strait Islander health workers, especially in rural and remote areas. This is a major factor affecting the quality of primary health care services for Aboriginal Australian people. The data from this study supported the presence of this shortcoming.

The identification of this problem suggested the need for an efficient, sustainable, and culturally-appropriate program as a source of continuing information that could be used by Aboriginal and Torres Strait Islander health workers at their own practice locations, and the possibility for the use of interactive multimedia technology on common multimedia storage drives including CD-ROM/USB drive as a new training method that took a different approach than those traditionally offered through face-to-face training.

This study focuses on Aboriginal health, Information Technology, and Aboriginal and Torres Strait Islander health workers' continuing education, in particular upon communicable diseases, with an emphasis on Tuberculosis as an example explored in the CD-ROM model.

There is a recognised need for effective, well trained health workers in the primary health care sector, particularly in the field of early detection and the raising of public awareness. This study

focuses on the viability of producing interactive multimedia software for supporting Aboriginal and Torres Strait Islander health workers.

The study explores this proposed model through documentary analysis and qualitative interviews, incorporating multiple stakeholders' perspectives and tries to find a best-fit solution.

This thesis aims to explore and articulate the barriers to Aboriginal and Torres Strait Islander health workers' continuing education rather than simply listing them after the literature review.

Previous studies on producing health education program for supporting Aboriginal health workers have been designed with more traditional classroom-style form of education using verbal, face to face, and textural materials.

The study highlights an existing gap in the literature, as through my research I have been unable to find examples of the use of culturally-appropriate interactive multimedia programs for supporting Aboriginal health workers.

Although I could find no current examples of such programs, I did find some references that discussed the use of Information Technology for the support Aboriginal education and training programs in general.

This thesis has devised a theoretical framework for the development of an interactive multimedia health informatics program that was guided by the input the author gained from interviewing stakeholders and the literature review. This study was carried out from a non-Aboriginal perspective, indeed my own perspective as non-Aboriginal researcher affects the content and organisation of this thesis.

Endorsement of this study by the Aboriginal community is evident in the model development, which was revised and reviewed by Aboriginal health workers through their participation in the studies; and in the development of the model content, as the stories used have been adapted from anthropological studies from within Aboriginal communities.

Structure of the Chapters

Chapter 1

This Chapter offers some background to this research and a description of the nature of the study and its context, the aims of the research and its significance, the limitations and theoretical framework for the study.

Chapter 2

The literature review in Chapter 2 presents research findings from different fields that are considered relevant to this study. The areas of interest include:

1) Aboriginal Australian health and the burden of communicable diseases on them with particular emphasis on Tuberculosis,

2) Aboriginal and Torres Strait Islander health workers' role and their current and continuing work-based education and training,

3) The use of Information Technology in supporting health workers with emphasis on interactive self-paced multimedia technology, and

4) The effect of learning theory and principles in interactive multimedia model design, with special reference to the inclusion of Aboriginal cultural elements on the model design.

The literature review explores this and is complementary to and supportive of the interview results.

Chapter 3

In discussing the methodology used for this study, I dealt with the way that I developed the research from the initial proposal of the research idea, through the gathering of data and the use of qualitative methodology. A three-phase research design was used to address the following research objectives:

1) An assessment to explore the gap in the current Aboriginal health workers' continuing professional development and to identify the keys factors that should be considered when developing an interactive multimedia and culturally-appropriate program;

2) Developing CD-ROM health informatics program entitled "Interactive Multimedia Health Program: Tuberculosis"; and

3) Establishing a primarily formative evaluation for the program content, program's instructional and graphic design and user attitudes through expert, peer and end-user review.

Chapter 4

In this Chapter, I first outlined the rationale for interactive multimedia model development. This Chapter examines the methodologies for model development which consist of an educational approach and a systematic approach. It details the pedagogical methods of the program, exploring current theories of learning, learning principles, and learning approaches as they affect the multimedia design. This Chapter provides many specific guidelines to ensure that interactive multimedia model design were soundly based on active educational research.

Chapter 5

In this Chapter there is a detailed description of the systematic approach used for the interactive multimedia model. The Chapter includes details of the framework for the development of interactive multimedia model, with descriptions of the main three phases of model design.

Chapter 6

This Chapter reveals the first stage of the model development. It demonstrates in detail a model needs assessment that was undertaken through an analysis of the current Aboriginal and Torres Strait Islander health workers' continuing education program, from various perspectives through the experiences of key stakeholders, using a qualitative semi-structured open ended interview model. The assessment began with a systematic review of the literature.

Chapter 7

This Chapter elucidates the key factors that needed to be considered in the development of the interactive multimedia program. The clarification begins with a systematic review of the literature which served as background information followed by qualitative semi structured interviews. It ends with the inclusion of participants' recommendations for the development of the model.

Chapter 8

This Chapter looks at Aboriginal Australian cultural elements as they affect the development of the model development. It starts by exploring through learning from previous studies the need for improvements in the current continuing education programs for Aboriginal and Torres Strait Islander health workers.

Chapter 9

This Chapter details the process of software development. The framework and data analysis result provided in Chapters Four, Five, Six, Seven and Eight are employed for the model development. The documentation of the case itself occurs in this Chapter which describes in detail the procedure for the development of the software. Since this program focuses on Tuberculosis, I begin the first module of the model by illustrating a general information about Tuberculosis, and then go on to provide further details.

Chapter 10

This Chapter reports a small-scale formative evaluation for the planned preliminary model, and states the participants' recommendations for model improvement.

Chapter 11

I finalise the preceding chapters and discuss the research's major contribution to knowledge and its relevance. I conclude the thesis with discussion about the study, and some suggestions for further research and recommendations.

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LIST OF ABBREVIATIONS

ACCHS   Aboriginal community controlled health service

AHPOs   Aboriginal Health Promotion Officers

AHWs   Aboriginal Health Workers

ADM   Aide au Diagnostic Medical

AIDS   Acquired Immune -Deficiency Syndrome

AMS   Australian Medical Syndicate

ATSICHS   Aboriginal and Torres Strait Islander Community Health Services

CBL   Computer Based Learning

CDNA   Communicable Diseases Network Australia

CPD   Continuing Professional Development

DOTS   Directly observed treatment short course

HIF-net   Health Information Forum

HIV   Human Immunodeficiency Virus

ICT   Information Communication Technology

IMM   Interactive Multimedia

IVIMEDS   International Virtual Medical School

LTBI   Latent Tuberculosis Infection

NHIT net   National Health Interactive Technology net

NSW   New South Wales

PHC   Primary Health Care

PNG   Papua New Guinea

QAIHF   Queensland Aboriginal and Islander Health Forum

QAIHC   Queensland Aboriginal and Torres Strait Islander Health Council

RHTU   Rural Health Training Unit

RAN   Remote Area Nurse

SP   Self-Paced

TAFE   Technical And Further Education

TSIHWs   Torres Strait Islander health workers

TB   Tuberculosis

VACCHO   Victorian Aboriginal Community Controlled Health Organization

WHA   World Health Assembly

WHO   World Health Organization

CHAPTER ONE: INTRODUCTION

1.1 Overview

The context of this study is based on the fact that Aboriginal and Torres Strait Islander Australians have a higher prevalence of most types of health conditions than non-Aboriginal and Torres Strait Islander people, and the burden of communicable diseases for them is far greater than for other Australians (ABS, 2008; Trewin and Madden, 2005). Improvements in Aboriginal health can be measured by reference to evidence that more patients are being treated successfully in the community by primary health care services, rather than requiring hospitalisation (Barlett, 1995).

Aboriginal and Torres Strait Islander health workers are key providers of primary health services to Aboriginal communities, especially in remote and rural areas. Having adequately skilled Aboriginal and Torres Strait Islander health workers is one of the keys to achieving any effective improvement in primary health care services for Aboriginal and Torres Strait Islander Australians (HRSCFCA, 2000). Constantly upgrading of Aboriginal and Torres Strait Islander health workers' skills to keep them up-to-date with continuous changes has the potential to improve the health status of the Aboriginal and Torres Strait Islander community. This upgrading could achieved via facilitating the development of their training pathways, promoting academic success in their training programs, and the sustainable development of culturally-appropriate health care programs; (Digregorio et al., 2000; Pellekaan and Clague, 2005), and this study is a step toward achieving this.

Samaras et al. (2010) indicated that traditional classroom-based education and training does not always satisfy all the needs of the new world of flexible, personalised and lifelong learning, and a shift is being made toward e-Learning (also known as online training, distributed learning, and multimedia courses) where the medium of instruction is through computer technology, particularly involving digital technologies, which affords a lot of opportunities including learning-on-demand, and has potential ability to cut down learning time while at the same time increasing learning effectiveness and reducing learning costs.

Using Information Technology as a new learning approach is understood to be a key opportunity and tool for bridging gaps in health services and the digital divide through enhancing health care of underserved populations and the education of remote health care providers (Hunter et al., 2007; Sargeant, 2005). Figure (1.1) illustrates the impact of an interactive multimedia self-paced health informatics program for improving Aboriginal and Torres Strait Islander Australian health. This is through the availability of comprehensive, effective and appropriate primary health care services delivered by a trained health workforce.
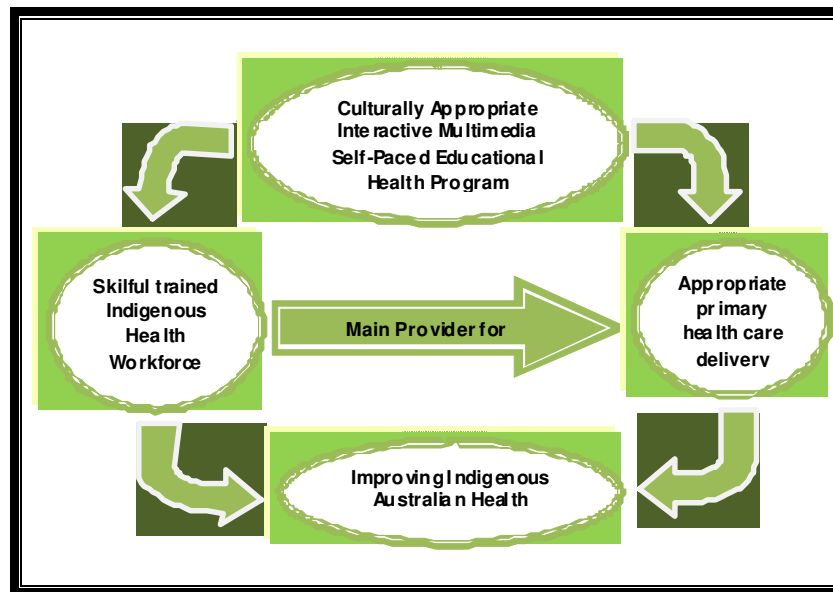
Illustration by F. El Sayed
Fig (1.1) Impact of multimedia model

The goal of the study is not only to enable an interactive multimedia self-paced program be developed as a source of health education information to support Aboriginal and Torres Strait Islander health workers in their roles in preventing and controlling Communicable Diseases, but also to ensure that the program promotes Aboriginal learning approaches and values.

1.2 Background to the Research

Whilst full access to quality health care through the state health system is arguably a basic human right for all individuals (Cunningham, 2009), and it has been recognised that based on their current health needs, Aboriginal Australians would access health services at about two or three times the rate of non-Aboriginal Australians (Taylor and Guerin, 2010); still the people in these communities in rural and remote locations face substantial problems and barriers in accessing appropriate primary health care services (Gruen et al., 2002).

Cunningham (2009) described those barriers for Aboriginal people in general as*" Cultural barriers present the most complicated challenge because there is little understanding of the social and cultural factors deriving from the knowledge, attitudes, and practices in health of the Aboriginal peoples. The bias towards Western medicine and intervention can be offensive or inappropriate for practitioners of traditional medicine. Finding health staff that speak and understand Aboriginal languages is difficult, and poor communication between providers and clients at all levels compromises access to quality care. Moreover, Aboriginal people are often discriminated against in health centres by non-Aboriginal staff and both fear and distrust caused by the attitudes and behaviours of health care workers prevent Aboriginal people from seeking the health care they need"* (p.173).

For Aboriginal and Torres Strait Islander Australians, cultural barriers are regarded as major factors that reduce their access to mainstream health services, as well as the large distances involved and the cost of logistics involved in transporting people to hospitals or clinics. There is a disproportionate incidence of severe and advanced disease in Aboriginal and Torres Strait Islander communities as a result (Gruen et al., 2002; QldHS, 2007).

Lowell (2001) and Trudgen (2000) argue that a communication gap exists between Aboriginal and non-Aboriginal Australian health care staff due to linguistic and cultural differences; and it is widely recognised as a major barrier to improving health outcomes; and is manifest in the current crisis in health. Aboriginal and Torres Strait Islander people require equity of access not only to mainstream services that are free of racism and other forms of discrimination, but also to services which are specific and culturally-appropriate (Phillips, 2004).

Gruen et al. (2002) classified the barriers Aboriginal Australian faced when accessing hospital based specialist services into five main categories; they are geographical, cultural, communication, poverty, and the health service structure, Table (1.1).

Table (1.1) Barriers faced by Aboriginal people in accessing hospital-based specialist services

Geographical remoteness of patients	- Inadequate public transport to regional centres. - Inappropriate, unavailable or costly accommodation in regional centers. - Disorientation and fear experienced in unfamiliar urban centers. - Dislocation from family.
Cultural inappropriateness of services	- Poor appreciation by hospital staff of the needs of Aboriginal people and communities. - Concepts of health, illness and medicine may be unfamiliar to patients.
Poor doctor-patient communication	- Aboriginal people with limited English language skills. -Limited appreciation by medical staff of need for interpreters. -Inadequate access to interpreters. -Lack of family and familiar health staff in attendance. - Difficulty obtaining informed consent.
Poverty	Lack of money for transport, accommodation and food.
Health service structure	- Rushed consultations - Inflexible appointments. - Inadequate communication between hospitals and remote clinics.

Source (Gruen et al., 2002)

Gruen et al. (2002) and Lehmann (2007) suggested that access to and coverage of basic health services to communities could be improved through assisting community members to provide certain basic health services to their own communities and offering a culturally-appropriate services through a greater involvement of Aboriginal and Torres Strait Islander health workers. They are employed by primary health care services as a strategy to ensure that health services are not only accessible, but also cultural appropriate and acceptable to Aboriginal Australians (Genat et al., 2006).

Recognition of the importance of the potential of Aboriginal and Torres Strait Islander health workers, which in turn is linked to their close association with, and detailed knowledge of the communities they serve, was documented by the National Aboriginal Health Strategy working party (NAHSWP, 1989). Aboriginal and Torres Strait Islander health workers are playing a very important role overall in health services and are considered key providers of primary health services to Aboriginal and Torres Strait Islander communities, particularly in remote and rural areas (Pacza et al., 2001). They are providing the link between their own communities and the health care provider, supporting both of them, helping to build trust, improving communication, and promoting better health outcomes (Gerrard, 2004).

Previous studies explored the challenges facing Aboriginal and Torres Strait Islander health workers. They are operating under challenging conditions; they are faced challenges of distance, personal and professional isolation; and communication difficulties especial in rural and remote areas with the increasing pace of change in the health sector. They cope with the pressures of maintaining health standards and complying with health regulations. They face enormous complexity due to historical legacies of exclusion, cultural oppression and racism that continue to erode the environmental, psychological, social and cultural health of their Aboriginal Australian clients. They are often overloaded with competing demands. The pressure to know a little about everything is a common theme (Dixon, 1991; Grant, 1992; Genat et al., 2006).

This pressure is best described by Aboriginal and Torres Strait Islander health workers Mitchell and Hussey (2006) saying *"Working in one's own community can be rewarding but stressful; there is a perception that you are "everything to everyone"* (p.529). Trudgen (2000) described this challenges as *"the main problem is the huge expectation put on them. They are expected to understand complicated medical terminology in a foreign language with almost no training, as well as managing clinics and be clinicians, health promoters and education experts. All these responsibilities are rolled up into the one job".*

Also the broad scope of Aboriginal and Torres Strait Islander health workers' practice often places them under pressure, they are overwhelmed by the magnitude of their clients' demands,

and it leads them to base their service provision on their concept of a holistic practice which encompasses a wide range of complex needs relating to clinical, environmental, social and psychological wellbeing (Genat et al., 2006).

Currently, Aboriginal and Torres Islander health workers appear less than adequately trained to skillfully handle the complexity of their work. Ongoing training and professional development support for these workers is essential (Genat et al., 2006). There has been limited attention given to the maintenance and ongoing enhancement of their skills and knowledge, following the completion of formal training (Soar and Yuginovich, 2006).

Providing them with high quality training opportunities can be problematic (Collyer 2006). A national review of Aboriginal and Torres Strait Islander health worker training (2000) identified a number of concerns in relation to their ability to access continuous professional training. Many Aboriginal and Torres Strait Islander health workers highlighted difficulties in accessing and attending education and training opportunities because they were required to leave home, family, and work to attend training courses in urban centers large enough to have training facilities (CIRC, 2000). It can be a challenge to attend refresher courses, face-to-face training workshops, and placement in clinical settings or updating seminars away from their communities (Soar and Yuginovich, 2006).

1.3 Research Problem

The most important factors in any strategy to improve the human resources involved in health, for the purposes of improving the overall health of the Australian Aboriginal population, are the provision of continuing professional education, and the capacity to leverage that knowledge effectively through the practical application of this learning by assisting professional practitioners in the workplace (Beddoe, 2010; Collins, 1995; Ueffing et al., 2009).

The need for ongoing, available and culturally-appropriate continuing education for Aboriginal and Torres Strait Islander health workers has been documented. Ongoing training provides essential support for Aboriginal and Torres Strait Islander health workers and has the potential to transform them into a skilled workforce that is able to make an effective contribution and bring increased credibility to their role. This training could be achieved through the provision of education and skills transfer as well as professional development and support to Aboriginal and Torres Strait Islander health workers; and by providing them by a continued primary health care program to update their knowledge (Genat et al., 2006; Gruen, Weeramanthri & Bailie 2002; NBCC, 2006).

In the changing environment in which the health care system operates, training of health sector workers must go beyond the acquisition of knowledge, skills and attitudes needed for traditional practice. Training should be adequately and constantly upgrading health workers'

skills in order to keep them up-to-date with ongoing change in procedure and practice. It has to be extended to include wider aspects of continuing professional development, and be improved so that it fosters a culture of lifelong self-directed learning. There is an increasing need for "just in time" training which is available on demand (Garrison et al., 2000; Thurab-Nkhosi, 2000).

This need is highlighted in the National Strategic Framework (May, 2002) and the Queensland Strategic Work Plan (2008) for Aboriginal and Torres Strait Islander Health Workforce reports which recommends improving the effectiveness of professional health training and arrangements for life-long learning, targeting health staff working within Aboriginal primary health services (AHMAC, 2002; QATSIHPWWG, 2008). Innovative ways of acquiring and delivering continuing education without the inconvenience of leaving the immediate work area and incurring travel expenses are becoming more popular, and they are being developed to meet these needs and provide health information professionals with quality, cost-effective alternatives to traditional continuing-education courses (Garrison et al., 2000).

Using Information Technology (IT) has emerged as a key tool to drive efficiency and effectiveness in health systems, and it is a promising strategy for improving the training of Aboriginal and Torres Strait Islander health workers and the quality of care provided within their communities (Collyer, 2006; WHO, 2006b). The use of distant and internet based education in rural and remote areas is an increasing requirement for experiential learning in primary health care settings for health professionals in all disciplines. Providing access to training in close proximity to where people from rural and remote communities live has been identified as a key strategy to increase Aboriginal and Torres Strait Islander Australian participation in the health workforce (AHMAC, 2002; QATSIHPWWG, 2008).

An interactive multimedia cultural appropriate self-paced informatics program as a mechanism to improve the accessibility and the use of scientific data and information for health purposes is a basic method for the improvement of training for Aboriginal and Torres Strait Islander primary health care workers in their practice locations. It is a computer-based delivery of information in a range of forms which may include text, graphic, the material it contains (Alber, 1996). It could offer health workers training courses in epidemiology, communicable diseases control, HIV, infective hepatitis, and Tuberculosis and provides them with knowledge, skills, and abilities needed for improved job performance (Roper et al., 1992).

1.4 Research Questions

Two main research questions provide the main structure of this study:

1. Can an interactive multimedia self-paced program be developed as a source of health education information to support Aboriginal and Torres Strait Islander health workers in their roles of prevention and control of Communicable Diseases?

2. What are the key factors that need to be considered in order to develop culturally-appropriate software?

1.4.1 Sub provision questions

To answer the research questions, we need to determine a focus for the inquiry and establish boundaries for the study Figure (1.2). The focus of the study is the development of an interactive multimedia health informatics model. The boundaries are the current Aboriginal and Torres Strait Islander continuing education, and the impact of learning aspects, cultural principles, and IT literacy and availability on the model development.
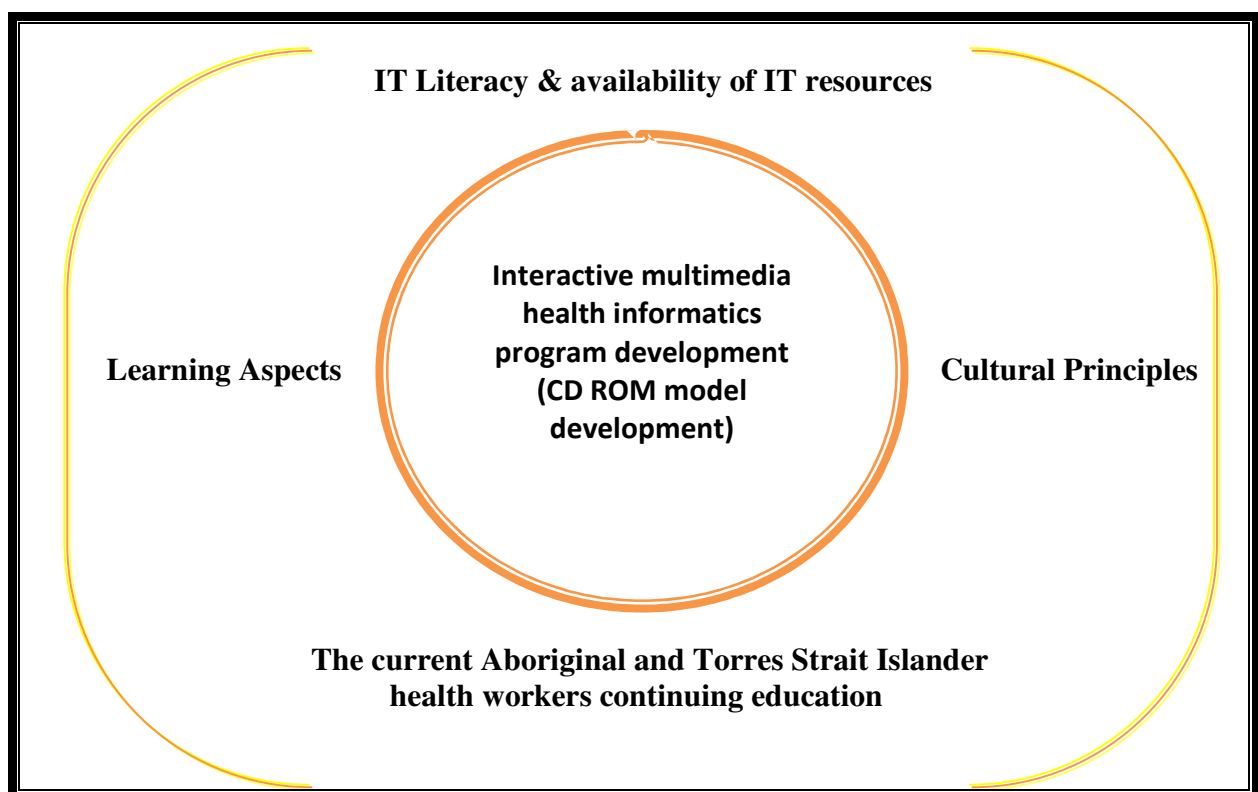
Illustration by F. El Sayed

Figure (1.2) Focus and boundaries of the study

So we need at the beginning to clarify the following:

1. What is the current state for Aboriginal and Torres Strait Islander health workers' continuing education, and is there is a need for applying a new method for Aboriginal and Torres Strait Islander health workers' continuing education?

2. What is the current level of literacy and availability for Information Technology for Aboriginal and Torres Strait Islander health workers?

3. What are the important cultural principles and learning aspects that need to be considered and followed the development of the model?

1.5 Purpose of Study

Trudgen (2009) suggested in a media release about intelligent education to close the gap in health standards between Aboriginal and non-Aboriginal Australians, that with free and full access of Aboriginal and Torres Strait Islander people to information and knowledge about the world around in a language they can understand, they will be able to take back control of their own lives and they will themselves create the interventions to deal with the problems they face. Technology is only useful as an answer to health problems after being modified and adapted by a particular community to meet the conditions and values of that community; including its cultural and spiritual values (Barlett, 1995).

This study is motivated to create up-to-date, culturally-appropriate, interactive multimedia, computer-assisted educational, informatics health program for Aboriginal and Torres Strait Islander health workers, that would give them opportunities to exercise independent control over their learning within an attractive and interesting environment, and to improve their quality of healthcare delivery and overall health outcomes (Phillips, 1997).

The study is guided by the vision, objectives and architecture of the Australian National Strategic Framework for Aboriginal and Torres Strait Islander Health 2003-2013 (NATSIHC, 2007).

The main objectives of this study are to:
1. Produce a preliminary design for a culturally-appropriate multimedia program, using Tuberculosis as a model.
2. Identify key factors that would impact multimedia model development as perceived by the stakeholders.
3. Formative evaluation of the effectiveness of the model.
4. Provide recommendations for policy development and further research.

1.5.1 Rationale for choosing Tuberculosis (TB) as a focus for the Model

Tuberculosis is an infectious disease with symptoms including coughing, night sweats, and loss of body weight, but as the illness has a slow onset, the patient doesn't perceive how sick they really are. Patients with pulmonary TB cough their TB germs on to other people, causing it to spread. So, once one has been diagnosed as TB, all of the people they have been in fairly close contact should be tested. People who are malnourished, or who are alcoholic are more likely to contract the disease. Tuberculosis requires a lengthy period for proper recuperation and uninterrupted treatment. Patients need assistance from health workers to successfully complete their treatment and be cured (Barlett, 1995).

Hume (2006) cited that maintaining control of infectious procedures in hospitals with Aboriginal communities can sometimes be compromised by cultural customs, such as passing cigarettes and pipes from mouth to mouth around campfire, or patients being admitted to infectious wards for long term stays who then went fishing with relatives, and communed together that way under the trees outside the wards with very small children amongst them.

Couzos and Murray (2008) concluded that factors that adversely affect all levels of TB prevention and control in the Aboriginal population include:

1. Lack of TB awareness, by patients and health care providers, cultural barriers, alcoholism, and other substance abuse.

2. Health staff shortages frequently occur in communities and preventive services are often postponed to deal with immediate crises.

3. Population mobility can lead to symptoms being ignored or visits to health services being delayed.

4. Sparsely-populated and widely-dispersed communities and inadequate transport further hinders preventive service provision.

The long duration and often unpleasant associated side effects of TB treatment are the main causes for patients not finishing the full course of standard therapy, and treatment is often discontinued prior to completion, once the symptoms are resolved. This poor treatment and inadequate control of anti-Tuberculosis drugs will result in the emergence of multidrug-resistant and extensively drug-resistant TB strains that make the disease very difficult to treat and also difficult to control the transmission of TB in some parts of the world, which may have the effect of making Tuberculosis incurable (Fauci, 2006; Oest et al., 2005; WHO, 2004).

The most important preventive measure for Tuberculosis is public education, which is provided by Aboriginal and Torres Strait Islander health workers. Patients who have this knowledge are less likely to delay diagnosis, a delay that could result in transmission of the disease to uninfected persons (Miller et al., 2003). The key recommendations of the National Strategic Plan for TB control in Australia beyond 2000, published by the National TB Advisory Committee of Communicable Diseases Network Australia (CDNA), were the improvement of awareness-raising of TB through education and training among health care workers in order to promote early detection, and the education and empowerment of high-risk groups and their families/carers (NTAC, 2002).

1.6 Significance & Strength of the Research

This study was undertaken during 2009-2012, after the historical apology of the Australian Prime Minister to Aboriginal communities, which was a turning point for a new era of understanding and cooperation between all Australians and recognised the need to close the triple gaps in Aboriginal society; gaps in health, access to digital technology and education. This study will potentially contribute to closing these triple gaps by the delivery of technology designs such as multimedia packages on common multimedia storage drives including CD-ROM/USB drive as a means for delivery of continuing health informatics education programs for Aboriginal and Torres Strait Islander health workers in rural and remote areas.

The design of the software package outlined in this thesis will help to manage and prevent communicable diseases, which are of particular importance to Aboriginal people. The model developed can be modified to make it applicable for use in managing other important diseases and can be applicable in other environments with similar characteristics. It can also be deployed on both a national and global level.

Also, this thesis will contribute to a better understanding of the difficulties faced by Aboriginal and Torres Strait Islander health workers' continuing education and professional development needs from the perspective of current participants who undertake a variety of roles in the field.

1.7 Expected Benefits

Some of the advantages anticipated from the use of the multimedia CD-ROM/USB drive technology as an efficient tool for delivering educational information to Aboriginal Health Workers are:

1) Using interactive multimedia technology to develop an up-to-date education program for Aboriginal health workers has the potential to expand and reinforce their professional skills throughout their careers, to maintain and improve their capabilities, and to improve the quality of healthcare delivery and overall health outcomes for their patients.

2) The program is designed to be culturally-appropriate, self-directed, with easy instructions that are straightforward and can easily be used by Aboriginal health workers at their practice locations.

3) Extends the traditional classroom learning mode into a new learning environment and can help Aboriginal and Torres Strait Islander health workers to build up self-confidence by allowing them to apply this new learning technology in their work.

4) The program could be used by health workers in role of promoting health education programs.

5) The development of an interactive CD-ROM model which provides a basic software engine which could be used as a template for developing future similar programs on different health topics.

6) The immediate and time-independent availability of technology-based education ensures constant individual help (Fedak, 1999), and enables users to update themselves on recent advances in primary health care and communicable diseases.

7) The opportunity for health workers to have access to the same standard of information regardless of their location (Shackcloth, 1999)

8) Provides an on-line component for updated course content, and links to the Aboriginal Health *Info Net* designed in the program as a means of keeping Aboriginal health workers up-to-date with news relevant to their fields and training.

9) Enables the users to review the material within their current workplace at the time, pace and place of the users' choice.

1.8 Research areas

In our study we focus on Aboriginal and Torres Strait Islander health workers in South West Queensland (Toowoomba Region) which has a total area of 12,978 square meters, and an estimated total population, as measured in 2010 at 162,057, and of these, 4,120 persons identified themselves as being of Aboriginal or Torres Strait Islander origin. In 2006, 57.5 percent of all occupied dwellings in South West Queensland identified that their place of residence had an internet connection (Queensland, 2011).

1.9 Limitation of the Research

There are many issues to be considered when developing a medical informatics program using common multimedia storage drives including CD-ROM/USB drive, including task analysis, instructional design, material production (text, audio, graphics, photographs and video), computer program development; common multimedia storage drives including CD-ROM/USB drive production, quality assurance and marketing (Shaw and Standfield, 1990).

This study was limited to the research, design and assessment for the appropriate learning content and techniques for the model adopted. The availability of Information Technology tools among Australian Aboriginal and Torres Strait Islander health workers, especial in remote and rural areas remains questionable. Another limitation is that Australian Aboriginals are not a homogenous cultural group, and therefore there is no guarantee that all Aboriginals will accept the planned model. In addition, my ability to actually design and develop the software is a limiting factor. The parameters within which the study takes place are as follows:

Geographical: South West Queensland.

Communicable Diseases: An emphasis was placed particularly on Tuberculosis (TB) as the focus of the interactive multimedia model.

Model Approaches: The program was aimed mainly to be a source of information that is culturally-appropriate, and could be easily used by Aboriginal and Torres Strait Islander health workers. It is designed to provide limited instructive, straightforward, up-to-date learning resources. It fosters surface approaches to the learning task with little branching of instruction implemented (Conrick, 2006).

Mode of delivery: Geographical isolation of Aboriginal and Torres Strait Islander health workers has encouraged a focus on Self–Paced (SP) methods as an appropriate mode of delivery for the multimedia training program, where a computer is controlling the delivery of materials through a Compact Disc (CD-ROM) player and the source of materials is multimedia delivered via a common multimedia storage drives including CD-ROM/USB drive. The CD-ROM/USB drive as a delivery system combines very large storage capacity of multimedia materials with the interactive control of a personal computer. Also offering the resource via common multimedia storage drives including CD-ROM/USB drive addresses the issue of poor internet access in remote areas in order to overcome the digital divide (Lockwood et al., 2009).

1.10 Theoretical Frameworks

The theoretical framework for this study is based on the empowerment and community participation theory as outlined in the Alma-Ata Declaration, World Health Organization (WHO). This theory suggests that improving primary health care requires maximum community and individual self-reliance and participation in the planning, organisation, operation and control of primary health care. When this happens through appropriate education it enhances the ability of the communities involved to participate (WHO, 1978).

Syme argues that in terms of developing better proactive strategies for preventing diseases and promoting health, it is best to focus on aspects of social class which are amenable to change, such as 'control of destiny', and the empowerment of individuals and communities to develop the capacity to exert greater control and influence over their social circumstances (Syme, 2004).

Closing the health gap requires the development of programs to treat issues like inadequate housing, water, sewerage, health services and nutrition as the primary causes of poor health, but without consideration of the importance of the issue of loss of control that may be at the heart of such changes, is like looking at the wrong end of the cycle. This program needs to be redeveloped to return control to the people (Trudgen, 2000).

Community participation, as has been described by Danielle Campbell in a health sociology review (2007), can be categorised into two types:

a) **Participation as a "means"** - in which there will be a guarantee of local peoples' cooperation and collaboration with externally-introduced programs. This approach has been adopted by the Australian and Queensland state government since 1990 and can be seen in the establishment of the Queensland Aboriginal and Islander Health Forum (QAIHF), which has been reconstituted in 2004 to The Queensland Aboriginal and Torres Strait Islander Health Council (QAIHC). The Queensland State Health Plan 2007-2012 (1.7.1) acknowledges that improving access to safe and sustainable health services for Aboriginal and Torres Strait Islander peoples can be achieved through supporting the transition of health service provision to community-controlled Aboriginal and Torres Strait Islander health services, as and where appropriate, and where both community support and capacity to do so is strong. Queensland Health, in partnership with the Australian Government, provides system and infrastructure support to ensure that the transition of services is sustainable (QldHS, 2007).

b) **Participation as an "end"** - means the empowerment of people to take greater responsibility for their development through their acquisition of skills, knowledge and experience. Education, training employment for health workers should be promoting empowerment (CSAHTALtd, 1998). This approach has been recognised in the Queensland State Health Plan 2007-2012 (1.1.7/5.1.8) (QldHS, 2007). An example for community participation as an "end", might be employing local people to work on intervention and training them in community development processes, appears in the Lawson & Close (1994) study, which is one of 17 studies has been reviewed in Danielle C Smith's health sociology review (2007).

Lawson & Close (1994) study refers to Aboriginal Health Promotion Officers (AHPOs), who undertook an Associate Diploma in Health and Community Development, and were employed by the New South Wales (NSW) public health program in ten different Aboriginal communities to support a range of activities designed to improve physical environment, health promotion and self esteem.

Lawson & Close notice that the combination of the professional skills acquired AHPOs and their personal characteristics (mature interpersonal skills, knowledge about health promotion, and commitment to and participation in the affairs of the community) enabled them to play a leading role in health promotion (Smith et al., 2007).

Another example for community participation as an end is illustrated in a study carried out by The Victorian Aboriginal Community Controlled Health Organisation (VACCHO), in which a community development process has been used to develop a health worker training course "based on the conviction that Aboriginal people know what is best for them" (Adams and Spratling, 2001).

This research study has an underlying assumption that improvements in health outcomes for Aboriginal and Torres Strait Islander people can only be achieved when the community and services are empowered to act on their own behalf (Bailey et al., 2006), and the process of developing continuing education programs for Aboriginal and Torres Strait Islander health worker is supporting, and promotes empowerment and increased participation of Aboriginal and Torres Strait Islander health workers in managing the health of their communities (Fleischl, 2001).

Introducing new Information Communication Technology (ICT) tools into their learning environment to support educational needs; together with programs develop with Aboriginal pedagogical qualities at the forefront; will empower Aboriginal and Torres Strait Islander communities to have higher levels of self-determination (Donovan, 2007).

Figure (1.3) illustrates the reflection of empowerment and community participation theory in the role of Aboriginal and Torres Strait Islander health workers within their own communities.
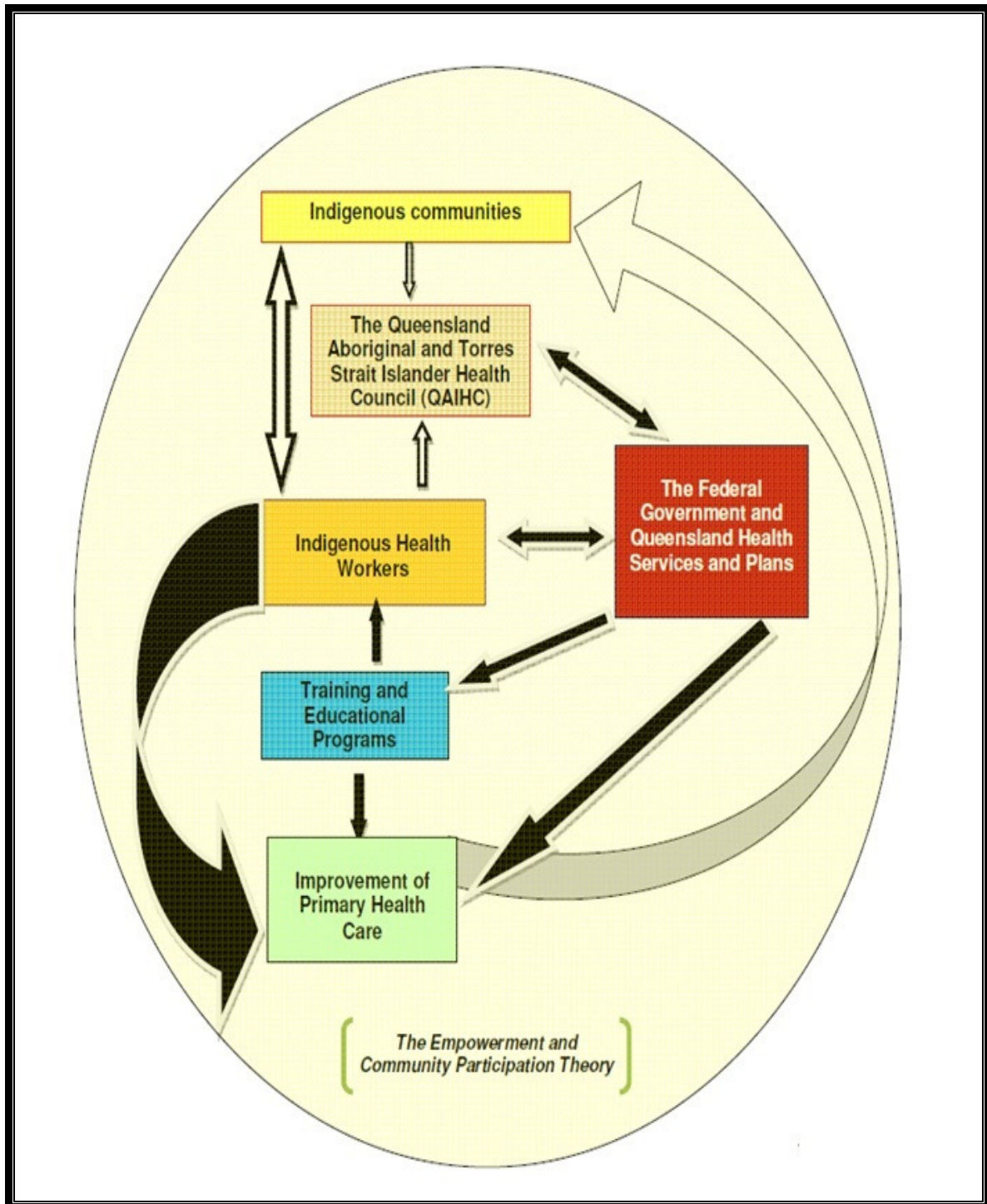
Illustration by F. El Sayed

Figure (1.3) Empowerment and Community Participation Theory

CHAPTER TWO: LITERATURE REVIEW

This Chapter primarily focuses on a review of the literature and contains three main sections: first, Aboriginal Australian colonial history and its impact on the current state of Aboriginal health in Australia, with an emphasis on communicable diseases; second, the origin of Aboriginal and Torres Strait Islander health workers program and some definitional matters related to their roles. The third part considers the potential for information and communication technology to be effectively used as a training resource within the health sector.

An on-line search for electronic sources and library research for printed sources was conducted. The search covered literature databases (Medline, PubMed Central Journals, PMC journal, ERIC, BioMed Central, Informaworld, and El-pub) and included use of the World Wide Web (www) and Google Scholar. The search employed key words such as Aboriginal and Torres Strait Islander health worker, primary health care, Aboriginal and Torres Strait Islander health, communicable diseases, Tuberculosis, individual training, just-in-time" training, computer-based education and training in single search terms, concepts and their combinations.

The main factual information in the review relating to Aboriginal and Torres Strait Islander health status is available from the Australian Institute of Health and welfare and Australian Aboriginal and Torres Strait Islander Health *InfoNet* (Health-InfoNet, 2009; Trewin and Madden, 2005).

2.1 Aboriginal and Torres Strait Islander Australian

2.1.1 History

The European colonisation of Australia began in 1788 with the establishment of a British penal colony in Botany Bay (modern Sydney), New South Wales. Initially relations between native inhabitants and settlers were amicable, but as the colony expanded, the Aboriginals resisted (Faganm et al., 2010). Broome (2001) described that:*" On 26 January 1978 British ships containing 290 seamen, soldiers and officials and 717 convicts sailed into port Jackson of the Sydney area. The meeting of people from two different cultures was bound to be marked by; misunderstandings, confrontation and cultural resistance"* (p 26-27).

When Europeans settled in 1788, there were 300,000-350,000 Aboriginals living in Australia, and over the next 150 years, this figure declined by 80 percent (Faganm et al., 2010; Saggers and Gray, 1991). At present Aboriginal and Torres Strait Islander peoples constitute a small proportion of the total population of Australia. The 2006 census figures reported their total numbers as 455,028 or around 2.3% of the Australian population, and of these, almost one third of the preliminary estimated resident Aboriginal population resided in major cities (32%);

21% lived in inner regional areas; 22% in outer regional areas; 10% in remote areas and 16% in very remote areas, Figure (2.1) (ABS, 2011).
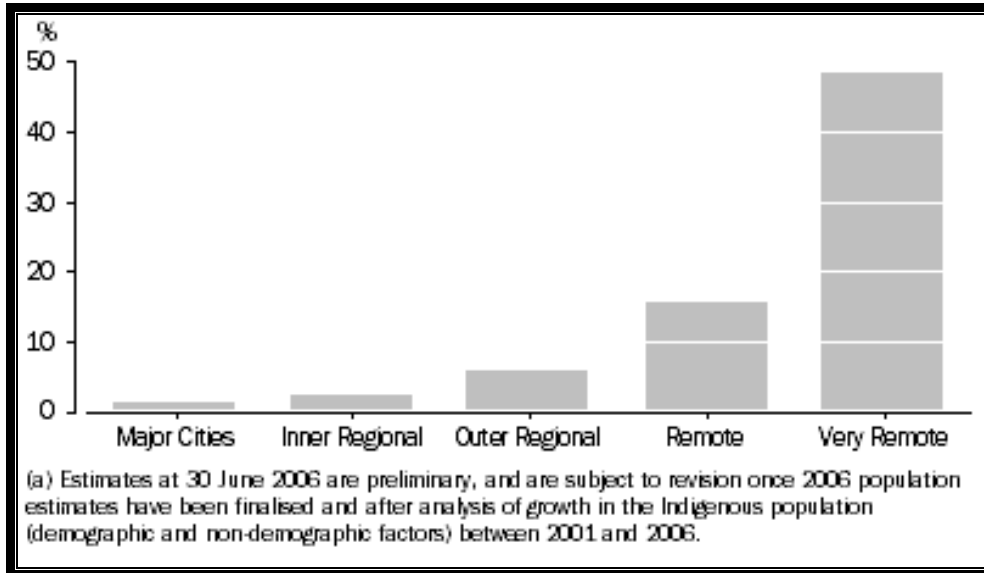
Figure (2.1) Aboriginal proportion of estimated resident population 2006 - Source (ABS, 2011)

Figure (2.2) and Table (2.1) show the distribution of Aboriginal population by urban centres in 2006.

Figure (2.2) Urban centers with more than 2,000 Aboriginal Australians counted as usual residents in 2006,
Source (Biddle, 2009)

Table (2.1) Aboriginal and non-Aboriginal population distribution by urban centre, 2006

Urban centre	Usual resident population count			Share of Australian population by urban centre	
	Indigenous	Non-Indigenous	Per cent Indigenous	Indigenous (%)	Non-Indigenous (%)
Sydney	34,279	3,352,848	1.01	7.53	18.35
Brisbane	29,251	1,559,570	1.84	6.43	8.54
Perth	17,950	1,162,666	1.52	3.94	6.36
Melbourne	12,656	3,162,285	0.40	2.78	17.31
Adelaide	12,036	981,471	1.21	2.65	5.37
Cairns	8,429	81,268	9.40	1.85	0.44
Townsville-Thuringowa	7,358	113,867	6.07	1.62	0.62
Newcastle	6,568	269,316	2.38	1.44	1.47
Central Coast	6,237	261,325	2.33	1.37	1.43
Darwin	6,232	54,113	10.33	1.37	0.30
Wollongong	4,415	218,423	1.98	0.97	1.20
Gold Coast	4,206	367,485	1.13	0.92	2.01
Canberra	3,831	303,319	1.25	0.84	1.66
Dubbo	3,713	24,785	13.03	0.82	0.14
Rockhampton	3,617	53,600	6.32	0.79	0.29
Alice Springs	3,617	16,249	18.21	0.79	0.09
Hobart	3,295	118,363	2.71	0.72	0.65
Mount Isa	3,089	13,430	18.70	0.68	0.07
Toowoomba	2,955	88,048	3.25	0.65	0.48
Mackay	2,881	58,651	4.68	0.63	0.32
Tamworth	2,854	29,510	8.82	0.63	0.16
Palmerston	2,770	18,124	13.26	0.61	0.10
Broome	2,337	7,394	24.02	0.51	0.04
Geraldton	2,314	22,907	9.17	0.51	0.13
Port Augusta	2,289	10,227	18.29	0.50	0.06
Wagga Wagga	2,136	43,150	4.72	0.47	0.24
Kalgoorlie-Boulder	2,058	23,087	8.18	0.45	0.13
Sunshine Coast	2,036	172,181	1.17	0.45	0.94
Rest of Australia	259,618	5,679,147	4.37	57.06	31.09
Australia total	455,027	18,266,809	2.43	100	100

Source (Biddle, 2009)

Saggers and Gray (1991) declared that *"When Australia was invaded in 1788 it is claimed that the Aboriginal Australians were physically, socially and emotionally healthier than most Europeans of that time"*. The continuing impact of European diseases was the greatest problem resulting from European contact (Broome, 2001). Foreign diseases, to which the Aboriginal population had little resistance, caused widespread mortality (Faganm et al., 2010). The geographical isolation which had protected Aboriginal people from exposure to many diseases ensured that their ability to cope with the diseases of the European population was virtually nonexistent (Saggers and Gray, 1991).

Epidemics of small pox broke out in 1789, followed by influenza, typhus, chicken pox, whooping cough, Tuberculosis, syphilis, malaria, leprosy, filariasis, measles, gonorrhea, common cold, lung and chest complaints, diarrhea, and dysentery killed hundred and swept away many Aborigines. All illnesses were driving from Aborigines' understandable ignorance of the health problems caused by static living, and the Aboriginal people had developed no natural immunity for all of these diseases. Also their new diet not only caused malnutrition, but appeared to raise their blood pressure, cholesterol levels and induce diabetes (Broome, 2001; Faganm et al., 2010; Saggers and Gray, 1991).

The European response to Aboriginal infection was largely one of indifference until the health of Europeans appeared to be at risk, and the lack of any health services which the people felt they could trust impaired the health of Aboriginal people. This poor contact with the health and medical care delivery system is one of the important factors which determined the health status of Aboriginal people (Broome, 2001; Saggers and Gray, 1991). Another historical legacy is a general lack of education, which undermines efforts to instill health care messages and to encourage the appropriate use of medication (Genat et al., 2006).

Australia's colonial history has impacted adversely on Aboriginal peoples in Australia, and there are significant developments and impacts suggest that history remain influential in the health and wellbeing of Aboriginal peoples today (Taylor and Guerin, 2010). Aboriginal people have a well-documented history of alienation, discrimination, and a fundamental challenge lies in tackling the marginalised position of Aboriginal people within Australian society (Gruen et al., 2002). The vast majority of Aboriginal people, regardless of where they live, or their cultural background, are largely excluded from acessing Australian mainstream society's resources and opportunities (Lowe, 2010; Saggers et al., 2011).

Saggers and Gray (1991) claimed that since the early 1970s in Australia it has been acknowledged that Aboriginal ill-health is attributable to the impoverished conditions of Aboriginal people. The present epidemiological profile of the Aboriginal population, which was inherited from colonisation, is associated with high poverty indices, unemployment, illiteracy, exclusion from the main stream society, lack of land and territory, destruction of the ecosystem, alteration of the dynamic life, unmet basic needs, lack of access to education and

social services, destruction of their economic and socio-political structures, forced displacement, and degradation of their customary lands and waters. All these forces are determined and compounded by structural racism and discrimination (Cunningham, 2009).

The social and environmental factors underlying the inferior health status of Aboriginal Australian people, and many illnesses that have a disproportionate impact on them, are the legacy of colonial oppression, and are related to the colonialist and racist structures that cause Aboriginal communities to be some of the poorest and most marginalised in the world (Cunningham, 2009; Genat et al., 2006).

Aboriginal Australian health is an example of how the imposition of colonial ideologies continued to disadvantage Aboriginal people (Lowe, 2010). The poor health status of Aboriginal people is the direct consequence of invasion by a capitalist society which established its dominance over the Aboriginal hunter–gatherers, expropriated their land and effectively destroyed their mode of production, this had felt them a remnant population on the fringe of the wider society; a population which was powerless, excluded from the mainstream economy, and depend upon "paternalistic charity" (Saggers and Gray, 1991).

2.1.2 Health

The legal framework for the foundation of international human rights include provisions for the right of everyone to enjoy the highest attainable standard of physical and mental health, with some specifically recognising the rights of individuals from marginalised populations, including Aboriginal peoples and ethnic minorities (Cunningham, 2009). At present, practices are operating within health that define non-Aboriginal Australians as having good health while generally speaking, Aboriginal people do not. This is a setting of a boundary and the inculcation of a norm (Lowe, 2010).

An overview on the health status of Aboriginal and Torres Strait Islander peoples across all age groups shows that it is poorer than that of other Australians, and it has failed to improve like that of some Aboriginal communities within other developed counties (Gruen et al., 2002). The exceedingly poor health status of the Australian Aboriginal population has become the subject of international criticism. Aboriginal Australians have the lowest life expectancy of any Aboriginal population in a developed country and their overall health status significantly lags behind the Aboriginal populations of similar wealthy countries such as New Zealand, Canada and the USA (McRae et al., 2008). Taylor and Guerin (2010) declared *"As long as the health of Aboriginal Australians remains so far below that of other Australians and behind other Aboriginal People throughout countries with a similar colonizing history, we are diminished as a nation"* (p.3).

The health of Aboriginal peoples in first world countries, measuring by life expectancy, is significantly worse than that of the mainstream populations of those countries (Cunningham, 2009). Mortality rates for Aboriginal Australians compared with those for non-Aboriginal Australians remain disproportionate with some evidence that the gap has widened recently. The life expectancy for Aboriginal men is 56 years (21 years less than for the total male population) and for women 63 (20 years below the expectancy for the total female population) (Pellekaan and Clague, 2005). For the period 1999-2003, Australian Aboriginal infant mortality rates were almost three times that of non-Aboriginal infants and child mortality was twice as high. Moreover, many of the most widespread causes of mortality among Aboriginal children are preventable, such as malnutrition, diarrhea, parasitic infection, and Tuberculosis (Cunningham, 2009).

Saggers et al. (2011) claimed good health is the result of a complex combination of factors, including those with which we are born, such as our genetic makeup, and those we encounter throughout our lives. The lifestyle that sustained Aboriginal Peoples for tens of thousands of years was irrevocably disrupted, resulting in changed lifestyles stemming from dispossession of country, language, cultural identity, and disintegration of families (Pellekaan and Clague, 2005; Taylor and Guerin, 2010).

Previous studies discussed the connection between history and present health outcomes of Aboriginal and Torres Strait Islander people and argued that the inequalities in the health of Aboriginal Australians result from a range of interrelated historical, environmental, physiological, political and behavioural factors. This health inequality is related to a complex interplay between socio-economic, cultural, English literacy and access issues; and is governed more by the historical and social determinants of health, than with inherent Aboriginality.

Most of the programs set up to address the Aboriginal health crisis were driven by and based on this official view about the causes of Aboriginal health inequality (McRae et al., 2008; Phillips, 2004; Trudgen, 2000). Figure (2.3) summarises those main official factors that impact upon Aboriginal Australian communities and the obstacles that are preventing them from achieving an improvement in their health.

Trudgen (2000) claimed that the unofficial view which should be considered in addressing Aboriginal health crisis is the dual perspectives of both dominant western culture and the Aboriginal people on this crisis. The Western view sees the Aboriginal community as not futuristic, too simple to understand complicated health issues, and regards them as hunter gatherers so their culture is primitive and not intellectual enough to understand the reasons for diseases and sickness. They blame Aboriginals for having no culture of learning, cannot speak English, don't worry about their children's health and blame all incidences of sickness in their communities on 'spirits'.

Meanwhile, the Aboriginal perspective on their health crisis is that it is due to the fact that they now live in one place and have broken with traditional nomadic patterns of the past, that Western people don't explain everything to them and keep it secret, that they are black and black people are always sick, and that even when they have adapted the "white's" way of life; they live in their houses and eat their food but they still have so much sickness.
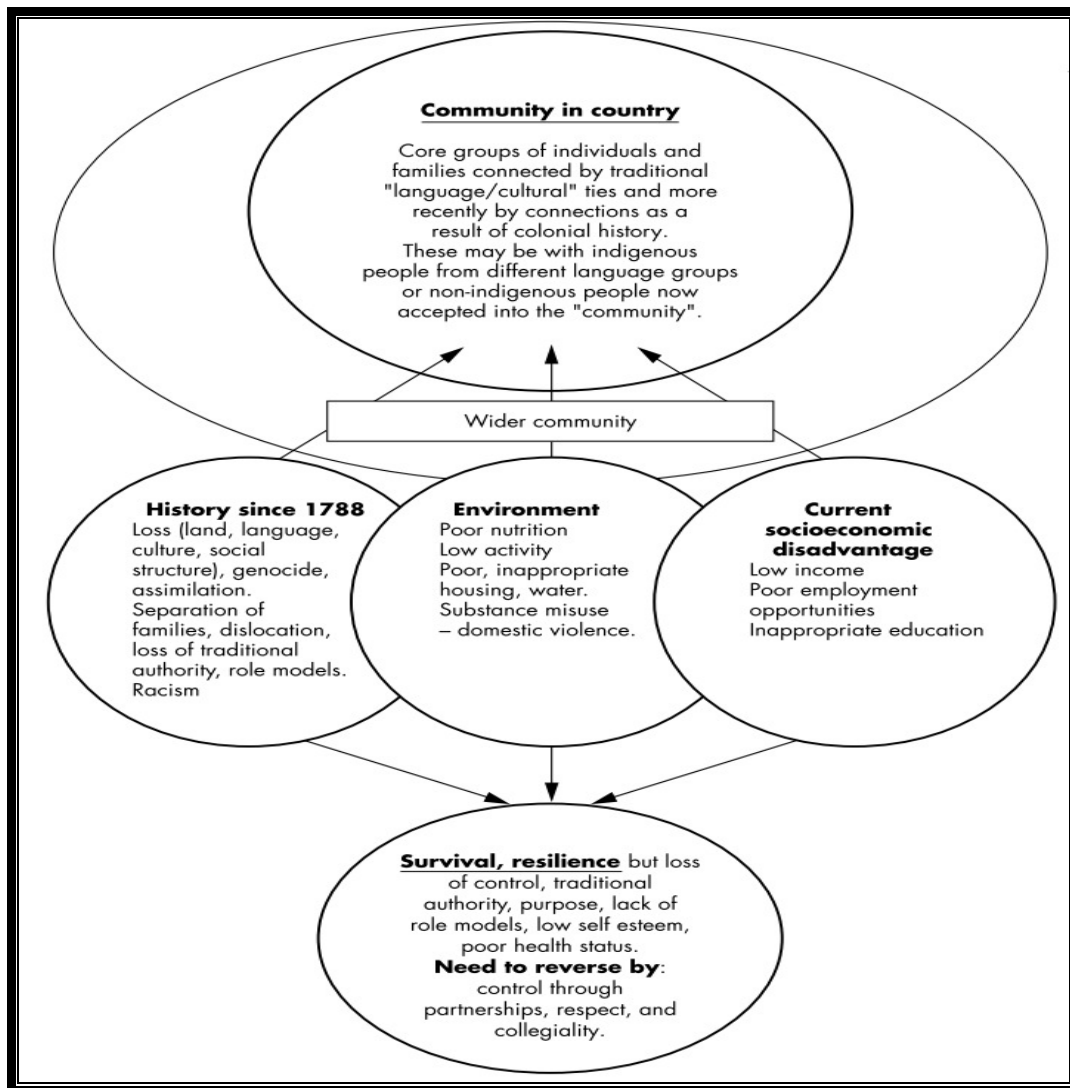
Figure (2.3) Summary of factors that impact on the health of Aboriginal Australians
Source (Pellekaan and Clague, 2005)

Saethre (2007) argues that local conceptions of health do influence how illness is conceived of and treated. Cunningham (2009) clarifies this concept, as for Aboriginal peoples all over the world in general, health is equivalent to the harmonious coexistence of human beings with nature, with themselves, and with others, aimed at integral well-being, in spiritual, individual,

and social wholeness and tranquility. So the health situation of Aboriginal peoples is linked to the sustainable human development of Aboriginal communities in all aspects.

For Aboriginal Australians, Hamilton (1982); Pellekaan (2005) describe the meaning of health as a state of complete physical, mental and social well-being; and not merely the absence of disease or infirmity, in which maintenance of wellness, not management of illness should be the goal.

The seriousness of the poor state of health of Aboriginal and Torres Strait Islander peoples has been obvious for decades and known within the Australian health systems, and therefore it is at the forefront of the national focus on health and service delivery initiatives (Bailey et al., 2006; Pellekaan and Clague, 2005). Gorman et al. (2006); and Hickman (2004) claimed that despite attempts over considerable time to address the issues and successive government and community efforts to improve Aboriginal health, there are no signs that significant progress is being made to narrow the gap that has seen Aborigines die on average 20 years earlier than other Australians, and this appalling situation continues to exist.

If Aboriginal health is to be improved, we should recognise the ongoing problems facing Aboriginal and Torres Strait Islander peoples who continue to suffer a much greater burden of ill-health than other Australians, and not ignore the living realities that many Aboriginal people must deal with on a daily basis including poverty, social obligations, gender concerns, and the experience of illness. These are important first steps in closing the Aboriginal and Torres Strait Islander health gap (Anderson, 2008; Saethre, 2007).

Improving the health of Aboriginal peoples must involve a multi-sector and multi-disciplinary approach, which includes issues of education, political participation, environment and economic development (Cunningham, 2009). The government's commitment to reducing health inequalities is now recognised as a priority in the Queensland Health State-Wide Service Plan 2007-2012 (QldHS, 2007)

The poor health status of Aboriginal Australians cannot be addressed effectively without acknowledging and incorporating the knowledge and understanding of Aboriginal and Torres Strait Islander health workers (Genat et al., 2006).

Improvement of Aboriginal and Torres Strait Islander Australian health can be achieved by enhancing the capacity of primary health care services and the presence of a sustained comprehensive primary health care programs delivered by a trained Aboriginal and Torres Strait Islander health workforce (Gruen et al., 2002). This was one of the immediate priorities of the National Strategic Framework for Aboriginal and Torres Strait Islander Health 2003-2013 (NATSIHC, 2007).

2.1.3 Communicable diseases

Communicable diseases are characterised as types of disease that are contagious, since the agent of the disease may be transmitted from the infected host to another. Transmission may take place through fluid exchange or through exposure to vectors contaminated by the infective agent (Biologyonline, 2010). Even short-term communicable diseases can impact on longer-term health (Davis, 2008). Communicable diseases may range from the very rare to the very common and from the exotic to the ordinary. The ranges of climate, topography and population density in Australia mean that some parts of the country will regularly experience diseases, which will never or rarely be seen in others (Deeble et al., 1999).

There is a clear gap between the rate at which Aboriginal and non-Aboriginal people suffer from communicable disease (Davis, 2008). The NHMRC Road Map (2002) and the Australian Bureau of Statistics' report (2005) described the burden of Communicable diseases across the spectrum, with the exclusion of some vaccine preventable conditions, as being more prevalent in Aboriginal and Torres Strait Islander communities (NHMRC, 2002; Trewin and Madden, 2005).

The communicable diseases that are of particular importance to Aboriginal and Torres Strait Islander people, and which have an almost overwhelming impact on some communities are: Tuberculosis, Hepatitis (A, B, and C), Sexually Transmitted Infections, Human Immunodeficiency Virus (HIV), Acquired Immune Deficiency Syndrome (AIDS), Haemophilus influenza type b (Hib), Pneumococcal disease, and Meningococcal disease, many of these diseases can be prevented through the use of protective measures (Pellekaan and Clague, 2005; Thomson N et al., 2008).

The strengths of western medicine in terms of its efficacy in controlling communicable diseases and in treating infection have made little inroads into Aboriginal communities, due to the persistence of knowledge about Aboriginal medicine within the Aboriginal families and communities (Barlett, 1995). Vaccination, improved housing, infrastructure and education are strategic factors that need to be addressed to contain these communicable diseases and close the gap in the foreseeable future (Davis, 2008). Aboriginal health workers can help in reducing the burden of disease through disease prevention that focuses on health risk and health determinants (WHO, 2007).

2.1.4 Tuberculosis (TB)

Tuberculosis is a disease that primarily affects people living in poverty (Cunningham, 2009). It is primarily a lung infection caused by the bacterium Mycobacterium Tuberculosis, which penetrates the lung tissue, causing inflammation and the development of encapsulated bacterial cells (tubercles) (Thomson N et al., 2008). According to the World Health Organization (WHO) Tuberculosis is one of the world's most deadly infectious diseases, once thought to be

under control, its rates and cases declined every year from the early 1950s until the mid-1980s, but it has bounced back with a vengeance, killing 1.5 million people a year, even more when in it appeared in combination with Human Immunodeficiency Virus (HIV) / Acquired Immune Deficiency Syndrome (AIDS) (Heymann, 2002; Miller et al., 2003).

In 1991 a World Health Assembly (WHA) resolution recognised TB as a major global public health problem (Uplekar et al., 2006), and one of the most important causes of death in adults that is strongly associated with social and economic inequality (WHO, 2004). Urban poverty, high HIV infection rates, a lack of access to medical care and drugs, cultural barriers, language differences, geographical remoteness, and the effects of household overcrowding are issues that contributed to the disproportionately high number of TB cases that affect Aboriginal people around the world; and the lack of success of programs that were designed to prevent Tuberculosis from reaching Aboriginal peoples (Cunningham, 2009; Fauci, 2006).

According to 2008 statistics, Tuberculosis still presents an urgent crisis for much of the world as more than 2 billion people, (one third of the world's population), are infected with the bacteria responsible the disease (Britton, 2010; Cunningham, 2009; Heymann, 2002).

Factors behind the growing number of TB cases that have emerged are HIV positivity, social factors, interruption of treatment, intravenous drug use, and the development of a particular strain of drug-resistant TB (Faustini, 2006). The main goal of the WHO Stop TB strategy 2006 was to reduce dramatically the global burden of TB by 2015 (Uplekar et al., 2006).

The main risk factors for Tuberculosis, such as poverty, overcrowding, malnutrition, diabetes mellitus, smoking, alcohol abuse, advanced renal diseases and, more recently, HIV; are common among many Aboriginal and Torres Strait Islander communities. Early diagnosis of TB cases and prompt, effective treatment remain the cornerstone of TB control, however, treatment of latent TB infection (LTBI) in those most at risk of progression to disease is a strategy needed to further reduce disease and transmission (Couzos and Murray, 2008).

Important measures for preventing TB include public education and improving awareness-raising of TB through:

1) Education and training among health care workers in order to promote early detection, and to consider TB for at-risk patients,

2) Increasing patient awareness of available treatment,

3) Education and empowerment of high-risk groups and their families/carers which serviced by ATSI health workers. Patients who have this knowledge are less likely to delay diagnosis, a delay that could result in transmission of the disease to uninfected persons (Bastian and Krause, 2008; Miller et al., 2003; NTAC, 2002).

2.1.4.1 Burden of Tuberculosis within Aboriginal Australians

In Australia

On the national level, Bastian & Krause (2008) highlighted that TB is a global health emergency in which Australia has the responsibility and the capacity to make a difference both within and beyond our shores. Australia has a low incidence of Tuberculosis (TB) which has remained constant for over a decade, due to strict controls on the diagnosis and treatment of Tuberculosis within national borders.

However, the incidence is not the same across the population; immigrants and ATSI Australians are most affected, with rates many times those of non-Aboriginal and Torres Strait Islander (Bastian and Krause, 2008; NTAC, 2002; Simpson et al., 2006).

In the late 1980s, Tuberculosis, was introduced to the Northern Territory in Australia from prison inmates, and somewhat later in Central and Southern Australia, its surveillance was neglected, then resulting in problems that emerged in the 1990s (Hargrave, 1993).

Between 2000 and 2007, there was a total of 258 cases of Tuberculosis (TB) notified in the Northern Territory, and of these, 157 (61%) were identified in Aboriginal people. There was a marked spike in the rate of infection for Aboriginal people in 2007 that was mainly due to cases found following a community screen prompted by 2 active TB cases being diagnosed in one community, Figure (2.4).

In 2008 a TB outbreak in a Northern Territory (NT) Top End community highlights that maintaining a high level of awareness among health professionals who work with groups at high risk of TB is central to managing and reducing the impact of this disease (Coleman et al., 2008).
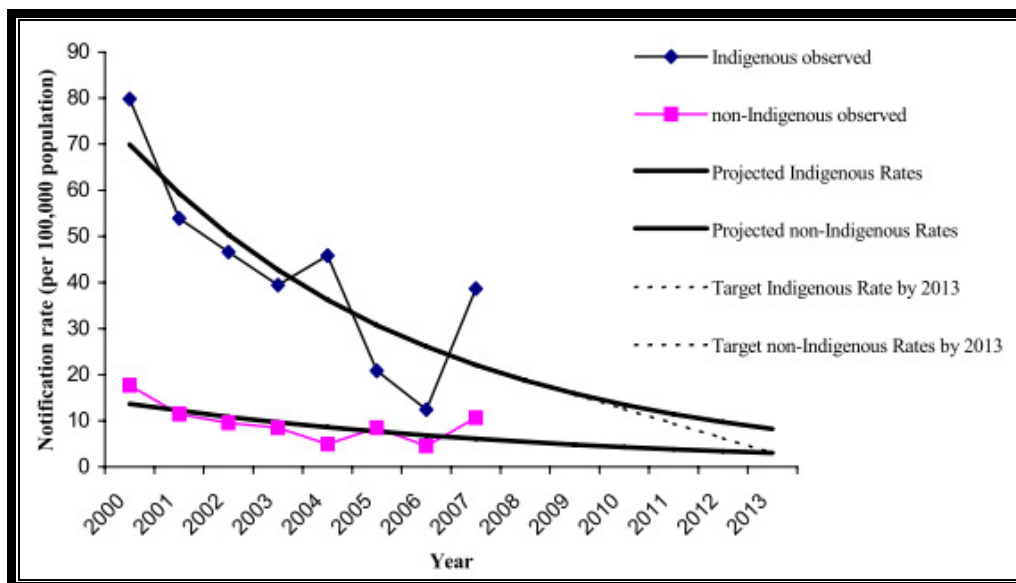
Figure (2.4)   Tuberculosis notifications in Northern Territory, Source (Davis, 2008)

A significant public health threat is represented in the dramatic increase in Tuberculosis cases in people from Papua New Guinea (PNG), which is located only 3 kilometers away from the outer Australian Islanders in the Torres Strait, where there is free movement of peoples across the border under a treaty arrangement. Although there are no precise figures, it is clear that there are epidemics of both TB and HIV in PNG (Simpson et al., 2006).

Given that the natural history and transmission of TB predicates against the elimination of TB in a single geographical area, it is important that Australia has a vision for TB control globally and a commitment to being involved in and assisting with reducing the regional burden of TB (NTAC, 2002). Data gathered from TB in patients from Papua New Guinea who have accessed Queensland TB services in the Torres Strait illustrates how TB control in the region can impact upon public health control of TB in Australia (Roche et al., 2008). Also, Health-*InfoNet* (2008) shows that there is an increasing concern regarding the emergence of multidrug resistant strain of the disease. Plant (1995) argues that while Tuberculosis rates are low in Australia they have not continued to decline at the same rate seen prior to 1986, and that the best public health efforts should be directed at case identification and treatment, prevention and monitoring. On March 2002 the National Strategic plan for TB control in Australia beyond 2000 released in which Tuberculosis has been categorised as a national notifiable disease (Couzos and Murray, 2008). The following table (2.2) shows the Bacteriological-confirmed cases of Tuberculosis in Australia, 1995 and 2003 to 2005, cases and rate per 100,000 populations, by State or Territory

Table (2.2) Bacteriological-confirmed cases of Tuberculosis in Australia (1995-2005)

State or territory	2005		2004*		2003*		1995*	
	n	Rate	n	Rate	n	Rate	n	Rate
New South Wales[†]	346	4.9	308	4.4	325	4.6	305	4.8
Northern Territory	24	11.9	21	10.5	20	10.1	37	21.3
Queensland	91	2.3	88	2.3	91	2.4	86	2.6
South Australia	36	2.3	43	2.8	36	2.4	33	2.2
Tasmania	10	2.1	8	1.7	4	0.8	2	0
Victoria	261	5.2	262	5.3	254	5.2	186	4.1
Western Australia	42	2.1	57	2.9	54	2.8	56	3.2
Total	810	4.0	787	3.9	784	3.9	705	3.9

*   Data from previous reports of the Australian Mycobacterium Reference Laboratory Network.
†   Data from the Australian Capital Territory are included with those from New South Wales.
Source (Lumb et al., 2007)

The main risk factors for Tuberculosis are poverty, overcrowding, malnutrition, diabetes mellitus, smoking, alcohol abuse, and advanced renal diseases. All those factors are common among many Aboriginal people (Health-*InfoNet*, 2008; Thomson N et al., 2008). The incidence of TB is higher for Aboriginal and Torres Strait Islander people than for non-Aboriginal and Torres Strait Islander people across all age groups, with rate ratios being highest for the 45-54 years and 55-64 years age groups. Of the 885 notifications of Tuberculosis among Australian-born people in Australia in 2002-2006, 174 (20%) were identified as being Aboriginal and Torres Strait Islander, Table (2.3), (Thomson N et al., 2008).

Table (2.3) Tuberculosis: numbers of new cases and crude incidence rates,
Aboriginal people, by jurisdiction, Australia, 2002-2006

Jurisdiction	Number	Population	Rate
NSW	22	141.533	3.1
VIC	4	29.683	2.7
Qld	45	134.013	6.7
WA	11	69,665	3.2
SA	7	27,060	5.2
TASM	2	18,317	2.2
ACT	0	4,204	-
NT	83	59,508	27.9
Australia	174	483,992	7.2

Source: Overview of Australian Aboriginal health status, November 2008, Australian Aboriginal Health *InfoNet*,
Notes: - Population figures are for 30 June 2004 (the mid-point of the five-year period, 2002-2006)
- Rates are crude incidence rates per 100,000 populations.

This comparison underestimates the true difference between Aboriginal and non-Aboriginal people because of differences in the age structures of the Aboriginal and non-Aboriginal populations; after adjusting for these differences, the incidence rate for Aboriginal people was 14 times that of non-Aboriginal people as appear in Table (2.4), (Thomson N et al., 2008).

Table (2.4) Tuberculosis: numbers of new cases and age-specific incidence rates,
by Aboriginal status, and rate ratios, Australia, 2002-2006

Age group	Aboriginal		Non-Aboriginal		Rate ratio
	Number	Rate	Number	Rate	
0-4	10	3.3	47	0.8	4.2
5-14	10	1.6	44	0.3	4.8
15-24	21	4.4	43	0.3	13.9
25-34	32	8.8	74	0.5	16.6
35-44	28	9.3	60	0.4	22.7
45-54	31	15.6	70	0.5	30.1
55-64	22	21.2	71	0.7	31.1
65+	20	29.8	301	2.3	12.8
All ages	174		711		14.1

Source: Overview of Australian Aboriginal health status, November 2008, Australian Aboriginal Health *InfoNet*

Notes: -Rates are per 100,000 populations.

- Any discrepancy between the figures shown for 'all ages' and the sum of the number for the specific age groups is due to age not being stated in the notification.

- Rate ratio is the Aboriginal rate divided by the non-Aboriginal rate.

- The rate ratio for 'All ages' is the standardized incidence ratio, which is the number of Aboriginal cases reported divided by the number expected if the Aboriginal population had the same age-specific rates as the non-Aboriginal population

- Among the notified TB cases in 2003-04, the male to female ratio changed from 0.7-1.4 to 1.0 in Aboriginal Australian population.

- A more recent review of 2003to 2005 data revealed the prevalence of LTBI in Aboriginal students to be 2.6%.

- The relatively high rates in Aboriginal children reflect higher levels of active TB transmission among families or communities and the potential for future disease.

In Queensland

Audit about Tuberculosis in period 1993-1997, Simpson et al. (2006) reported that:

1. Rates of TB in the Aboriginal Australian population were highest in far north Queensland, as in the years 1993-97 they were 87 total cases of Tuberculosis, 54 were diagnosed as pulmonary Tuberculosis, 67% with sputum smear positive.

2. 50 cases on Aboriginal Australian while 30 cases were in the non-Aboriginal residents, and seven cases were in Papua New Guineans.

3. 18 cases (21%) were under directly observed treatment.

4. Of the ten cases notified in far North Queensland died from TB, seven were Aboriginal Australians.

5. Six cases suffered from drug resistance, seven were early relapse and there were no case diagnoses associated with HIV.

An audit of these cases led to a number of policy changes including:

1. A greater use of directly observed treatment (DOT) provided by an increased use of Aboriginal health workers in remote communities, and

2. More aggressive prolonged treatment of relapsed cases.

A follow up audit for years 1998-2002 showed:

1. An increased in the total TB cases to 92 cases, of which 57 cases were diagnosed as pulmonary Tuberculosis with 47 were sputum smear positive.

2. A significant reduction in new cases from 50 to 22 cases of TB in the Aboriginal Australian population, from 30 to 22 cases in the Non-Aboriginal population, and an increasing in number of TB cases among Papua New Guineans from seven to 44 cases, refer to table (2.5).

3. Four cases notified in far North Queensland died from TB, of whom none were Aboriginal Australians.

4. 67 cases (73%) were undergoing directly observed treatment.

5. Seven cases suffered from drug resistance, two cases were total early relapse, and in two cases the diagnosis was associated with HIV.

In 2005, of the 38 cases of TB in Far North Queensland, 26 were from the Torres Strait including seven cases of multidrug resistant TB.

Table (2.5) Findings of two 5-year audits on Tuberculosis in Far North Queensland

Findings	**1993–1997**	**1998–2002**
Total cases	87	92
Aboriginal Australians	50	22
Non-Aboriginal	30	26
Papua New Guineans	7	44
Pulmonary Tuberculosis	54	57
Sputum smear positive	67%	47%
Directly observed therapy	18 (21%)	67 (73%)
Death from Tuberculosis	10	4
Deaths in Aboriginal Australians	7	0
Total early relapses	7	2
Aboriginal Australians	7	0
Drug resistance	6	7
Multidrug resistant Tuberculosis	1†	3‡
HIV co-infection	0	2‡

* Queensland average, 48%. † Patient from the Philippines. ‡ All in Papua New Guineans. ◆
Source (Simpson et al., 2006)

2.2 Aboriginal and Torres Strait Islander Health Workers

2.2.1 History

Giblin (1989) describes qualities of Aboriginal people as including, in the most general terms, the possession of the social, environmental, and ethnic qualities of a subculture and, in more specific terms, a sharing with a client of a verbal and non verbal language, an understanding of a community's health beliefs and barriers to health care services, and an enhanced empathy with, and responsibility toward a community and its health service needs. In 1920, the colonial administration employed Aboriginal Health Workers across Asia and Africa to dispense Western healing concepts and practices across the cultural divide. Until 1980 Aboriginal health workers worked as druggists, disease-specific treatment providers, first-aiders, vaccinators and health promoters (Genat et al., 2006).

Aboriginal health workers have been referred to as community health aides, health care expediters, neighborhood workers, Aboriginal environmental health workers, neighborhood-based public health workers, health guides and health hostesses, health assistants, lay workers, neighbohood representatives, auxiliary health workers, family health counsellors, community workers in human services, resource mothers, and Aboriginal non-professionals drawn from lower socioeconomic groups (Giblin, 1989).

The World Health Organization (WHO) defines "Community Health Workers" as "*Men and women chosen by the community and trained to deal with the health problems of individuals and the community in remote areas and to work in close relationship with the health services*" (WHO, 2007). UNICEF and the World Health Organization (WHO) envisioned Aboriginal health workers programs as pivotal to the emphasis on cultural appropriateness, community participation, self-determination; and further asserted that they would cost less than highly trained professionals (Genat et al., 2006).

The Aboriginal and Torres Strait Islander health workers model is based on the World Health Organization exemplar for primary health care delivery in Aboriginal communities (Barlett, 1995). The National Review of Aboriginal and Torres Strait Islander Health Worker Training team 2000 has suggested the following basic definition for an Aboriginal and Torres Strait Islander Health Worker: "*The Health Worker is an Aboriginal or Torres Strait Islander person who formally engages in health related activities with individuals, families and community groups for the maintenance and promotion of health within Australian Aboriginal and Torres Strait Islander and mainstream cultural contexts and recognizes the State, Territory or Regional level customization of this definition*" (CIRC, 2000).

Australian Aboriginal and Torres Strait Islander health workers differ from the international community health workers in that they are not volunteers; they work for government health

agencies; non-government health agencies or Aboriginal community-controlled health services (Felton-Busch et al., 2009).

In the 1970s Aboriginal and Torres Strait Islander health workers became part of the way health services were delivered to Australian Aboriginal and Torres Strait Islander communities, providing them with a culturally-appropriate medical service (Barlett, 1995; Collins, 1995).

In 1985, an Act of Parliament was passed in the Northern Territory and Aboriginal Health Workers were registered as health professionals and participated in the delivery of health care and various health programs within the Department of Health and Community Services, health centres in remote communities, and in independent Aboriginal health services (Collins, 1995). There are currently more than 1,000 Aboriginal Health Workers (AHW) working at the interface of primary health care and the Aboriginal community (McRae et al., 2008).

2.2.2 Roles

"...Aboriginal and Torres Strait Islander health workers are vital for effective functioning of PHC (primary health care) teams serving Aboriginal communities. In fact we can't imagine these teams operating successfully without the strong presence of AHWs." (Ridoutt et al., 2010).

The initial conceptions of Aboriginal and Torres Strait Islander health workers practice broadly paralleled those in the international development context. Then their practice was broaded to include basic medical care, personal health care (health education), community health action, and health service management with emphasis on their role as 'cultural liaison' (Genat et al., 2006).

Cultural liaison was explained by Ridoutt et al. (2010) as Aboriginal and Torres Strait Islander health workers actively helping to relate mainstream health beliefs within an Aboriginal framework, making it possible for Aboriginal patients/clients of health services to understand what is being said and to assess the validity of the statements; and also they make it possible for the non-Aboriginal health centre staff to communicate with Aboriginal people in language and concepts that they understand. They are providing a cultural link between the community and government and non-government health services and programs (Collyer, 2006).

Their role has been illustrated by the Commonwealth of Australia's House of Representatives Standing Committee on Family and Community Affairs (2000) as the key to delivering effective programs for Aboriginal and Torres Strait Islander Australians across a broad range of services and locations. Their real value is in ensuring the acceptability of the service to Aboriginal and Torres Strait Islander Australians, and providing a linkage between the Aboriginal and Torres Strait Islander patients and the non-Aboriginal and Torres Strait Islander

Health professionals (HRSCFCA, 2000). Their success lies in the fact that they have a close association with, and an intimate knowledge of, the communities they serve (AMA, 1998).

The Qualifications Framework for the Health Training Package (HLT07), which includes the Certificate IV in Aboriginal and/or Torres Strait Islander Primary Health Care qualification, identified a generic role description for Aboriginal and Torres Strait Islander health worker as: "*... workers who provide a range of primary health care services to Aboriginal and/or Torres Strait Islander clients, including specific health care programs, advice and assistance with medication. These workers are expected to flexibly assume a variety of job roles and undertake a broad range of tasks*" (Ridoutt et al., 2010).

AHWs are playing an integral role in community health solutions and other primary health care services which include health promotion and education concerning health problems and how to prevent and control them, and by providing a direct care to individuals, family and the community at large. Their role is of equal, and in some instances greater, importance than the roles of other health professionals in providing health care to Aboriginal and Torres Strait Islander Australians (Bailey et al., 2006; Barlett, 1995; Fleming and Parker, 2007; NRHA, 2006).

The roles played these workers and the skills they require in order to perform these roles are complex and multi-dimensional. They are providing the first point of contact for clients attending the community health centre, including responsibility for the delivery of primary health care and referral to the Remote Area Nurse (RAN) or doctor, if necessary (Collyer, 2006). They are linking western health beliefs to Aboriginal and Torres Strait Islander health or cultural practices by taking from western medicine that which is useful, blending it with the communities' understandings, and achieving better outcomes for the health of the community (Barlett, 1995; Collyer, 2006). They are promoting and supporting traditional healing methods. They are endorsing traditional and cultural values within local health services. They are improving coverage of communities with basic health services, and they are playing a very important role overall in health education (Collyer, 2006).

The development of Aboriginal Controlled Community Health Organisations is helping to expand the role of Aboriginal Health Workers. They are based on the concept that ensuring consultation with Aboriginal communities to develop relevant health goals is critical to successful health care delivery (McRae et al., 2008). The extent of their role is influenced by the availability of other health professionals (CIRC, 2000). The actual work undertaken, particularly in small remote health centres, can vary depending on the nature of the work in the health centre, the type and number of other health professionals, and the confidence and competence of the individual Aboriginal and Torres Strait Islander health workers and the willingness of service management to commit to the fullest utilisation of Aboriginal health workers (Ridoutt et al., 2010).

Despite the many assertions have been made about the importance of Aboriginal health workers within Aboriginal health policy, their place within the health system has not been clearly articulated (Genat et al., 2006). Aboriginal and Torres Strait Islander health workers' roles have come to differ between the government and the non-government sectors, and from community to community, and can involve all health-related services from health education and health promotion through the delivery of clinical care in both hospital and community settings (Felton-Busch et al., 2009; Genat et al., 2006).

There are some differences between urban and rural and remote Aboriginal and Torres Strait Islander health workers, with the latter two concentrating on primary health care, while those in the city-based centres deal more with education and liaison (Saggers and Gray, 1991). Consequently, they are identified with a wide range of practice (Genat et al., 2006).

Their roles require much specialised knowledge, cultural and clinical, and that their functions are defined as those of a discrete health profession (NRHA, 2006). Their core skills are communication skills, interpersonal skills, knowledge base, service coordination skills, capacity skills, advocacy skills and organisational skills (Collyer, 2006). Responding to the complexity of their task, they have been developing a unique client-centered holistic practice (Genat et al., 2006).

2.2.3 Aboriginal and Torres Strait Islander health workforces

Although Aboriginal Australians have had a greater need for health services, this does not always translate to a greater uptake of, or access to, health services. One of the main causes for reduced access to mainstream health services is that staffing of health services in Australia does not reflect the Aboriginal population, let alone represent their health requirements (Taylor and Guerin, 2010). Aboriginal and Torres Strait Islander health workers are a very important component of the workforce (SADH, 2010).

Despite the need and demand for their services which is currently being placed upon Aboriginal and Torres Strait Islander health workers in Aboriginal communities to provide primary health care, there is still shortage in their numbers. According to 2006 census Aboriginal and Torres Strait Islanders constituted only one per cent of the health workforce in Australia, 95.5 percent were Aboriginal and Torres Strait Islander health workers and 0.5% were medical practitioners, midwifery, nursing, and other welfare support workers (Anderson, 2008). This imbalance provides an immediate challenge (Taylor and Guerin, 2010).

According to information collected as part of the 2006 Australian Census, there were 4,891 Aboriginal people aged 15-64 years working in the health industry in 2006, as illustrated in the following Table (2.6) , (2.7), (AIHInfo*net*, 2012).

Table 2.6 : Numbers and proportions (%) of Aboriginal health workers, by jurisdiction, Australia, 2006

	Jurisdiction	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Aboriginal health workforce	**Numbers**	1,743	381	1,343	486	302	196	47	390	4,891
	Proportions of total health workforce	1.1	0.3	1.4	1.0	0.7	1.7	0.6	8.8	1.0
	Proportions of Aboriginal population 15 years and older	2.0	2.0	1.7	1.3	1.9	1.8	1.9	1.1	1.7
Aboriginal people as proportion of total population		1.6	0.5	2.5	2.4	1.3	2.8	0.9	24.1	1.8

Source: Steering Committee for the Review of Government Service Provision (2008) Report on Government Services 2008, Aboriginal Compendium, Productivity Commission, Canberra. Notes:
1. The 2006 Australian Census of Population and Housing was the primary source for these figures
2. Proportions of populations relate to people aged 15 years and older
3. Figures for Australia include 'other territories'

Table 2.7 : Numbers and proportions (%) of Aboriginal health workers, by age group and sex, Australia, 2006

	Age group	15-24	25-34	35-44	45-54	55-64	All ages
Numbers	**Males**	108	301	388	314	104	1,223
	Females	406	803	1,100	984	347	3,666
	Persons	518	1,098	1,486	1,290	453	4,891
Proportion of total health workforce	**Males**	0.3	0.3	0.3	0.2	0.2	0.2
	Females	1.1	0.8	0.9	0.7	0.5	0.7
	Persons	1.4	1.1	1.2	0.9	0.7	1.0

Source: Steering Committee for the Review of Government Service Provision (2008) Report on Government Services 2008, Aboriginal Compendium, Productivity Commission, Canberra. Notes:
1. The 2006 Australian Census of Population and Housing was the primary source for these figures
2. Figures for 'all ages' include people aged 65 years or older

Closing the Aboriginal Australian health gap through enhancing the capacity of primary health care services to Aboriginal Australian communities were to be accomplished through increasing the number of Aboriginal people working across the entirety of the health profession, improving the clarity of roles and regulations, and recognition of Aboriginal health workers as a key component of the health workforce (AHMAC, 2002; QATSIHPWWG, 2008).

SADH (2010) declared that ongoing support and development opportunities for Aboriginal workforce could include:

1) Identifying individual training or development needs for all Aboriginal employees;

2) Providing mentoring for new Aboriginal employees;

3) Promoting participation on leadership programs, such as Health LEADS;

4) Assisting with career planning; and

5) Providing career pathway opportunities.

2.3 The Potential of Information Communication Technology (ICT) within the Context of Health

Information Communication Technology (ICT) refers to computers, software, networks and related systems that allow users to access, analyse, create, exchange and use data, information and knowledge (Kinuthia, 2007). Rapid advancement in computer technology with the increasing availability of electronic health information and the numbers of multimedia learning packages to the health professional are revolutionising health care systems worldwide (Brock and Smith, 2007; Vivekananda-Schmidt et al., 2004).

Information Technology has the potential to reform the way medicine is learned by students and healthcare professionals, providing learners with easier and more effective access to a wider variety and greater quantity of information (Mooney and Bligh, 1997b).

During the last three decades, a number of educational multimedia materials have been developed and now play an important role in health sciences education, reducing the demand for face-to-face lectures and making access to learning material easier (Candler et al., 2003; Chuthapisith et al., 2009; Vivekananda-Schmidt et al., 2004).

Many research studies have shown that healthcare education has been enhanced through the use of multimedia technology; and interactive multimedia computer-assisted instruction, combined with the internet for formal courses, connects learners to sophisticated learning resources in medical education and provides an opportunity to enhance learning (Marsh et al., 2008; Reddy et al., 2006; Sargeant, 2005).

Using simulations, computer-based health education allows the learners to manage greater and variety number of patients' cases, to develop and practice patient care skills without danger or inconvenience to real patients, and to manage cases, as diseases evolve over time (Hoffer and Barnett, 1990).

Examples of the impact of information communication technology on health include the International Virtual Medical School (IVIMEDS), where online and interactive multimedia computer-based learning is used in medical education and health care training. IVIMEDS is a major international collaboration between 20 leading medical schools located in 14 countries, created to meet the challenges facing medical education using information and communication technologies, and working to improve global health through improved education of providers.

In addition, it provides medical-education resources and medical education services to teacher and learners world-wide, as well as customised postgraduate and continuing professional development (CPD) programs that can be taken at the time and place of choosing of the learner. It is facilitates convenient and cost-effective lifelong learning (IVIMEDS, 2001; Lazakidou et al., 2006).

There are also different types of medical multimedia programs which designed to address different learning needs (Mooney and Bligh, 1997b). Examples include a well-designed multimedia program on hyponatraemia, which incorporates teaching elements in anatomy, physiology, biochemistry, chemical pathology and nephrology for preclinical and clinical students (Tan, 1998); an undergraduate program that teaches examination of the eye and ear (Grundman et al., 2000); an interactive patient program designed to evaluate performance in history taking, physical examination, diagnosis and treatment (Hayes and Lechmann, 1996), multimedia computer assistant learning tool to assist the understanding of congenital heart diseases (Vivekananda-Schmidt et al., 2004), and the infectious diseases interactive online learning program which enabled primary care professionals to increase their knowledge and skills in the area of infectious diseases (Walsh, 2008).

An example of the role of Information Technology in supporting health workforces can be found in the Computer Assisted Medical Diagnosis system (Aide au Diagnostic Medical or ADM) in France. It is an international model for using Information Technology to support health workforces. It is knowledge and data-base available via a Web server.

This project was started fifteen years ago and comprises a large database containing information on more than 10,000 diseases from all pathological fields, using more than 100,000 signs or symptoms. The ADM system provides physicians with a comprehensive list of disease descriptions, and a list of diseases containing one or more symptoms, helping them in making diagnoses and offers a rapid access to medical information (ADM, 1995).

The Health Information Forum (HIF-net) service is another model using internet technology to support health planners and providers in developing countries and remote locations (HIF-net, 2000). This encourages international communication and exchange of information between clinicians (Soar and Yuginovich, 2006).

On the national level, a model for using interactive multimedia for health education and training is the collaborative project between the Rural Health Training Unit (RHTU), the Anton Brienl Centre in Tropical Diseases and the James Cook University Centre for Interactive Multimedia which aims to produce a CD-ROM on Infectious Diseases (ACDHFS, 1996).

Further, the National Health Interactive Technology net (NHIT net), is a program that began in two Aboriginal communities in North Queensland, concerning health promotion, in which an interactive multimedia featuring touch screen-based technology has been implemented to improve access to information, and helps to address choices in relation to health behaviours for Aboriginal communities (Hunter et al., 2007).

The experiences of these existing services in using technology broadly across health planning and delivery strongly was supported the planned study. These examples are broad in their application whereas this project was targeted at one area of need that is currently poorly supported.

2.3.1 Self-Paced Health Program in Health Sector

The term "self-paced" (SP) refers to education that is undertaken by learners at their own pace, largely independent of the guidance of educators (Burgess, 1994).

SP is a type of computer based Learning program (CBL), in which a multimedia presentation on common multimedia storage drives including CD-ROM/USB drive has been used.

Table (2.8) shows the different categories of CBL programs in order of their educational sophistication. (Mooney and Bligh, 1997a) describe CBL as information resources of the simplest terms of educational design and are primarily used as aids to finding information quickly.

There are 4 levels of computer-based learning (CBL):

Level 1: Customised linear presentation in which learning is similar to a standard Power Point overhead presentation with little interactivity.

Level 2: Instructor-led, nonlinear presentation in which learning by facilitator accompanied by navigation through the information on a computer without the use of multimedia.

Level 3: Facilitator-led training that leads learners through a multimedia presentation, in a classroom-based training scenario.

Level 4: Self-paced (SP) in which a multimedia presentation is being used by learners independently with minimal assistance (also known as stand-alone learning), where individuals can use the resource at their own pace (Knebel, 2000).

Table (2.8) Computer Based Learning categories

Categorisation of CBL programs

- information resources: reference/literature databases (eg, Medline)
- electronic textbooks: textbooks converted into electronic format (usually CD-ROM)
- tutorial: sequential lessons (usually multimedia) aimed at teaching specific subjects (eg, anatomy of the liver)
- mind tools: programs to help learners organise and plan learning (eg, personal information manager) and structure and record knowledge/information (eg, mindmap)
- study guides: programs designed to support an educational process (eg, problem-based or task-based learning)

Source (Mooney and Bligh, 1997a)

SP has been a feature of medical training and education programs since the mid-1980s. It has the potential to meet medical training needs, and other professions have already started to embrace it in continuing professional education (Davis et al., 2007; Knebel, 2000). It can facilitate continuing medical education, providing a mechanism for integrating ongoing education with the patient-care process (Hoffer and Barnett, 1990).

Knebel (2000) described the SP as a promising innovation in training and educational methods; especially for health care settings located far from a training facility in areas with poor transportation, because this method has the capacity to cross demographic, social, economic and national boundaries; and connect learners to information resources that are important for informal continued learning.

The SP model effectively shifts time, space, and content into viewer-controlled programming, making information available whenever, wherever and in whatever amounts needed. The information is digital, portable, conveniently located on one's desktop, and is only a mouse click away, no need to approach the internet or library to access the same health information (Cartwright and Cartwright, 1999; Tomita, 2003).

SP emerged not only as an alternative to traditional education, but also as a practical solution to the problem of continuing education with limited resources, as it is less expensive. It minimises the need for paid trainers, printing and updating of paper materials and resources that need to be rented or scheduled.

It is cost-effective as the costs decrease in proportion to the number of learners using SP programs, whereas the costs of classroom instruction increase in proportion to the number of learners. The SP model saves valuable training time, and increases the effectiveness of achieving training goals. It is consistent and more effective than traditional class room methods as it is always accessible to the learner and can be interrupted and resumed at will.

An SP program can be delivered to large audiences and permits a larger number of health care workers to be taught at the same time, but needs to be culturally sensitive, relevant to local health care priorities and supportive of local resources (Cartwright and Cartwright, 1999; Harrison, 1999; Jerram and Gosney, 1995; Knebel, 2000; Sargeant, 2005).

2.3.2 Interactive Multimedia Technology

Interactive multimedia (IMM) is a technology implemented in software that primarily deals with the provision of information, and is often delivered on common multimedia storage drives including CD-ROM/USB drive; it involves computer based technology that uses a combination of elements or media on a desktop personal computer, for the purpose of communicating information (Burgess, 1994; Fahy, 2005; Phillips, 1997). It can display information using a wide variety of formats such as sound, digital video, animation, pictures and text, and integrate multiple media together (England and Finney, 1996; Samaras et al., 2010; Villamil-Casanova and Molina, 1996).

IMM technology has the ability to link the different media together into an instructional lesson which is built into hypermedia programs software tools (Barron and Orwig, 1997), and allows the presentation of clinical cases and information in an interactive way, giving the user the ability to control the components and interact with them as needed, therefore multimedia technology is considered to be a tool, and not an end in itself (Villamil-Casanova and Molina, 1996; Williams and Harkin, 1999).

Multimedia programs can evolve as some sort of resource database in which learners are either free to create new information or are guided to produce valuable conclusions. It could guide the learner along the path from fully structured information to unstructured exploration (O'Brien, 2002).

Multimedia software is often stored on common multimedia storage drives including CD-ROM/USB drive as a delivery system; it combines very large storage capacity of multimedia materials with the interactive control of a personal computer (Shaw and Standfield, 1990). It allows for great amounts of data to be stored in a convenient format and randomly accessed quickly and accurately, and offers a broad base of accessible knowledge (Abrams, 1996). CD-ROM multimedia is not synonymous with CD-ROM; as software is only 'multimedia' if it uses multiple media to display information (Mooney and Bligh, 1997b).

O'Brien (2002) argues that there are fundamentally two different sorts of interactive multimedia. The first type is the information dissemination interactive multimedia systems which are content driven, rely heavily on good presentation and design to allow learners to extract the information, have no evaluation mechanism built in, or any means to take action to improve learning, and it used maily in the education area.

The second type is the instructional interactive multimedia system, which is designed to teach a skill, evaluate learning, provide feedback, and it used mainly in training area. In this study, the information dissimination method was used in the design of the interactive multimedia model.

2.3.3 Strengths of Interactive Multimedia for Learning

The current literature on multimedia and empirical results indicate and support the effectiveness of multimedia as an effective learning tool for imparting knowledge and skills through its inclusion in online learning and in the form of CD-ROMs as a multimedia computer-aided instructional medium (Donnelli et al., 2009; Sargeant, 2005).

Interactive multimedia has a number of potentially powerful characteristics and advantages over other learning resources, and can provide a learning environment that can be used to enhance and improve the education process, and provide learners with educational experiences that traditional text-based methods cannot (Mooney and Bligh, 1997b; Phillips, 1997; Vivekananda-Schmidt et al., 2004). Multimedia has been embraced also in training environments, because it combines the interactivity and management features of computer-based training with the benefits of realistic audio and video (Barron and Orwing, 1995).

However, in order for interactive multimedia to have the potential to produce effective educational outcomes, it requires a user-friendly interface, interactivity to engage the students actively in the learning process, a variety of navigational opportunities to cater for individual learning styles, and an appropriate assessment and feedback (Kennedy and McNaught, 1997).

The strengths of IMM in education include:

Mixed media (Simulation and visualisation): The multimedia principle finds that students learn better from words and pictures than from words alone (Donnelli et al., 2009). Dual encoding facilitates and enhance the rehearsal process in learning (Villamil-Casanova and Molina, 1996). The ability of interactive multimedia to mix media such as images, sound and text, allowing the possibility of selecting the most appropriate method of presenting particular content (Albion, 2000). Providing instruction through multiple sensory channels, and allowing the learner to use the sensory modes that they prefer, helps in motivating and encouraging exploration (Barron and Orwing, 1995). Associating sound, text, and image with the concept being presented help the retrieval process in learning (Villamil-Casanova and Molina, 1996).

User controlled and Individualised Learning: the factor of learning control plays a key role in the effectiveness of multimedia (Hede and Hede, 2002). Most interactive multimedia have the ability and the potential to allow users to take their own path through the material, make a significant decision to produce a more customised personal lesson, learn at their own convenience, build up their own knowledge, and allow self-paced and self-directed instruction (Abrams, 1996; Fahy, 2005; Hannafin and Peck, 1988; Hoffer and Barnett, 1990; Phillips, 1997).

Active Learning: Involving and engaging of the learner in an imaginative productive way is best way to motivate them to learn. Interactive multimedia offers an engaging problem-solving approach, or simulation of real, or imaginary events (Abrams, 1996; Gjedde, 2005). This interactive learning force the learner to make choices, answer questions, and actively solve problems rather than passively collect facts (Fahy, 2005; Hoffer and Barnett, 1990).

Different learning styles: The versatility and the multi-sensory approach of interactive multimedia allows it to support different learning ways and styles (Abrams, 1996; Albion, 2000; Williams and Harkin, 1999).

Visual Representation of Knowledge: Human beigns are primarly visual learners, so interactive multimedia offers a wider toolbox to educators, and developing Multimedia stimulates designers to think visually (Abrams, 1996).

The sum of these qualities enhances the retention of knowledge, increase the understanding, and reduce learning time (Cartwright and Cartwright, 1999; Villamil-Casanova and Molina,

1996). Figure (2.4) illustrated inter-related conceptual elements which has clear implications for the design of multimedia in education.
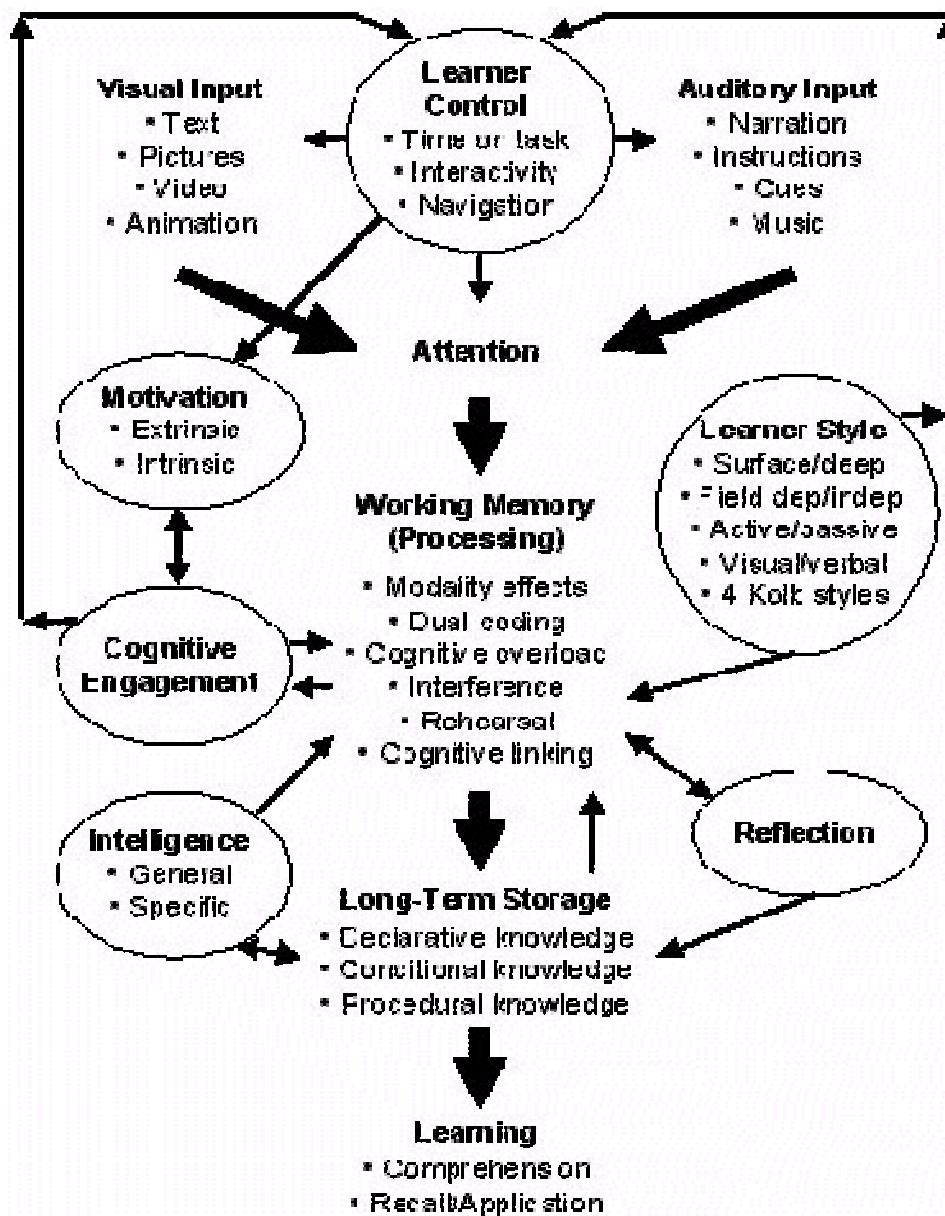
Figure (2.5) Integrated model of multimedia effects on learning
Source (Hede and Hede, 2002)

CHAPTER THREE: RESEARCH METHODOLOGY

This Chapter explains the reasons for using a qualitative methodology in this study, and then demonstrates a general outline of the research procedures used, and describes in detail the research design and its different stages of development.

3.1 Qualitative Methodology

This study employs a qualitative research strategy. The choice of this approach is guided by the focus and purpose of the research.

Beddoe (2010) explained that the key value of qualitative research is that it allows issues that have been under-researched to be explored in detail, and enables the researcher to explore the participants' opinions and the underlying rationales for attitudes and behaviours.

The qualitative approach chosen for this study has given participants the freedom to reflect on and describe their experiences of continuing health education for Aboriginal and Torres Strait Islander health workers.

Qualitative research is designed to be illustrative rather than providing statistical representative data.

Why qualitative research approach has been chosen as a method of research methodology for this study.

Three main reasons for choosing a qualitative methodology for this study include the type of question or problem that is being explored, the stakeholders for which the multimedia program developed, and the goal of the researcher.

1) **The type of question or problem that has been explored**

The reason for choosing a qualitative methodology revolves primarily around the type of question or problem that has been explored. Exploratory questions that begin with *how* or *what* lend themselves well to qualitative study (Anderson, 2008). Moreover, qualitative research is well suited for the purposes of description, interpretation, and explanation (Imel et al., 2002).

Strauss and Corbin (1998) claim that qualitative methods can be used to better understand any phenomenon about which little is yet known; to gain new perspectives on things about which much is already known, or to gain more in-depth information that may be difficult to convey quantitatively.

Thus, qualitative methods are appropriate in situations where research problems tend to be framed as open-ended questions that will support the discovery of new information (Hoepfl, 1997).

Three main qualitative questions explored in this study, they are:

a) What resources and training opportunities are currently available to ensure that Aboriginal health workers are able to continually update their professional learning (especially in rural and urban areas)?

b) What are the challenges facing Aboriginal health workers in dealing with communicable diseases (focused on Tuberculosis)?

c) What level of access do Aboriginal health workers have to IT resources (especially in rural and urban areas)?

2) Stakeholders for whom the multimedia program has been developed.

Qualitative methodology will play a greater role in helping health educators to develop appropriate educational programs and researchers in directing their studies to better understand the needs of minorities and other vulnerable populations that are experiencing disparity in health care (Caldero´n et al., 2000).

3) Goal of the researcher

Qualitative research is best used when the goal of the researcher is to understand how participants make meaning of a situation or a phenomenon. It seeks to understand a given research problem or topic from the perspectives of the local population it involves.

It is especially effective in obtaining culturally-specific information about the values, opinions, behaviours, and social contexts of particular populations. A basic interpretative qualitative study model is used when the goal of the researcher is to understand how participants make meaning out of a situation or a phenomenon.

The researcher serves as the filter for the meaning, using inductive strategies with a descriptive outcome (Merriam, 2002). The researcher is serving as the filter for the meaning by using inductive strategies with a descriptive outcome (Imel et al., 2002).

In the health care context, a range of qualitative research methods have been employed to tackle important questions about social phenomena, ranging from complex human behaviours, and decision making by health care professionals, through to the organisation of hospital clinic or the health system as a whole (Pope and Mays, 2006).

The feasibility for the development of a culturally-appropriate, self-paced interactive multimedia model for providing information resources for Aboriginal and Torres Strait Islander health workers to support them in their dealing with communicable diseases, such as Tuberculosis, is the assumption and the focus of this research.

Using qualitative methodology was essential because:

1. It was as an attempt by the researcher to understand the research assumption through the meanings that the participants assigned to it, using in depth interviews;

2. In order to design an effective educational multimedia program, the researcher was required to explore an understanding of the viability for using the program from the points of view and various perspectives of Aboriginal and Torres Strait Islander health workers and their educators, trainers, managers, and program coordinators;

3. To design a culturally-appropriate program, there was a need to have a deep understanding of the cultural values, learning preferences, and cultural knowledge base of Aboriginal Australians.

3.2 The Research Design

Exploratory approaches are used to develop hypotheses and more generally to make probes for circumscription, description, and interpretation of less well-understood topics (Johnson, 1998).

The research design in the study involved three clear stages as follows, Figure (3.1):
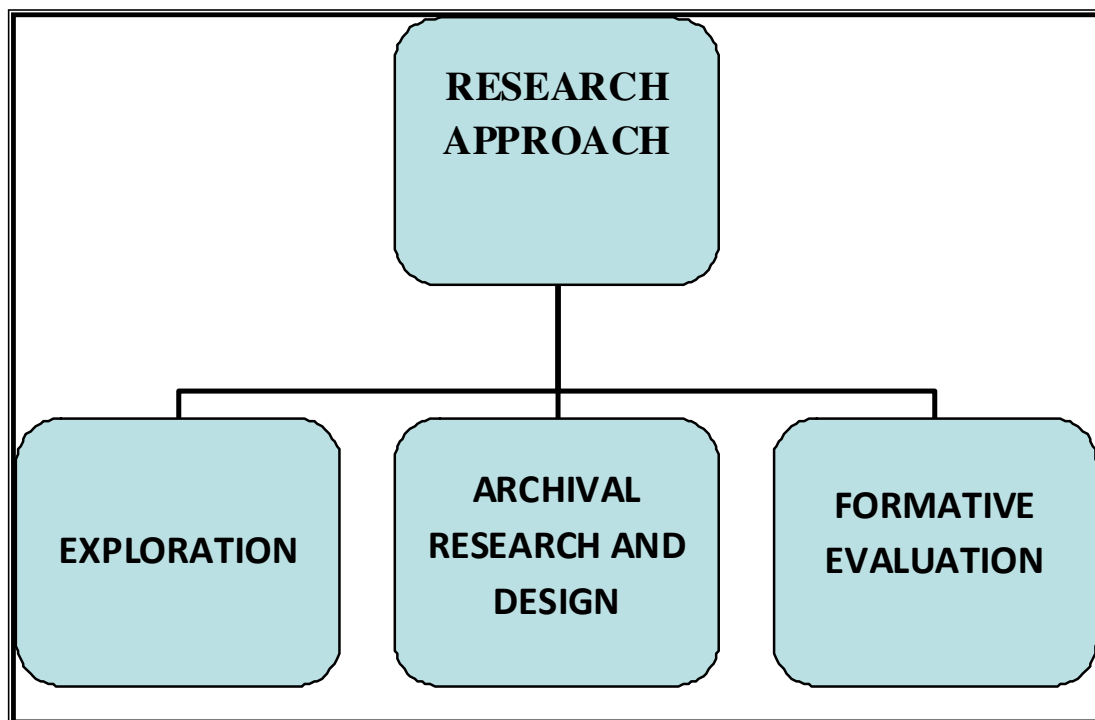
Figure (3.1) Research Approach

Stage one (Exploratory):

This phase was undertaken through an analysis of the current Aboriginal and Torres Strait Islander health workers' continuing education program, from the various perspectives and experiences of key stakeholders, using qualitative semi-structure open-ended interviews.

This phase included also an examination of the literature and a documentary research review of the published literature and reports by national and international agencies on the need for improving Aboriginal and Torres Strait Islander health workers professionalism using Information Technology.

The qualitative semi-structured interviews had two main goals:

Firstly, to assess Aboriginal and Torres Strait Islander health workers' continuing education regime and explore their need for resources of continuous information, in the form of computer-based training programs to assist with their management of communicable diseases.

Secondly, the goal for the interviews were to explore the key factors that would impact upon the interactive multimedia health informatics model development, IT literacy within Aboriginal and Torres Strait Islander health workers and the level of access they have to IT resources.

Stage two (Preliminary interactive multimedia model development):

This phase involved the design and development of a preliminary interactive multimedia cultural appropriate health informatics CD-ROM model titled "Interactive multimedia Health Program: Tuberculosis". This task included searching for the medical learning material related to Tuberculosis.

This phase also included a review of the literature about the different methodologies for the design and development of interactive multimedia informatics software, and about Australian Aboriginal culture and its effects on the educational program, and cultural issues and pedagogical aspects of the model development.

Stage three (Formative evaluation):

This phase was the final one, aimed primarily at the formative evaluation of the suitability, validity and effectiveness of the preliminary model regarding the general contents and media technique used. This stage was implemented through the use of a Likert Scale and a questionnaire that featured mostly open-ended questions.

3.4 Methods

The purpose of the following section is to describe the research participants, data collection and analysis strategies employed in this study.

3.4.1 Ethical considerations

The proposal for the research was submitted to the University of Southern Queensland, Office of Research and Higher Degrees, with ethical clearance obtained, and approval to commence was granted. An approval was also obtained from Tertiary and Further Education (TAFE).

A written agreement in form of a consent form obtained from each participant. The purpose of the study and the reason for their participation explained. Copies of this document are included in Appendices (13.3), (13.4), (13.5).

Anonymity and confidentiality were assured and were participants informed that they may willingly withdraw from the study, or retract any information they gave to the investigator, at any time. No personal or identifiable details used or kept in any records or reports.

3.4.2 The participants

The study conducted in South-West Queensland. The participants in the study were 25 people engaged in the field of Aboriginal health worker education for many years, including lecturers, program coordinators, training organisers, Aboriginal health worker managers, and Aboriginal health workers; and another five of the participants who shared in the formative evaluation of the program were involved in the field of Information Technology.

This broad range of people was involved so as to ensure a diverse range of perspective would be incorporated, thereby improving the potential viability and validity of data.

Ten people participated in the qualitative interview, and a further fifteen participated in the formative evaluation of the preliminary model development. The research was not restricted to a particular ratio between genders.

Invitations for participation were advertised through the Aboriginal & Torres Strait Islander Community Controlled Medical Service through personal approaches and by using a flyer, a copy of which is included in Appendix (13.7).

The following organisations were approached:
1) Local Aboriginal and Torres Strait Islander community-controlled health centers (Toowoomba Sexual Health Service – KOBI HOUSE, Darling Downs Public Health Unit and Carbal Medical Centre);
2) Local registered health training organisation (Cunningham Centre);
3) The Centre for Rural and Remote Area Health (CRRAH), USQ, Toowoomba campus;
4) University of Southern Queensland, Faculty of Sciences, Department of Nursing; and
5) Tertiary and Further Education (TAFE), Toowoomba.

3.4.3 Data collection and recording modes

This study was based on a review of the relevant literature as well as data obtained through telephone or face-to-face interviews with stakeholders, Aboriginal and non–Aboriginal Health care staff who deal with Aboriginal health worker education.

Data collected through three methods: Semi-structured open-ended interview, archival research, Likert Scale Questionnaire, Table (3.1) illustrated the research main and sub-provision question and the research methodology used to answer those questions.

The principal source of data was gathered from transcripts of taped interviews made by the researcher with the participants. In addition, answers to evaluation questionnaires were employed, and data from archival research was used to support and complement the main data.

The questionnaire reflects the feedback received from various experts working in the field of Aboriginal and Torres Strait Islander health workers education, Information Technology, and peer review.

3.4.4 Qualitative open-ended interviews

The main aim for the interview was to generate base line data. The purpose of these interviews was to learn from the experiences and opinions of participants in order to better understand Aboriginal and Torres Strait Islander health workers' continuing education needs and features that would make it more attractive to them.

As the interviews were used as a method for primary data collection for the study, the interviews were semi-structured with open-end questions and inquiries, which gave participants the opportunity to respond in their own words, rather than forcing them to choose from fixed responses.

Weller (1998) explained that open-ended interviews could be used in the early stages of investigating any socio-cultural phenomenon, but such probes quickly lead to more focused, fact-finding questions. In the beginning of the interview, the participants were asked about three main topics, namely:

1. Aboriginal and Torres Strait Islander health workers' professional backgrounds and their training program;

2. Information Technology resources; and

3. Their views about the design of a self-paced continuing education model.

These preliminary questions were followed by more detailed and focused questions guided mainly by the interviewees' responses, as detailed in Appendix 13.3 (Interview guide). The selected participants were asked to describe their own experiences, with the intention of incorporating the knowledge and opinions of participants in the planning and management of

the multimedia project. All interviews were stored as audio recordings and transcribed in full, with notes written at the time, and more comprehensive notes written afterwards.

The interviews were digitally recorded. Interview responses transcripts were then sent to the participants in order to confirm their validity. Analysis and collection data occurred concurrently. This shaped the process of ongoing data collection, allowing for the refining of questions and the pursuit of any emerging avenues of inquiry in further depth.

Data collected at this stage from the qualitative semi-structured interview used to:

1. Assess the current status of Aboriginal and Torres Strait islander health workers' continuing education, and their need for continuous information, in the form of computer-based training programs to support for their role in managing communicable diseases.

2. Explore the key factors to be considered that would make the training program more attractive and culturally-appropriate to Aboriginal and Torres Strait Islander health workers.

3. Identify Information Technology literacy and availability among Aboriginal and Torres Strait Islander health workers.

4. Determine Aboriginal and Torres Strait Islander health workers' baseline knowledge on communicable diseases in general, with emphasis on Tuberculosis, which was used as the basis for the program content.

5. Identify the specific needs of Aboriginal and Torres Strait Islander health workers, in order to better direct the development of the model.

6. Establish suitable learning materials that can be used in the research model.

Qualitative data analysis: Analysis is the process by which qualitative data is transformed into results (Hansen, 2006). It is carried out using thematic analysis by exploring the content of material from a variety of sources.

Analysis begins with proofreading the material and simply underlining key phrases to identify the terms used by participants themselves, which is called "in vivo coding". Through the identification of the themes and the refining of them to the point where they can be applied to the whole text, a lot of the interpretive analysis has been done (Bernard and Ryan, 1998).

Thematic content analysis, which is a descriptive presentation of qualitative textural data, was used in this study; through identifying common themes in the texts provided for analysis, detecting reoccurring statements that are related to the topic and grouping those statements into meaning units. Identifiable themes emerged from the collected data, and the literature review was helpful in explaining and understanding the themes that emerged.

In the study, the collection and analysis of data often occur concurrently. The themes were validated by an independent research against the original transcripts, and the interview data were imported into the NVivo computer package for coding and categorisation.

3.4.5 Archival research (Documentary Material)

A further source of information is the analysis of documentary and textual data. Such documents might include official records, letters, newspaper and reports, as well as the published data used in a review of literature (Hansen, 2006).

Archival research was used mainly to select the medical learning material related to Tuberculosis which was used in the development of the program content; to determine methodology for design and development of interactive multimedia model, and to provide the identification of an ideal approach on the need for improving Aboriginal and Torres Strait Islander health workers' professionalism, through a review of the published literature and reports by national and international agencies.

3.4.6 Formative evaluation

This is carried out using expert review (quality review), and peer review to eliminate correctable errors and to provide comment and feedback on issues such as the language and grammar, the display, the use of audio, the questions and menu, the subject matter and the direction and instructions in the documentation (Mann, 2006). Information was collected using Likert Scale and open-end questionnaire, and a descriptive statistical analysis was used as an approach to analyse data from the questionnaire.

Table (3.1) Research Methodology

Research Questions	Data Type	Research approach	Sample Selection Strategy	Data Collection Strategy	Data Analysis
1- Can interactive multimedia self-paced program be developed as a source of health education information to support Aboriginal and Torres Strait Islander health workers in their roles of prevention and control of Communicable Diseases?	Qualitative and Quantitative .	Semi-structured interview and Archival research and Design and Development of IMM CD-ROM health informatics model and Likert Scale and open ended questionnaire	Purposeful sampling	Interview and questionnaire	Thematic description analysis and Description and Descriptive statistics

Research Questions	Data Type	Research approach	Sample Selection Strategy	Data Collection Strategy	Data Analysis
2- What are the key factors that need to be considered in order to develop culturally-appropriate software?	Qualitative	Semi-structured interview and Archival research	Purposeful sampling	Interview	Thematic description analysis

Research sub provision Questions	Data Type	Research approach	Sample Selection Strategy	Data Collection Strategy	Data Analysis
1-What is the current state for Aboriginal and Torres Strait Islander health workers' continuing education.	Qualitative	Semi-structured interview and Archival research	Purposeful sampling	Interview	Thematic description analysis
2- What are the current Information Technology availability and literacy for Aboriginal and Torres Strait Islander health workers?	Qualitative	Semi-structured interview and Archival research	Purposeful sampling	Interview	Thematic description analysis

3.5 conclusion

This Chapter details a general framework about the research approach used in the study. A detailed description for the research methodology is described later in the thesis as follows:

1) Aboriginal and Torres Strait Islander health workers' continuing education gaps and the causes for this gap are described in detail in Chapter Six.

2) The key factors that need to be considered in the development of a culturally-appropriate interactive multimedia CD-ROM model are described in detail in Chapters Seven and Eight.

3) The general framework for the design and development of interactive multimedia software are illustrated in Chapter Nine as a case study.

4) A formative evaluation for the planned model is explained in detail in Chapter Ten.

CHAPTER FOUR: INTERACTIVE MULTIMEDIA PROGRAM METHODOLOGIES - EDUCATIONAL APPROACH

4.1 Overview

"Designing software that helps people to learn is a difficult and rewarding experience, no matter which philosophical approach you ascribe to. All philosophies share the common goal of having the people learn something useful and meaningful" (Alessi and Trollip, 2001).

The development of educational interactive multimedia software could support structured multi-disciplinary development methodologies: the educational and the systematic approaches, each of which comprises several subcategories (Dagdilelis, 2005; Mooney and Bligh, 1997a).

Alessi & Trollip (2001) described the multi-disciplinary development methodologies like those that interactive multimedia development builds on two foundations. The first foundation is the understanding of the different theories of learning that underlies all instruction and learning environments. The design of interactive learning systems should be based upon sound learning theories and well-researched ideas about the nature of learning in science. Designers must expand their perspectives to consider teaching and learning methods, establish principles, and identify the implications of the principles for interactive multimedia (Alessi and Trollip, 2001; O'Brien, 2002; Park and Hannafin, 1993; Reeves and Hedberg, 2003).

The second foundation that interactive multimedia should build in order for it to be effective are grounded in a strong understanding of human factors. Human factors are the study of the interaction of people with technology, such as screen design, multi-sensory presentation, types of interactions, learner control, and the facilitation of motivation (Alessi and Trollip, 2001). The construction of educational software should be based on a didactic efficiency and advanced technology (Dagdilelis, 2005).

The educational principles have been used as a design guideline, and Information Technology has been utilised to support and stimulate learning, and provided a variety of mechanisms to help produce the model's materials (Mooney and Bligh, 1997a). Software development should ideally involve a multidisciplinary collaboration including the involvement of those with expertise in the educational and technical areas (Vivekananda-Schmidt et al., 2004).

The framework for model development represented in Figure (4.1) displays the two foundations of interactive multimedia development methodologies which have been used for the production of culturally-appropriate interactive multimedia health informatics program for Aboriginal and Torres Strait Islander health workers in this study. This Chapter details the Educational approach, while the systematic approach is described in the next Chapter.
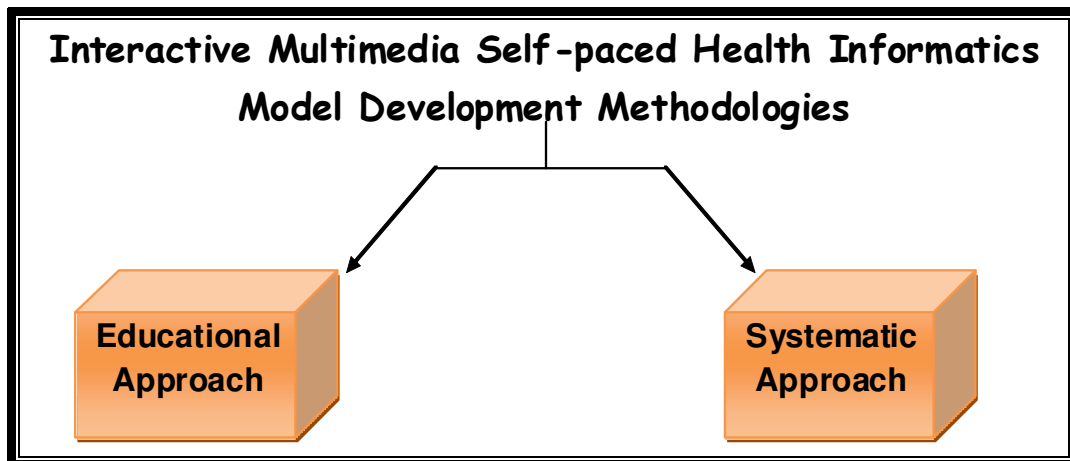
Figure (4.1) Developing Methodologies of Interactive Multimedia Informatics Health Software
Illustration by F. El Sayed

4.2 Educational Approach

One of the main foundations of interactive multimedia program is the influence of learning theories, principles and approaches on model design, see Figure (4.2). The underlying basis of designing instructional multimedia is the theory of learning (Alessi and Trollip, 2001). If multimedia is used to demonstrate the technical capabilities of a computer, and not set in an educational context, then the true value of multimedia is lost (Mooney and Bligh, 1997b).
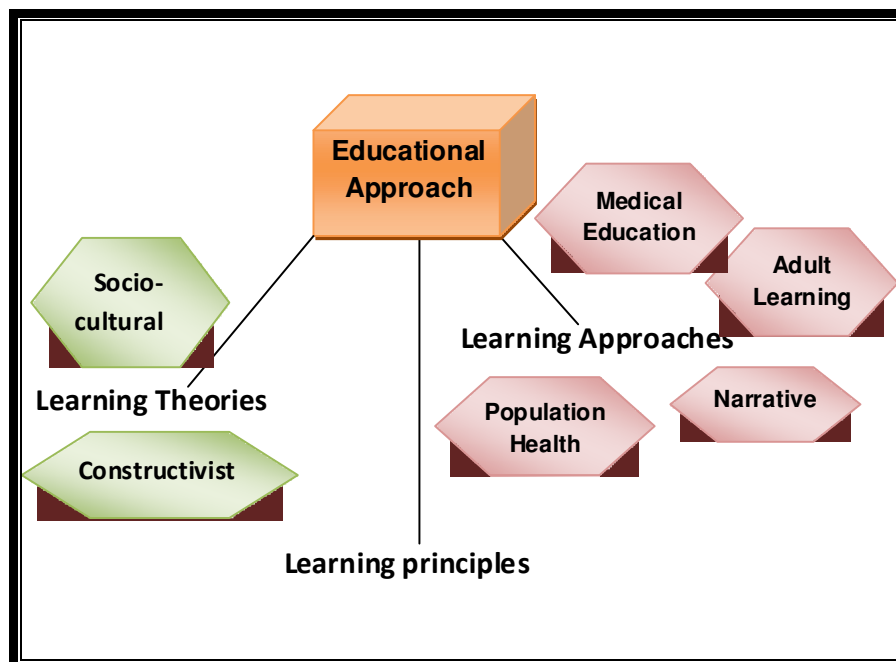
Figure (4.2) Educational Methodology
Illustration by F. El Sayed

Developing effective materials and designed instruction, in any medium that facilitates learning requires an understanding and appreciation of the principles underlying how human beings learn, and must be based on knowledge of those principles (Alessi and Trollip, 2001; Gagne et al., 1992).

Learning is the process that makes permanent changes happen in the behaviour of human beings and in their capabilities for particular behaviours, this change takes place following human experience within a certain identifiable situation. This situation called a "Learning Situation" and it is consist of two parts - one external and the other internal to the learner," (Gagne et al., 1992).

Understanding these learning principles that underlie how people learn is essential to understanding the ongoing debate in the field of education about the best instructional approach for each learning situation. It is also essential to the debate among instructional designers about how multimedia can be used to design effective educational materials (Alessi and Trollip, 2001).

Theories of learning, and principles derived from these theories, have been employed to produce measurably better instruction and to understand the function of multimedia in enhancing the learning experience for users and increase the amount of knowledge they retain (Hannafin and Peck, 1988; Villamil-Casanova and Molina, 1996). By developing instructional design in accordance with the internal process of learning, a greater degree of confidence in the performance of the lesson may be attained (Hannafin and Peck, 1988).

4.2.1 Learning Theories and Their Relationship to Multimedia Education Program

This part of the thesis looks at several current learning theories that are integral to the process of building effective educational tools. Understanding these learning paradigms is essential to understanding the ongoing debate about how multimedia should be used to design effective educational materials (Alessi and Trollip, 2001).

4.2.1.1 Behavioural Learning Theory

Reeves & Hedberg (2003) claimed since the earliest days of teaching machines, behavioural learning theory has had a pervasive influence on the learning systems. This learning theory is based on the premise that learning results from the pairing responses with stimuli, and that knowledge could be transferred intact from educator to learner.

As the learning experience was primarily a passive experience with little effort required by the learner, behavioural learning theory maintains that the psychology of learning should be restricted to external observable behaviours, and environmental events when attempting to explain why behaviours occur (Alessi and Trollip, 2001; Hannafin and Peck, 1988; O'Brien, 2002).

From the behaviourist perspective, instruction consists primarily of shaping desirable behaviours through a stimulus provided often in the form of a short presentation of content, followed by a response. Then feedback is given regarding the accuracy of the responses, followed by a positive reinforcement that is given for accurate responses. Inaccurate responses result in either repetition of the original stimulus or a modified simplest version of it, and the cycle begins again (Reeves and Hedberg, 2003).

<u>Active</u> Stimulus ⟶ response ⟶ feedback ⟶ reinforcement = Instructive Learning

For multimedia design, a strict behavioural approach which pays attention only to observable learner behaviours and ways to influence them is not an appropriate approach. As the outcomes of education and training from multimedia program should include more than just learner achievements, they should include also learner satisfaction, self-worth, creativity, and social values (Alessi and Trollip, 2001).

Molenda (2002) had identified four guidelines could be considered as a programmed instruction's prescriptions under the behaviourist model; they are:
1) Provide relevant practice for the learner;
2) Provide knowledge of results;
3) Avoid the inclusion of irrelevancies; and
4) Make the material interesting.

4.2.1.2 Cognitive Theory

Beginning in the 1970s and especially in the 1980s, most instructional designers began to take cognitive principles into consideration. Computer-based instruction, interactive multimedia, screen design, and presentation strategies increasingly reflected theories of attention and perception; and today designers are increasingly incorporating motivation principles (Alessi and Trollip, 2001).

Cognitive theory of learning focus on the way knowledge is constructed by the thinking subject (Lowe, 2010). Reeves and Hedberg (2003) claimed that the cognitive psychologists place more emphasis on internal mental states than on behaviour. Cognitive theory takes its name from the word cognition, which means the process of knowing. It emphasis on unobservable constructs such as mind, memory, attitudes, motivation, thinking, reflection and other presumed internal processes (Alessi and Trollip, 2001). It attempts to determine how learning takes place, based on processes believed to occur within the learner (Hannafin and Peck, 1988).

According to cognitive theory, the learning process consists of four steps: attention, rehearsal, encoding and retrieval (Villamil-Casanova and Molina, 1996) refer to Figure (4.3).
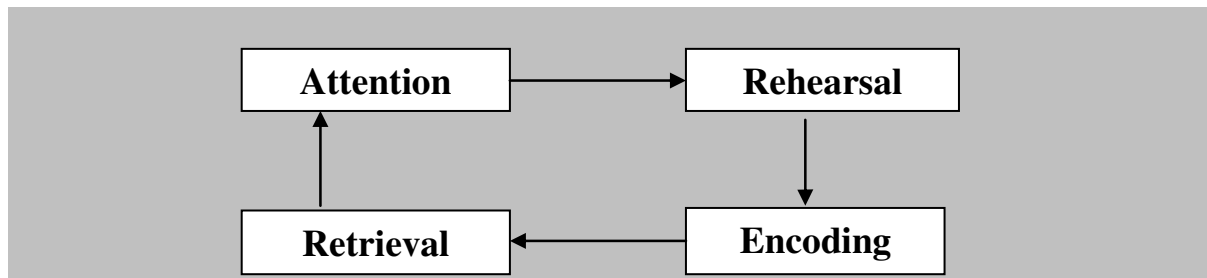
Figure (4.3) Cognitive Theory, Learning Process
Source (Villamil-Casanova and Molina, 1996).

Hannafin & Peck (1988) clarified the events that occur in an act of learning as it starts with stimulation that affects the learner's sensory receptors and produces a pattern of neutral activity which recorded in short-term memory. Encoding take place as information moves from short-term memory to long-term memory, where it is stored according to its meaning. When existing information is retrieved, it is either returned to short term memory where it may be combined with incoming information to form new learned capabilities, or is passed to a mechanism that transforms information into action.

Gagne et al. (1992) listed nine events of instruction for instructional software relating to the learning process, they are:
1) Stimulation in order to gain attention;
2) Informing learners of the learning objective;
3) Reminding learners of previous learned content;
4) Presenting the content;
5) Providing learning guidance;
6) Eliciting performance;
7) Providing feedback;
8) Assessing performance; and
9) Enhancing retention and transfer.

Reeves & Hedberg (2003) claimed the cognitive learning theory confront many obstacles, not the least of which is the dominant "instructive" pedagogical paradigm that is used to justify the production of interactive learning systems that transmit a standardised curriculum to every learner.

While the instruction strategies and user controls are increasingly based on individual needs and differences, additionally the modern interactive multimedia program provides a better mixture of learner and program control (Alessi and Trollip, 2001).

4.2.1.3 Constructivist Theory

Constructivist learning theory became prominent in the late 1980s, and maintains that knowledge is not received from outside, but that people learn by actively constructing knowledge based on their own interpretations of experiences in the world. They weigh new information against their previous understanding, thinking about working through discrepancies, coming to a new understanding, and take final responsibility for their learning, therefore they need to have some understanding and control over their learning process (Alessi and Trollip, 2001; Hedberg et al., 1994; Ivers and Barron, 1998; Molenda, 2002; Reeves and Hedberg, 2003).

The Constructivist view is that the best program is related to the depth of internal processing required by the learner and the quality of thinking demanded of the learner (O'Brien, 2002). They argue that learning outcomes depend on the learning environment, the prior knowledge of the learner, the learner's view of the purpose of the task and the motivation of the learner (Hedberg et al., 1994). A major goal of the constructivist approach is to ensure that the educational learning environment is as rich and interactive as possible, promote active learning, cooperation between learners, investigation, as well as formulation of hypotheses (Dagdilelis, 2005; Phillips, 1997).

Active learners + surrounding environment (Technology mediated aspects and other support provide by other learners) = Constructivist learning

Interactive multimedia offers a discovery learning approach which supports the Constructivist view of the learning environment, it is a powerful channel for self-expression and communication, as well as an appropriate vehicle for interactive learning, in which learners can create their own worlds, and actively interact with new material in way which requires reflection (Abrams, 1996; Kennedy, 2002; Reeves and Hedberg, 2003).

Employment of constructivist principles in program design provides a new level of difficulty and challenge for the designers, as they are required to consider the perceptions and previous experiences of the learners including culturally-shared perceptions, and ensure that the learning environment is as rich and interactive as possible (O'Brien, 2002; Phillips, 1997).

O'Brien (2002) makes the point that the use of multimedia to assist the process of learning from a Constructivist viewpoint is an emerging field with some researchers attempting to develop practical guidelines, such as:

1. Learning sequence should not be controlled, and multiple perspectives should be provided (Gagne and Medsker, 1996).

2. Learning outcomes are not always predictable and that instruction should foster the processing of learner. So they emphasise the design of learning environments rather than instructional sequences (O'Brien, 2002).

3. Interactive multimedia methodologies such as tutorial and drill instruction are poor for developing lifelong learners. By contrast, interactive multimedia methodologies such as hypermedia, simulation, virtual reality and open-ended learning environments are of more benefit to learners, allowing them to explore information freely, apply their own learning styles, and use software as a resource rather than as a teacher (Alessi and Trollip, 2001).

Programmed instruction's principles could be considered as recommendations under the constructivism view include:
(1) Embed learning in complex, realistic, and relevant environments;
(2) Provide for social negotiation as an integral part of learning;
(3) Support multiple perspectives and the use of multiple modes of representation;
(4) Encourage ownership in learning; and
(5) Nurture self-awareness of the knowledge construction process (Molenda, 2002).

4.2.1.4 Socio-Cultural Theory

Jordan et al. (2008) identified the word cultural as "…*a fuzzy set of attitudes, beliefs, behavioural norms, and basic assumptions and values that are shared by a group of people, and that influence each member's behaviour and his/her interpretation of the meaning of other people behaviour*"(p.82). Learning in human could illustrated as a social venture by which children grow into the intellectual life of those around them (O'Brien, 2002).

Socio-cultural theory take into account the effect of culture and environment on the learner, it points out that learning is a form of enculturation in which the individual is socialised through gradual participation in tasks, assisted by adults until full competence is attained (Lowe, 2010; McLoughlin and Oliver, 2000).

Campbell (2001) clarified the social learning theory as using "…*a three-way reciprocal theory in which personal factors (one's cognitive processes), behaviour, and environmental influences continually interact in a process of reciprocal determinism or reciprocal causality.*

These are very dynamic relationships where the person can shape the environment as well as environment shaping the person. Change is bi-directional."

The choice of a learning theory is so important that most times it determines, directly or indirectly, the characteristics of the educational environment or event its type (Dagdilelis, 2005). It is extremely difficult to find one conceptual framework that can support the educational design, and in most cases applications are not designed on the basis of a single theoretical viewpoint but use several to try to resolve a specific instructional problem (Illera, 2005). Further, educational software must be created according to the most up-to-date learning theories and, more specifically, constructivism (Dagdilelis, 2005).

The Socio-Cultural and Constructivist learning theories have been recommended for use as the base for design of a culturally-inclusive program for Aboriginal Australian learners (McLoughlin and Oliver, 2000), in which learning is viewed as being socially constructed ideally through active participation and real life tasks (Milton and Vozzo, 2010).

4.2.2 Learning Principles

After determining the learning theories that could be used in the developing of interactive multimedia informatics health program for Aboriginal and Torres Strait Islander health workers, the second step is to identify pedagogical principles, in the kind of work already established as best practice in the literature, and use these principles to produce a statement of outcome which would assist in the development of the interactive multimedia model (Williams et al., 1996). The designer of interactive multimedia should develop an understanding of all the learning principles and theories and create materials based on them (Alessi and Trollip, 2001).

Combining behavioural, cognitive, and constructivist learning theories, these include principles of reinforcement, attention, perception, encoding, memory, comprehension, active learning, motivation, locus of control, mental models, transfer of learning, individual differences, knowledge construction, situated learning, and collaborative learning (Alessi and Trollip, 2001).

Based on existing research in psychology, pedagogy and technology, Park and Hannafin (1993) described a total of 20 empirically rooted learning principles and their implications for the design of interactive multimedia (refer to Table 4.1). These principles are representing the range of empirically referenced design guidelines that can be employed to guide the program developer to produce software based on established research findings (O'Brien, 2002).

Table (4.1) Learning Principles for Interactive Multimedia

PRINCIPLE	IMPLICATION
1. Related prior knowledge is the single most powerful influence in mediating subsequent learning.	Layer information to accommodate multiple levels of complexity and accommodate differences in related prior knowledge.
2. New knowledge becomes increasingly meaningful when integrated with existing knowledge.	Embed structural aids to facilitate selection, organization, and integration; embed activities that prompt learners to generate their own unique meaning.
3. Learning is influenced by the supplied organisation of concepts to be learned.	Organise lesson segments into internally consistent idea units.
4. Knowledge to be learned needs to be organised in ways that reflect differences in learner familiarity with lesson content, the nature of the learning task, and assumptions about the structure of knowledge.	Linkages between and among nodes need to reflect the diverse ways in which the system will be used.
5. Knowledge utility improves as processing and understanding deepen.	Provide opportunities to reflect critically on learning and to elaborate knowledge; encourage learners to articulate strategies prior to, during, and subsequent to interacting with the environment.
6. Knowledge is best integrated when unfamiliar concepts can be related to familiar concepts.	Use familiar metaphors both in conveying lesson content and designing the system interface.
7. Learning improves as the number of complementary stimuli used to represent learning content increases.	Present information using multiple, complementary symbols, formats, and perspectives.

8. Learning improves as the amount of invested mental effort increases.	Embed activities that increase the perceived demand characteristics of both the media and learning activities.
9. Learning improves as competition for similar cognitive resources decreases and declines as competition for the same resources increases.	Structure presentations and interactions to complement cognitive processes and reduce the complexity of the processing task.
10. Transfer improves when knowledge is situated in authentic contexts.	Anchor knowledge in realistic contexts and settings.
11. Knowledge flexibility increases as the number of perspectives on a given topic increases and the conditional nature of knowledge is understood.	Provide methods that help learners acquire knowledge from multiple perspectives and cross- reference knowledge in multiple ways.
12. Knowledge of details improves as instructional activities are more explicit, while understanding improves as the activities are more integrative.	Differentiate orienting activities for forthcoming information based upon desired learning; provide organising activities for information already reviewed.
13. Feedback increases the likelihood of learning response-relevant lesson content, and decreases the likelihood of learning response- irrelevant lesson content.	Provide opportunities to respond and receive response-differentiated feedback where critical information is involved, but avoid excessive response focusing when incidental learning is expected.
14. Shifts in attention improve the learning of related concepts.	Differentiate key terms, concepts, and principles through cosmetic amplification, repetition, and recasting.

15. Learners become confused and disoriented when procedures are complex, insufficient, or inconsistent.	Provide clearly defined procedures for navigating within the system and accessing on-line support.
16. Visual representations of lesson content and structure improve the learner's awareness of both the conceptual relationships and procedural requirements of a learning system.	Provide concept maps to indicate the inter relationships among concepts, and hyper maps to indicate the location of the learner relative to other lesson segments.
17. Individuals vary widely in their need for guidance.	Provide tactical, instructional, and procedural assistance.
18. Learning systems are most efficient when they adapt to relevant individual differences.	Interactive multimedia must adapt dynamically to both learner and content characteristics.
19. Meta cognitive demands are greater for loosely structured learning environments than for highly structured ones	Provide prompts and self-check activities to aid the learner in monitoring comprehension and adapting individual learning strategies.
20. Learning is facilitated when system features are functionally self-evident, logically organized, easily accessible, and readily deployed.	Employ screen design and procedural conventions that require minimal cognitive resources, are familiar or can be readily understood, and are consonant with learning requirements.

Sources (Park and Hannafin, 1993)

4.2.3 Learning Approaches

An issue that may be more important than the details of program content is the soundness of the learning approach (Cole and Engel, 1976). Choosing the appropriate learning approaches to be used in the program development depends upon the type of learner being targeted and their needs. The recognition of difference in learning preferences of Aboriginal and Torres Strait

Islander learners, and the recognition of the need for change, is important when developing appropriate educational programs (Donovan, 2007).

Educators and designer of instructional multimedia must adapt to the needs of different learners, subject areas and situations. They should use a variety of multimedia materials and approaches to provide flexible learning environments meeting the needs of their learners (Alessi and Trollip, 2001). In the search for learning approach which might be suitable for Aboriginal and Torres Strait Islander health workers' continuous professional education there are four approaches that adapted and outlined in Figure (4.4), and they are:

1- Adult learning;

2- Population health;

3- Medical education; and

4- Narrative.
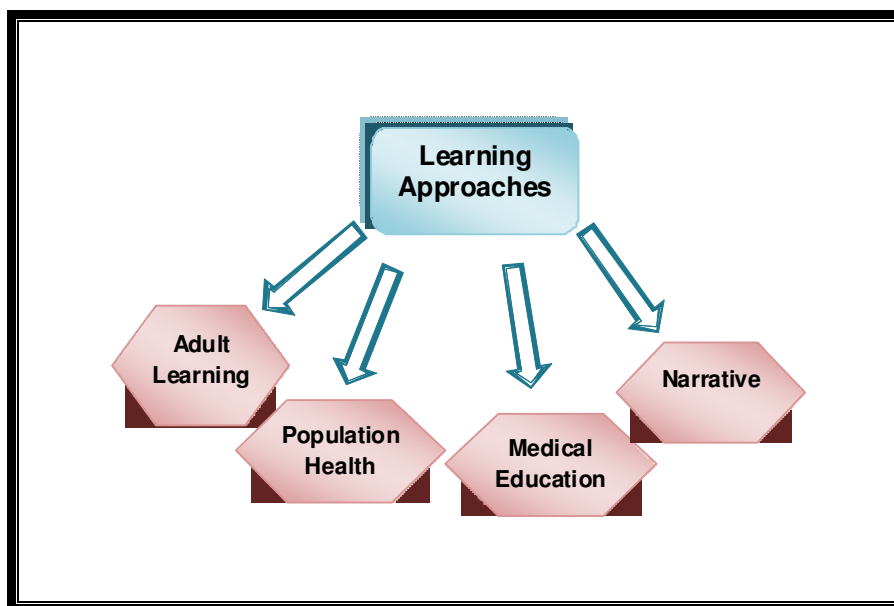
Figure (4.4) Framework for learning approaches in model development. Illustration by F. El Sayed

4.2.3.1 Adult learning approach

In the development of culturally-appropriate education program, in addition to identified cultural needs, it was recognised that the principles of adult learning were particularly pertinent to the development of the program (Williams et al., 1996). Theories of adult learning emphasised the importance of a learner identifying an educational need and planning to meet that need (Zeiger, 2005). Three underlying assumptions have been stated in the report of Brundage & MacKeracher (1980) about the adults learning principles and their application to program planning:

1. The more an adult learner can be involved in the planning related to his/her own learning activities, the more productive those activities will be;

2. Program planning by experts or by teachers with no learner involvement tends to lead to subject-centered programs and theoretical problems; and

3. Program planning carried out largely by learners with teacher assistance tends to lead to problem-centred programs.

The national review of Aboriginal and Torres Strait Islander health worker training 2000 for improving access to education and training recommended the participation of Aboriginal and Torres Strait Islander health workers in planning the development of their training packages (CIRC, 2000).

In the National Health Interactive Technology Net development program, Ernest Hunter emphasised the importance of engaging end-users in the development and production of program materials, rather than being just passive recipients (Hunter et al., 2007).

Other adult learning principles directing our choice of the program's goals, objectives and educational strategies can be summarised as follows:

1. Adult learners are typically autonomous and self-directed, and are motivated by education that has intrinsic value to personal goals and a sense of self;

2. Adult learners bring with them a great range of prior experience; and

3. The necessity to learn something must be clear to the adult learner before they will commit to learning it (Sisson et al., 2010).

Employing an adult learning approach in the program planning will help to accommodate Aboriginal and Torres Strait Islander health workers' needs and goals, and facilitate learning activities rather than imposing standards for performance and content (Grant, 1992). The model will be an open and flexible learning program, available in short self-instructional modules which can be studied by individuals at their own pace, place and time; and structured to give learners control over their learning (Harrison, 1990).

4.2.3.2 Population health approach

The term "population health" focuses on populations as entities, not only on individuals. Using a systematic population-focused approach can have a greater effect on individual health outcomes than individual care (Wagner et al., 2001). This approach can be realised through emphasising health promotion and disease prevention strategies at a population level and

stressing the underlying social, economic, biological, genetic, environmental and cultural determinants of health of the whole population during program planning (Smith, 2005).

The population health approach fits the Aboriginal and Torres Strait Islander Australian view of their own health; they see health is not just the physical well being of an individual, and not merely the absence of disease or infirmity, but is more holistically as including the physical, mental, social, emotional, spiritual and cultural well-being of the whole community.

They believe that social and spiritual dysfunctions can be associated with the cause of illness. It is a whole way-of-life view and it also includes the cyclical concept of life-death-life (Barlett, 1995; Devanesen, 2000; Hausfeld, 1977; NAHS, 1989; NAHS, 1994). Phillips (2004) claimed Aboriginal views on health and well-being are both valid and critical to the delivery of culturally-appropriate, and safe, medicine and health care.

A population health approach will be adopted in the structure of the program planning to ensure the population health perspective as well as the individual clinical perspective in included. The program content will focus on how to treat patients within appropriate guidelines and protocols, as well as describing how to improve living conditions, nutritional status, environmental conditions, socioeconomic factors and any other risk factors that contribute towards a particular disease.

4.2.5.3 Medical education approach

The education content of a well-planned curriculum has more impact on learner satisfaction than the technology used to disseminate it (Sisson et al., 2010). A common approach in developing education programs is to collect existing material and to assemble what appears most useful and interesting (Vanderschmidt et al., 1997).

Designing a course for health professionals should have aims or goals, which meet the needs of the learners, patients and society. Kern's (1998) design of a six-step approach for this purpose includes:

1. Problem identification and general needs assessment;
2. Specific needs assessment;
3. Defining goals and objectives;
4. Determining the educational strategies and the designing activities;
5. Implementing designed activities; and
6. Evaluation and feedback.

This approach presents a step-by-step method, technique or way of developing educational courses.

4.2.3.4 Narrative approach

Historically, cultural beliefs and philosophies shared orally have provided the cornerstone for perpetuating the collective identities of Aboriginal communities. Multimedia technology can be used to centre curricular pedagogy and material on the oral tradition (Inglebret et al., 2007).

Potential learning advantages could be gained by constructing multimedia learning environments which offer the learners a narrative experience through a narrative framework, narrative visual elements, as well as multimedia tools for narrative construction (Gjedde, 2005).

Narrative structure is one of the most important fundamental ways in which the instructional message comes to be understood. The extent to which it is clearly absent from certain forms of multimedia can seriously undermine comprehension of the material (Laurillard, 1996).

CHAPTER FIVE: MODEL DESIGN AND DEVELOPMENT - SYSTEMATIC APPROACH

5.1 Overview

The Interactive multimedia model is based on a more iterative approach than a more traditional instructional systems design. In this model, the information is derived from a need assessment that is converted into a description of the project space and a concept map of the ideas that are to be included in the project (Hedberg et al., 1994). In order to design a culturally-appropriate instruction program for Aboriginal Australian learners, the instructional design needed to be sufficiently flexible, and to ensure that learning activities and tasks were designed to take learner needs and perspectives into account. The cultural inclusivity in the design process needed to affirm the social and cultural dimensions of constructed meaning (McLoughlin and Oliver, 2000).

The way to address the numerous issues involved in the design and development of multimedia projects is to follow a systematic plan like that outlined in Figure (5.1), as it encompasses an analysis of learning and performance problems, design, development, implementation and evaluation of the project (Ivers and Barron, 1998; Kinuthia, 2007).
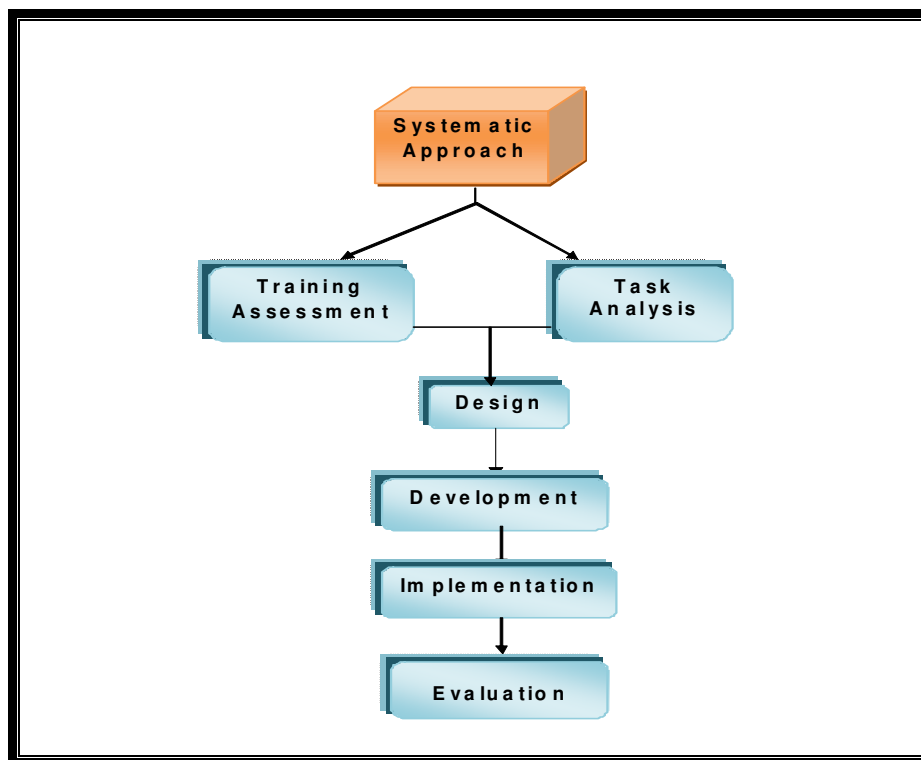
Figure (5.1) Systematic Approach - illustration by F. El Sayed

The systematic approach followed to produce these multimedia applications is the same regardless of the instructional delivery system (Orr et al., 1993). This approach provides an easy to follow, step by step guide to creating a successful multimedia program (Cartwright and Cartwright, 1999; Harrison, 1999).

The complexity of interactive multimedia software depends upon the context in which the software is used. Small interactive multimedia programs that are designed and constructed to enhance learning of particular concepts, have the advantage of being relatively simple to design and construct, using low level software packages which require minimal levels of programming and development time (Kennedy and McNaught, 1997)

5.2 Framework for the Development of Interactive Multimedia Model

Interactive multimedia development focuses on hardware and software tools, the delivery platform and the educational design. The educational design is considered to be the most important factor of the project software development process (Kennedy and McNaught, 1997). To create effective learning materials, there is a need to structure information so that it can be learned effectively, and to design activities that maximise interest, learning and retention (Alessi and Trollip, 2001). The systematic approach to develop interactive multimedia programs is illustrated by Figure (5.2).
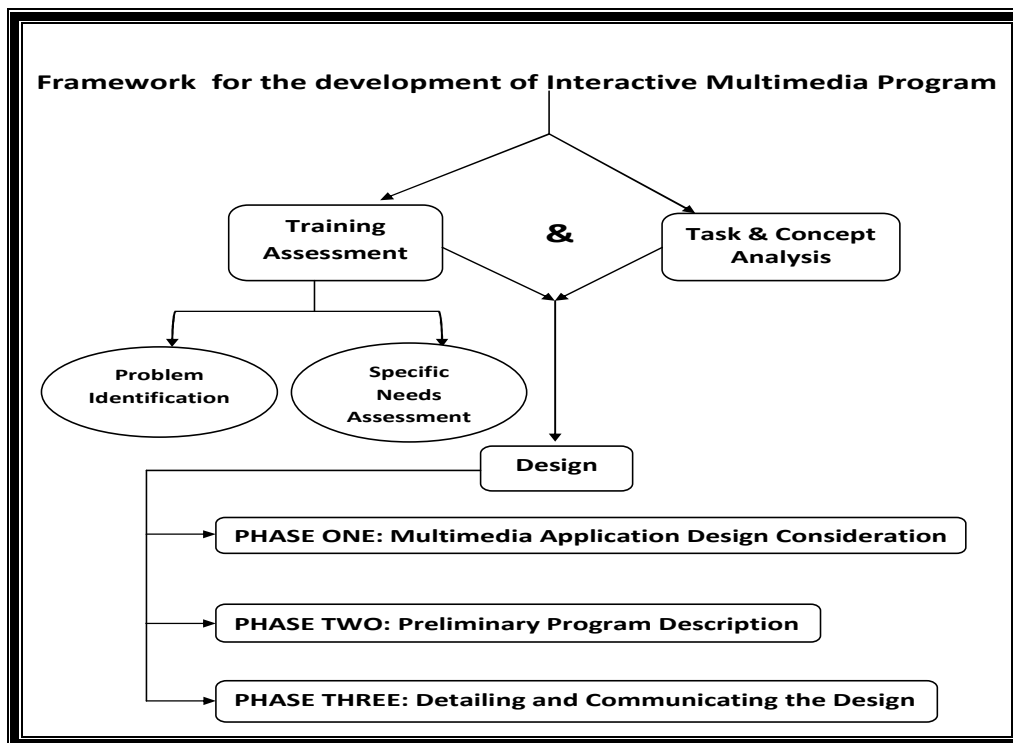
Figure (5.2) Framework for the Development of Interactive Multimedia Program
Illustration by F. El Sayed

5.3 Training assessment

The first step in program planning is to identify, clarify and clearly define the problem through both a general and specific needs assessment. A thorough needs assessment identifies the problem and is the key to a successful multimedia project (Alber, 1996). If this step is not carried out and the needs are determined through an assumption the resulting programs will not be as effective.

5.3.1 Problem identification and general need assessment

Before starting a multimedia project, there is a need to consider whether it is the most effective way to achieve the desired learning outcomes; and whether or not an alternative approach might be more effective or efficient (Ivers and Barron, 1998). Problem identification should identify a deficiency in performance and indicate a performance standard against which the deficiency may be measured, and the difference between the ideal approach and the current approach represents a general needs assessment (Cartwright and Cartwright, 1999; Kern, 1998).

Identification and critical analysis of the needs of Aboriginal and Torres Strait Islander health workers for a self-paced educational program to develop self-directed, lifelong learners, requires an analysis of the current state of Aboriginal and Torres Strait Islander health workers' continuing education in general.

This analysis is supported by the identification of an ideal approach through a review of the published literature and reports by national and international agencies on the need for improvement in Aboriginal and Torres Strait Islander health workers' continuing professional education.

5.3.2 Specific needs assessment

It is crucial that a program's users have the necessary prerequisite skills for using the computer and multimedia tools (Ivers and Barron, 1998), for a software designer to know the degree of technology sophistication of the program's users (Cartwright and Cartwright, 1999).

The benefits of such a program depend on the prediction that Aboriginal and Torres Strait Islander health workers have access to suitable Information Technology. This prediction has been assessed as a specific need assessment by focusing on Information Technology (IT) literacy and the availability of IT resources and tools for Aboriginal and Torres Strait Islander health workers, and ensures that they are familiar with basic computer skills.

5.4 Task and Concept Analysis

A thorough task and concept analysis at the start of a project is crucial to clarify a clear set of educational objectives, the skills to be taught, and any prerequisite skills which needed before starting the program (Boyle, 1997; Cartwright and Cartwright, 1999; Gagne et al., 1992;

Harrison, 1990; Riptoningrum, 2003). Task analysis is used primarily for analysing what a learner must learn to do (procedural skills), while concept analysis is used primarily for analysing the content itself, the information, principles and rules the learner must understand, i.e. declarative knowledge (Alessi and Trollip, 2001). Both types of analysis begin with the development of targeted objectives for the program (Gagne et al., 1992).

The primarily purpose of the analysis is to distill and split a topic or a complex skill into component and small measurable steps, so as to assist in designing the details and to determine an effective learning sequence. The point is to divide a final goal into enabling objectives by using the pyramid analysis technique to produce a learning map or flowchart which will be the main structure for the multimedia training program (Alessi and Trollip, 2001; Cartwright and Cartwright, 1999; Harrison, 1999; Riptoningrum, 2003).

A good learning sequence should begin with skills that require the learner to use and combine skills they already have (Alessi and Trollip, 2001). The scope and sequence of the learning material should follow standard educational practice (Tomita, 2003). Analysis depends on the methodology employed in interactive multimedia development (Alessi and Trollip, 2001).

5.5 Design

Design of educational software is a complex issue which depends upon the designer's experience, subject area, learners' needs and skills, and educational philosophy (Alessi and Trollip, 2001). The design phase uses the conclusions from the training assessment and analysis phase to build a road map for development (Lee and Owens, 2004). The designer links the intended outcomes to the requirements and constraints of the project, using learning theory and the different methodologies to engage the people in such a way that learning takes place in an effective and efficient manner (Alessi and Trollip, 2001). Interactive multimedia design passes in three phases, they are, firstly, the planning phase which focuses on multimedia design considerations; secondly, preliminary program description; and thirdly, detailing and communicating the design.

5.5.1 Phase one: Multimedia application design considerations

The first phase of the design process is to identify the primary requirements specification, which specifies the functionality required of the project; and determines ways of structuring the content to meet educational and project goals (Alessi and Trollip, 2001; Phillips, 1997).

5.5.1.1 Definition of the target audience

The initial phase of learning in any new program is based upon learner's background knowledge, which is a sum of all of the abilities acquired as a result of exposure to earlier learning experiences (Fedak, 1999). A clear audience profile regarding the age, educational level, corporate culture, needs and expectations, level of computer literacy, background

knowledge, motivation and interest of the user will provided the program producer with valuable information for script development, media selection, and helped to create a concept of delivery that increase the program's chances of success (Cartwright and Cartwright, 1999; Fedak, 1999; Harrison, 1990; Villamil-Casanova and Molina, 1996).

The skill and knowledge level of the intended population, IT literacy and the availability of IT resources need to be assessed to determine what design elements can be introduced into the multimedia training program (Tomita, 2003).

The quality and the effectiveness of the planning program will depend upon how well the designer understand what motivates, interests the target group (Harrison, 1990). Defining the need-to-know level during audience analysis helps to determine the influence and level of motivation, and helps to create a concept of delivery that increase the program's chances of success (Cartwright and Cartwright, 1999).

5.5.1.2 Identified type of learning

The goal of educational multimedia is to facilitate learning for a defined audience. Identifying types of learning within the content will help determine the methodologies and other instructional factors (Alessi and Trollip, 2001). Gagne et al. (1992) has identified five types of learning that require different instructional techniques, and they are: verbal information, intellectual skills, motor skills, attitude, and cognitive strategies.

Alessi and Trollip (2001) suggested that a good way to identify the types of learning was to ask what the learners must ultimately do. Verbal learning is demonstrated by being able to state or discuss information. Attitude is demonstrated by choosing to do something. Problem solving is represented by generated solutions or procedure to find solutions. Rule learning is demonstrated by applying rules and demonstrating principles. Concept learning is demonstrated by being able to label or classify things as members or non-members of a class (Alessi and Trollip, 2001).

5.5.1.6 Application's intended use: individual or group

The media choice for the program depends on the size of the audience (Cartwright and Cartwright, 1999). Many elements such as extensiveness of the text in the program, the quantity and length of narration, interactivity and colour are dependent on whether the planning of a multimedia application to be used on a one-user per computer basis or for a large group (Villamil-Casanova and Molina, 1996).

5.5.1.3 Program Goals and objectives

The first step is to lay out the purpose of the design, as well as to discuss design documents and their various audiences (Alessi and Trollip, 2001). The purpose of the proposed application and the expected results it should achieve must be clear and be considered throughout the planning

and development phase of the program (Villamil-Casanova and Molina, 1996). The impact of the program often becomes its overall objective or goals (Cartwright and Cartwright, 1999). The classifications of objectives into "understanding, knowledge, and competence" are more simple, applicable, and useful than "knowledge, skills, and attitudes" (Cole and Engel, 1976).

5.5.1.4 Program content

Program content can be defined as the specific message, data, facts or information to be presented through the multimedia application (Villamil-Casanova and Molina, 1996), and to be driven by the learning needs of the target audience (Trudgen, 2000). Learners are most likely to use multimedia programs if the information presented is relevant to their goals and experiences (O'Brien, 2002). First step is to develop the initial content ideas through brainstorming with a group of interesting people to help to determine the possible topics and to obtain a basic understanding of the content. This is effective only if the designer is somewhat familiar with the content, so every project should include some time for the designer to research the content (Ivers and Barron, 1998; Phillips, 1997). This is followed by elimination of some initial ideas and outlining the content. Many factors will influence the content outline, including the target audience, the development time and the project requirements in terms of content; the relationship of ideas to the subject matter and goals; and understanding the components and restrictions of the delivery system (Alessi and Trollip, 2001; Ivers and Barron, 1998). Referencing existing training material could also be useful (Harrison, 1990)

5.5.1.5 Multimedia building blocks

Multimedia building block is the interactive multimedia material which constructs the multimedia program, and they are usually produced using a variety of software applications and then assembled together using authoring programs (Villamil-Casanova and Molina, 1996). This step begins through the collecting of resources for the multimedia materials, and determining that all of the necessary materials are, in fact, available (Alessi and Trollip, 2001).

5.5.1.7 Branching & Navigation

Multimedia technology enables the designer to design applications with several layers of information, each accessible by means of navigational tools and each containing several different multimedia building blocks. The connections and links among various sections of the multimedia application are called navigational structures. There are basic navigational structures which design the flow of a multimedia application: the linear, the hierarchical, the hypertext (non-linear), and the hybrid. Branching provides greater flexibility and learner control than linear design. In practice, several of these schemes may be mixed in a single project (Cartwright and Cartwright, 1999; Phillips, 1997, Villamil-Casanova and Molina, 1996).

Linear model
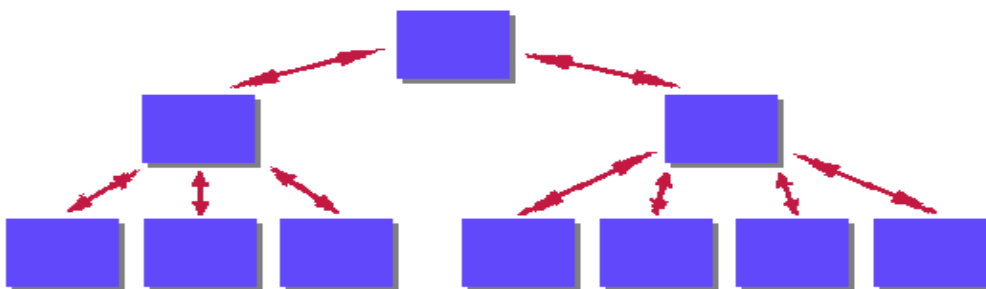
Hierarchical model
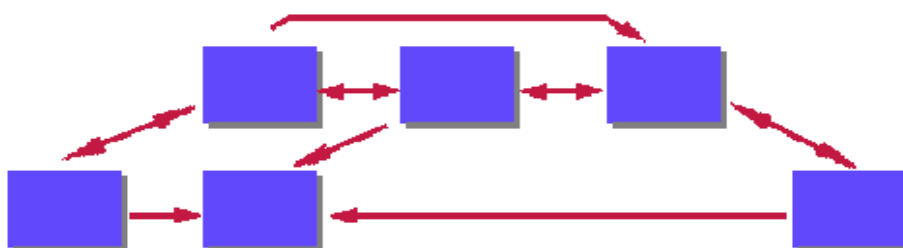
Hypertext (non-linear) model
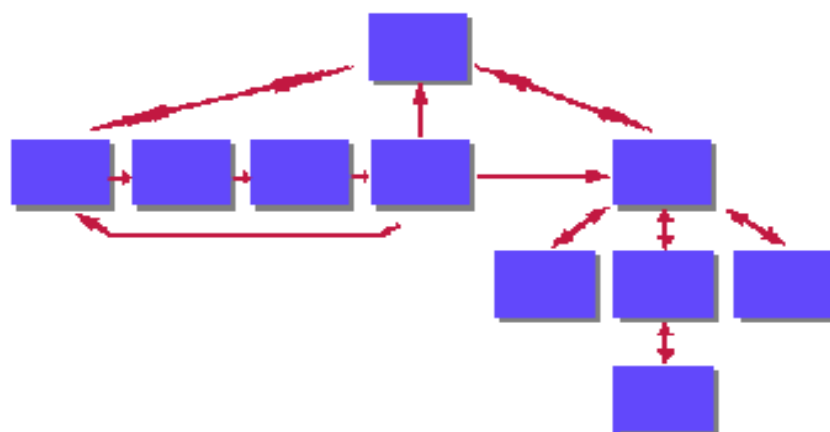
Hybrid model

Figure (5.3) Model of basic navigational structures
Source (Borda, 2004)

5.5.1.8 Degree of Interactivity

The focus of the program should be on effective performance and problem solving rather the ability to remember facts and repeat theory without real understanding about its applicability (Hedberg et al., 1994). Tomita (2003) argues that an actual health education CD-ROM needs to be more than simply having links to primary resources, and its format must accommodate interactivity.

Determination is needed of the level and degree of interactivity required to accomplish the program goals. It is particularly important in educational applications to decide whether or not the program will provide questions, methods of answers and computer feedback (Villamil-Casanova and Molina, 1996). For many medical multimedia programs, the interactivity consists of button clicking or electronic page turning and this is the lowest level of interactivity where the computer is performing tasks requested by the user (Mooney and Bligh, 1997b).

5.5.1.9 Definition of the computer configurations

An important planning consideration, more so for multimedia than traditional computer-based learning, is to define the type of machine that will run the application, and establish the constraints for hardware and software under which the project will be run (Alessi and Trollip, 2001).

CD-ROM is an optical medium that can store 660 megabytes of media including text, graphic, sound and video, CD-ROMs are usually 650 or 700 MBs in capacity, the 700 MB CD-ROMs also record 80 minutes of audio (Tomita, 2003) (Reeves and Hedberg, 2003). The average machine configuration is 33-66Mhz, 8-16 RAM, double speed CD-ROM, 480-640 color monitor; video card 1024x768 with 65,536 color and 8- 16 bit audio board (Rathbone, 1995; Villamil-Casanova and Molina, 1996; Alessi and Trollip, 2001; Saxena 2003).

5.5.2 Phase two: Preliminary Program Description

The second stage from interactive multimedia program design is the learning map of the content, sequence and characteristics of a program in pictorial form, that will be follow through the development phase, as shown in Figure 5.3 (Cartwright and Cartwright, 1999).

Having good objectives based on, and related to, proper task and concept analysis; and written program content based on the setting objectives are the first three cornerstones of a good self-directed learning program (Piskurich, 1993).
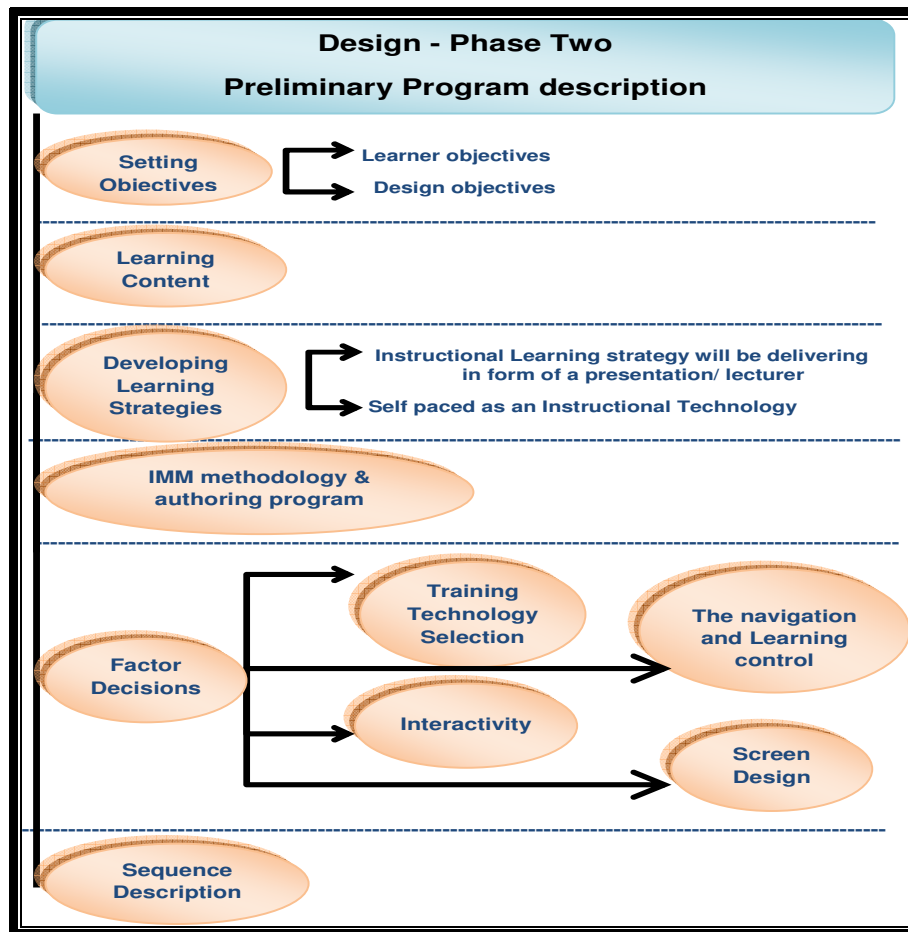
Figure (5.4) Preliminary Program Description
Illustration by F. El Sayed

5.5.2.1 Setting objectives

As with any health education program, clearly defined goals and measurable objectives are the first step in program design. They are essential to facilitate effective program design, and to help in the determination of the learning resources required. They are also considered the measurements of the evaluation for the program (Cartwright and Cartwright, 1999; Grant, 1992; Kern, 1998; Tomita, 2003). It is necessary to translate the needs and goals into performance objectives that are sufficiently specific and details how progress toward the goals (Gagne et al., 1992).

Each objective should achieve the program aim, be stated precisely and specify the appropriate measurable outcomes (Boyle, 1997; Harrison, 1999). The success of the project can then be decided by measuring how well the outcomes have been achieved (Boyle, 1997).

There are two types of objectives. Learner objectives provide a clear statement of the program outcomes, the results that the learner is expected to accomplish, help for the learner by pointing out important topics; and design objectives which provide guidelines for media production decisions, help the developers prescribe appropriate activities, focusing more on required topics than on tangential issues, and choose effective delivery systems (Cartwright and Cartwright, 1999; Gagne et al., 1992; Hannafin and Peck, 1988; Harrison, 1999; Kennedy et al., 1998). Programs that elicit the audience's active participation are more successful than those that do not (Cartwright and Cartwright, 1999).

5.5.2.2 Learning content

Phase one of program design generated a creative approach to the topic. In phase two an initial content idea developed, using technique of brainstorming to generate idea about what information is to be learned (Alessi and Trollip, 2001). Learning content depend mainly on the program topic and the target learner.

Werner and Bower (1982) in his book "Helping health workers learn" identified important points should take in consideration in developing health program for community health workers such as:

1. Program content should be aiming to teach what is most important and essential.

2. Learning must relate to life so the program content should be based upon what is already familiar to health workers, and start with their own knowledge and experiences within communities and individuals.

3. In developing the program content, the developer needs to look at social and physical causes of illness, its symptoms, and its effects on people's health and lives.

4. Health workers learn better and remember content longer if they understand the reason why things happen and what needs to be done.

5. The program should discuss health programs in clear, simple language that everyone understands.

6. Learning health skills helps health workers to understand anatomy and physiology.

Programs could have successful outcomes only in so far as they introduce the appropriate ideas and opportunities to group in the appropriate social and cultural conditions (Pawson and Tilley, 1997). The most obvious way that educational technology can be made culturally-inclusive is by including the cultures of the target audience in the educational content (Robbins, 2007).

5.5.2.3 Developing Instructional learning and technology strategies

The purpose of developing the learning and technology instructional strategies before developing the materials themselves is to outline how instructional activities will relate to the accomplishment of the learning objectives (Gagne et al., 1992).

Instructional strategy is the method by which the learning will take place, and the plan for assisting the learners with their study efforts for each performance objective (Cartwright and Cartwright, 1999; Gagne et al., 1992). Instruction is the creation and use of environments in which learning is facilitated.

The process of instruction consists of four phases, including:
1) The presentation of information to learners;
2) Guidance of learners' first interaction with the material;
3) Learners practicing the material to enhance fluency and retention; and, finally,
4) Assessment of learners to determine how well they have learned the material and what they should do next (Alessi and Trollip, 2001).

Instructional Technology is the delivery system chosen to accomplish the strategies. Both the learning and technology strategies are based on the type of learning "Learning domains" that will take place (Cartwright and Cartwright, 1999).

The cognitive learning domain deals with the thought process, is associated with intellectual skills, and is most closely related to teaching of facts, figures, concepts, principles, and procedures; and is delivered in the form of lecture/presentation (Cartwright and Cartwright, 1999; Lee et al., 1995).

The delivery system for the program should involve the learner in experiences that cause the learning to take place (Cartwright and Cartwright, 1999). The multimedia interactive program allows the viewer to control the pace of the program, therefore it requires a special form of delivery that is built upon a platform of computer technology and driven by self-directed learning (Alber, 1996; Cartwright and Cartwright, 1999).

Self-paced learning (SPL) is an appropriate mode of delivery for the multimedia training program, where a computer is controlling the delivery of materials through a compact disc (CD-ROM) player and the source of materials will be multimedia sourced from a CD-ROM disc (Shaw and Standfield, 1990). As individuals need time to accept new ideas and weigh them against their personal experiences (Cartwright and Cartwright, 1999), the choice of using SPL as a method of program delivery is supported by Brundage and MacKeracher (1980) in his report about adult learning principles and their application to program planning, specifically his finding that adults do not learn productively when under severe time constraints. They tend to learn best when they can set their own pace.

The four phases of instruction process reveal in SPL lesson as following:
1. Module presents to the learner a learning objective,
2. An activity guide,
3. The material to be viewed or read, practice exercises, and
4. A self-check test (Gagne et al., 1992).

Lee et al. (1995) considers that individualised instruction, interactivity, systematic instruction, a multi-sensory approach and the immediate feedback are the factors which make SPL an ideal method of delivery of educational programs.

5.5.2.4 Choosing an IMM methodology and Authoring Program

Previous studies (Alessi and Trollip, 2001; Cartwright and Cartwright, 1999; Hannafin and Peck, 1988) suggested that the decision of choosing and selection of an appropriate methodology for an interactive multimedia program should be based and dependent   upon:

1 How the various methodologies serve the four phases of instructional process (presentation, guidance, practice, and assessment of learning);
2 The type of learning and learning task (verbal information, intellectual skills, motor skills, attitude, and cognitive strategies);
3 The learner's profile;
4 External constraints;
5 The specific objectives that the learner is attempting to achieve;
6 Methods of program delivery i.e. via the World Wide Web or using a CD-ROM (Alessi and Trollip, 2001).
7 The function of the interactive multimedia, whether it is for the acquisition and maintenance of new knowledge and skills, or for the application of knowledge and skills.

There are eight methodologies of interactive multimedia for the facilitation of learning using one or more of the four instruction process' phases, they are:
1 Tutorials used for teaching new information;
2 Hypermedia used for guidance;
3 Drills and practice provide practice and feedback on a topic;
4 Simulations used for simulations or to model complex concepts or events;
5 Games used for teaching new information or concepts and practice;
6 Tools and open-end learning environments;
7 Tests provide for assessment of learning; and
8 Web-based learning (Alessi and Trollip, 2001; Hannafin and Peck, 1988).

Programs that combine these methodologies will have a greater likelihood of being effective. Tutorials and hypermedia are the simplest methodologies for presenting information and guiding the learner in their initial acquisition. Hypermedia is less structured than a tutorial, thus allowing learners to choose their own paths through the material and to get a more constructivist style of learning experience (Alessi and Trollip, 2001). These two methodologies were adapted in this study for the purposes of model planning.

In tutorials, information is taught, verified, and reinforced through interaction with the computer, and the instruction is designed to be self-contained (Hannafin and Peck, 1988). A good tutorial program should include both information presentation and guidance for the learner through the information (Alessi and Trollip, 2001). The instructional factors that are particularly relevant to tutorial instruction may be organised as displayed in Figure (5.4)
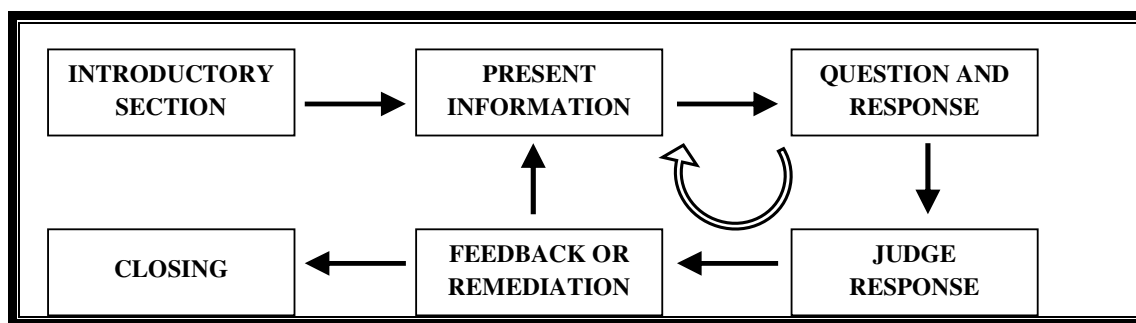
Figure (5.5) General structure and sequence of a tutorial program
Source (Alessi and Trollip, 2001).

Hypermedia methodology consists of a database of information with multiple methods of navigation and features designed to facilitate learning (Alessi and Trollip, 2001).

Authoring programs are software programs where all media elements are brought together into a final project (Ivers and Barron, 1998), and allow an author to create multimedia applications without having to worry about the details of programming for multimedia (Luther, 1994).

The selection of the authoring tool should depend ultimately on the job needs and on the chosen IMM methodology (Ivers and Barron, 1998; Villamil-Casanova and Molina, 1996). There are many software programs that can be used to author a multimedia project as Power Point, Hyper-Studio, Author ware, and Icon Author; all are examples for an authoring tool run under Windows (Ivers and Barron, 1998; Luther, 1994; Villamil-Casanova and Molina, 1996).

As a rule, creating CD-ROMs that can "stand alone" or function without having unusual software and hardware to run the CD-ROM is preferable. Microsoft PowerPoint is ideal for use in health education because most users have access to Microsoft PowerPoint (Tomita, 2003).

5.5.2.5 Factor Decisions

At this stage we consider other factors relevant to the chosen methodology and how they will be managed within the program, such as feedback, question types, directions, learner controls, and the use of graphics and learning factors (Alessi and Trollip, 2001). Shank (2011) recommended a learning environment for the program designed to be more directed as the best approach for beginner in using the Information Technology.

5.5.2.5.1 Training technology selection

According to Fletcher (1990) people retain only 20 percent of what they hear; 40 percent of what they see and hear; and 75 percent of what they see, hear, and do. Development of the proposed project will be based on the premise that, to learn most effectively, users need to see, hear, and do consistently (Knebel 2000).

The program could be more effective if a variety of communication modes and media are used to present the same concept, thus fulfilling the different learning style of all audience members (Cartwright and Cartwright, 1999; Villamil-Casanova and Molina, 1996).

The media selection process will be based on the resources available, the objectives of the program and the characteristics of the target learner (Cartwright and Cartwright, 1999). A bibliographical information sheet will be used to record and track all sources of multimedia material used throughout the projects regarding description, media type and source (Ivers and Barron, 1998).

5.5.2.5.2 Interactivity

There is substantial agreement among analysts that knowledge is neither pre-given, nor stamped in by the impact of external stimuli. It is constructed and validated through interaction, which is the most important aspect of a learning program, aside from the content itself. Promoting effective and efficient learning depends on immersing learners in educational activities that are situated in a meaningful and relevant context (Boyle, 1997; Frater and Paulissen, 1994; Genat et al., 2008). The model should be flexible, engaging and learner-centred (Sisson et al., 2010)

Multimedia has the potential to provide learners with educational experiences that traditional text-based methods cannot, and they are often described as 'interactive' (Albion, 2000). Interactivity refers to activities performed by both the learner and the computer; they conduct an interchange (Cartwright and Cartwright, 1999; Mooney and Bligh, 1997b; Orr et al., 1993). It involves the learner in an active learning method which can serve to maintain attention, create new knowledge, and improve achievement (Barron and Orwing, 1995).

Hede and Hede (2002) point to the importance of distinguishing between functional interaction and learning interaction. Functional interaction encompasses learner-controlled software functionality which includes such functions as volume control, audio and video queuing, and search tools. Learning interaction, on the other hand, is interaction that is provided for through specific learning outcomes.

The truly interactive multimedia computer-based programs aim to establish an educational 'conversation' between a user and a computer and emulate interpersonal communication (Orr et al., 1993). Designing these interactions around observation and imitation enables learners to act on instructions within the learning interface (Robbins, 2007). Interactivity can be achieved through using features such as feedback on strengths and weaknesses and progress charts linked to learning activities and self-assessment (Mooney and Bligh, 1997b). An instant feedback process for all activities supports the self-directed learning (Lockwood et al., 2009).

Having determined the level and degree of interactivity needed to accomplish the program goals, it is particularly important to decide whether the program will provide questions, methods of answers and computer feedback (Villamil-Casanova and Molina, 1996). For many medical multimedia programs, the interactivity consists of button clicking or electronic page turning and this is the lowest level of interactivity where the computer is performing tasks by requested the user (Mooney and Bligh, 1997b).

5.5.2.5.3 Navigation and learning control

Tomita (2003) suggested that CD-ROM multimedia programs need to have a main page, table of contents, or main menu where the user may view all of the contents of the CD-ROM, where they may be informed about how to navigate and find information. Template navigation bars would be inserted on each slide for ease of use. Robbins (2007) agrees with the importance of the presence of a separate menu, as it could summarise the longer text, and allow the learner to jump directly to a point of interest without losing their place, and this is the best solution created to enable learning in whole approach (i.e.) learning in a holistic way; which is a feature of the Aboriginal learning style.

'Learner control' refers to the degree to which learners are allowed to take an individual path through the material and to take charge of the instruction and the learning environment. It is the ability of the user to cause things to happen or to interrupt the flow of information in a program. That is an advantage for multimedia over video or television (Abrams, 1996; Albion, 2000; Orr et al., 1993)

5.5.2.5.4 Specifying screen design

Cartwright and Cartwright (1999); Harrison (1990); Ivers & Barron (1998) identified some important factors that should be considered in any program screen design, which help the learner interact and concentrate with the content of the program. Those factors are:

1   Screen should be simple, consistent and intuitive;

2   The text on the screen should be readable, and written clearly and effectively;

3   Standard screen types should be in use throughout the program;

4   There should be a separate main menu that summarises the program content and allows the user to jump directly to a point of interest; and

5   For consistency, the screen template that will be used in the project should contain defined functional areas.

The exact design of the screen template will depend upon: a) the type of information, b) the authoring program used, and c) the primary purpose of the planned designing screen. There may be more than one screen template that could be considered in developing the interactive multimedia program, for example, the information screen, the navigation screen (menu), and the interaction screen (question) (Cartwright and Cartwright, 1999; Ivers and Barron, 1998).

5.5.2.6 Sequence Description

Instructional design is guided by educational and technological theories and models that direct the development of instructional sequencing (Kinuthia, 2007). Sequence description is the last activity in the preliminary description and this depends upon the methodology.

For a tutorial, the preliminary sequence description appears in the form of drawing a diagram (simple flowchart), which should include the general order in which the learner will encounter directions, choices, presentations, interactions and remediation. The closing sequence description for the tutorial did not need to contain the details such as branching based on performance, which will be elaborated on in a later step. In hypermedia, the program's sequencing is replaced by specifying navigation and hyperlink structures.

The preliminary sequence description appears in form of drawing diagram (Simple flowchart). Its purpose is to integrate the analysis that has occurred so far and to serve as a transition into producing a flowchart (Alessi and Trollip, 2001).

5.5.3 Phase three: Detailing and communicating the design

There are different types of designs that can be used to elaborate the design and communicate it to others, such as treatment, scriptwriting, flowchart and storyboarding (Alessi and Trollip, 2001). The script and storyboard developed for interactive programs should be closely related to the chosen authoring program (Cartwright and Cartwright, 1999).

5.5.3.1 Scriptwriting

Scriptwriting is a written description for all actions of all components of the proposed multimedia project, and the project's anticipated outcomes; it starts by developing a working "content outline" that presents the sequence of the information and frames the amount of information to be covered; followed by details about how the program would appear in the screen; it includes the program objectives, the audience profile, and the interface chosen to deliver the program (Cartwright and Cartwright, 1999; Villamil-Casanova and Molina, 1996).

5.5.3.2 Flowcharts

A flowchart is a road map of the proposed application (Villamil-Casanova and Molina, 1996), and a visual depiction of the sequence and structure of instructional programs, showing how the program progresses or flows (Alessi and Trollip, 2001; Ivers and Barron, 1998).

Flowcharts provides the big picture of the project and then divide the overall program into individual instructional elements such as menus, course objectives, lessons, questions, and exercises (Cartwright and Cartwright, 1999). Flowcharts represent the multimedia application's navigational structures (Villamil-Casanova and Molina, 1996).

The flowchart will provide a concise description of each task to be performed arranged in a proper sequence and a visual image of how the parts of the multimedia training program relate to each other (Cartwright and Cartwright, 1999; Jerram and Gosney, 1995). It presents the required detailed and precise instructions on how the underlying model of the simulation is to work (Alessi and Trollip, 2001). It can be a helpful tool in calculating graphic, animation, and video requirements (Cartwright and Cartwright, 1999).

The production of a clear, logic, and detailed flowchart is facilitated by adopting an iterative approach, beginning with a brief overview and progressing to the level of detail necessary for program. That means identifying and defining the branching of the program could be achieved through developing an outline for the interactive multimedia project followed by depicting the program sequence from beginning to end and all possible decisions throughout (Alessi and Trollip, 2001; Villamil-Casanova and Molina, 1996).

There are 3 levels for a detailed flowcharts, the level of detail required depends on the complexity of the program being developed and is determined primarily by the project's goals and content.

Level 1 (Macro) flowchart is likely to be a one page overview of program sequence and method. It contains no branches and no explicitly stated decisions.

Level 2 (Mini) flowchart has more branching and elaborates upon the major decision and what happens at each step. The minute details do not appear in level 2, but the major strategies do. This level of detail is appropriate when the main idea branches into a few other topics, which in turn are subdivided further.

Level 3 (Micro) flowchart is a very detailed of the program (Alessi and Trollip, 2001).

There are several common structures for flowcharts, including linear design which consists of program elements that follow one after the other (Ivers and Barron, 1998).

Tutorial programs generally require only level 1 and level 2 flowcharts because many of the sequences and procedures are repetitious. It is sufficient to show the overall sequence and primary decisions such as menu choices or request for help (Alessi and Trollip, 2001).

5.5.3.3 Storyboards

Storyboards are the learning maps of the content, displaying the sequence and characteristics of a multimedia program in pictorial form which are followed through the development phase. It used to reflect on the flow of the application, and show the details of what learners see (Alessi and Trollip, 2001; Cartwright and Cartwright, 1999; Hofstetter, 1997), see Figure 5.6.

A storyboard a model and a script, and it is a complete specification of the text and narration in a multimedia application. It helps the designer to role-play the model from the viewpoint of a user and identify any missing elements (Hofstetter, 1997).

The storyboard and flowchart develop in tandem, because a change in one requires modifications to the other (Alessi and Trollip, 2001).

Title:		Section:		Page:
Unit:		Graphics: YES NO	Audio: YES NO	

Notes:

NEXT →
BACK →

BACK   NEXT

Audio:

Figure (5.6) Storyboard for multimedia program
Source (Alessi and Trollip, 2001)

CHAPTER SIX: A GENERAL ASSESSMENTS OF THE DEMANDS FOR THE MODEL

This Chapter illustrates in detail the first step in interactive multimedia health informatics program development; a model needs assessment. Identification of the needs of Aboriginal and Torres Strait Islander health workers for an interactive multimedia health informatics program requires an analysis of the current situation of Aboriginal and Torres Strait Islander health workers' continuing education in general.

This assessment was undertaken through an analysis of the current Aboriginal and Torres Strait Islander health workers' continuing education program, from the various perspectives and experiences of key stakeholders, using a qualitative semi-structured approach and through the use of open-ended interviews. The assessment began with a systematic review of the literature, and compared findings with those previously published.

To arrive at this we conducted a search of literature on Aboriginal health workers' continuing education, using key words such as Aboriginal health worker, primary health care worker, Aboriginal health, Aboriginal health workers' education, Aboriginal health worker' roles, and professional development, in Medline, PubMed Central Journals, PMC journal, ERIC, BioMed Central, Informaworld, El-pub, Science Direct, *InfoNe*t, and WHO.

6.1 Aboriginal and Torres Strait Islander Health Workers Education and Training Framework

Appropriate levels of education and training are regarded as fundamental to the quality of the service (CIRC, 2000), and well-planned workforce education and training is critical to deliver a professional, competent workforce (NRHA, 2006).

On the international level, Prasad & Muraleedharan's (2007) review shows that in most countries, Aboriginal health workers have had education up to primary level, with 8 to 10 years of schooling, and they are often selected without any prior experience or professional training in community health. Because of this, induction and continuing training that has been programmed for them has received considerable attention.

On the national level, Aboriginal and Torres Strait Islander communities traditionally have had people who fulfilled the roles of prevention and treatment of illness and who are responsible for the spiritual and physical health of their people. In 1965 a hospital assistant's course for Aborigines was established in the Northern Territory, which was replaced in 1975 with a Territory-wide Aboriginal Health Worker Training Program (Collins, 1995).

Their training program was developed to bridge the cultural and social gaps between Aborigines and the normal health care facilities (Hausfeld, 1977), as many practitioners do not

recognise the impact cultural and societal attitudes play in the practice of medicine (Barlett, 1995).

In recent times, training has been provided to expand the skills of Aboriginal and Torres Strait Islander health workers to help meet some of the challenges in Aboriginal and Torres Strait Islander health (AMA, 1998).

There is a growth in the education and training of Aboriginal and Torres Strait Islander health workers through a variety of sectors such as the Aboriginal and Torres Strait Islander Corporations for Health Education and Training, the State Department of Health and the Vocational Education Training (VET) sector (Felton-Busch et al., 2009; Fleming and Parker, 2007).

Aboriginal Community Controlled Health organisations already exist across the nation and have the responsibility for, along with long experience and success in delivering, Aboriginal health related training in a culturally-appropriate manner (ATSIHRTONN, 2009; Engelhard and Walford, 2007).

There are currently more than 100 Aboriginal Community Controlled Health Organisations in Australia (McRae et al., 2008). In the state of Queensland there are ten training providers operating in varying modes of delivery from community-based to institutional programs that offer different levels of courses ranging from certificate to diploma to advanced diploma (CIRC, 2000).

Nationally there is a range of accredited certificate, diploma, associate degree and degree courses available for Aboriginal and Torres Strait Islander health workers at tertiary and non-tertiary educational settings Figure (6.1). Courses and training programs have been designed to address specific health issues (AIH*Info*net, 2012), whichever modes are chosen, regular on–site supervision and re-training follow-up programs are essential (Saggers and Gray, 1991).

The present education and training program for Aboriginal and Torres Strait Islander health workers is competency-based, with primary focus on the practical skills required for primary health care, information and strategies in preventing communicable diseases and strategies in chronic disease care. It is delivered through a series of complementary primary health care certificates, (Engelhard and Walford, 2007; Felton-Busch et al., 2009; Rose and Pulver, 2004), and it is varied throughout Australia from individual on-the-job training to full-time year-long courses. The course content also varies considerably (CIRC, 2000).

Saggers & Gray (1991) argued that the mode of training adopted for Aboriginal and Torres Strait Islander health workers has been much debated. Given the variation in the needs of Aboriginal communities, it seems preferable to have a range of modes which incorporate everything from on-the-job tuition to short-term modules and also longer-term study.

Aboriginal Health Worker and Torres Strait Islander

Health Worker Primary Health Care Qualifications
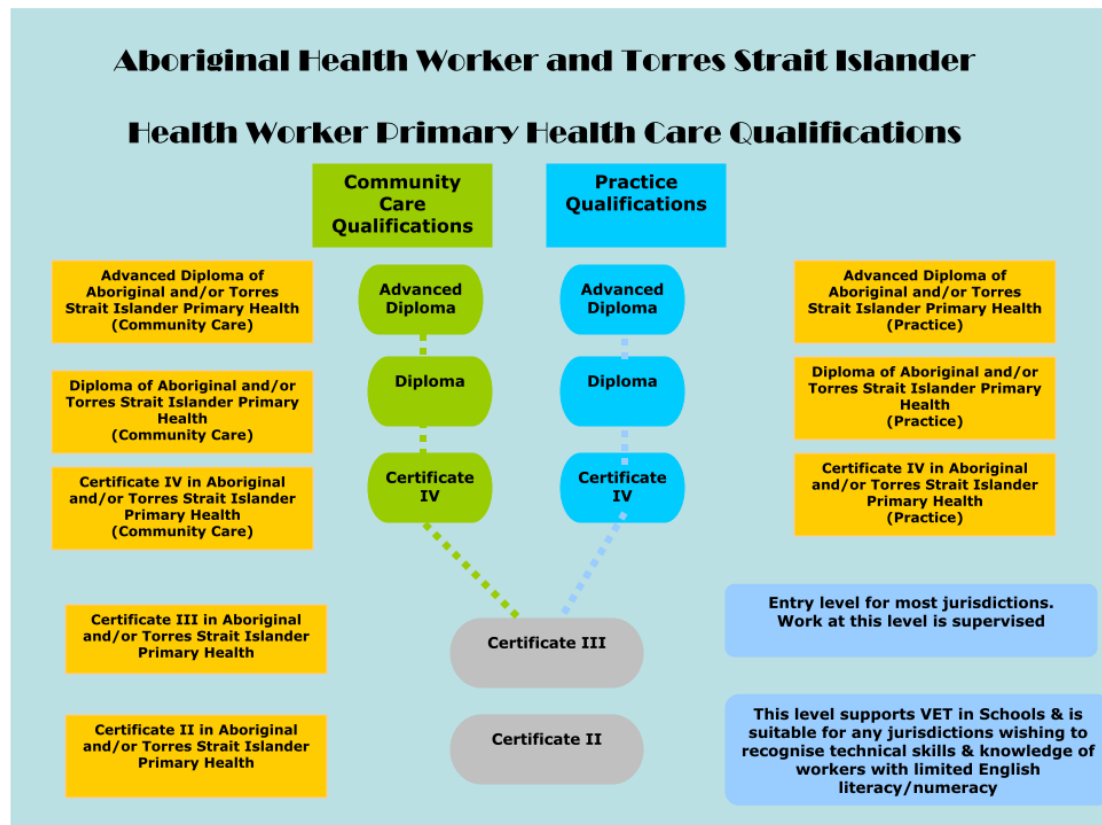
Fig (6.1), Aboriginal and Torres Strait Islander Health Workers Primary Health Care Qualifications Framework
Source (CS&HISC, 2007)

6.2 Aboriginal and Torres Strait Islander Health Workers Challenges

Previous studies show that Aboriginal and Torres Strait Islander health workers have a diverse role and educational backgrounds according to local needs and opportunities. Their roles are increasingly multifaceted, and there is a huge need to enhance Aboriginal participation in health workforce, and to expand their roles as a successful strategy to improving the accessibility and appropriateness of healthcare for Aboriginal Australians (Abbott et al., 2007; HWFA, 2011; McRae et al., 2008; Riddell et al., 2010; Sibthorpe et al., 1995).

In the meantime, their education does not adequately prepare them for managing the demand of these roles, their clinical understanding and skills are inadequate, their training gives them far better diagnostic and curative skills but is still inadequate for enabling them to meet the level required to meet their communities' health needs and match their role's expectation (CIRC, 2000; Genat et al., 2006; Rose and Pulver, 2004).

Documentary research and review of the published literature and reports have concluded the current challenges and struggles for Aboriginal and Torres Strait Islander health workers as follows:

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1. Aboriginal and Torres Strait Islander health workers are currently trained to act as cultural brokers, to provide first aid and early management of common conditions and to recognise many health problems that are immediately life threatening, but they do not have the skills of more highly trained professionals; as generally they are not trained to deal with chronic conditions that have serious long-term implications for health, nor to implement preventative program (HRSCFCA, 2000).

2. While the vocational programs provided Aboriginal and Torres Strait Islander health workers with a foundation to develop practical skills and competencies, they are limited because they cannot provide them with the skills and knowledge they need to manage the increasingly complex health issues of their communities (Rose and Pulver, 2004).

3. In Aboriginal health workers' education , they know the name of the condition, perhaps some of its symptoms and the name of the medicine used to treat it, but the complicated dynamics of the disease and medicine relationships are not understood (Trudgen, 2000).

4. Although they have an expanding role in medicines management and education; as they are considered the most appropriate members of the health care team to provide medicines to their own communities, they have reported they don't have adequate appropriate education, sufficient knowledge or skills to support this pivotal role (McRae et al., 2008).

5. Aboriginal health workers who generally have strong community credentials and high profile within health workforce could be more actively involved in developing, delivering and evaluating health program. However, it is incumbent that Aboriginal health workers have appropriate training and skills for such roles (Bailey et al., 2006).

6. Aboriginal and Torres Strait Islander health workers are confronted by a lack of community cooperation due to the lack of status of health workers compared to traditional healers and to medical doctors; and community conflict over employer expectations that health workers advocate behaviours changes to people who were their senior in kinship terms (Genat et al., 2006).

7. Saethre (2007) claims that in remote Aboriginal communities in Australia two healing traditions /Aboriginal and Western/biomedical are often considered to exist. Cunningham (2009) defined the traditional health systems in Aboriginal communities as "… *complex and quite structured in their content and internal logic; they are characterized by a combination of practices and knowledge about the human body, and coexistence with other human beings, with nature and with spiritual beings. They involve all aspects of health promotion, prevention of illness and treatment and rehabilitation, but differ from most Western health systems in that they take an integral or holistic approach*" (p.157). Traditional medicine is part of Aboriginal Australian culture, and traditional healers and traditional health practitioners are respected in the

Aboriginal community for their knowledge of traditional medicines and healing techniques. Despite the fact that a fundamental differences between Aboriginal and western/bio-medical approaches to health exist, the interaction between the two may have a significant impact on treatment outcomes, and in the meantime as little is known by western medicine about traditional healing practices and their benefits (Gorman et al., 2006; Saethre, 2007); many people will choose to use a combination of traditional healing methods and western medicine (Cunningham, 2011; Devanesen, 2000); and each local community health worker faces the challenge of integrating western and traditional health approaches and managing the difficulties emerging from this integration (CSAHTALtd, 1998),

8. Aboriginal and Torres Strait Islander health workers rely on the clinical supervision of doctors and nurses for some duties. The same doctors and nurses rely on them to provide a cultural supervision and to facilitate the clinical care they seek to provide to their Aboriginal client (Abbott et al., 2007); simultaneously there is doubt about their ability to ask clients strategic health-related questions (Genat et al., 2006), and they are often untrained in interpreting; in these cases poor communication can result in poor patient treatment, in extreme cases serious harm, or the very least it can result in ineffective health service delivery (Trudgen, 2000).

9. Genat et al. (2006) argued that despite acknowledgment of the key roles played by Aboriginal and Torres Strait Islander health workers in the field of Aboriginal health, there is a lack of organisational and professional recognition by managers and by more clinically-oriented health professionals. The absence of professional status for them within their organisation makes it possible for other health professionals ultimately to undermine their contribution, compromise their efforts, and management is unable to support them. This disillusionment about their professional role has an effect on their capacity to contribute to the field of Aboriginal health in general.

10. Under the current arrangements there is no consensus on the role of Aboriginal and Torres Strait Islander health workers, which can vary considerably between States and even between types of services within a State, thus causing tension between community expectations of what services Aboriginal and Torres Strait Islander health workers should be providing and the limitations imposed on them by their employers, their colleagues, and a general lack of resources, (Genat et al., 2006; HRSCFCA, 2000). The current lack of national consistency regarding the role, recognition and career structure of Aboriginal and Torres Strait Islander health workers has restrained the development of nationally accepted professional standards of practice (NRHA, 2006). Genat et al. (2006) explained that the nature of Aboriginal and Torres Strait Islander practice remains open to speculation, assumption and rumour, therefore the health service managers and other health professionals frequently hold disparate views about their roles and have little understanding of their training and /or how to work with them;

supervision is often ad hoc; many of health workers work as subordinates; and uncertainty arises among health workers guideline practice. Giblin (1989) point out the difficulties faced by Aboriginal health workers working with health professionals and restriction of their responsibilities to menial tasks, while many of them were trained and employed as broad generalists, employers often placed them in a specialised area in which they had only superficial knowledge (Genat et al., 2006). In the South-Eastern States, Aboriginal and Torres Strait Islander health workers are not allowed to perform clinical tasks and work more as liaison officers, health promotion officers, or even as simply drivers (Abbot and Fry, 1998). Also the ambiguity in the Aboriginal and Torres Strait Islander health workers role can undermine relationships with other health professionals since there is no benchmark for those workers to form a reasonable set of expectations on Aboriginal and Torres Strait Islander health workers (Ridoutt et al., 2010).

11. When Aboriginal medical services were not government-run, patients viewed Aboriginal and Torres Strait Islander health workers more as practitioners in their own right. In addition to liaison and healthy education roles, they practiced as basic clinicians and advocates (Genat et al., 2006). Mitchell and Hussey (2006) clarified that Aboriginal and Torres Strait Islander health workers chose to work in an Aboriginal community controlled health service (ACCHS), because they were free to use their clinical skills and were called on to perform a wide range of procedures, unlike those in mainstream services sector who are often tied to specific clinical areas or to non-clinical work, such as transport and social assistance.

12. Aboriginal and Torres Strait Islander health workers see their role as an equal member of the health service team – a team that comprises at least doctors, nurses and Aboriginal and Torres Strait Islander health workers who bring their own equally critical personal and professional skills to the service of the community.

However, in practice Aboriginal and Torres Strait Islander health workers experience inequality through their treatment by other health professional staff (Ridoutt et al., 2010). Mitchell and Hussey (2006) claimed that a continued source of stress is the lack of national qualifications and recognition of the competencies of Aboriginal and Torres Strait Islander health workers.

Although they are accepted into training courses, sit the same exams and develop the same levels of competency, only registered nurses gain formal recognition across all sectors. Repeatedly, Aboriginal health workers stress the importance of a balanced approach in which Aboriginal and non-Aboriginal staff work collaboratively, and highlight to the requirement for a shared role in providing health care to their communities and to accommodate their needs (Bailey et al., 2006; Lowell, 2001).

6.3 Current Approach for Aboriginal and Torres Strait Islander Health Workers' Continuing Education

The national review of Aboriginal and Torres Strait Islander health workers training revealed that even the health workers in Queensland did not have the underpinning knowledge and skills to meet National Competency Standards and to competently perform the functions expected of them, with very few of them given the opportunity to gain additional education and training (CIRC, 2000).

Many training providers found it difficult to fulfill the needs of Aboriginal and Torres Strait Islander health workers due to the diversity of location, Aboriginal and Torres Strait Islander health workers' duties, literacy and numeracy skills, community needs and health organisation priorities (CIRC, 2000).

Previously published studies concluded that the relevant issues and important factors in implementing and sustaining Aboriginal and Torres Strait Islander health workers' continuing education programs were as follows:

1) Lack of a common approach to their education and training, status, registration, career and award structures and professional recognition;

2) Lack of clarity in paraprofessional roles and training for their roles;

3) Lack of an active involvement in determining program goals and objectives;

4) Lack of a planned evaluations for their continuing program;

5) The lack of Aboriginal health worker specialisation courses;

6) Inadequate travel and accommodation resources;

7) Lack of planning and coordination for health workers training within and between State and territories;

8) Employment of health workers by two different organisations; Queensland Health and Aboriginal & Torres Strait Islander Community Health Services (ATSICHS); which leads to a lack of co-ordination and consistency in health worker training,

9) Training opportunities were often poorly distributed in terms of location, were difficult to access and lacked the ability to meet the learning needs of many health workers;

10) Despite the many programs available, there were many health workers who had no formal qualifications (in some States and Territories they constituted 40-60% of this workforce).

11) There was a lack of refresher courses available for health workers to upgrade their skills and knowledge;

12) Position descriptions in the workplace did not specify a qualification requirement;

13) Senior positions and promotional opportunities were limited, and there was an absence of sustained funding for these positions;

14) The programs which have focused on medical services and clinical management, and attempted to meet the social, cultural and environmental needs of Aboriginal people, have been relatively under-resourced; and

15) The unavailability of professional development and any incentive to further study (CIRC, 2000; Genat et al., 2006; Giblin, 1989; HRSCFCA, 2000).

Ridoutt et al. (2010); Trudgen (2000) agreed that it was important for Aboriginal and Torres Strait Islander health workers to have clearly-defined roles and the absence of a strategic vision for their roles meant that it became difficult to develop a range of important human resource interventions; all of which are dependent on a strong specification of the work to be performed. There is a need to either re-define Aboriginal and Torres Strait Islander health workers' roles and responsibilities in the determination of developing education and training or restructuring existing programs to levels applicable to their actual occupations (Williams et al., 1996).

In addition, Fleischl (2001) pointed to the effect that the power knowledge relationship of dominant groups and individuals within the culture has a significant impact on deciding the content and design of continuing education program development. The various health programs developed by governments and others never seem to work, because they get their authority from the dominant culture system of law, not Aboriginal law (Trudgen, 2000).

6.4 Suggestion for Improving Aboriginal and Torres Strait Islander Health Workers' Continuing Education

On the international level, WHO (2007) suggested the development of Aboriginal health workers could achieved by providing them with proper development and training on a regular basis so that they could understand the change in health problems and the work to be done.

The application of the following strategies should lead to a perceptible change in social values to create self-responsibility, self-reliance, self-discipline and partnership for health for all the community level; namely: providing them a proper referral system for sending sick people from the community to a higher level of care; institutional support throughout their career, incorporating their professional development needs into health planning, implementing and monitoring their activities to ensure efficiency and effectiveness, and clear government policy and operational back-up for their effective development and deployment.

On the national level, AHMAC (2002); QATSIHPWWG (2008) indicated that closing the Aboriginal Australian health gap could be achieved by improving the vocational education and training sector whose role it was to support the training of Aboriginal and Torres Strait Islander health workers' education and professional development.

Also, the NRHA (2006) recommended the need for competency-based education and training, professional recognition and national registration for Aboriginal and Torres Strait Islander Health Workers.

The Commonwealth, in conjunction with States, Territories and the community controlled sector, could develop a national system of training for Aboriginal and Torres Strait Islander health workers, which is based on agreed national standards and competencies, and takes into account the varied nature of the roles of Aboriginal Health Workers. The national system should incorporate a combination of:

1) Basic local training, based in community controlled organisations involved in practical work within the community;

2) Block release type training, leading to more advanced qualifications, through accredited training organisations, including the Australian Medical Syndicate (AMS); and,

3) More formal undergraduate and post-graduate training through Technical And Further Education (TAFE) and Universities.

The development of a national training system also is supported by the introduction of common classifications for Aboriginal and Torres Strait Islander health workers, and an agreed career structure (HRSCFCA, 2000). Aboriginal and Torres Strait Islander health workers' colleagues (doctors & nurses) regard them as potential assistants, and for improving of their continuing education, they need:

a) A greater understanding of the human anatomy in order to interpret clinical data.

b) Greater exposure to the training of other health professionals, and more practical training in a structured and supervised environment.

c) Putting greater emphasis on inter-personal investigative skills and on the understanding of medications.

d) In-depth of training in specific areas rather than training as broad generalists (specialised in-service training).

e) Ongoing refresher courses and practical supervision (Genat et al., 2006).

Pellekaan & Clague (2005) assume that there is increased funding directly for health services, especially in remote areas and for education, and this should mean increased opportunities for accessible training for Aboriginal personnel at all levels including local health workers and adequate cultural awareness for non-Aboriginal people, especially health professionals. Williams et al. (1996) recommended that education and training programs for Aboriginal health and education professionals should include integrated modules promoting facility in effective cross-cultural communication, also the providers of health education and education training should establish more open communication with employers with a view to reducing the perceived gap between work place and training institutions offerings.

6.5 Interviews

The purpose of the interview was to assess the current continuing education and training program for Aboriginal and Torres Strait Islander health workers. It focused on issues impacting on the currently available program, based on the perspective and the experiences of a diverse range of key stakeholders, exploring their expectations, recommendations, and sought their opinions about how it could be improved.

Data was obtained through semi-structured, open-ended, in-person and telephone interviews of approximately 30 minutes duration with key stakeholders. More detailed information about the methodology and the procedure of qualitative interviews was explained in Chapter Three.

6.5.1 Ethical considerations

Ethical approval for the study was granted from the office of research and high degree of University of Southern Queensland, and approval from Technical and Further Education (TAFE).

6.5.2 Participants

The 10 participants involved in the interviews had all worked for a long time, not less than two years, in the area of Aboriginal health education and training, and had various roles as educators, general managers, program managers and developers, coordinators and health workers.

Therefore the exploration for the needs of Aboriginal and Torres Strait Islander health workers has been derived from a group with varied backgrounds and different points of view to those involved in Aboriginal health education and training.

Thirty stakeholders were invited but only 10 participated. There were seven female and three male subjects. Two of the participants started their career as Aboriginal health workers. Table (6.1) describes the participants by role, gender and work experiences.

6.5.3 Getting in

Participants were invited to participate in the study via a flyer that was distributed in their work places (See Appendix 13.7), and through personal approaches. Introductory letter and information sheets were distributed to the participants before the interview (See Appendix 13.4, 13.6). Open-ended semi structured interviews of approximately 30 minutes were conducted and audio taped with the stakeholders. Permission to use the recorder was requested and a signed consent form was obtained (See Appendix 13.5).

Table (6.1) Participants by role, gender and years of experiences

Participants	*Roles*	*Gender* *(F/M)*	*Years of Experiences*
01 JH	AHWs' TAFE lecturer	F	4
02 RD	AHWs' University lecturer	F	5
03 LS	AHWs' University lecturer	F	4
04 AV	Director of Training centre for AHWs	F	7
05 JF	AHWs' general manager	M	*5*
06 SL	AHWs' program coordinator	F	*3*
07 RT	AHWs' coordinator	M	15
08 MK	AHWs' program manager	F	15
09 CWS	AHWs' development officer	M	7
10 ZW	AHWs' University lecturer	F	3

6.5.4 Content Analysis

Data analysis started from the first interview and was ongoing until the completion of the writing process. Interview transcripts were returned to the participants for a final check and approval was used as a measure to ensure the trustworthiness of the study.

Transcripts were analysed and interpreted to ascertain the stakeholders' experience and their opinions and perspectives using thematic content analysis.

The interview transcription was organised and divided into sections to facilitate the process of coding data for analysis. Major themes within the topic have been identified from the literature review or given by the participants 'comments in interview, or arose out of the interview guide topic (See Appendix 13.3).

Data collected during the interviews was imported into the NVivo9 computer package along with summaries of the relevant literature. Qualitative Data was coded and categorised concurrently using an iterative approach, and constantly refined over the period of study. Themes emerged from the collected data, and literature review helped in explaining the major emerging themes.

Issues and key themes were identified through reiterative review using QSR NVivo9 computer software to manage the data (See Appendix 13.8). A description of the findings was included in project journal at QSR NVivo9 computer software to show the stages of analysis and interpretation (See Appendix 13.9). There were a continuous follow up from the study's supervisors on the coding and the analysis.

The major theme that emerged indicates the limitation of availability of formal training. The themes and issues were gathered into three major categories which represent gaps in the current ATSI health workers' continuing education and training program; they are: sustainability, efficiency, and acceptability.

6.6 Interpretation of Findings

This study outlines responses from varied stakeholder backgrounds regarding the current Aboriginal and Torres Strait Islander health workers' continuing education program and issues impacting on it. All participants agreed that there are a number of general factors, such as economic, social, cultural, management, and pedagogical factors, which have an enormous impact, and agreed on the need to deal with all these factors together at the same time to close the current educational and training gap.

About 70 percent of the participants believe that improving Aboriginal health could only be achieved by:
1) Ingenious Aboriginal health services in the management, delivery and training sectors;
2) Cessation of dictation to them;
3) Improvement of their education and support provided to them to be self-reliant; and
4) Incorporating their traditional culture into health services.

The remaining 30 percent believed that Aboriginal traditional medicine was irrelevant, and could not compare with Western medicine, and that traditional medicine was difficult to provide it State-run health services. They argue that changing the social environment of Aboriginal people by living in urban areas did not improve their health problems. They identified the need for services provided by non-Aboriginals to be delivered by people who could learn the Aboriginal cultures and provide them with culturally-sensitive services.

In these interviews most of the participants agreed that Aboriginal and Torres Strait Islander health workers were very committed people who were looking forward to supporting their own community and solving their own health problems. Their ambitions were restrained by the limitation on their roles specified in their code of practice. The lack of a unified government body was the main reason for the absence of co-ordination and consistency in health worker training. They also identified that lots of expectations were placed on them from the main health stream and their community, while in the meantime there were big learning and cultural gaps in their training program.

In general, Aboriginal and Torres Strait Islander health workers' educators were supportive and enthusiastic about the development of multimedia program, and the need of educational materials that accurately represent their cultural needs. Most of the participants felt that a training program carrying academic credits would appeal Aboriginal and Torres Strait Islander health workers because it would help them in their current work while moving them toward an academic degree.

The findings and responses from the participants revealed those gaps in their current continuing education and training program which could be summarised under three main categories; sustainability, efficiency, and acceptability.

6.6.1 Sustainability

One theme that emerged was that the current training program is unsustainable. This comes into view as access to continuing education and training is an important factor in improving knowledge retention. The participants reported that this access has been overlooked, and is reliant on the availability of funding and subject mainly to employer approval. Those funds are not steady or planned for, due to the lack of registration or provisional body to govern Aboriginal and Torres Strait Islander health workers.

> *"Doctor, nurses, they receive funding for their professional development but health workers don't receive funding for their training"*, *"They are essentially relying on the district to support their training"* **(04 AV).**

> *"They get a bit of money so they decide to do some education and training and then they run out of money and that's the end of it, sort of things"* **(08 MK).**

> *"Only have the level of health service the district provides or their employer should he be able to do it, there is constriction,.... not as other health professionals maintain their continuing professional development because there is no registration yet for health workers, there is no provisional body to govern... and provide a credential"* **(06 SL).**

Participants explained that face-to-face was the predominant mode of delivery for Aboriginal and Torres Strait Islander health workers' continuing education and training programs, and that this required the gathering of enough health workers from within a reasonable distance to offer it. This mode of delivery is therefore restricted in its location to big cities and district areas, and is not available in remote and rural areas.

It is also dependent upon Aboriginal and Torres Strait Islander health workers' ability to travel. Their travels are also challenged by the availability of funding, and their work and family commitments.

"It is not economically attractive to go to the district because we don't see large numbers, for us it is much more economical to stay here and then get everybody to come to us", "We're often having our training whether in Toowoomba or in Brisbane or in district may be in Cairn or Townsville, so people have to travel" **,** *"they did not come in to training for two reasons first one is financial reason, they don't have the resources or permission to have funds off the district to travel or the other reason is the family commitment"* **(04 AV).**

Participants emphasised the lack of sustainability in terms of funding for programs development and delivery. The economic point of view and business perspective are two major themes indicating the huge influence of the expense of the training on their training strategies and planning.

"It is probably not easy a set up for training and cost a lot of money for training." **(07RT).** *"Economics must play a role"* **(05 JF).**

Participants stressed a lack of planning, stating that there was no unified system to organise Aboriginal and Torres Strait Islander health workers' continuing education and training. It is planned on an individual level with no general management and no collaborative work between the different sectors responsible. The word ADHOC appears as a common theme in all interviews.

"They have no government body, you know the health workers in a sort of structure as I suppose their career force like to assume them to be under the heath but they are actually under the allied health not under a medical health, so they are sort of floating around with no governed body" **(01 JH)**.

"there is need for a structure like council, advisory group, focus groups, meeting group, conferences to appoint the people to get together, and got to talk on a regular basis of structure, so we have a meeting every two months or one month, one week , or two weeks as they decide and always get context reiterated, repeated, emphasized , giving more substance so the sustainability is built in, have the structure as ADHOC the sustainability goes down" **(05 JF).**

"Look it is barely ATHODC when we think about it" **(06 SL).**

" It is more or less one of", **(07 RT)**.

"but it is not regular, not something that they would go out and do every year or every two years or that kind of stuff, I think is use to be ADHOC*,"* **(08 MK).**

Participants revealed that there was a lack of follow up and no way to assess the efficiency of current training programs and no evidence or evaluation that health workers did change their practice as a result of the current program. There is no continuing support for Aboriginal and Torres Strait Islander health workers after completion of their formal training, and guidance mentors. In remote and rural areas, after they finish their formal basic learning, they rely on a manual for management of any specific situation known to them as a Bible which provides them with information about acute and clinical care, chronic diseases care, health promotion, and safe medication management.

> *"So these people, I have a lot of admiration for them, because the tasks that they are given by the program, ok that's the information about the program, congratulations, they are free to go, and no wonder why they have difficulty"* **(05 JF).**

> *"But, whether they actually take that away, anything away with them it's a lot harder to determine. So you know, they might be there and they might be getting this education but I don't think there's any real way of finding out whether it's going to change their practice or anything, so I am not sure how useful it is or if it is acceptable there then"***(08 MK).**

> *"It contains a manual for management of a specific situation, the manual for acute and primary clinical care, this is going through the rural areas all over Qld, the chronic diseases guideline which has a manual as well, has a chronic care manual. Those sorts of books are like a Bible in remote health centers in Qld"* **(06 SL).**

All the above factors reflected in participants' experiences show that there is no sustainability in ATSI health workers' continuing education and training, and that there is a need to have a look at the whole system.

> *"There is no sustainability, that's the key"* **(05 JF)**.

> *"If you are going to have effective training in these areas you need to look far beyond the resources, you actually need to look at the whole system; the whole organization that makes it happen….that's the problem"* **(08 MK).**

Most of the participants support the availability of easy to use resources for information that are available at any time as a way to encourage sustainable continued education and training.

> *" So, an update resource will be handy in all different type of health so you can always get back and have a look at it so you're up to speed with what you know before"***(07 RT).**

6.6.2 Efficiency

The incapability of the current training program to support Aboriginal and Torres Strait Islander health workers to fulfill their roles has been explored in the participant's experience as follows:

All participants agreed that Aboriginal and Torres Strait Islander health workers' initial training was just a starting point that gave them the main elementary skills but it was not enough to prepare them for their versatile roles, that their continuing training program was not sufficient and that they depended mainly on field work to get more information and experience.

> "*At university in three years they have to cover so much so I don't think they will have a comprehensive understanding about different diseases but they have a general idea about it*" **(10 ZW).**

> "*I think the initial training that they conduct is a good basis, it is when they are on ground and further professional development may be lacking, the real community based, the community knowledge, the medical terminology, knowledge about other diseases where they can virtually extend their knowledge and skills*" **(09 CWS).**

> "*, I think they'd get something out of it though I don't think it's* enough," **(08 MK).**

> "*They try to cope with their own level of knowledge and experience. Sometimes they are doing something they has never been trained in or studied how to deal with that problem, and so there is a mismatch, sometimes it is a part, sometime it is a full and sometime it is complete and a good match*" **(05 JF).**

> "*I think when they leave they go to Qld Health where they certainly get a lot of information*" **(02 RD).**

> "*Lots practice learning at the work place .Once they complete this study like any, I suppose, health professionals like to go into the workforce and work with theoretical knowledge and build on that, they try to learn back from what they learn*" **(01 JH).**

> "*as you know with any course study, people come out with a variant of degree of confidence at the end of the program, but a lot of practical learning happens at the work place*" **(06 SL).**

Despite this fact, all participants confirm that there are a lot of expectations placed on Aboriginal and Torres Strait Islander health workers in providing the support for other health work professional colleagues to understand the Aboriginal culture, supplying community health care to the Aboriginal communities and facilitating clinical care, as well as referring the patient to the right place to get the appropriate health treatment and support. They are also the main health providers in some remote and rural areas.

> *"The health workers provide you with a lot of information, culture stuff: when you come, what you can and can't say, what works and what doesn't work, so you can build on that for your teaching"* **(01 JH).**

> *"They deliver the community health care stream not the practice stream"* **(06 SL).**

> **"***We got health workers in rural and remote communities and you know they are the only ones there, they are presented with medical emergencies and their skills are very limited at that stage"* **(09 CWS).**

Some of the participants expressed their concern regarding the limitations in Aboriginal and Torres Strait Islander health workers' background and knowledge. They consider those limitations to be the critical source of their incapability for further training.

> *" Most health workers are working on the operational stream and most health worker do not have a well-known tertiary qualification"* **(04 AV).**

> *"No degree at all, certificate level, we're called sub professional, I am not saying those certificates are not good they are but they are at a very basic level, most of them have done it or are in the process of doing it"*, *"Their knowledge is not working at full speed, they got some knowledge but not a lot, They tend to try to help them do the training course, when they do the course they find it difficult to do that"* **(05 JF).**

All the participants pointed to the gap between what Aboriginal and Torres Strait Islander health workers learn and what they actually do. That gap leads them to feel that most of the information that they learn is irrelevant. Aboriginal health workers that participated in this study complained that despite the fact they spent a long time in training and gaining skills, their role was limited and their training program was not a credit to their career. They learned information in their studies but they do not use it due to the limitations in their code of practice and the extent of their responsibilities and their role. Their role only comprised the delivery of the community health care stream, not the practice stream, and the referring and reporting of the patient. Their clinical role was routinely double-checked by doctors or nurses.

"you are looking at around six to seven years trying to skill up, there is a long process a long time to do it , you look at that time you could become a doctor or a nurse, but they don't graduate at the same level, you have health workers sit at the community practice with doctor and nurse, they're all in the same level, but health workers are more promoted" **(09 CWS).**

" Bearing in mind that course only runs for twelve months and the Qld guide to practice of health workers is very limited, the focus is very limited and they don't have a big scope on that, as everything is double checked with the nurse or the doctor" **(01 JH).**

"They are limited a bit because of their code of practice" **(08 MK)**.

"They have the knowledge about the disease and all their role is to know where to send the patient but they do not deal with the patient in term of diagnosis or giving medication" **(04 AV).**

"They do not need to have a leading role in clinical services in primary health care services; it is more of a reporter role they prepare for" **(06 SL).**

Interviews explored the fact that their studies do not fit with their target group. They study mainly Western medicine; they do not get in their education and training studies any information about Aboriginal traditional healing or bush medicine. In the meantime, their target group was still dependent on their traditional bush medicine, especially in rural and remote areas with a great possibility for negative interactions between traditional and western medicine.

"We use very much western medicine; we don't necessarily talk to them about bush medicine, so we don't necessarily go into bush medicine or other medicine because that is really not the scope of the health workers" **(04 AV).**

"I know some used bush medicine some normal medicine, it's really up to the person, up to the family" **(07 RT)**.

"so by using the traditional medicine, we know it is happening, we know they use the traditional medicine, … the people in isolated areas and remote parts of Qld, ….doctor may describe something making interaction, so it is an awareness program which need to be considered in an awareness plan for use of those traditional medicines" **(06 SL).**

Participants stated that program development is generalised and not based on individual needs. Also most of their current training program was developed without clear objectives and did not

achieve any behavioural changes. They are also heavily dependent on Aboriginal and Torres Strait Islander health workers ' input on the program, as they are considered the main cornerstone in the revision, feedback and advice processes in the development of any new training program from a cultural perspective, leaving them facing the challenge of integrating western health approaches and their traditional cultural.

> " *So it is not planned based on somebody's need or to evidence for the need for clinical training or any specific training,….it is very open to individual interpretation"* **(06 SL)**.

> *"look lots and lots and lots of training has been delivered to this population group of various different ways and it's much bigger than the actual resources, it's to do with the ability to apply the knowledge, You know… the training's gotta be applicable…. But you also need to be very clear about the behaviour change otherwise you're just giving them information that they're just gone file away and never look at again"* **(08 MK)**.

> *"I make sure when I develop the training that I actually let the health workers tell me and give me feedback on what I have done"***(04 AV)**.

> *"They have two bigger roles for the quality of their training and the experiences we put it"* **(05 JF)**.

Some of the participants explained that the inefficiency of the current education and training approach is due to the generalisation in health workers' roles, and they suggested that greater specialization in their role, like with other medical professional colleagues, could help them be more focused and successful in their training, more knowledgeable and competent to fulfill their role at the appropriate standard.

> *"As I said before unless you are specialised in something, I am at the moment under the mental health department, I am very much up to speed on mental health and then I forget stuff, unless you're actually doing it all the time you will lose it"* **(07 RT)**.

> *"there are gaps, their role is generalised in a general situation, a little of a community based program initiative, promotion but when you get to the actual community there is only one doctor and one nurse and health worker so health workers need to be in the same path as their practical colleague, to administer other medical practices"* **(09 CWS)**.

Participants point to the improvement of the current training program to include a wide view of all aspects of program development, not only the program's content or the delivery method, but the system as a whole.

> *"I think when we start talking about education for health workers, we need a go in and talk about everything else that affects it...;. It's not enough to get the content right, it's not enough to get the mode right, to get the delivery mode right, it's a whole system (thing), you gotta get everything right, you gotta get the support, you gotta work through the culture – it's a really hard thing to do"* **(08 MK).**

Focusing on Tuberculosis as an example of a communicable disease, most of the participants realised that there was shortage and learning gap regarding this important topic in Aboriginal and Torres Strait Islander health workers' education and training. Chronic diseases and life style diseases such as cardiovascular diseases, diabetes and obesity are the predominant issues in their training.

> *"Probably not Tuberculosis too much, sexual transmitted diseases, I think they get some information about that, they have a fair knowledge about that, have the knowledge about what to be screening and about sex management . But Tuberculosis is less"* **(08 MK)**.

> *"We do not provide health workers any training in regards to communicable diseases; They don't know a lot, in fact our program is not about communicable diseases, most of our program is about three or four diseases, for example we have training about diseases that have a very high mortality rate such as heart diseases, diabetes, obesity, so those life style issues that affect health"* **(04 AV).**

> *"Chronic diseases have got a huge investment from the government to provide services in remote areas because of the burden of the chronic diseases there, so there is a lot of education about chronic diseases that goes there to isolated areas"* **(06 SL).**

Despite Tuberculosis being a widespread problem all over the world, and its early manifestation appearing as a normal respiratory disease and needing to be diagnosed early by primary health care as soon as possible, participants point to the fact that there is no general training on it.

> *"I know there is a problem now abroad in Papua New Guinea and Torres Strait, definitely it is a problem because they have people who have multiple*

drug resistant TB, the Papua New Guinea people. The TB team based here in hospital they are going regularly up there to treat people" **(08 MK)**.

"Sexual health is covered in those manuals, TB is very small now, small part all over health services" **(06 SL).**

6.6.3 Acceptability

The interviews show a cultural gap in the current training program which was disclosed as follows:

Some of the participants acknowledged that despite the culture difference between Aboriginal peoples, the training program was the same for all health workers irrespective of their origin, culture and language.

> *"We can all categorised them according to one stop shop but they are all very different according to where they grow up, what land they are based on, what family affiliations they have "***(05 JF).**

> *"We have the same product for north, south west or east of Qld"* **(04 AV).**

> **"***The national program's target is mostly national. It has to modify to suit the target community"* **(09 CWS).**

In Queensland, most program development for Aboriginal and Torres Strait Islander health workers' continuing education and training is done by main stream health, which has a predominantly white perspective. This means that it is designed and planned from the perspective of non-Aboriginal program developers, devoid of deep understanding of the health workers and their target group's socio-cultural context in which health problems are constructed.

> *"I think what I realise is that a lot of people develop stuff for Aboriginal health, but you can see that all of it is done by mainstream health, most of them are white, so they said here we go again people told us what is wrong"* **(01 JH)**.

> *"Appropriate education that means something because we've got to stop dictating to them"* **(08 MK).**

Program developers in their attempts to design a very simple, easily understood and uncomplicated program to be used by Aboriginal and Torres Strait Islander health workers, have inadvertently achieved superficial results without real inspiration or sufficient input and

which are not ruled by real understanding or use of Aboriginal learning styles, preferences, pre-existing knowledge, or key performance indicators.

> *"So, they don't really look at deliverables, they don't look at Key performance indicators, they don't look at the delivery system… it's all sort of hello…sit down…let's talk about tobacco, do you smoke? ……. There is not a lot of thought put in,"* **(05 JF).**

Any new knowledge taken to traditional Aboriginal people should be intellectually thorough or it will be rejected (Trudgen, 2009). The content of the current training program is basic and focused mainly on practical issues: "What you need to do and how you can do it", but not so much on the theories, or why they do that. The lack of this sort of culturally-appropriate health information has a negative effect on their health promotion and education role within their own communities.

> *"They are trained to do screening, trained to do swabbing and can take blood, that's more likely a clinical approach but not much the theories, not that much for background stuff more like how they do the blood test and how they do the swab but what to do with this information as opposed to why this is happening and what we can do to prevent it, you know what I mean , It is purely like how they do it, It is not what we should be do to stop that happening or what that means, that sort of information"* **(08 MK)***.*

> *"They need to have that knowledge of how things are treated so it takes away a lot of the fear from their clients"* **(01 JH).**

In general most of the participants were supportive of and enthusiastic about the development of a culturally-appropriate program for Aboriginal and Torres Strait Islander health workers and the need for educational material that accurately represents cultural aspects.

> *"What we put in must suit the tribe of the Aboriginal world"* **(05 JF)***.*

> *" I think that the history side and culture side would really help"* **(01 JH)***.*

> *"We need to be very culture sensitive to what they learn and how they learn"***(02 RD)***.*

> *"This is important as health workers when communicating with patients that they communicate in a way so that patients understand what they are talking about"* **(04 AV).**

The following are some citations from interviews with Aboriginal and Torres Strait Islander health workers which reflect the need for human relations and cultural respect in program development. These citations have remained in my mind and I would like to reveal them as an example of a socio-cultural context surrounding health problems; and reflecting important points could be taken into consideration during the development of a program concerning Aboriginal individual health education and promotion.

> *"most of the elders have limited education, at their time there is no school and all this stuff, so they take a little bit of time to digest the information and to get it and save it, so give them time, if you give them something give them a couple of days or a little bit longer because it is hard to have a decision on the spot, they need to digest a little first."*

> *"Aboriginal and Torres strait Islander people what is important to them is different to the white person, they look to the earth, the land is everything when they make decisions not better for themselves but better for the land.",*

> *" that Aboriginal population, they see the hospital as the last resort so they don't go to the hospital unless they see may be death it is a place to die, yes it is a place to die and the reason is that a lot of their family have died there, because they leave it to the last moment to get treatment, that is the reason they need early treatment,"* **(07 RT)**.

6.7 Outcomes & Recommendations

Responses from the interviews were compared and supported by previously published literature about Aboriginal and Torres Strait Islander health workers ' current continuing education and training.

The outcomes of the needs assessment highlights the presence of gaps in the current continuing education and training program for Aboriginal and Torres Strait Islander health workers, and are indicative of the need for a new concept to improve their continuing education and to support them in their roles. The new concept needs to be able to deliver a sustainable, efficient and culturally-acceptable program, and should be suit there need, fit their preference and well-suited with their culture. Those outcomes could be summarised under three main issues:

1) Lack of sustainability and co-ordination and consistency in Aboriginal and Torres Strait Islander health workers' continuing education and training;

2) Inefficiency of the current program and the presence of learning gaps between what health workers study and the tasks they perform. This inefficiency is an important factor in the struggle of health workers to fulfill their roles, and

3) Presence of a cultural gap due to the lack of deep understanding of socio-cultural contexts in which health problems are constructed. This cultural gap is evident in the current program design which is concerned mainly with adding Aboriginal art and pictures without a deep breal down into cultural localisation, cultural contextualisation, cultural knowledge base, and their oral cultural background in the current program.

Using Information Technology is a promising new approach for closing this gap and in improving Aboriginal health workers' continuing education and training.

These interviews have identified wide-ranging recommendations due to the diversity of the participants' background and roles in the Aboriginal and Torres Strait Islander health workers education and training field. The following are those recommendations from participants' citations:

1. De-limitation for Aboriginal and Torres Strait Islander health workers' training skills so they can be able to carry on more practical duties, and work independently in their own practical locations.

2. Computer-based training could make it easy for Aboriginal and Torres Strait Islander health workers to have access to training in their own place.

3. The training material in the program should be written with Aboriginal patients in mind and should be targeted at the level of learner.

4. There is a need to include bush medicine in Aboriginal and Torres Strait Islander health workers' curriculum to avoid any possibility of adverse drug interactions.

5. Program content should not be limited to what to do but should include more information about why it happens, how it happens, how we can prevent it from happening, and how to educate the community about it.

6. It is better to do the health education and promotion program on an individual opportunistic basis.

7. Development of a training program should have a goal and objective and should achieve behavioural change and determine that change.

8. There is a need for a locally knowledgeable Aboriginal facilitator to deliver the training program to Aboriginal and Torres Strait Islander health workers.

9. To achieve sustainability in program development, there is a need for cooperation between all different sectors working in the fields of Aboriginal and Torres Strait Islander health workers' education and training, and for regular meetings and discussions of barriers, problems and challenges as well as a unification of goals.

10. There is more need for an applied training in the form of a scenario or case-based content.

11. Specialisation of Aboriginal and Torres Strait Islander health workers could help them in retaining information, succeeding in their training, and having more knowledge and competency to fulfill their role to the appropriate standard.

Those results and recommendations were used as a base and a guide in the development of the interactive multimedia health informatics program model for Aboriginal and Torres Strait Islander health worker.

CHAPTER SEVEN: KEY FACTORS FOR MODEL DEVELOPMENT

This Chapter explores the second objective in this study which is elucidating the key factors which need to be considered for developing the program.

The identification began with a review of the literature which served as background information followed by qualitative semi-structured interviews with diverse key stakeholders to explore their expectations and recommendations.

7.1 Overview

Previous studies have indicated that there is a need to leverage knowledge more effectively and to better support the continuing education of health workers, not only to update information and skills, but also for promoting empowerment and to make them feel better supported in their jobs (CSAHTALtd, 1998; Minore, et al., 2009; Ueffing, et al., 2009). Gruen, et al. (2002) claimed the provision of education and skills transfer as well as professional support to Aboriginal and Torres Strait Islander health workers would help turn them into a more skilled workforce able to make an even more effective contribution.

Ueffing, et al. (2009) indicated that the development of learning methods, materials and approaches is one of the most important principles and guidelines for health worker education and the up-scaling of training. Using Information Technology as a new learning approach is understood to be a key tool for bridging the health services and the digital divides through enhancing health care of underserved populations and education of remote health care provider (Hunter, et al., 2007; Sargeant, 2005)

There are a variety of factors that can have an impact on the success of implementations of new technologies including determining learner characteristics, assessing their ability to access technologies, and their comfort level with and preferences about technologies (Willcockson & Phelps, 2010).

Birman (2005) investigated number of factors associated with the use and adoption of new technology by a society, with emphasis on communication technologies; the results showed that chance of technology adoption raises with increasing in the motivation, knowledge, skills, and supportiveness for the user.

Based on Rogers' diffusion of innovation theory, innovation, communication channels, time, and social system are the four key components of adopting new innovations and technology (Sahin, 2006).

Aboriginal and Torres Strait Islander health workers program delivery should have a flexible approach, to avoid a "one size fits all" approach, and recognise cultural and linguistic barriers. Approaches need to be undertaken in a way that each individual is given the opportunity to use a relevant program which can be delivered in a manner or mode that recognises their previous experience and skills, specific needs, learning styles and required outcomes (ATSIHRTONN, 2009).

The key factors that impact the development of a cultural appropriate, interactive, multimedia and informative health program for Aboriginal and Torres Strait Islander health workers could be classified under four major categories, cultural, Information Technology, learning aspects, and interactive multimedia factors.

7.2. Cultural Factors

For new information to be accepted by Aboriginal societies, the process can be just as important as the quality of the content (Trudgen, 2000). Catherine McLoughlin & Oliver (2000) stressed that instructional designers must incorporate the skills and values of the community in creating and developing interactive multimedia, in order to create a unified and authentic learning environment.

This cultural inclusivity could be achieved through placing of learning tasks in the context of the Aboriginal life or cultural experience, and allows learners to access learning resources in a manner that is matching with their values, beliefs and styles of learning; that could increase the learner's motivation (C. McLoughlin & Oliver, 1999; Donovan, 2007).

The story telling is considered a traditional way in Aboriginal cultural. Using a narrative cultural appropriate interactive multimedia learning environment could support the learner toward the understanding of the events and the meaning they hold and not just achieving knowledge of factual events (Gjedde, 2005).

Story content should be meaningful, capable of engaging the learners and should take into consideration possible differences in social and cultural background (Gjedde, 2005). A story teller could mention some issues briefly, or elaborate on details about - what to do, how to do it, when, where, and perhaps why (Berndt, 1982).

Trudgen (2000) explained that an understanding of cultural knowledge base, that is the pre-existing knowledge, is especially important when one culture is trying to share unfamiliar or new information with another culture. This means the new knowledge taken to traditional Aboriginal people should build on their existing, culturally-accepted truths and knowledge base and have to be intellectually through or it will be rejected.

Collins (1995) suggested it can help to incorporate elements of traditional and cultural aspects into the health service for Aboriginal people, through using a bicultural approach where the best elements of both cultures are incorporated into health services.

Previous studies recommended some cultural principles could be taken into consideration during program design. These principles include:

1- The Program designer must take into account the learning styles of Aboriginal people. The program must use graphics as much as possible and be less reliant on text. It needs to be self-paced, with instant rewards and have an absence of negative remarks (Steen, 1997).

2- The use of third party visual and audio tools and the adaption of pictograms and diagrams as opposed to just verbal communication is recommended (Duggan, 2009; Swain & Taylor, 2005).

3- Program designers can influence material and symbolic culture in creating and developing interactive multimedia (Catherine McLoughlin & Oliver, 2000).

4- Learners should not be expected to have advanced computing skills, but development of information literacy skills need to be integral to the learning outcomes (Catherine McLoughlin & Oliver, 2000).

5- Particular consideration should be given to the Aboriginal Australian concept of illness and health care in the program development (Fleming & Parker, 2007).

6- The educational software should be designed in a suitable way for disseminated information between individuals as Aboriginal people commonly share learning experiences in small groups, thus reinforcing the social and collaborative focus of learning, and removing any risk of embarrassment of being publically wrong (Catherine McLoughlin & Oliver, 2000; Duggan, 2009; Dyson, 2002).

7- Starting the program by discussing a realistic health problem in the form of a story makes more sense to health workers, in term of what they have already experienced (Werner & Bower, 1982)

8- An associated website can provide further new information that builds on that given on the program which means that health care professionals will be able to access a wealth of pertinent information regardless of their geographic location (Geissinger, 2001).

Cultural localisation, cultural contextualisation, oral cultural backgrounds, and cultural knowledge base are elements should be considered in development of an interactive cultural

appropriate multimedia educational health program for Aboriginal and Torres Strait Islander health workers.

7.3 Information Technology Factors

Donovan (2007) argued that "*Information Communication Technology (ICT) pedagogies is stills developing field of understanding, and some of these pedagogical qualities include the flexibility of this learning tool, the ability to contextualize the learning to suit individual or small group needs, the use of ICT tools in self-directed or peer-directed learning tasks and the ability to develop a space for learning where learner can interact and experiment of the learning tasks* " (p.98).

Lazakidou, et al. (2006) stressed the importance of more clearly recognizing and appreciating the role of Information Technology (IT) in health care education. Geissinger (2001) supports using a CD as a delivery mechanism for continuing professional education for health practitioners in rural area and suggests also that health workers living in remote areas need to be provided with a CD player as an add-on component if it is not supplied as part of their original computer equipment.

The format of continuing health education has been presented in the past in face-to-face sessions in a geographical location, is now in transition to the use of flexible modes and moved to more extensive use of technology for learning that support professionals so they can study on their own or in small groups in their local area (Leist & Kristofco, 1990).

Health education program offered by Information Technology is a promising innovation training method; especially for health care settings located far from a training facility in areas with poor transportation (Knebel, 2000), because they have the capacity to cross demographic, social, economic and national boundaries; and connect learner to information resources which are important for informal continued learning.

Vivekananda-Schmidt et al. (2004) indicated that as with any new medium, the gain from Information Technology tools relies not only on their design, but also on their successful integration into the existing user culture. So they need to be culturally sensitive, relevant to local health care priorities and supportive of local resources (Sargeant, 2005).

Mugumya (2010) observed in a study for promoting continuing medical education among rural health workers using information and communication technology (ICT), that there were improvements and empowerment of the rural health worker in the area of computer literacy, and the project bridged the digital divide between the urban-based and rural-based health workers.

This is evident through the increase of computer knowledge obtained by staff members who participated in the study. Ivers & Barron (1998) point out to the importance of program's users to have the necessary prerequisite skills for using the computer and multimedia tools.

7.3.1 Information Technology within Aboriginal Australian

The wave of privatisation, deregulation and liberalisation of the information and telecommunication sectors during the last two decades have paved the way for more innovative implementations of information communication technology (ICT) initiatives in Aboriginal communities (Salazar, 2007). ICT tools can support Aboriginal learner' life long education through distance education programmes, access to information via the internet, communication with other learners or the establishment of learning communities where understandings and experiences can be shared (Donovan, 2007).

Information Technology literacy has become a critical aspect of the incorporation of Aboriginal cultures into the information society (Salazar, 2007).

There has been a general concern that Aboriginal and Torres Strait Islander groups have been left behind in the diffusion of new information and communication technology (ICT) and the related skill development, such as Information Technology literacy which has become a critical aspect of the incorporation of Aboriginal cultures into the information society; and that this may have long term implications for their ability to participitate in the society.

This concern has been corroborated by the 2001 census which provided a useful aggregate picture of home access to computer and the internet and included information on Aboriginal Australians for the first time, data indicated that only 18 percent of Aboriginal Australian population has computer at home and 9 percent had access to the internet (Daly, 2007).

Rate of Information Technology use were higher among young people than older people, and were markedly lower for Aboriginal population living in remote and very remote areas than Aboriginal people living in major cities who were most likely to have used information technologies (ABS, 2004). Educational qualifications, income, and living outside a major urban area were determinants of access to the internet at home and associated with lower levels of computer and internet usage (Daly, 2007).

Using Information Technologies is a potential strategy for improving the education of Aboriginal and Torres Strait Islander health workers and the quality of care provided within their communities (Collyer, 2006). As bridging the digital divide is understood as a critical opportunity to contribute to bridging the health divide between Aboriginal and non-Aboriginal Australians (Hunter et al., 2007).

Information Technology, like all technologies, comes embedded with the values of the society which produced them (Dyson, 2004), and the main challenge with ICT introducing to Aboriginal groups is to make it relevant to the user (Kinuthia, 2007).Technology is only useful as an answer to health problems after being modified and adapted by a particular community to meet the conditions and values of that community including its cultural and spiritual values (Barlett, 1995).

Previous published studies have explored the fit of computer and information technologies with Aboriginal learning preferences and learning style theory. Duggan (2009); Dyson (2002); O'Donoghue (1992) argued that information technologies can appeal to Aboriginals' visual-spatial strengths through the use of colorful graphics.

The use of technologies can require little writing so these can better suit an oral cultural background. This approach could produce more positive learning experiences for Aboriginal learners, allowing them to take greater charge of their own learning, and help in the development of digital literacy

Donovan (2007); Foster & Meehan (2007) claimed that multimedia and ICT are readily accepted and are being used creatively and passionately by Aboriginal learners, especially younger Aboriginal learners and those using computers at work who were adept at using the technology.

Samaras (2005); Kinuthia (2007); Duggan (2009) confirmed that Aboriginal groups have historically taken advantage of new technologies depending on availability, access, perceived benefit and economic capacity; and they refer the digital divide within the Aboriginal Australian to the inequality and the limitation in access to computer facilities or the unavailability of suitable capabilities to use such resources effectively. The most important factor affecting Aboriginal access to ICT is their geographical distribution as 70 percent of them live outside major cities (Samaras, 2005).

7.4 Learning aspects

From an educational point of view, programs should be a challenge to the user and present novel, rich problems that involve a synthesis of current information and a move towards a more sophisticated understanding. O'Brien (2002) recommended that multimedia program should focuses on the theories of constructivism and social constructivism and their relation to how software learning program have been produced, also the research program would include constructivist principles to ensure maximum user engagement in the learning process.

O'Brien (2002) explained that the framework within the basic underlying idea of constructivism build is that each individual has an existing knowledge base and all new information has to be accommodated. Accordingly, learning is not viewed as transfer of

knowledge but the learner actively constructing, or even creating, his/her knowledge on the basis of knowledge already held.

The socio-cultural theory stresses the interaction between developing people and the culture in which they live and focuses on how cultural beliefs and attitudes impact how instruction and learning take place (Cherry, 2011).

This theory points out that learning is a form of enculturation which occurs in a social context, in which the individual is socialized through gradual participation in tasks, assisted by adults until full competence is attained and the accumulated achievements of particular groups shape the intellectual development of the individual (Henderson, 1996; McLoughlin and Oliver, 2000; Ormrod, 1999).

7.5 Interactive multimedia factors

Multimedia used for communication and education purposes proved to be compatible with cross-cultural and with Aboriginal preference for communication and education (Coulehan, et al., 2005), as delivery of information comes in a range of forms which may include text, graphic, sound, and video (still or full motion), which provides the user with a range of ways of interacting with the material it contains (Alber, 1996).

Villamil-Casanova and Molina (1996); Phillips (1997) indicated there are many key factors to be considered in designing interactive multimedia program from which the learner can actually learn rather than being told, and those essential factors are critical parameters for planning the production of an interactive application.

The most important factors are that the design of the model should be based on sound educational principles and theoretical approaches to learning and instruction (David M. Kennedy, 2002; G Kennedy, et al., 1998; Phillips, 1997).

Effective learning from multimedia displays is subject to a number of requirements which can be categorized into the processing, fitting and task design requirements (Rouet, 2001). These requirements should take into consideration during program design.

7. 5.1 Process Requirement

Previous studies revealed some principles for program development procedures, they include the following:

Multimedia principle: which means the presentation should consist of both words and pictures. Any relevant instructional graphics to supplement the written text should be incorporated to improve learning through the dual coding of verbal and visual information (Donnelli, et al., 2009; Mayer, 2001).

The integration of a variety of multimedia elements will appeal to different learning styles, help the audience comprehend and retain more information, and direct the learner's perception and draw attention to key elements, so the learner is actively engaged in the learning task (Cartwright & Cartwright, 1999; Hannafin & Peck, 1988; Villamil-Casanova & Molina, 1996).

Concise principle: which means to keep the model small and focused (Mayer, 2001; Phillips, 1997). Cartwright & Cartwright (1999) claimed audiences prefer short program that address the problem accurately and delivers the message efficiently.

Coherence principle: which means avoiding using material that not essential to instruction and excluding any extraneous words and pictures deemed as unnecessary information that impede learning (Donnelli, et al., 2009; Phillips, 1997). In order to find the middle ground between maximizing the interaction and avoiding unnecessary activities, information should be closely related to the specific objectives of the program (Hannafin & Peck, 1988).

Modality principle: Fahy (2005); Donnelli, et al. (2009) suggested include audio to explain graphics as audio enhances learning more than text.

Measurable Objectives: Hannafin & Peck (1988) pointed out the presence of appropriate measurable objectives improves the probability of program success.

Contiguity principle: Fahy (2005) revealed learners learn better when corresponding words and pictures are presented simultaneously and near rather than successively and far from each other on the page or the screen

7.5.2 Fitting Requirement

The significance of program content and the target audience's character and needs are important factors for develop an appropriate program

Model Content: The content of the program should present the information that will be conveyed, informative, and not just entertainment (Cartwright & Cartwright, 1999; Mayer, 2001). Villamil-Casanova & Molina (1996) point out that using multimedia materials that will help convey the intended message or information is one of the critical elements in order to develop a successful multimedia application.

O'Brien (2002); Rouet (2001) observed that learners are most likely to use multimedia programs if the information presented is relevant to their goals and experiences, fit their needs, and given their skills and objectives.

Target Audience: Previous studies revealed the successes of instruction interactive multimedia programs were greatly influenced by the audience's background and characteristic and should be directed to the interest and abilities of the audience. That could be achieved by

considering and identifying of the audience's needs and expectations and assess their knowledge and skill levels accurately (Cartwright & Cartwright, 1999; Fahy, 2005; Hannafin & Peck, 1988; Villamil-Casanova & Molina, 1996).

7.5.3 Task Design Requirement

Previous studies concluded some important issues which should take into consideration in designing the program:

Introductory objectives and clear directions: This factor is important so that it is more obvious to the learner what the goals of instruction are, what is expected of them as they traverse the program, what information, skills and strategies will to recall for use during acquisition, and what learning objectives should be achieved, so that the learning accumulates in a logical fashion (Cartwright & Cartwright, 1999; Hannafin & Peck, 1988; G Kennedy, et al., 1998).

Navigation and orientation: For the tasks to be authentic, they should promote ownership by the learners with the implication that interactive multimedia software should promote a high degree of learner control both in program function and in choice of activity (O'Brien, 2002).

A consistent and clear navigation system is required; that is accessible by the learner at any time and able to provide the learner access to general features and an overview of the entire application; is a crucial aspect of an effective model (G Kennedy, et al., 1998; Luther, 1994). Determination the navigational structure, linear, hierarchical, nonlinear or composite, is an important design consideration in multimedia application development (Villamil-Casanova & Molina, 1996).

Interactivity: David M Kennedy & McNaught (1997); G Kennedy, et al. (1998) emphasized that interactive multimedia software should provide a high level of interactivity as it encourages deeper processing of learning material.

Sequencing: Cartwright & Cartwright (1999); Hannafin & Peck, (1988); G Kennedy, et al. (1998) stressed that the content of the model should be cohesive, well structured and designed, organized into manageable sections of content, and based on principles of instructional design.

Presence of consistency   between learning objectives and content of interactive multimedia program (G Kennedy, et al., 1998)

Aesthetics (Appeal): Hannafin & Peck (1988); Mayer (2001) ; Phillips (1997) claimed that in order for a project to be a success, the information must be presented in an attractive way, look good, and maintain learner interest. A thorough understanding of the aesthetic choices in program production design is critical for a program (Cartwright & Cartwright, 1999).

*Sophistication***:** Hannafin & Peck (1988); Mayer (2001) recommended that the interactive multimedia model designer needs to take advantage of the latest technology developments and use the computer's resources wisely.

Modularity: Luther (1994); Phillips (1997) claimed that learning is best facilitated by breaking a subject down into a series of single thoughts, this splitting of a program into a set of independent parts can ease the development task.

Feedback: Hannafin & Peck (1988); Hoffer & Barnett (1990) suggested evaluating the learner's response by providing specific immediate feedback with justifications for correct answers and explanation for the incorrect.

*Individualized***:** Cartwright & Cartwright (1999); Fahy (2005) identified that individualisation can help in adapting to the unique needs of each person's preferred learning style. Programs may be different in the level or depth, sequences of instruction, and length of time to complete a given section, and can be offered at different times and places to suit the needs of different learners

7.6 Interviews

The purpose of the interview component of the methodology was to gain a perspective from various stakeholders on what are considered to be the keys factors which would impact the development of a continuing informative program, and how the expected interactive multimedia model can be designed in order to accommodate to the learning approaches of Aboriginal and Torres Strait Islander health workers.

Data was obtained through semi-structured, open-ended, in person and telephone interviews from key stakeholders. More details information about interviews procedures, ethical consideration, sampling strategies, participants, and data analysis were described in previous chapters three and six.

7.6.1 Analysis

Interview transcripts were returned to the participants for a final check and approval. Transcripts were analyzed and interpreted for stakeholders' experience, opinions, expectations and perspective for model' design using thematic content analysis.

The interview transcription was organised and divided into sections to facilitate the process of coding data for analysis. Major themes within the topic have been identified from the literature review or given by the participants in interviews, or arose from the interview guide topic. Issues and key themes were identified through reiterative review using QSR's NVivo 9 computer software to manage the data.

The themes and issues were gathered into major categories which represent the Keys factors that could impact the design and development of a cultural appropriate Interactive multimedia informative health program for Aboriginal and Torres Strait Islander health workers. They are: cultural factors, Information Technology availability and literacy, and learning aspects.

7.7 Interpretation of Findings

Transcripts were interpreted for the stakeholders' experience, opinions, expectations, and perspective. The themes and issues were gathered into major categories which represent the Keys factors that could impact the design and development of a cultural appropriate interactive multimedia informative health program for Aboriginal and Torres Strait Islander health workers. They are: cultural factors, Information Technology availability and literacy, and learning aspects.

This study outlines responses from stakeholders of various but relevant backgrounds. All participants agreed that there is no cultural obstacle could prevent Aboriginal health workers from using IT as a new means to deliver a sustainable, efficient and culturally-acceptable program.

They concluded that there are a number of general factors, such as cultural issues, Information Technology literacy, the availability of the technologies, and learning aspects which have an enormous impact on the program developments, and there is a need to consider all these factors together at the same time.

7.7.1 Cultural factors

The diversity of cultures between Aboriginal Australian peoples and the variety between Aboriginal and Torres Strait Islander health workers' knowledge, background and code of practice in each Australian state have an impact on program design and content, and reflect the need for program to accommodate all this multiplicity. Participants explained that there is a need to produced program template which has a general, wide and stable character to suit work in every community.

> *"We had great difficulty because Aboriginal health workers from Victoria have different experience than health workers from Darwin, from NT, so very difficult"* *(04AV).*

> *"They are more traditional in the NT because of the geographic location and the set-up of communities" (01JH),*

> *"You try if you were specifically doing health area in Qld but it may different if you going up to Torres Australia area you start to look at turtle and things of their culture up there."(03LS).*

"And the planned tool kits is work in this area, and that area and every area" (05JF).

All participants agreed that Aboriginal and Torres Strait Islander health workers should be involved in the program development through their continuing formative evaluation of the program in all its development steps, and the program content should be relevant, and directed to their level.

"I have my ideas but I can't, I don't know if they are correct or efficient and effective until I discussed with Aboriginal Health workers, because who am I? "(05JF),

"You can make a draft and get some advice, before you finish the program. Just let have a look in them the sense is enough, cultural, get the message across, feedback" (07RT),

"If you want to make it cultural appropriate you need to be guided by health workers" (08MK),

"it is very important for anything we could develop that we have inform by the health workers and have a say into the development of it" (04AV).

All participants commented on the importance of cultural points which should be taken into consideration during program design. These points were seen as important in developing the right tool kits which can be used by all Aboriginal Australians. These points include the following:

1. Make the program simple, easy to understand and not too long, but in the same time it should be intellectually thorough and relevant, *"if you want it get across the point make it how it is relevant to their life" (07RT)*

2. Design the program to suit different Aboriginal cultural backgrounds, by emphasis on their common general cultural issues, like storytelling; minimize the written text, narrative, more visual and colorful, and using diagram and pictures familiar to them

3. Gender issues for the target group should put into consideration in program design.

4. Simplification for the medical terminology by using pictures and simple general words, *"most Aboriginal population do not have access or knowledge of higher medical terms , you would not go in that and talk in high medical jargon"* (03*LS*)

5. Using Aboriginal sound and accent in the narration

6. Using Australian English as a best common language for all different Aboriginal Australian.

7. Program content written with the Aboriginal patient in mind.

8. Using case study or scenario about Aboriginal people.

9. Knowledge sharing can be fostered by designing a stories module to be used by ATSIHWs in their health education and promotion roles within their own communities.

10. Aboriginal health workers should share in program development through continuing formative evaluation throughout all the development process.

Some of the participants supported involving the traditional bush medicine in program content. They argue that it could be a way for attraction to health workers and also because most of Aboriginal Australian still use their traditional healing methods which could act as a cultural barrier for them to use the western medicine and lead to drugs interaction.

We should put into consideration that the traditional bush medicine is differing from place to other and depend on the location and what native plant available in different areas.

7.7.2 Availability and literacy of Information Technology

The benefits of the program depend on the assumption that Aboriginal and Torres Strait Islander health workers have access to suitable Information Technology.

This assumption has been assessed in the qualitative interview, by focusing on IT literacy and the availability of IT resources for Aboriginal and Torres Strait Islander health workers.

Interpretations of material gathered in interviews indicated that most health workers should have basic computer literacy and facilities because they usually need to perform work on the computer such as prepare a resource or the administrative task.

Some participant point to that younger generation within Aboriginal health workers is more confident in using the computer than the older.

All the participants agreed to the major barriers for implementing the planned model for Aboriginal and Torres Strait Islander health workers are the availability and access to the equipments, its efficiency, maintenance, the cost to keep it running, and updating and training in many remote areas.

> *"They can use the computer, the basic computer (05JF),*
>
> *"I think they become able to use the computer I think because in health you have to do a lot of work on the computer (02RD),*
>
> *" We may get one or two in class not confident in using the computer but they are not from the younger generation (01JH)",*

"It is the older ones who shy away from the data collections system, and they get someone else to do it for them, they are scared, they are going blow up the computer or something(08MK),

" There is many health workers do not have access to computer, health professional have access to computer, but health workers don't have easy access to computer (04AV),

"You can find computer everywhere but the expectation that they all functioning may not actually be (06SL),

"The most difficult things that may find difficult to technology is the maintenance,, in those remote areas there is no that support that technological support so things don't work that just don't work (03LS).

7.7.3 Learning aspects in model development

Participants indicated that the program should include clear defined measurable objectives and achieve these objectives. This achievement could be measured during the program evaluation. They are requested that the program should be continuing, sustainable and planned on need analysis.

"If you are doing training you really do need to have an idea that there's going be a behaviours change at the end of it and know what it is (08MK)",

"It *could be continuing* (07RT)",

"Make *sure that you planed the program based on the context analysis and need analysis* (05JF)"

7.8 Results & Recommendations

The findings in previous published studies and the interview results are complementary and supportive to each other as shown in table (7.1).

These results and recommendation shall be used as a guide in the next phase of this research for development of an interactive multimedia health informatics model for Aboriginal and Torres Strait Islander health workers as a source of continuing education, updating and as a cultural appropriate sources of information.

The main findings revealed that the most important key factors could be categorised under four main categories: cultural factors, Information Technology availability and literacy, and interactive multimedia factors.

Cultural factors were cultural inclusivity, oral cultural, pre-existing knowledge, and Aboriginal learning style. Interactive multimedia factors were the requirements for the process, fitting and design of the program.

Culture is perceived as essential to Aborigine Health workers' education. All participants commented on the importance of cultural points which should be taken into consideration during program design.

These points were seen as important in developing the right tool kits which can be used by all Aboriginal Australians.

Table (7.1) Key Factors for model development
Comparison between the results of the research approaches

	Literature review	**Interview**
Cultural Factors	- Cultural localization, cultural contextualization, oral cultural backgrounds, and cultural knowledge base are elements should be considered in development of an interactive cultural appropriate multimedia educational health program for ATSIHWs.	- The diversity of cultures between Aboriginal Australian peoples and the variety between ATSIHWs' knowledge, background and code of practice in each Australian state have an impact on program design and content, and - There is a need to produced program template which has a general, wide and stable character to suit work in every community.
IT	- Limitation in access to computer facilities or the unavailability of suitable capabilities to use such resources effectively. - Learners should not be expected to have advanced computing skills, but development of information literacy skills need to be integral to the learning outcome	- The major barriers for implementing the planned model for Aboriginal and Torres Strait Islander health workers are the availability and access to the equipment, its efficiency, maintenance, the cost to keep it running, and updating and training in many remote areas

Learning Aspects	- The underlying basis of designing instructional multimedia is the theory of learning which should be employed to produce measurably better instructions.	- Program should have clear defined measurable objectives and should achieve these objectives. Program should be continuing sustainable and planned on context and need analysis
IMM	- Effective learning from multimedia displays is subject to a number of requirements such as: Multimedia principle, Concise principle, Coherence principle, Modality principle, Contiguity principle, Model Content, Target Audience, Introductory objectives and clear directions, Navigation and orientation, Interactivity, Sequencing, Presence of consistency, Aesthetics (Appeal), Sophistication, Modularity, Feedback, and Individualized.	- Program should design to be simple, not too long, easy to understand, intellectual through, relevant. - Gender issues should be considered. Using narration in form of storytelling, and minimise the written text. - Interactive material should be more visual and colorful; diagram and pictures.

CHAPTER EIGHT: CULTURAL ELEMENTS IN MODEL DEVELOPMENT

8.1 Overview

The cultural context of the national competency standards relating to Aboriginal health workers is based upon an acknowledgment and support of the diverse cultural and traditional values of communities that the health worker works in; and recognition that health workers are upholders of traditional and cultural values, and their behaviour and practice should be culturally sensitive and; supportive of traditional healing and health, knowledge and practices (CSAHTA Ltd, 1998).

Despite the fact that health related research has produced useful data on the extent of the health problem within Australian Aboriginal communities, this data has not been translated into appropriate interventions and many public health programs designed to be "culturally-appropriate" with Aborigines' involvement, proved to be less than effective in changing the health problem as intended (Pellekaan and Clague, 2005; Prior, 2009).

Searching the literature to explore the reasons for ineffective interventions into the current health programs for Aboriginal and Torres Strait Islander health workers and their communities reveals the following:

1) Australian's Aboriginal people call the health education program used in health promotion "a health education through white man's eyes" (Keleher, 2007), as much of the health program's training for Aboriginal and Torres Strait Islander health workers has been directed from a white, middle class perspective (Collins, 1995).

2) The monoculture health system, based exclusively on Western medicine, do not fully reflect the multiple cultures, marginalises Aboriginal peoples, and devalues their traditional health systems. Furthermore, the education of health practitioners is based on a biotechnological approach and ignores the contributions of Aboriginal cultures (Cunningham, 2009).

3) The mainstream cultural material designed for Anglo Australian education and training is not always pedagogically appropriate for the needs of Aboriginal and Torres Strait Islander health workers (CIRC, 2000; McLoughlin and Oliver, 1999).

4) The unique learning style of Aboriginal and Torres Strait Islander health workers is reported to differ from those emphasised in mainstream Western education and training (CIRC, 2000).

5) Health beliefs differ between cultures and it has been identified that the differences in the Aboriginal and non-Aboriginal constructs of health impacts negatively on the effectiveness of mainstream healthcare provided to Aboriginal peoples (Gorman et al., 2006).

6) Conservative traditionalism is the main cause for the inability of the Aboriginal culture to take advantage of the proven successes of Western medical science (Saggers and Gray, 1991).

7) The western biomedical model in the context of communication across cultures is conceptually limited, in terms of the way it looks at and deals with health and illness; it is primarily interested in the recognition and treatment of disease; and it is culturally relative in that it offers a particular rather than universally acceptable way of explaining health (Coulehan et al., 2005). In the meantime, the traditional Aboriginal medicine seeks to provide meaningful explanation for illness and to respond to the personal, family and community issues surrounding illness (Devanesen, 2000).

8) Gorman et al. (2006) argue that western medicine sees non-western health practices as less credible, despite the fact that number of Aboriginal patients were being treated by western health care practitioners, they utilised traditional healing practices to improve their general health status; and continue to explain the causes of their sicknesses through their traditional beliefs (Devanesen, 2000).

9) Western medicine and associated health care practices are themselves innately cultural, that is, they reflect the beliefs and practices of the health professionals who take on those roles (Saggers et al., 2011).

10) The separation of research data from human experience, lack of understanding of socio-cultural context in which the problems are constructed, and therefore the cultural context surrounding health problems lose its significance (Prior, 2009).

11) Language barriers and the differences in culture and world views make it difficult to establish common ground between Aboriginal and non-Aboriginal constructions of illness, causation and treatment (Coulehan et al., 2005).

12) Aboriginal and Torres Strait Islander peoples are not a homogenous population. They have a diversity of cultures, histories, and geographical locations, this reflects the need for educational materials to accommodate for the diversity that any group may bring to the educational setting (McRae et al., 2008; Phillips, 2004).

The main goal of program development should not be just to create an interactive multimedia model for Aboriginal and Torres Strait Islander health workers, but also to ensure that the model promotes Aboriginal approaches and values (Robbins, 2007).

Aboriginal knowledge has been described as personal, oral, experiential and holistic in nature, and is conveyed in narrative or metaphorical language (Castellano, 2000).

Cultural localisation, cultural knowledge base, cultural contextualisation, and oral cultural backgrounds are elements and principles should be considered in development of an interactive cultural appropriate multimedia educational health program for Aboriginal and Torres Strait Islander health workers.

These aspects of Aboriginal approaches to educational technology were chosen because they reflect a broad scope of the educational technology development process; interface, interaction, and content (Robbins, 2007).

8.2 Cultural Localisation

Cultural Localisation is a means of incorporating the values, styles of learning and cognitive preferences of the target population (McLoughlin and Oliver, 1999). Recognition of differences in learning preferences of Aboriginal and Torres Strait Islander learners, the diversity of learning styles represented across the Aboriginal and Torres Strait Islander communities, and the recognition of the need for change is important when developing appropriate educational programs, and should be accepted and recognised (Donovan, 2007; Williams et al., 1996).

Environmental factors such as socio-cultural backgrounds, experiences in upbringing and earlier educational experiences will have an impact on Aboriginal learning styles (Milton and Vozzo, 2010). The most obvious way that educational technology can be made culturally inclusive is by including the cultures of learner in the educational content (Robbins, 2007).

Huges (1987) describe Aboriginal cultural and learning styles as dependent on repetition, listening, observation, avoiding direct eye contact and criticism, use indirect questions and instructions, and demonstrating caring on an individual and group basis. Over the last two decades the most influential theory of Aboriginal education has been Harris' Aboriginal Learning Styles theory (Dyson, 2002). Harris (1980) observed Aboriginal communities in the Northern Territory for two years and based on this research, identified five major traditional informal learning style or strategies. He concluded that Aboriginal learning styles differ from mainstream non-Aboriginal learning styles in the following ways:

1) Learning by observation and imitation;
2) Learning by personal trial-and error;
3) Learning in real life activities performed by the learner;
4) Context specific learning; and
5) Person orientated (Duggan, 2009; Harris, 1980).

Barners (2000) offer an insightful perspective on Aboriginal learning preferences that can be summarised as follows:

1) They prefer oral to written methods;

2) They prefer the use of diagrams and visuals to help explain written text;

3) They prefer to learn in practical settings;

4) They prefer to learn in a holistic way by having an overview, then major headings prior to detail; and

5) Aboriginal learners are more group oriented, and less concerned with personal achievement, (Milton and Vozzo, 2010)

Previously published studies have explored the fit of computer and information technologies with Aboriginal learning preferences and learning style theory (Duggan, 2009; Dyson, 2002; O'Donoghue, 1992). Donovan (2007) points to there are many overlapping commonalities between Aboriginal and ICT pedagogical systems, and many aspects of ICT pedagogy would work with Aboriginal learners. Table (8.1) examines some comparable features of these two pedagogies.

Table (8.1) Aboriginal and Information communication technology pedagogies comparison
Source (Donovan, 2007)

Aboriginal pedagogy	ICT pedagogy
Learning through experiencing concepts	Learning through experimentation
Peer or group learning	Can allow group space
Space for own investigation	Allows them to investigate in their own time
Adapt to local context	Learning can be contextualized
Community can direct aspects in their local practices	Learning can be flexible and the design can adapt tasks to specified outcomes

8.3 Cultural knowledge base

Trudgen (2000) identified the cultural knowledge base as the core knowledge and information accepted by the majority of people in a cultural group as being true knowledge; it is what shapes the world-view of the group. That knowledge that is acquired by local peoples through daily experiences is unique to given cultures, localities and societies (Castellano, 2000).

The initial phase of education in any new program is based upon the learner's background knowledge, which is a sum of all abilities acquired as a result of exposure to earlier learning experiences (Fedak, 1999). To enable more effective and successful treatment, it is important to

acknowledge and work together with the Aboriginal understanding of health, rather than assuming the superiority of the current medical system (Behrens, 2007).

Practices that fit logically with peoples' beliefs about the causes, effects and treatment of illness will be more acceptable to them and therefore more likely to be effective (Gorman et al., 2006). In Aboriginal culture, illness is characterised by social and spiritual dysfunction; therefore the Aboriginal medical system seeks to provide a meaningful explanation for illness and to respond to the personal, family and community issues surrounding illness (Saethre, 2007).

8.3 Cultural contextualisation

Cultural contextualisation means placing learning tasks in the context of the Aboriginal learner's life or cultural experience (Donovan, 2007). It should be realised in order to provide learners with interactive learning packages that reflect the multiple realities of their society and their own experiences (Henderson, 1994).

Teaching from learners' own cultural contexts could be difficult with a population like Australian Aborigines, who are a culturally diverse group of peoples and no homogenous, whose experiences were complicated further by the colonial history, and as diverse as that of Australian Aboriginal people (Behrens, 2007; Robbins, 2007). Henderson (1996) emphasises that instructional design cannot, and does not, exist outside of a consideration of culture, and conceiving cultural contextualisation as a variable of consequence in interactive multimedia model instructional design is justifiable.

The cultural inclusivity in the design process needs to affirm the social and cultural dimensions of Aboriginal society in constructed meaning (McLoughlin and Oliver, 2000).

In the Aboriginal culture a collective wellbeing rules over and above individual wellbeing, family responsibilities take precedence over individual health needs, illness is associated with social and spiritual dysfunction, and a person is seen as the collective of mind, body and spirit; therefore the Aboriginal medical system seeks to provide a meaningful explanation for illness and to respond to the personal, family and community issues surrounding illness (Behrens, 2007; Saethre, 2007).

Land has special significance to Aboriginal people, it relates strongly to the spiritual aspect of health, and the management of land involves environmental health issues. A poor environment is thought to result in infectious diseases (Barlett, 1995).

Program designers had a difficult task in catering for the needs of Aboriginal learners through the management of the interface between Aboriginal community contexts and knowledge, and those of academic knowledge (Milton and Vozzo, 2010). Ideally, they should incorporate the

skills and values of the Aboriginal community, and can influence material and symbolic culture in creating and developing interactive multimedia, in order to create a unified and authentic learning environment (McLoughlin and Oliver, 2000).

Cultural contextualisation in program development can be achieved through consultation and working with representatives of the target population and community elders who provide an understanding of social and cultural constraints (Travers et al., 2006), as Australian Aboriginal elders are traditionally the carriers of knowledge, culture and traditional healing methodologies that are passed down to future generation through oratory, dance and song (Behrens, 2007).

8.5 Oral cultural backgrounds

With free and full access of Aboriginal people to information and knowledge about the world around them in a language they can understand, they will be better able to take more control of their own lives and they will themselves create interventions to deal with the problems they face (Trudgen, 2009).

In Aboriginal society, communication should be "heart to heart and mind to mind", this communication is like hearing the inner soul of a person (Trudgen, 2000). The narrative format has been a traditional way of teaching in many cultures (Gjedde, 2005). Aboriginal Australian cultural is traditionally oral, and storytelling is a feature of Aboriginal societies where oral traditions were the main form of transmitting and sharing knowledge with individuals and between groups; through which information was passed down through the generations in the form of stories and songs (Bessarab and Ng'andu, 2010; Berg, 2011; Dyson, 2002).

The important contribution factors in success with Aboriginal learners are acknowledgement of Aboriginal' learning as a cultural activity and fosters cultural security through respect, oral communication and traditional story telling are important contribution factors in success with Aboriginal learners (Foster and Meehan, 2007).

Learners coming from oral cultural backgrounds might not be able to fully engage with a text-based medium so the use of third party visual and audio tools would be required (Duggan, 2009). Story telling is considered as an integrated learning approach with a holistic view in which knowledge is integrated into social contexts, and it has been proven to be successful in Aboriginal education (Grant et al., 2007; Werner and Bower, 1982), and it has always been part of the practice of adult education (Clark and Rossiter, 2008).

Digital storytelling offers an enhanced level of communication flexibility, multi-medium distribution, interactivity, freshness and engagement, therefore this approach has been adapted in design to develop an interactive multimedia learning environment (Mukti and Hwa, 2004).

8.6 Recommendations

There is a need to develop a continuing education program for Aboriginal health workers which is built on real inspiration and is ruled by real understanding of Aboriginal learning styles, preferences, and pre-existing knowledge. The program should be based and focused on the theories, or why things are done a certain way. This sort of culturally-appropriate health information could support them in their health promotion and education role within their own communities. Participation of Aboriginal health workers in program development provides a deep understanding of the target group's socio-cultural context in which health problems are constructed.

Literature reviews show that:

1) Australian Aboriginal people in traditional societies have an Aboriginal epistemology; an Aboriginal world view incorporates much spontaneity, and based on shared cultural aspects of kinship, religion, mortality, personal communication, life situation and time (Huges, 1987). The existence of such a distinct cultural basis in Aboriginal and Torres Strait Islander society demands new approaches in developing an educational program (Williams et al., 1996).

2) Taylor and Guerin (2010) argues "*in health care, one's worldview has the potential to hinder or enhance the care experience for both the clinician and the patient*" (p.50). An understanding of how perceptions of health and sickness are culturally constructed is essential to ensure effective clinical and educational interactions (Lowell, 2001).

3) Trudgen (2000) argues that what Aboriginal health workers needed was not a simplified course where no-one learns anything; they need relevant courses that meet their different learning needs. In a study of learning preferences for Aboriginal learners Barners (2000) emphasises that several aspects of Aboriginal culture practices were evident and could impact on their learning.

4) The creation and inclusion of Aboriginal perspectives in instructional design is an important dimension and a means of recognising and integrating cultural knowledge (McLoughlin and Oliver, 2000).

5) Despite the fact that integration of graphics, sound, video and animation in multimedia applications has an enormous potential for Aboriginal peoples, whose cultures are rooted in ceremony, dance, music, art and oral language traditions; it is unlikely that an interactive learning program could be designed to adapt to every cultural norm (Dyson et al., 2007; Reeves and Hedberg, 2003).

6) Reeves and Hedberg (2003) recommended that programs should be designed to be as culturally sensitive as possible; and the interactive learning program should accommodate the diverse ethnic and cultural backgrounds among the learners expected to use it, and build upon the diversity in the target population so that the overall learning environment was enhanced.

CHAPTER NINE: MODEL DEVELOPMENT- CASE STUDY: INTERACTIVE MULTIMEDIA HEALTH INFORMATICS PROGRAM - TUBERCULOSIS (TB)

9.1 Overview

Pellekaan and Clague (2005) communicated an urgent need for a sound primary health care and education program to be implemented by dedicated people who were interested in improving the health and wellbeing of Aboriginal Australians. Producing effective educational interactive multimedia materials requires the cooperation of a three approaches: computer science, educational and medical content with an emphasis on educational structure. Kennedy (2002) recommended the collaboration of a team of people with a range of skills for developing modern learning environments that utilise interactive multimedia and Information Technology. This team may comprise of a subject matter expert, graphic designer, interface designer, and programmer.

This Chapter is a case study for the third phase of the study, the development of a culturally-appropriate interactive multimedia heath informatics CD-ROM for Aboriginal and Torres Strait Islander health workers. Program planning was based on stakeholder consultations through qualitative interviews. The focus of these consultations was based on including the stakeholders in defining the goals and the objectives for the program, in order to determine the activities of the program. The design and development of interactive multimedia model was based on a well-researched conceptual framework, illustrated in Figure (9.1).

In Figure 9.1, the qualitative interview and literature review were used as the basis for identification of the current gaps in the learning and training of Aboriginal and Torres Strait Islander health workers, drawing out key factors, pedagogical principles, and cultural elements that would guide model development; as well as assessing their Information Technology literacy and access to IT resources.

The insights gathered from these interviews was used to inform the development of the interactive multimedia health informatics program (CD-ROM model development), and was followed by formative evaluation as indicated in Figure 9.1. The model was designed according to the educational and systematic principles outlined in detail in the previous Chapters, and guided by the results and recommendations outcomes from the qualitative interviews.

This Chapter outlines the developmental stages and the content of an interactive multimedia CD-ROM health model titled "Interactive Multimedia Health Program: Tuberculosis". It was designed as an educational, informatics achievement course for Aboriginal and Torres Strait Islander health workers. Its creation required providing basic information about Tuberculosis (TB) for Aboriginal health workers using a culturally fitting pedagogy "the oral tradition". This model was developed and guided by the principles of iterative software design and development.
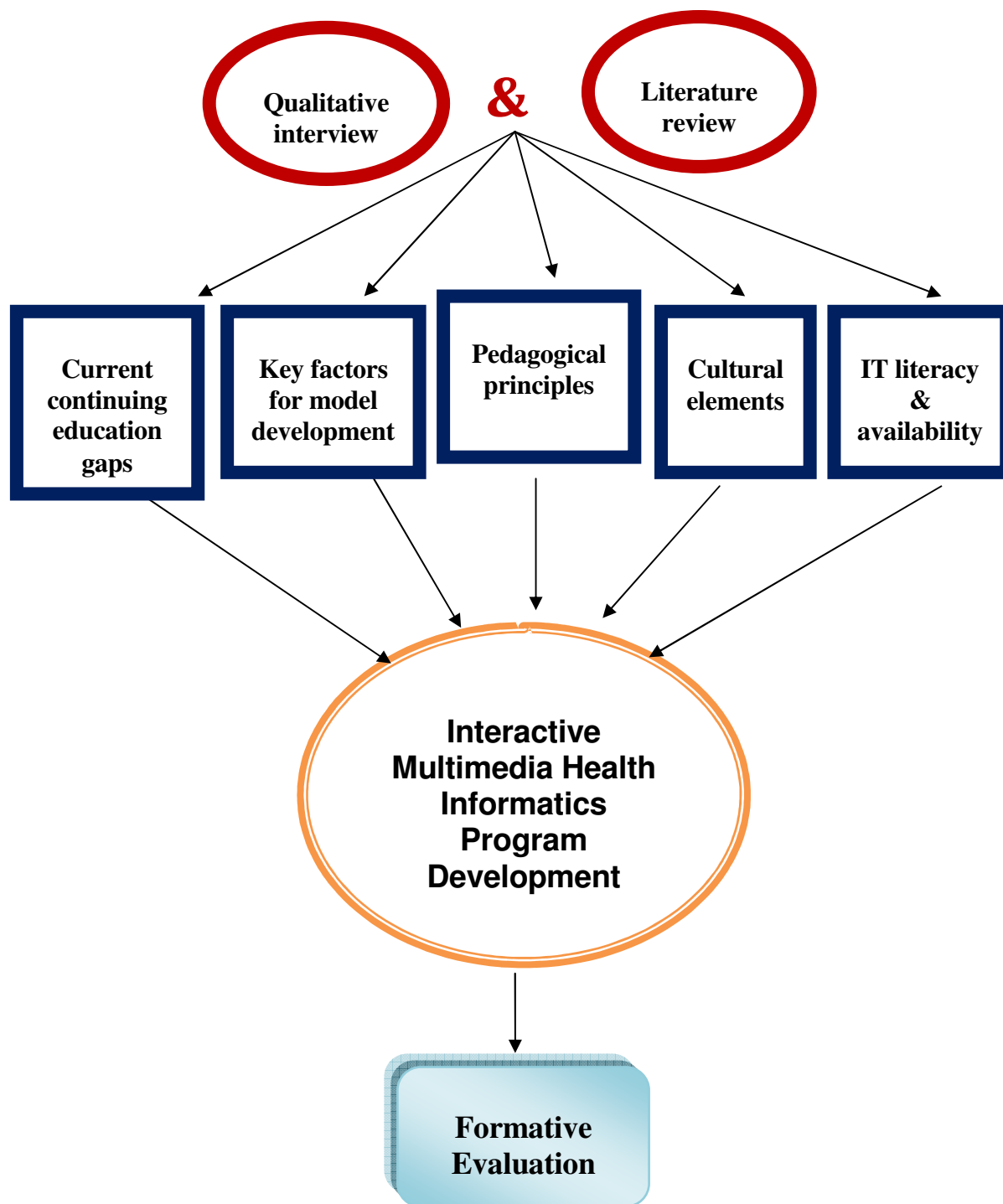
Figure (9.1) Base for Model Development
Illustration by F. El Sayed

9.2 Purpose

The main purpose of the interactive multimedia self-paced health informatics program on Tuberculosis is to provide and presents basic information about Tuberculosis (TB) for Aboriginal and Torres Strait Islander health workers, aiming to raise their awareness about TB. The program prepares them for any TB outbreak, and improves their ability to undertake simple medical procedures, recognise the symptoms of the disease, administer medical aid; including medical information that covered both preventive and curative elements.

Nutbeam et al. (1990) highlighted that there has been a growth in the potential contribution of health education to the overall improvement of public health. Aboriginal and Torres Strait Islander health workers could use the planned program in their health promotion and education roles with their own communities for the prevention and treatment of Tuberculosis.

9.3 Audience

The Audience for this course are Aboriginal and Torres Strait Islander health workers, in particular those who are caring for persons who have already contracted or who are at high risk of contracting TB. Previous studies have revealed that the initial phase of learning in any new program is based upon the learner's background knowledge, which is a sum of all of their abilities acquired as a result of exposure to earlier learning experiences. Also, the design of the learning program from a constructivist standpoint needs to start with an analysis of what is known or believed, and from there, develop a suitable pathway to follow (O'Brien, 2002).

During the assessment stage, and from a review of published literature and reports, a general profile for Aboriginal and Torres Strait Islander health workers, their level of education, computer literacy, and their way of learning and cultural principles were explored and adapted during program development. They are as follows:

1. Aboriginal and Torres Strait Islander health workers are used to learning from stories, and the interactive multimedia health model's content should not rely on text, but on narration and visual demonstration;

2. Elements of traditional and cultural aspects should be incorporated into the model's content; and

3. Model content should build on the pre-existing knowledge of Aboriginal and Torres Strait Islander health workers.

9.4 Goal

Developing an interactive multimedia health informatics program that is sustainable, efficient, and culturally-relevant to ATSI health workers is the goal of this study. Expected results are:

1. The model is developed as a continuing professional development approach that can keep Aboriginal and Torres Strait Islander health workers upgrading their skills, keep them up to date, and provide them with basic information about TB including disease type, diagnosis and early detection, as well as management and prevention procedures.

2. The model raises awareness about TB as a major global public health problem, and prepares Aboriginal and Torres Strait Islander health workers for any TB outbreak.

3. The model can be used to support Aboriginal and Torres Strait Islander health workers in their health education and promotion roles within their own communities.

9.5 Concept Analysis

Figure (9.2) illustrates concept analysis for Tuberculosis CD-ROM model, starting with an introduction and general information, followed by more specific information. It clarifies the educational objectives regarding detection, treatment and preventive measures of Tuberculosis and reveals the anticipated model design.

Figure (9.2) Concept analysis (Learning map) - Illustration by F. El Sayed

9.6 Program Objectives

The results of the general and specific needs assessments are used to develop the goals and objectives of the program. Designing activities and materials for the proposed program have been developed in order to achieve those goals and to be fitting with the defining objectives.

The program objectives are based on stakeholder consultations through qualitative and in-depth semi structured interviews. The focus of these consultations was on involving the stakeholders in determining and designing activities and program content. By using this collaborative approach, and involving the stakeholders in this process, has provided valuable input into the program's design and learner objectives.

9.6.1 Design objectives

Design objectives concern the process of how to transform what could be boring subject matter into an interesting screen-based unit (Harrison, 1999). The program was designed to have the following features:

1. Navigation: simple and easy to use;

2. Screen: standard screen components with the presence of main menu;

3. Interactivity: interaction through a quiz;

4. Culturally-appropriateness by using storytelling; and

5. Learner control of the program.

9.6.2 Learner's objective

The learning objectives provided in Tuberculosis informatics program developed in the present study include providing participants with a basic knowledge of early detection, treatment and preventive measures for Tuberculosis relevant to Queensland health. Essentially this was accomplished by giving Aboriginal and Torres Strait Islander health workers an introduction to the different types of disease and the life cycle of the microbe.

On successful completion of this program Aboriginal and Torres Strait Islander health workers will have a moderate knowledge of early detection and preventive methods of Tuberculosis.

After completing **Module One** in this program they will be able to:

- Describe the classification system for TB.

- Identify ways in which TB is spread.

- Identify conditions that increase the risk of TB infection transmission.

- Describe TB signs and symptoms.

After completing **Module Two** in this program they will be able to:

- Describe the pathogenesis (life cycle) of Mycobacterium Tuberculosis.

- Identify conditions that increase the risk of TB infection progressing to active TB.

- Identify high priority groups that should be tested for latent TB infection (LTBI).

After completing **Module Three** in this program they will be able to:

- Identify the major components of TB diagnostic procedures.

After completing **Module Four** in this program they will be able to:

- Identify anti Tuberculosis medications.

- Describe treatment regimens for TB disease.

- Describe patient monitoring.

- List common adverse drug reactions to anti-Tuberculosis medications.

After completing **Module Five** in this program they will be able to:

- Identify three levels of infection control (IC) measures to prevent the transmission of TB (administrative, environmental, and personnel controls)

- Identify BCG vaccination.

- Identify the roles of health professionals in preventing Tuberculosis.

- Identify the roles of patient in preventing Tuberculosis.

9.7 Multimedia application design considerations

At this stage other factors relevant to the design of the program are considered. These considerations include the configuration of the computer that will run the model, multimedia building blocks that form the model, the interactive multimedia methodology and the authoring program that is used for the development of the model.

9.7.1 Definition of the Computer configurations and CD-ROM

An important planning consideration is to define the type of machine that will run the application. The average machine configuration could be used for running an interactive multimedia application is: processor 33-66Mhz, 8-16 RAM, double speed CD-ROM, 480-640 color monitor; video card 1024 x 768 with 65,536 color and 8-16 bit audio board (Alessi and Trollip, 2001; Rathbone, 1995; Villamil-Casanova and Molina, 1996), see Appendix (13.10).

9.7.2 Multimedia building blocks

A search of the Web produced the graphic medical pictures, icons, activation buttons and Aboriginal music to be used in the program. The storyboard was sent to a professional artist who illustrated all the pictures used in the model.

Video footage was developed using movie maker software and drawn pictures were coloured using black magic coloring software. The narrated stories were recorded directly over the authoring program.

9.7.3 Choosing an interactive multimedia (IMM) methodology and Authoring Program

Tutorials and storytelling were used as the most simple and culturally-appropriate interactive methodologies for presenting the information and concepts. Tomita (2003) described the use of the Microsoft PowerPoint format as an authoring software on a CD-ROM; as an ideal approach for health educators planning to create multimedia presentations in a step-by-step format.

As health educators already use PowerPoint for slideshows for health education professional development, such as for presentations at conferences, so with further explanation about the content, these presentations could be used on CD-ROMs as self-learning modules.

PowerPoint software was chosen as the authoring program software to provide informative materials on CD-ROM with meaningful links between the various modules of the models, through the interactive navigational architecture of the software and incorporate text and music.

9.8 Program structure & content

Aboriginal health workers come from many different backgrounds, and have different skills and knowledge. Some are highly literate, while for others, English is their second language. Some live in large cities and others live and work in remote communities (Barlett, 1995). Given this, it can be difficult to meet every Aboriginal health workers' need in the same program.

Medicine, public health, understands of traditions, and developments of social awareness are all important but it is impossible for health workers to learn every detail. There is a need to determine and cover what is essential to know (Werner and Bower, 1982).

Two critical considerations arise within model development: Firstly, how to provide Aboriginal and Torres Strait Islander health workers with a program framework that could suit all different cultural considerations. Secondly, how to present complicated medical information presented as attractive, simple, and effective learning materials. In response to those considerations, the program design was simple and general in order to accommodate the diverse cultural backgrounds among the learners.

In the planned model we tried to develop a general design, accommodate the diverse cultural backgrounds among the learners, and make the content simple without affecting the main objective of the program; which is to provide the learner with important and useful health information.

During the assessment stage and from a review of the published literature and reports, Aboriginal and Torres Strait Islander health workers' ways of learning and cultural principles have been explored and adapted during program development.

They are the following:
- Aboriginal and Torres Strait Islander health workers are used to learning from stories.
- Interactive multimedia health model's content was planned so as not to rely on text, but rather on narration and visual demonstration.
- Elements of traditional and cultural aspects were incorporated into the model's content.
- The model content was built based on the pre-existing knowledge of Aboriginal and Torres Strait Islander health workers.

9.8.1 Model structure

This paragraph gives details about how to present the model content and what teaching components to use. Tomita (2003) recommended that when using Microsoft PowerPoint on a CD-ROM, it was better to create a modular format rather than being locked into a linear, sequential slideshow.

In the modular format, the user enters a home page which serves as a main menu to a series of slide sets. The main menu acts as a map for the CD-ROM content designed to assist exploration; and the presence of narrative instructions throughout the CD-ROM puts some structure on the way it should be explored.

In order to present the content clearly, the completed program consist of five independent modules with a total of 16 learning objectives distributed throughout the modules. The learning objectives were outlined descriptively and in details in the section called "Program Objectives".

The first module contains a story describing a health situation which gives introductory basic general information about Tuberculosis. As the learner progresses through the program modules, they are informed about Tuberculosis pathogenesis, diagnosis, treatment, prevention and prognosis of the disease in a storytelling, tutorial, and narrative manner. Each module ends with quiz. Users can enter the program through any module from the main menu depending on their needs and interests.

Links to relevant external resources are an obvious attraction for a medical education program. However, too many links can overwhelm the learner and are frequently bypassed, while a minority access external links that they find to be essential (Sisson et al., 2010). Throughout the program there are online links to national and international content in order to update information and keep the health workers in touch with main stream health developments.

9.8.2 Model content

Each module gives information about a special topic to achieve the previously specified objectives, as detailed below:

Module one, Figure (9.3): Introduction and basic general information about Tuberculosis and its types, Table (9.1).
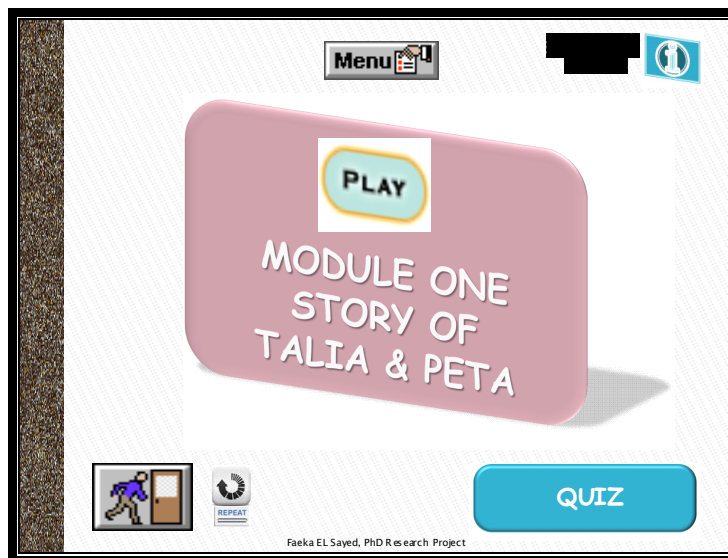
Figure (9.3) Module one
Illustration by F. El Sayed

Table (9.1) Tuberculosis type

Difference Between Latent TB Infection and TB Disease	
Latent TB Infection	**TB Disease**

• Have no symptoms
• Do not feel sick
• Cannot spread TB to others
• Usually have a positive skin test
• Chest x-ray and sputum test normal
	• Symptoms include
	  ○ a bad cough that lasts longer than 2 weeks
	  ○ pain in the chest
	  ○ coughing up blood or sputum
	  ○ weakness or fatigue
	  ○ weight loss
	  ○ no appetite
	  ○ chills
	  ○ fever
	  ○ sweating at night
	• May spread TB to others
	• Usually have a positive skin test
	• May have abnormal chest x-ray, and/or positive sputum smear or culture

Source (MDHSS, 2003)

Module two, Figure (9.4): Epidemiology of Tuberculosis, why TB happens? What are bacteria and how it can affect our body? And improving the understanding of M. Tuberculosis; defining how the host's immune system responds to infection by this pathogen, understand how TB is transmitted?
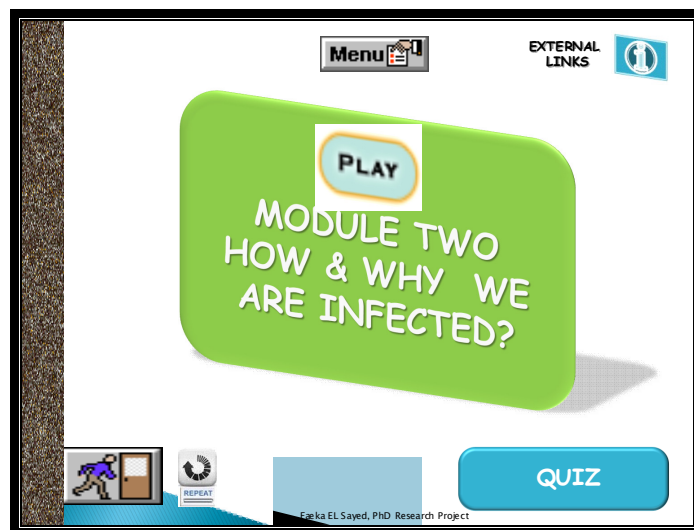
Figure (9.4) Module Two
Illustration by F. El Sayed

Module three, Figure (9.5): How to recognise Tuberculosis? When you think it is Tuberculosis? It targeted the diagnosis of Tuberculosis through observation, history, and

physical examination. Tuberculosis diagnosis relies on symptoms, the patient's history of exposure to Tuberculosis, and x-ray that may show evidence of Tuberculosis infection.
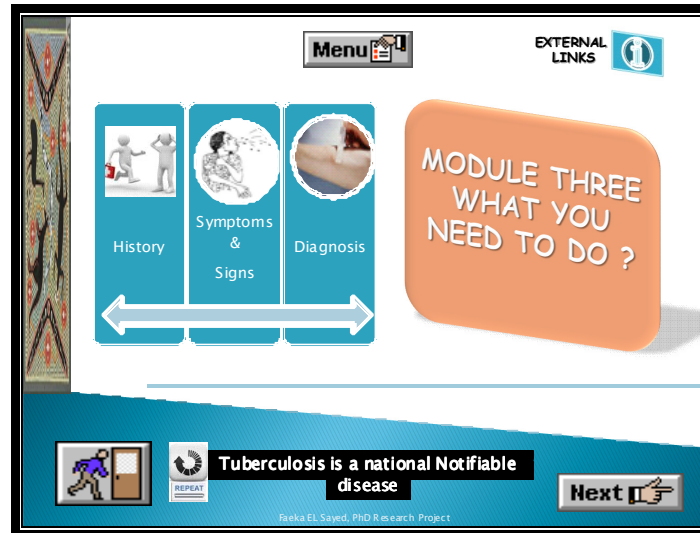
Figure (9.5) Module Three
Illustration by F. El Sayed

Module four, Figure (9.6): Treatment and compliance with treatment. Compliance is defined as "the extent to which a person's behaviour coincides with medical or health advice" (Lowe, 2010). Successful treatment of Tuberculosis depends on cooperation between patient and health provider, and patient education (X-Plain, 2009).
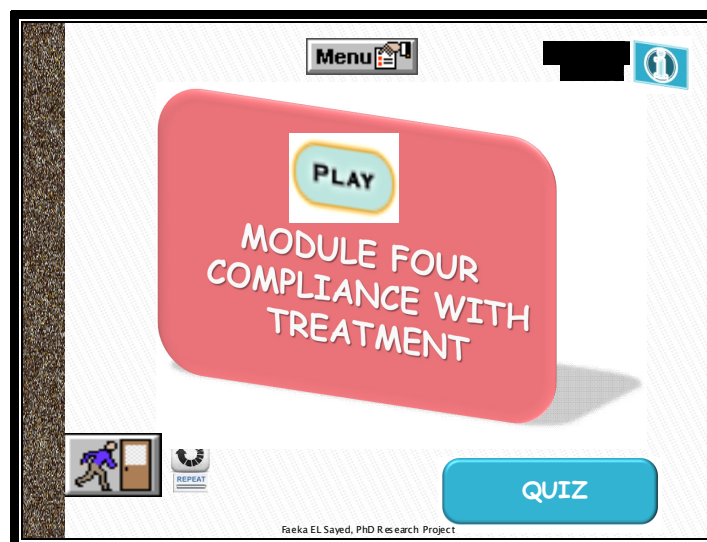
Figure (9.6) Module Four
Illustration by F. El Sayed

The less patients understand what it is they must do and why, the more compliance itself becomes simply an issue of obedience (Lowell, 2001). The key actions for preventing and controlling TB include use of recommended treatment regimens, a reliable supply of anti-TB drugs, and adherence to treatment by patients and to its proper provision by health-care providers (WHO, 2006a).

Modules five, Figure (9.7): Prevention is a reflection on the long term need for the community, and the role of health workers and patient in prevention. Tuberculosis prevention involves many disciplines, including both biological and socioeconomic aspects.

There are three biologic levels of control:

1) The control of the clinical disease with its associated morbidity and mortality,

2) The control of the infection itself whether it be manifested clinically or as an asymptomatic infection (Latent TB),

3) The control of presence of the causative organism in the environment and its transmission through it.

There are also important socioeconomic factors favouring the control of infectious disease such as availability of an inexpensive and stable vaccine must, improving housing, education, and fighting poverty, supporting human rights for the target communities (Couzos and Murray, 2008; Evans, 1985). Aborigines tend to be concerned with the present and only to conceptualise the future as a continuation of the present (Hausfeld, 1977). Prevention is expressed in the model in the form of public health advice to be accepted by Aboriginals, such as reducing crowding and care of the environment.
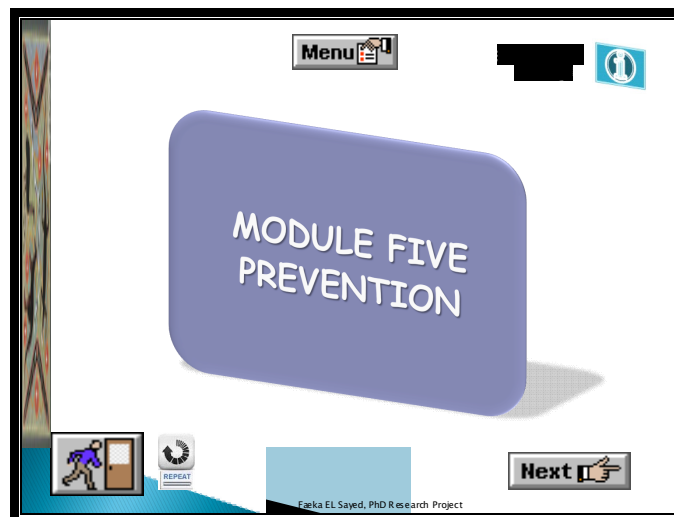

Figure (9.7) Module Five
Illustration by F. El Sayed

9.8.3 How the story written?

The content and style of the story was obtained from document research about Aboriginal cultural and healing beliefs (Devanesen, 2000). Anthropology case studies of remote Aboriginal communities in Australia were used to draw, realise and tell a detailed story (Saethre, 2007). That was followed by the transformation of the story scripts and creation of a scenario that can be used to suit the health topic. The story is then reviewed and revised and affirmed by health workers participating in the study.

9.8.4 Medical terminology

Interview results identified that the most user-friendly approach to defining health problems for Aboriginal communities was to divide medical terminology into a smaller number of conditions that have a common cause. This approach has been supported by Barlett (1995) who argued that to define health problems for Aboriginal communities in terms of diseases does not help the communities much, but rather, to focus on health problems by looking at the causes, as explained in Table (9.2):

Table (9.2) Aboriginal Concept on Health

	CAUSITIVE FACTORS	HEALTH PROBLEMS
LAND	Poor physical environment: 1. Environmental health issues include water supply, waste disposal, shelter, I(adequate and appropriate space for numbers of people), domestic and personal hygiene, and dust. 2. Housing and health hardware should be determined by how peoples want to live. Aboriginal enjoy living outside	Infectious diseases
MIND	Social and spiritual environment including unemployment, racism, lack of access/knowledge of country, loss of language/stories, inappropriate social behaviours	Alcohol/ substance abuse/ violence/ STds, and mental health
BODY	Poor nutrition	BP, heart disease, obesity, diabetes, infectious illness, poor development,

Source (Barlett, 1995).

9.8.5 Learning resources: Clarification of health information

The most important criterion by which the learning content in the program and medical resources are selected is that they focus on up-to-date information and provide comprehensive information about communicable diseases identification, reporting, control and prevention.

Medical learning resources which meet this criterion are derived from different national and international organisations.

They include the World Health Organization (WHO, 2004), U.S Agency for International Development (USAID, 2011), Centers for Disease Control and Prevention (CDC) Division of Tuberculosis Elimination (DTBE) (CDC, 2010), the "Control of communicable Diseases Manual" by (Heymann, 2004), and Queensland Health's Communicable Diseases Branch who are responsible for surveillance, prevention and control of communicable diseases in Queensland and provide information on communicable diseases as a key resources for health professionals (QLDHealth, 2010a),

The skills and knowledge that health workers specifically need to detect cases of pulmonary TB, inform patients about TB, and monitor the success of TB case detection and treatment at health facility level can be obtained from the WHO guide, and the related set of training modules for health facility staff can be obtained from "*How to Organize Training for Health Facility Staff on TB Control*" (WHO, 2004).

TB treatment regimens vary from country to country. The specific information regarding diagnosis of Tuberculosis, treatment guidelines, TB infection control guidelines, management of TB patients, and vaccination program was provided by Queensland Health's website for health professionals about Tuberculosis (QLDHealth, 2010b).

9.9 Model design

Using the capability of multimedia presentation technology ensures the effectiveness of content delivery to health workers (Chetley et al., 2006). The design process is iterative, and many of the earlier stages have to be revisited and the products reworked based on findings or new information uncovered during later stages (Gagne et al., 1992).

The goal of the design phase was to develop a framework for the "Interactive Multimedia Health Program: Tuberculosis" Interactive multimedia CD-ROM, Figure (9.8) which is intended to provide information about Tuberculosis to Aboriginal and Torres Strait Islander health workers. The entire design approach outlined here is in agreement with research findings on how learning takes place (Gagne et al., 1992).

In the planned model the development of a general design was attempted, keeping the design simple without affecting the main objective of the model which is provide the learner with important useful health information.

The design was guided by the data collected from the interviews as a solid base, and information from the literature review was added. There was a limitation placed by the need for simplicity in the design as a result of concern about the capacity of the computers of the users to run large and memory-intensive multimedia programs.

The design process began with documenting the design decisions through storyboards, followed by discussion regarding the navigation structure and the graphic design for the interactive multimedia model.

Model in general characters by: easy to enter and exit, provided a simple way to move forward and backward (from screen to screen), consistent in its key conventions, offered context-sensitive prompts and helps, provided tracking feedback (e.g., Where have I been? Where am I now? How much more is there to go?), offered bookmarks (i.e., quit now, resume later) and always offer a way out.

Figure (9.8) Model framework design
Illustration by F. El Sayed

9.9.1 Storyboard

Creating a storyboard for a model is done by creating script for it. A script is a complete specification of the text and narration in a multimedia application. It helps the designer to role-play the model from the viewpoint of a user and identify any missing elements (Hofstetter, 1997). Figure (9.9) illustrates an example of planned program storyboard.

9.9.2 Interactivity & Learner control

In the planned model the interactivity is developed through a series of interactive questions at the end of each module, followed by helpful feedback.

The planned program was designed to have limited instructions, to be straightforward and to be used as far as possible with a full learner control of the content. Instructions are overlaid on the active interface, rather than being provided in separate instruction screens; so that learners seeking help are shown exactly what to do, where to click and how to do it, rather than merely bring being provided with instructions (Robbins, 2007).

The program does not require completion of a certain topic before jumping into the next topic, thereby making it easy for learners to freely and easily search for specific information. They can exit the program at any time. This type of program has many limitations associated with behaviourism however it holds user attention much longer than the traditional methods of learning (Conrick, 2006).

Figure (9.9) Storyboard
Illustration by F. El Sayed

9.9.3 Navigation structure

One of the challenges in the model design was to present the program material in such a way that the user will not get lost or confused. So the designer should have a clear notion of how the material will be organised and how the user will navigate from screen to screen (Hofstetter, 1997).

The menu and the linear navigational structure were adapted in the design of the CD-ROM multimedia program, as shown in Figures (9.10), (9.11).
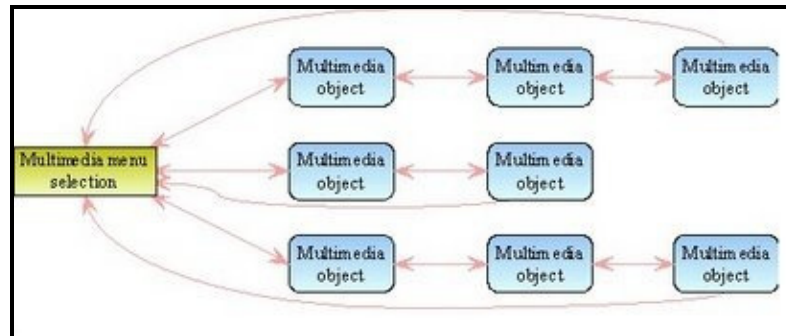

Figure (9.10) Menu navigation structure
Source (Hofstetter, 1997)

Figure (9.11) linear navigation structure
Source (Hofstetter, 1997)

The navigation design is presented in a flowchart as a logical diagram that illustrates the steps involved in an interactive decision-making process and includes the general order in which the learner will encounter directions, choices, presentations, interactions, remediation and finalisation (Alessi and Trollip, 2001; Hofstetter, 1997). The flowchart is helping to have a clear idea of how the program's material is organised and how the user could navigate from screen to screen.

The Model frameworks in Figures (9.7), (9.8), (9.9) are the underlying structures of planned model. There are designed to provide information in the form of tutorial presentations (P) within each modules (M) followed by short Quiz (Q) and feedback (F). The tutorial presentations (P) in modules one, two and four are offered in the form of storytelling videos and in modules three and five are presented in the form of PowerPoint presentations.

Complex links in Microsoft PowerPoint may be formed between slides to navigate the CD-ROM and to access more detailed information about a particular health topic (Tomita, 2003). Model modules are connected by permanent links that are used to link related

screens in the simplest form and to allow the user to return to the main menu or exit the program from any screen in the program.

The design framework provides two methods for navigation. The Systematic user's guidance (Linear method) as a means of access to the educational contents is present only in the presentation (P) of each module. The random access browser, a menu or web-like structure, provides the freedom to explore the information throughout any point in the program and moving between the different modules.

This navigation of the design framework ensures the effectiveness of learning control. The presence of optional quiz followed by the feedback at the end of each module; which corrects the learner's answers and verbally acknowledges achievement, provides an interactive learning experience.
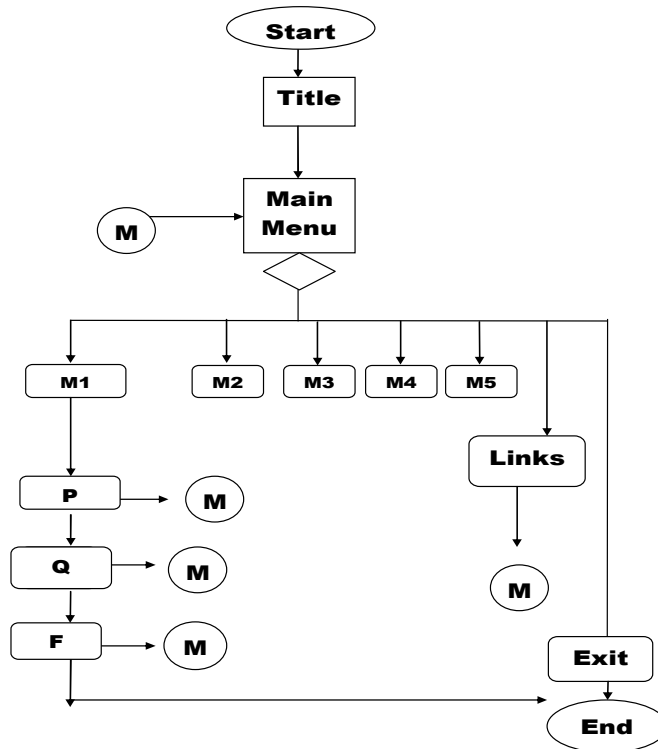

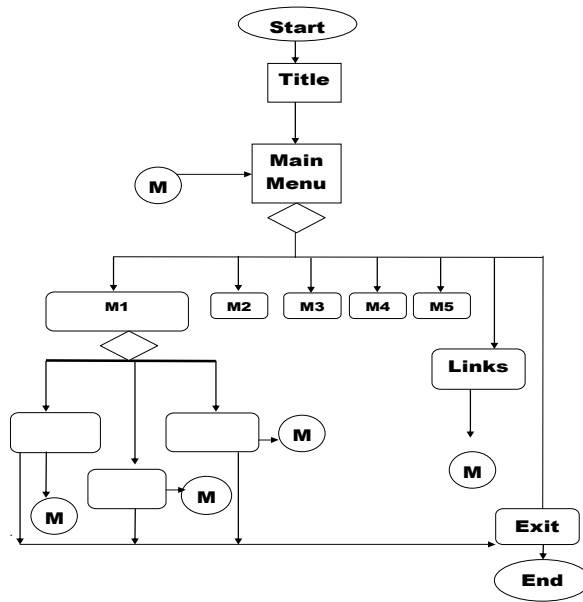Figure (9.12) Flowchart of the planned Model , Illustration by F. El Sayed

Figure (9.13) Flowchart of module one, Illustration by F. El Sayed
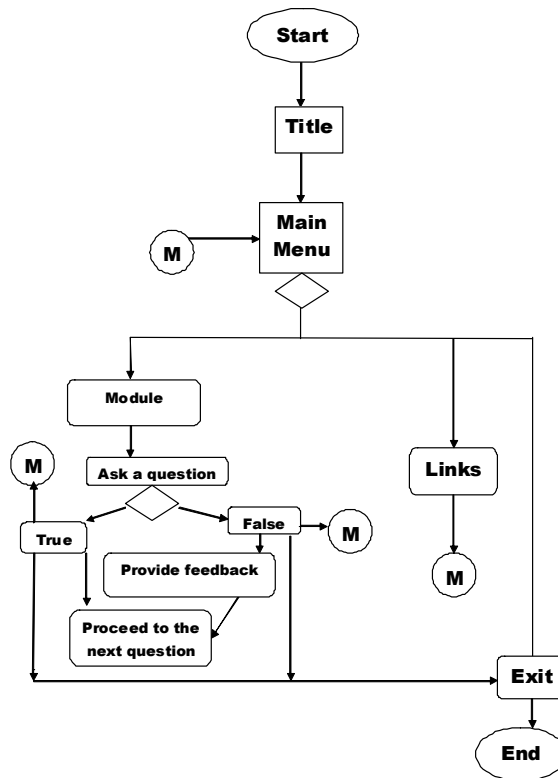
Figure (9.14) Flowchart of quiz, Illustration by F. El Sayed

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Each module, whatever forms it is in (presentation or story), is primarily narrative -based, and is supported by text, images, drawings, figures and links to medical references.

Design objectives and learner control of the program were achieved through the following functions:

1. Learners are able to make better sequencing decisions for their learning activities.

2. Learners are able to temporarily end the program and return to it later.

3. The screen buttons are visible and remind learners of things that can be done.

4. The menu list is present throughout the program and the options available are clear.

5. The main menu is easy to access in the entire program.

6. The mouse is used as a simple mode of control of the program.

7. The presence of a repeat button in each slide throughout the program provides a way for the learner to control hearing of the instructions and the narration.

9.9.4 Screen graphic design

There was more than one template used in the project. These are: a template for information (Screen Template, Figure 9.10), another for questions (Interaction Screen, Figure 9.11), and a third for the menu screen (Navigation screen, Figure 9.12). An Aboriginal art were used constant in all slides.
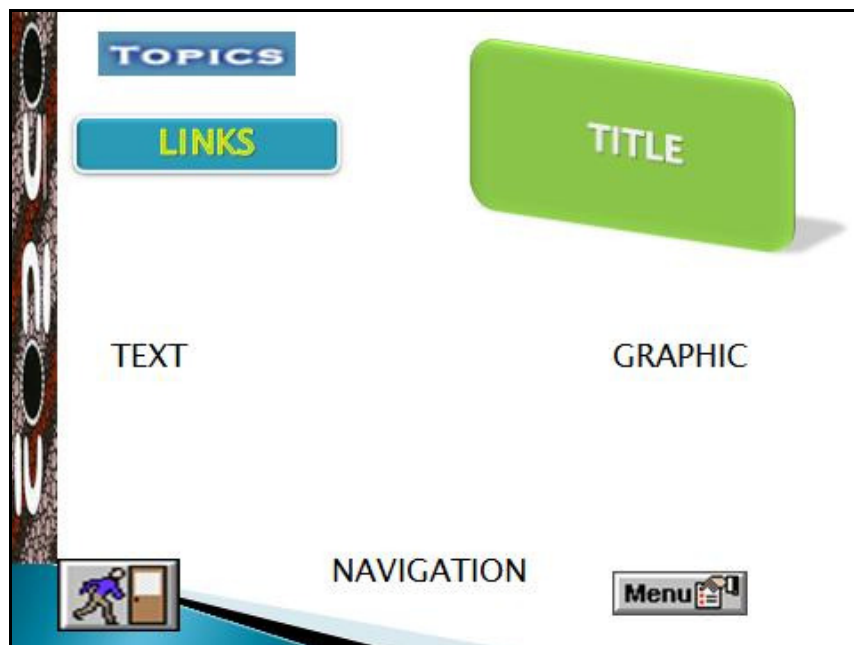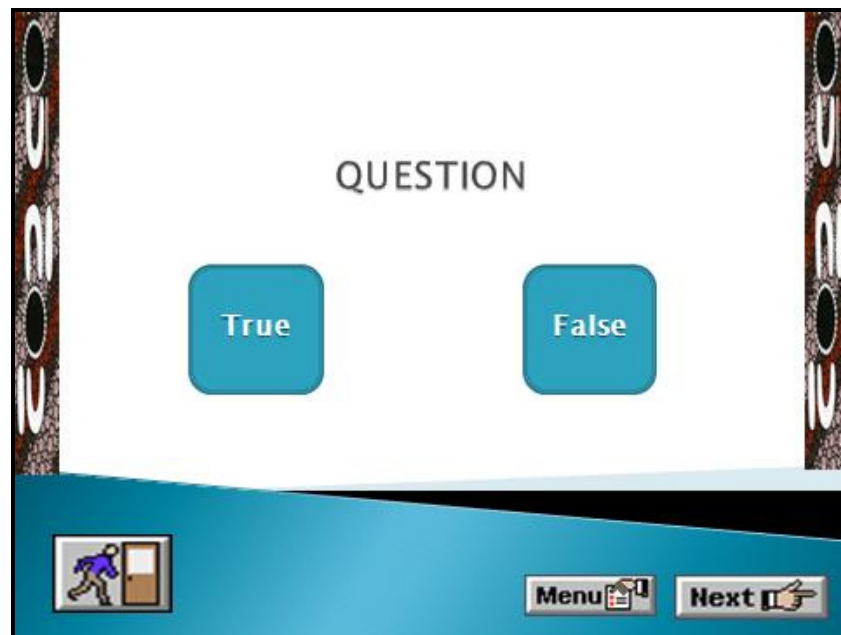

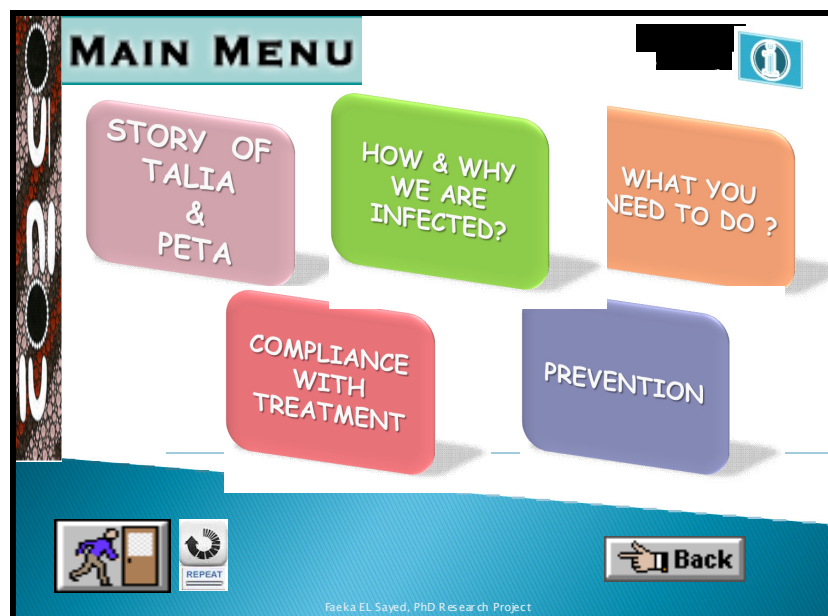Figure (9.15) Instructional Screen Template

Figure (9.16) Question template

Figure (9.17) Menu Screen Template

9.9.5 Visual and multimedia elements

Visual elements in this program include video, pictures, graphics, music, and texts.

Modules three and five were demonstrated as lecture presentation modules, the content was presented in constant location on the center, to avoid any confusion for learners.

Each page consisted of page title, supporting text and other supporting multimedia elements, such as graphic, videos.

Below the content, a backward and forward buttons were available to help the learners go through the module.

Since narration was present in all program modules; repeat button for audio was provided below the content with exit button all over the program.

Main menu and external links buttons were available at the upper part from the slide above the title and the content.

Modules one, two and four were demonstrated in form of video, worked on window media player software.

9.10 Program Implementation

The organisation of materials should be consistent with the format selected , and the scope and sequence should follow standard educational practices (Tomita, 2003).

The program design was directed by the adult learning, population heath and medical education learning approaches. It was influenced by constructivist and socio-cultural learning theories and principles.

Story transcripts were sent to artists to portray the pictures.

The graphics were produced using Black Magic painting software and then assembling the graphics with Movie maker software

The material collected and the narration used were recorded direct on the authoring program software.

The main designs of screen templates were specified.

The media modules were assembled using Movie Maker software to produce the stories in the form of video clips.

Following the completion of the storyboard, the program was developed using PowerPoint software.

CHAPTER TEN: FORMATIVE EVALUATION

10.1 Overview

Sound learning environments begin with principles of learning and instruction, but require evaluation, revision, and fine tuning to balance these competing values and ensure that the benefits are accrued for all intended learners (Alessi and Trollip, 2001). Evaluation is the process by which a researcher assesses whether or not the developed model works in the sense of achieving its objectives (Gagne et al., 1992). Evaluation starts with problem identification, and is an ongoing process throughout the development of the training program (Cartwright and Cartwright, 1999). Incremental feedback and informal evaluation during development help to keep a project on track and to alert developers to the need for midcourse correction (Perreault and Wiederhold, 1990).   There are two main phases in evaluation: formative and summative (Boyle, 1997; Laurillard, 1994).

Formative evaluation is a key element of iterative software design through continual review and evaluation of the product as it evolves (Inglebret et al., 2007). It has a vital role to play in the progress of multimedia because it is the means by which we build up our knowledge of what the medium can do and it involves checking that the form of the learning material is valid and helping the learner to achieve the objectives (Cartwright and Cartwright, 1999; Harrison, 1999; Laurillard, 1994).

Mann (2006) defined formative evaluation as a process of revising material developed according to principles of instructional design, it should be carried out during the development of the program in order to debug it, and to enhance an interactive learning system at various stages of its development (Reeves and Hedberg, 2003), and it is most cogently concerned with the extent to which the stated objective been met (Gagne et al., 1992).

Formative evaluation consists of a wide variety of strategies designed to help in improving the usability, effectiveness, and appeal of an interactive learning system (Reeves and Hedberg, 2003). It is a critical phase to direct good self-directed learning, unlike traditional training which can be easily modified at a later date; self-directed learning has to stand on its own (Harrison, 1999).

Formative evaluation could achieve an appraisal for the users' attitudes, and the effectiveness and usability of the program. User attitudes are defined as likes and dislikes, with roots in social, emotional, behavioural, and cognitive experiences. The effectiveness of the program depends on whether it achieves its learning and design objectives. Usability refers to the ease of learning and ease of use (Boyle, 1997; Cartwright and Cartwright, 1999; Harrison, 1999; Laurillard, 1994; Mann, 2006).

Summative evaluation is conducted at the completion of the program to test it against normal practice. It looks to the sum effects of the program in order to decide whether that design is better than others in some way, or contributes something unique (Boyle, 1997; Laurillard, 1994). It begins in the analysis phase by setting up data collection for evaluation and defining the criteria to measure whether the desired performance objectives have been achieved (Harrison, 1999). Clear and measurable objectives are a good evaluation tool for measuring results (Cartwright and Cartwright, 1999). Summative evaluation can be carry out using comparative studies or through enabling interested individuals and groups to participate in critical debate about the program in order to assess whether or not objectives were being met (Grant, 1992; Laurillard, 1994).

How should formative evaluation be conducted?

Evaluation can achieved through enabling interested individuals and groups to participate in critical debate about the program in order to consider whether objectives were being met (Grant, 1992). Formative evaluation could takes place through small group pilots, field testing, implementation, and interviews after implementation using a test/quiz and a feedback sheet. This could also take place through end user, peers, and expert reviews, using a questionnaire as an evaluation form to identify areas of inaccuracy or omission in the content, and to identify any problems in terms of the consistency of the format, clarity of directions, looking for missing material or poor style, and could alleviate many potential design problems (Alessi and Trollip, 2001; Harrison, 1990; Harrison, 1999; Kennedy, 2002; Reeves and Hedberg, 2003).

10.2 Method

The key to sound formative evaluation is to collect data systematically, at critical stages of the interactive learning system's development (Reeves and Hedberg, 2003). For this study, preliminary feedback was obtained through two Aboriginal health workers reviews as end-users, in the form of an informal open discussion during the different stages of model development regarding the program's simplicity, acceptability, ease of use, attractiveness and cultural appropriateness. Modifications were made to the software to reflect the feedback that was received. Post-instruction questionnaires are one of the most frequently used methods of collecting effectiveness-based data in the formative evaluation process, and they are known as "evaluation forms" (Reeves and Hedberg, 2003).

We did conduct small-scale formative evaluations for the final CD-ROM model based upon different perspectives in form of expert, user and peer reviews in the field of Aboriginal health workers' education, health, education and Information Technology using an evaluation questionnaire, in order to adjust the program and test whether or not it was culturally-appropriate, efficient, acceptable and motivating to the users.

10.2.1 Determining the formative evaluation criteria

Program objectives are important for guiding the design process, crucial in helping to determine appropriate teaching technology and content, and providing a standard against which judgments can be made (Beattie, 1994; Kern, 1998; Laurillard, 1994).

Based on the model objectives, an evaluation framework was developed for the multimedia program regarding program design and content.

The evaluation criteria were categorised under two key topics:

- Design: which incorporated the instructional and conceptual design, graphic design and user attitudes, and

- Program' content: within which each topic contained specific criteria that guided the evaluation process and formed the main framework for the model evaluation.

Instructional and conceptual design criteria involve devising the introductory objectives, the presentation of the information, learner control, navigation, orientation, interactivity, and sequencing, providing help and the ending of the program.

Graphic design criteria related to features of the interface such as colour, frames, text, types of media, and graphics; assessing them in terms of their usability, consistency, clarity, structure, relevancy, usefulness and co-ordination. The user attitude criteria that were developed related to program acceptability and user's perceived effectiveness, whereas the program content criteria related to its reliability and efficiency.

10.2.2 Questionnaire development

Reeves and Hedberg (2003) illustrated in Table (10.1) that different types of decisions should be made in improving an interactive learning system, each of which is tied to one or more specific questions that can be addressed by formative evaluation activities.

Likert scaling is a bipolar scaling method, measuring either positive or negative response to a statement with a middle option of "Neither agree nor disagree".

DeVaus (2002) explained that producing a Likert Scale begins with a concept and questions are developed in order to tap that concept, and then measurements are made about the strength of the respondents' opinions on particular items through the use of a numerical value to indicate a person's position on a number of questions.

The first step in the framework to guide the evaluation process is to determine the goals guide the questions and the answers of the respondents.

In this study the questionnaire consisted of forty eight questions, deemed to be relevant to evaluation program effectiveness, usability and user attitudes. The questionnaire was adapted and slightly modified from previous research projects, with the aim of evaluating an interactive multimedia health educational program (Phillips, 1997).

Table (10.1) Decisions and questions in a formative evaluation

Decisions	Example Questions
Should the interface be redesigned?	Is navigation clear to users? Are the meanings of icons clear? Do users get lost in navigation through the program?
Should the number and length of video segments be decreased?	Do users select to view video segments? Do users use video reply options
Should more practice opportunities be added?	Do users pass module quizzes? Do users achieve mastery on unit tests? Do users rate video highly?
Should the program scope be expanded?	Are the materials coordinated with curricular guidelines? Do content experts rate the program as comprehensive?

Source (Reeves and Hedberg, 2003)

Items in the questionnaire corresponded to the criteria in the evaluation framework for instructional design, graphic design, user attitudes and program content presented in the first forty one questions, using a 5-point Likert Scale ('strongly disagree to the concept' to 'strongly agree to the concept') with multiple indicators.

The last seven questions targeted the suggestion, rating, constructive criticism and recommendation of the program using a 5-point Likert Scale and open ended questions as a qualitative means in the evaluation to determine any specific modifications requirement, see Tables (10.2), (10.3).

Table (10.2) Structure of interactive model evaluation questionnaire

Number	Question Type
1-4	5 point likert scale, strongly disagree to strongly agree, Introduction of the program
5-15	5 point Likert scale, strongly disagree to strongly agree, Presentation of information
16-20	5 point Likert scale, strongly disagree to strongly agree, Learner control
21-26	5 point Likert scale, strongly disagree to strongly agree, Program content
27-31	5 point Likert scale, strongly disagree to strongly agree, User attitude
32-37	5 point Likert scale, strongly disagree to strongly agree, Program design
38-39	5 point Likert scale, strongly disagree to strongly agree, Providing help
40-41	5 point Likert scale, strongly disagree to strongly agree, Ending of the program
42-45	5 point Likert scale, strongly disagree to strongly agree, Suggestions
46-48	Open ended invitation to add any other comments, rating , criticism and suggestions with space provide for response

Table (10.3) Formative evaluation form

QUESTIONS	1	2	3	4	5
Introduction of the Program					
Title of the program is attractive					
The Title of the program is telling what the program is about					
The objectives were clearly stated.					
The purpose of the program was clearly stated					
Presentation of the Information					
The computer instructions were clear					
The information is presented in a meaningful way					
Program is well planned, logical and easy to understand					
The material was well organized and presented in a systematic manner					
It is clearly indicated when new topic are being introduced					
It is clearly indicating where to look for direction					
The technique for presenting information is consistent					
The written text on the screens was easy to read					
The graphic were clear					
The quiz is very helpful					
Feedback after the quiz is consistent and appropriate					
Learner Control					
The screen button remind the user of things that can be done					
The position, appearance and function of buttons are clear and consistent					
Program structure let the user able to make better sequencing decision					
Main menu is easy to access throughout the program					
Menu lists throughout the program are clear					
Program content					
The information is correct					
The content was relevant and up-to-date					
Information given were sufficient for professional educational needs					
Some information are not covered					
Program provided more information than text or lecture					
Program provided too much detailed information					
Attitude					
I found program content stimulating					
I would like to spend more time using the program					
Compared to class method training the program is more effective					
I prefer the program because it is done at learner space and time					
The stated objectives were met					
Program Design					
The layout is clear and consistent.					
Graphics and other media elements are meaningful and add to the project.					
The text is easy to read and contrasts with the background.					
The navigation button are simple and easy to understand					
The graphics, sounds, and text used in the program help to better understand the concepts					
The screen buttons are visible					
Providing Help					
Procedural help stated clearly in the initial direction of the program					
Program allowed return to main page at all times					
Ending of the Program					
Program gives the option to exit at any point					
Program provided a final message to confirm the exit					
Suggestions					
Availability to all health workers should be increased					
Make similar programs for other topics					
Increase the amount of information in the program					
Program work well as is					
What do you recommend to improve the program?					
On a scale of 1 to 5 (5 being the highest), How would you rate this program?					
GENERAL COMMENTS: Please feel free to express any criticism or comments regarding the program					

10.2.3 Validity and reliability

Vivekananda-Schmidt et al. (2004) identified validity as a state in which a particular outcome index measures what it purports to measure, and reliability refers to the consistency, accuracy, or precision of a measure. Maurer and Andrews (2000) argued the Likert Scale measurement as an acceptable alternative to other measures, as it required 50% fewer participant responses than the traditional format, and provides more specific diagnostic information. Robson and Neuman, cited by Minisini et al. (2010), agreed that the simplicity and ease of use of the Likert Scale is its real strength.

Page-Bucci (2003) recommended when developing a Likert Scale, a pool of statements needs to be generated that are relevant to the attitudes of the respondents. The facts and the number of choices on the scale should be evenly balanced to retain a continuum of positive and negative statements with which the respondent is likely to agree or disagree. This will help avoid the problem of bias and improves reliability. Using multiple indicators to measure a concept is desirable for helping to get at the complexity of the concept, assisting in developing more valid measures, increasing reliability, enabling greater precision, and simplifying the analysis of many variables into one variable (DeVaus, 2002).

10.2.4 Getting in

A CD-ROM with a written instruction and an evaluation sheet in form of questionnaire were posted to participants in the studies who are involved in Aboriginal health workers continuing education, expert and colleagues working in field of Information Technology, health education. We asked various stakeholders to work through the CD--Rom and complete an evaluation questionnaire. Twenty questionnaires have been sent, only fifteen returned completed. Both qualitative and quantitative data were collected.

10.2.5 Scoring and analysis

A Likert item is simply a statement that the respondent is asked to evaluate according to any kind of subjective or objective criteria; and generally the level of agreement or disagreement is measured by choosing a corresponding score. The scores for each item are then added together to provide each evaluator with an overall score for that set of statements, known as a scale score. The evaluator's position for each evaluation criterion is represented in the scale score (Alessi and Trollip, 2001; DeVaus, 2002).

After the questionnaire is completed, responses were coded according to common responses from all participants within each questionnaire. This is a primary evaluation to the program and is used mainly to determine the agreement and disagreement for certain criteria for improving the program. So the 'strong disagree' and 'disagree' scores are summed together and the

'strongly agree' and 'agree' scores also are summed to achieve at the end to achieve three main scores for 'agree', 'disagree' and 'not decided'.

The frequency of participants' responses for each of the questions was coded. Item responses were summed to create a score for a group of items which represented the participants' evaluations for each group of items. Once coded, the data were analysed using the Microsoft Excel program spreadsheet to sum the responses of the evaluators (scores) and calculate the averages of the evaluation scores for each group of questions, and percentages of this average as it related to the number of participants.

10.3 Results

The evaluation results measured the level of agreement of participating achieved during their working on the CD-ROM summarised in Table (10.4), (10.5) and (10.6)

Table (10.4) Evaluation Results, Descriptive Statistics

	Disagree	Not decided	Agree
Introduction of the Program	1	2	12
	7%	12%	81%
Presentation of the Information	2	2	11
	12%	12%	76%
Learner Control	1	2	12
	7%	12%	81%
Providing Help	1	1	13
	7%	7%	86%
Ending of the Program	0	2	13
	0%	14%	86%
Program Design	2	1	12
	12%	7%	81%
Attitude	2	4	9
	12%	29%	59%
Program content	3	5	7
	20%	36%	44%
Suggestion1	1	4	10
	7%	29%	64%
Suggestion 2	1	3	11
	7%	20%	73%
Suggestion 3	3	4	8
	19%	29%	52%
Suggestion 4	4	2	9
	29%	12%	59%
Rate	1	5	9
	7%	36%	57%

Table (10.5) Model evaluation results

Evaluation criteria	Percentage
Program's instruction design	
Introduction of the program: Title of the program is attractive. The purpose of the program and the objective were clearly stated	81% agree
Presentation of the Information: the computer instructions were clear, well organized and presented in a systematic manner and consistent. Program is well planned, logical and easy to understand. The written text and graphic were clear. The quiz and its feedback were consistent, appropriate and very helpful.	76% agree
Learner Control: The position, appearance and function of buttons are clear, consistent. Menu list is clear and easy to access throughout the program. Program structure let the user able to make better sequencing decision.	81% agree
Providing help stated clearly in the initial instruction of the program, and the program allowed return to main page at all times	86% agree
Ending of the Program and option to exit at any point provided with a final message to confirm the exit.	86% agree
Program's graphic design	
The graphic design criteria related to features of the interface such as color, frames, text, and types of media was clear, visible, consistent, and easy to read, and understand. Also the graphics regarding their usability, consistency, clarity, structure, relevancy, use fullness and co-ordination was well designed, meaningful, add to the project, and help to better understand the concepts.	81% agree
User attitude	
Program content stimulating, more effective comparing to the class method training, and the stated objectives were met.	59% agree
Program's content	
Information is correct, relevant, up-to-date, and sufficient for professional educational needs. Some information is not covered. Program provided too much detailed information than text or lecture	44% agree
Suggestions	
Frequency to the availability of the program to all health workers should be increase.	64% agree
We should develop similar programs for other topics.	73% agree
We should increase the amount of information in the program.	52% agree
Program work well as is, and there is no need to do any change in the program.	59% agree

Table (10.6) Most popular aspects of the program from a total 15 questionnaire

Description	Number of agree responses	% of responses
The title of the program is telling what the program is about	12	80%
The objectives were clearly stated	13	87%
The information is presented in a meaningful way	12	80%
Program is well planned, logical and easy to understand	12	80%
The material was well organized	12	80%
The purpose of the program was clearly stated	13	87%
It is clearly indicated when new topic are being introduced	13	87%
The Quiz is very helpful	12	80%
It is clearly indicated where to look for direction	13	87%
Main menu is easy to access throughout the program	13	87%
Program content stimulating	12	80%
The text is easy to read and contrast with the background	12	80%
Menu list throughout the program are clear	14	98%
The navigation button are simple and easy to understand	14	98%
Program allowed return to main page at all times	14	98%
Program gives the option to exit at any point	12	80%
Program provide a final message to confirm the exit	13	87%

Last step in the analysis is produce a design chart to show the evaluators' position regarding each point in the evaluation criteria, i.e. the instructional design, graphic design, user attitudes, and the program content, as represented in Figures (10.1) to (10.12).
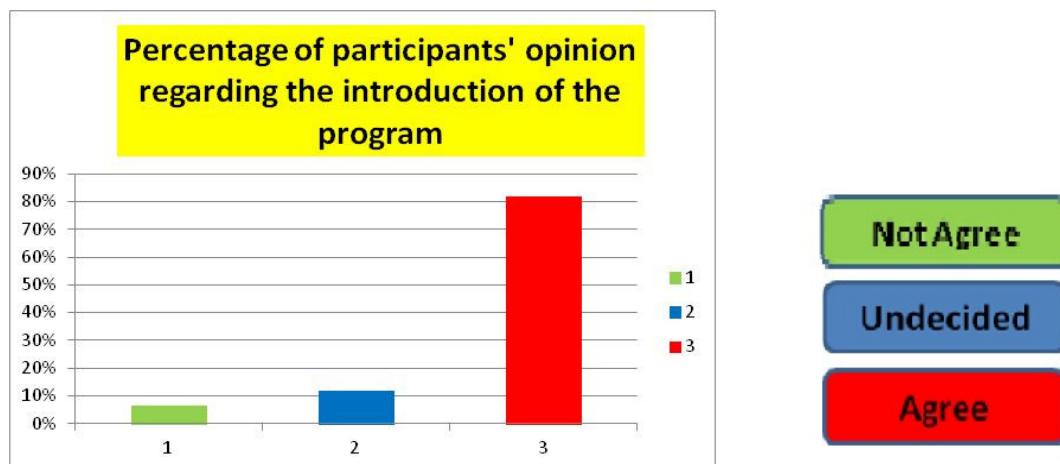
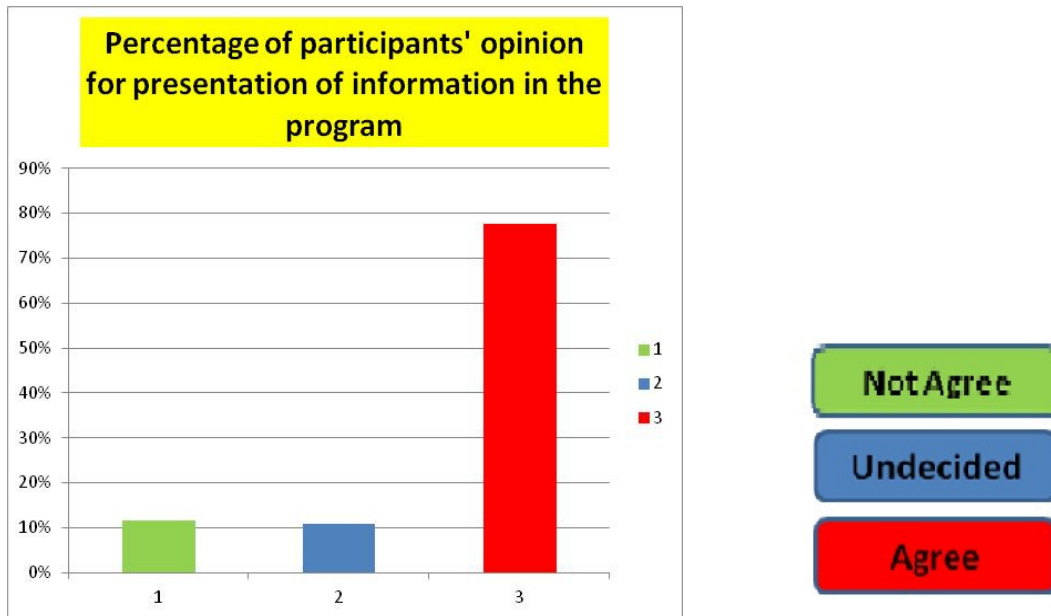**Instructional design**

Figure (10.1) Program Introduction

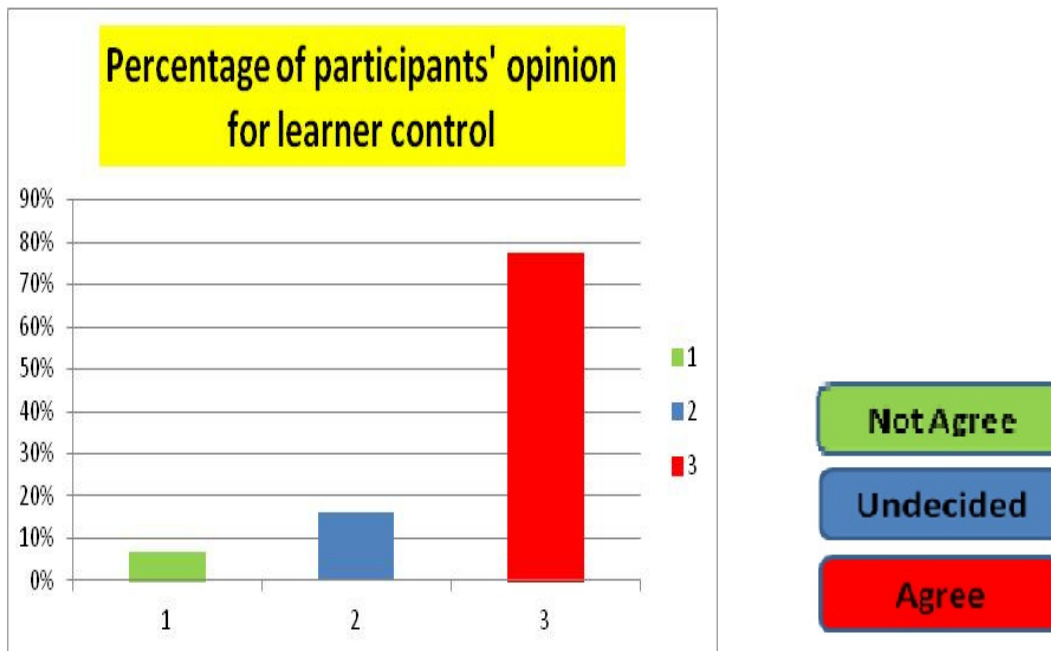Figure (10.2) Presentation of Information
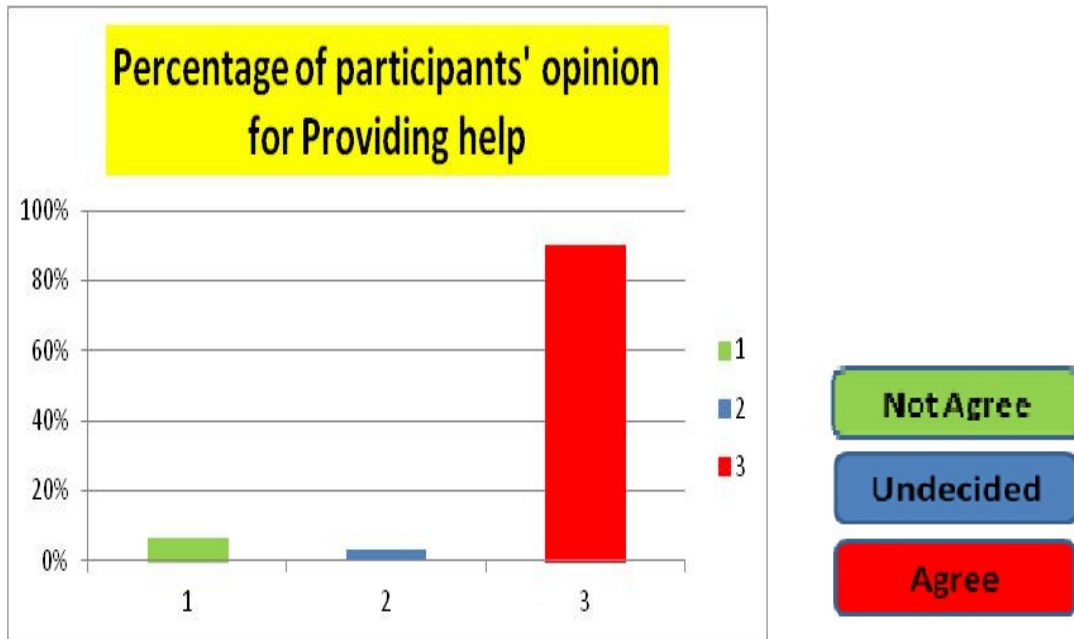

Figure (10.3) Learner control
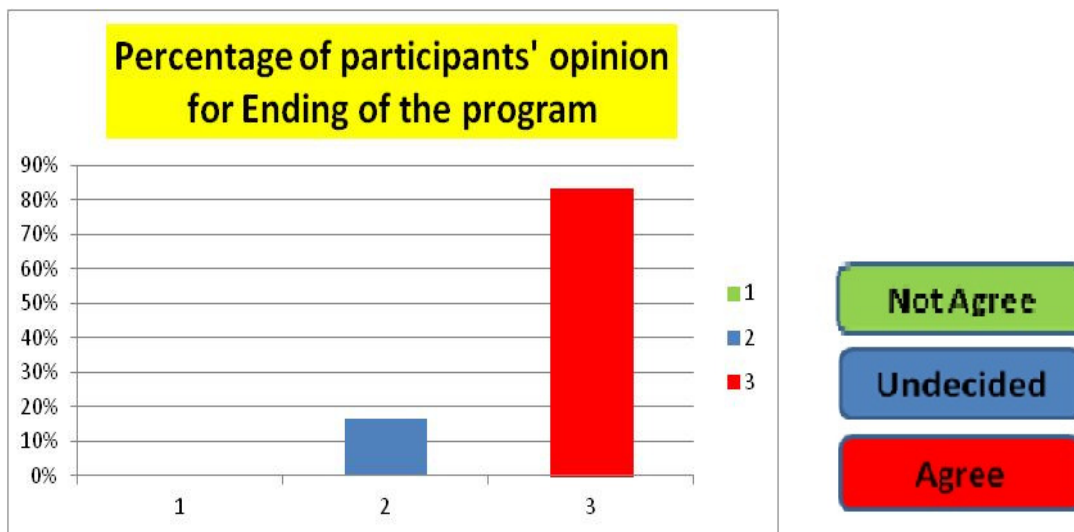
Figure (10.4) Provident help

Figure (10.5) Ending of the program

The above diagrams, figures (10.1, 10.2, 10.3, 10.4 and 10.5), show that the majority of the participants agreed that the program's instructional design criteria, including the introduction of the program, the presentation of the information, learner controls and navigation, providing help and ending of the program were well planned, and that the program objectives were well stated and clear.
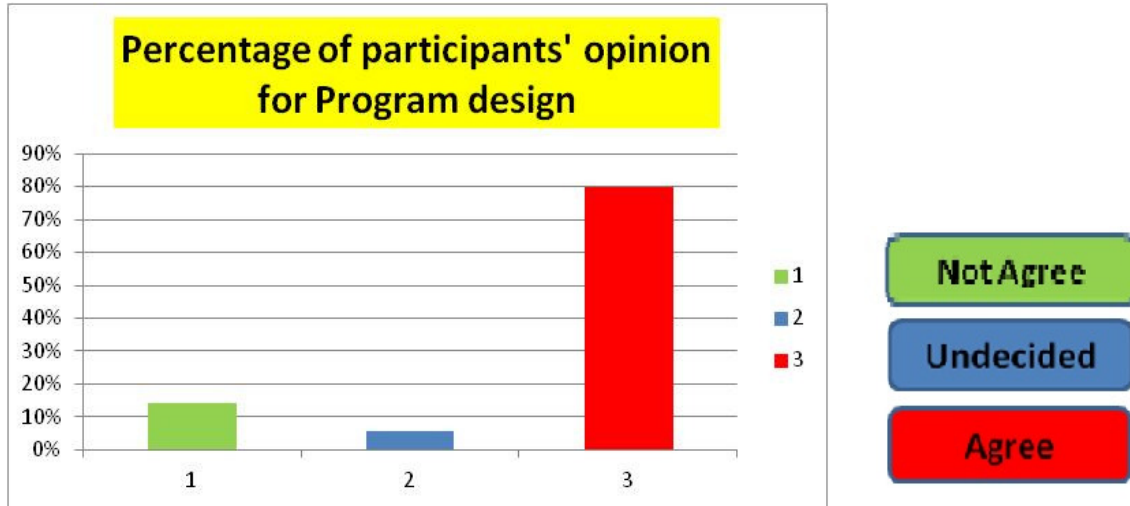
Graphic design

Figure (10.6) Program design

The above diagram, figure (10.6), shows that 80% of the participants agreed that the graphic design criteria related to features of the interface such as colour, frames, text, types of media were clear, visible, consistent, easy to read, and easy to understand. Also the graphics, regarding their usability, consistency, clarity, structure, relevancy, usefulness and co-ordination was well designed, meaningful, add to the project, and helped users to better understand the concepts.
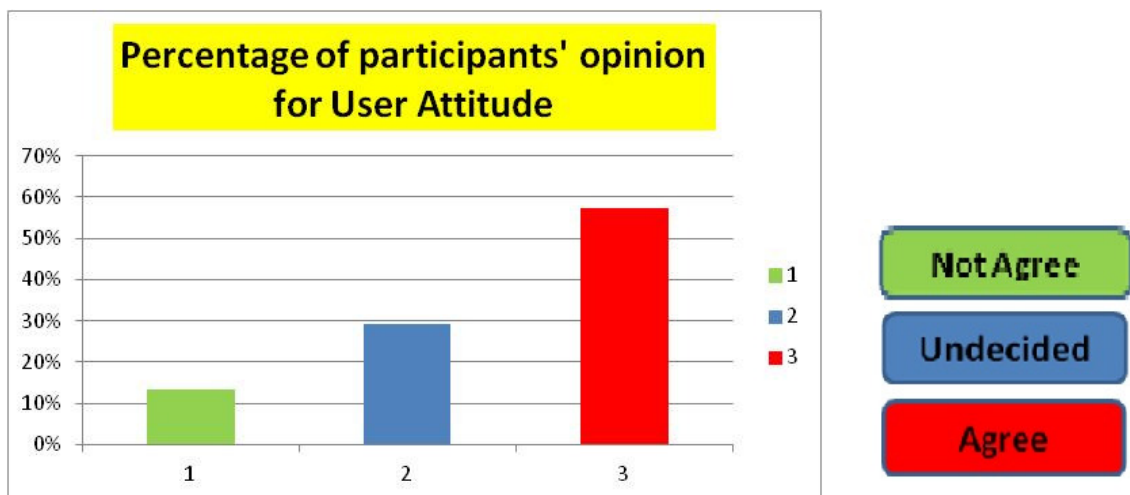
User Attitude

Figure (10.7) User Attitude

The preceding diagram, Figure (10.7), shows that 29 percent of the participants could not decide about the simulating nature and attractiveness of the program; and whether or not the program could replace face-to-face class training methods.

This is indicative that the program needs to be evaluated mainly from the end-users' perspective (Aboriginal health workers), in order to investigate whether the planned program offered a significant advantage to their continuing professional development.

Program content

Figure (10.8) Program content
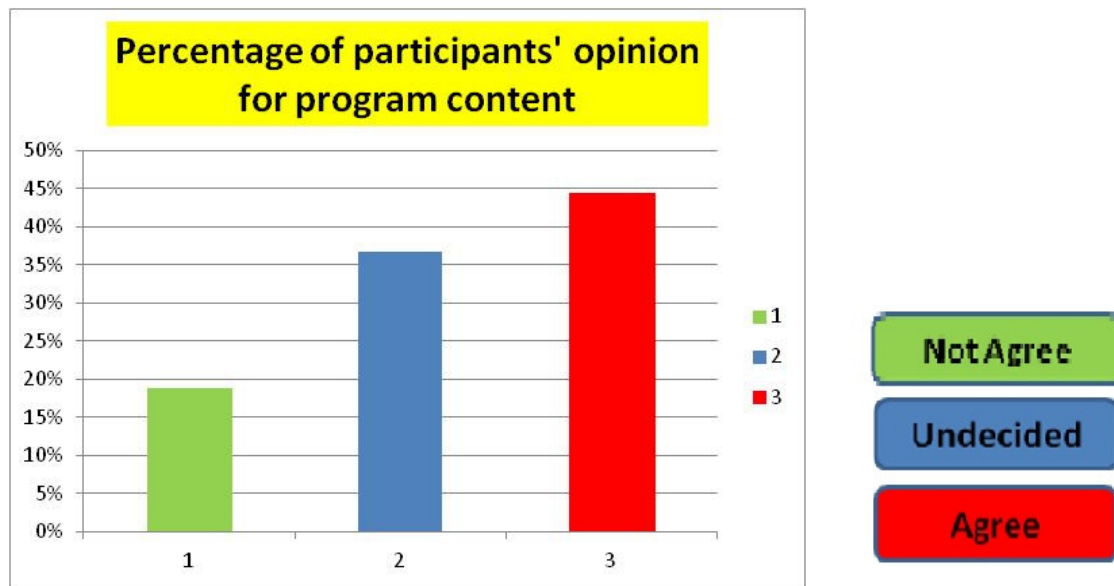
The above diagram, Figure (10.8), shows that 37 percent of the participants could not decide about the validity of the program content and thus was indicative that the program needed to be evaluated by more specialised experts in the field of communicable disease and Tuberculosis.
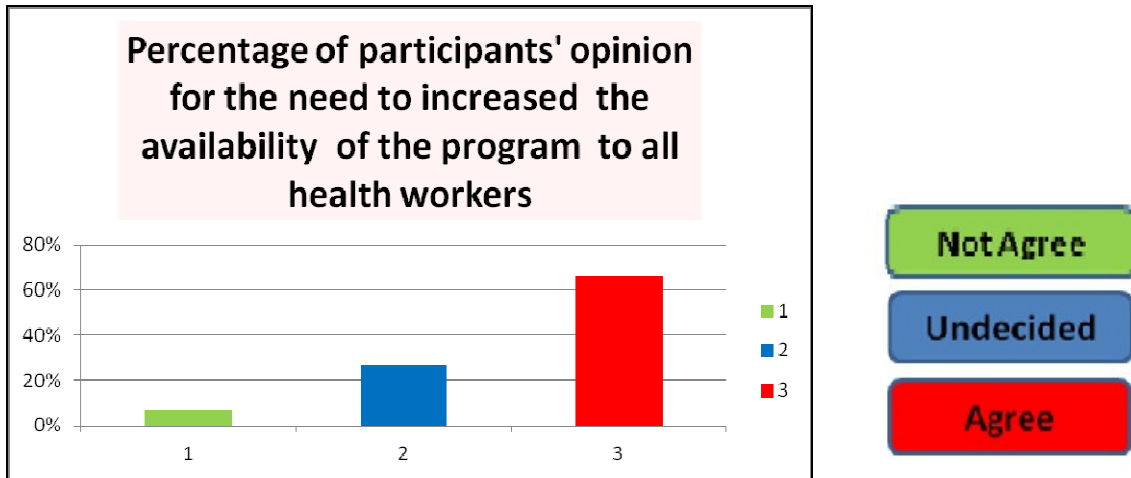
Figure (10.9) Increased this sort of program
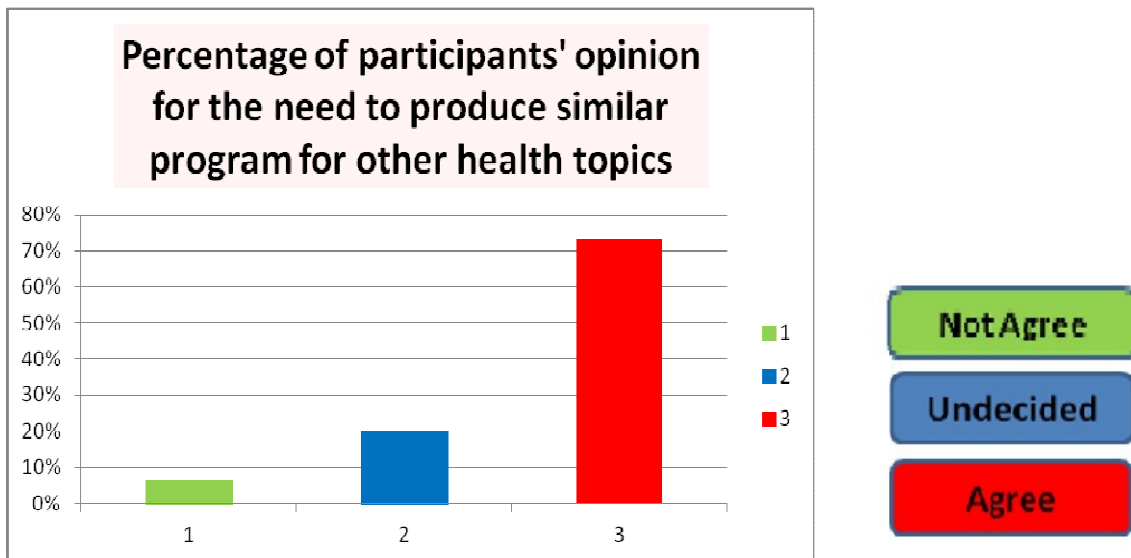
Figure (10.10) Develop more program on other health topic
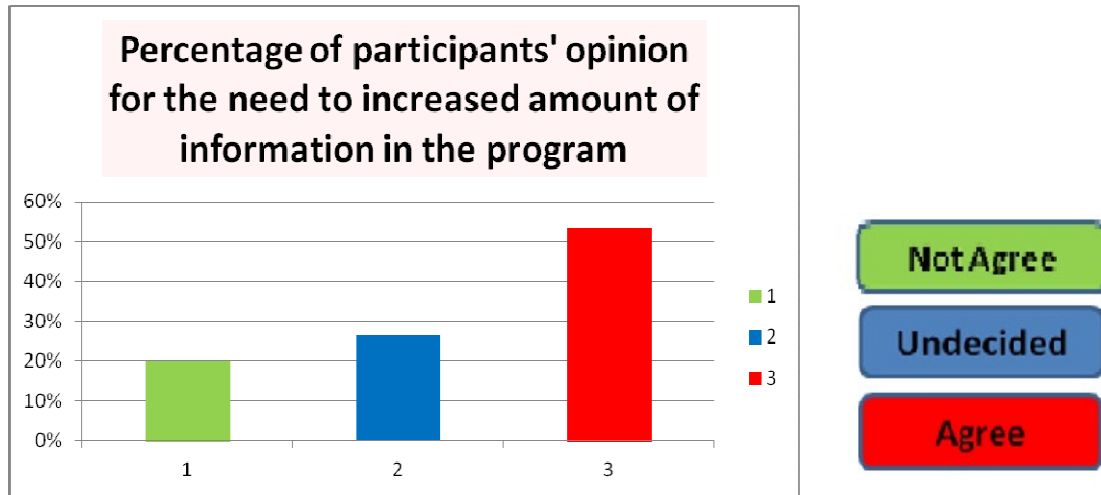
Figure (10.11) Increased amount of information in the program
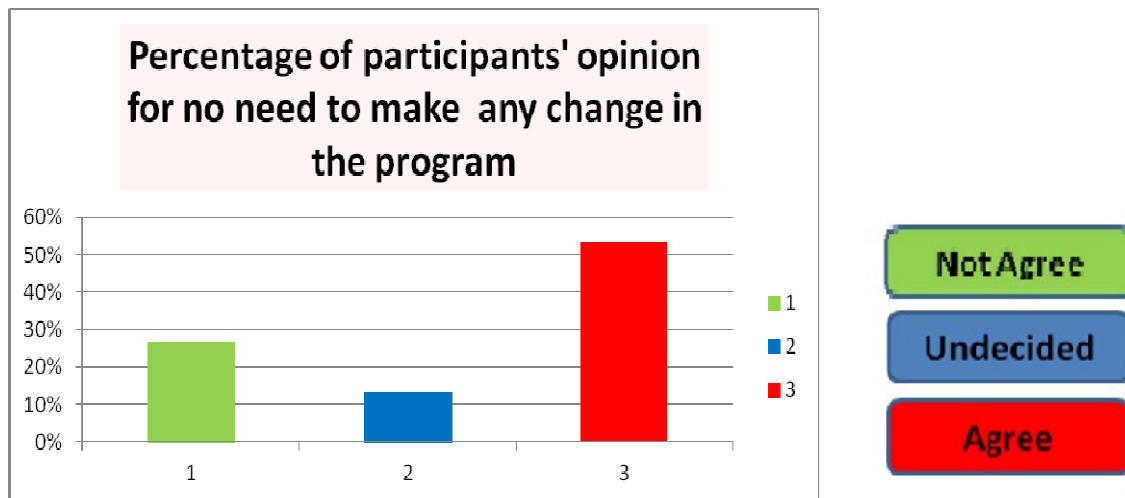
Figure (10.12) No need to change

10.4 Discussion

The program in this study is still at a very early stage of its development. Nonetheless, the findings are interesting. The findings indicate that evaluators were positive about the program. Comments included that "is a great start point", "good concept", "could be used for teaching those in the community as it is easy to understand" and "provides enough information", and "it needs a few cosmetic alterations and some more written explanatory resources".

Rating the model on a scale from 1 to 5, with 5 as the most positive score, only one participant rated it to the lower level of 1, and claimed that the program was not culturally- appropriate. While six others out of the 15 participants rated the model on an average score of 4, five rated it at level 3 and three rated it to the highest level, 5. The main aspects that worked well in the planned model as described by the evaluators were:

1) The combining of presentations and video stories with culturally accurate information is a good learning resource; and

2) The combining of practical and clinical information in presentation and videos in the planned model.

The main criticism for the planned model was that the ethical procedure used as the planned model was a prototype for using interactive multimedia in supporting Aboriginal and Torres Strait islander health workers, but in the final stages of development that would be used by Aboriginal communities, the model should reflect a real health problem in that community and should seek the community's consent for using their name. There was also a need for the model to be more precise and accurate, including the use of professional terminology, including the use of the correct terminology when referring to Aboriginal and Torres Strait Islander health workers.

The most important results for the formative evaluation which need further consideration are:

- About 29 percent of the participants did not make a determination about whether or not they found the program to be stimulating and attractive, and this was indicative that the program needed further evaluation from the point of view of the end-user themselves, namely ATSIHWs.

- Also 37 percent of the participants did not make a determination about the validity of the program content and thus this was indicative of the fact that the program needed to be evaluated by more specialised experts in the field of communicable disease and Tuberculosis regarding program content.

- About 27 percent of the participants pointed out that there were some changes and alteration should be made to the program. Those changes were explained in detail in the recommendations.

- Also, there are ethical procedures that need to be followed, as well as seeking guidance from the community about which content might be used in the model in order to choose a health topic relevant to this community, and to ensure that the developer has the community's permission before their name or other identifying information was used in any resource, as well as using accurate images to depict the chosen community.

10.5 Recommendations

Participants stressed that best practice in Aboriginal and Torres Strait Islander education resources required input from members of the target audience; as this helped to ensure that the resource was culturally safe, applicable and appropriate to the target group. Regarding the CD- ROM model, they pointed out the following:

- *Program Instructional design*: The CD should be accompanied by a written instruction resource that included the initial instructions, and more explanation should be provided about how to start and end the program.

- *Program Graphic design* could be more "Aboriginal" through the use of the voice of a real Aboriginal person, the graphics should reflect Aboriginal communities, and there was a recommendation for a greater use of Aboriginal art works. Improvement of graphic design was recommended through changing the color of the slides to be more attractive, editing the texts, checking spelling, grammar, and punctuation, and improving the images by using pictures of real people instead of cartoons. Evaluators pointed out the presence of too many variants in the model graphics; and the need for greater consistency. The sound recordings and the speaker need more professional input, as did language improvements, and adding some background sounds with smooth instrumentation. The narration was considered to be too flat and slow, it needed to be more engaging.

- *User Attitudes*: Participants suggested that the planned program ran too long, and this is an important issue that needs to be addressed in order to maintain user interest. Also, other participants were concerned about the program's duration and the need for it to run slightly faster in terms of the narration and video in the program.

- *Program contents:* users identified a need for greater explanation of some scientific words like droplet nuclei, alveoli, etc. Other recommendations were for the program to be more accurate in describing the symptoms and signs of diseases.

The testing of the final model showed that certain issues on the planned CD-ROM model need to be modified. There is a need for continued evaluation in collaboration with Aboriginal health workers. The results of evaluation guided the recommendations for the final phases of the project.

CHAPTER ELEVEN: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

11.1 An Overview of the Research Findings

Universities are playing an important role in bridging the Aboriginal health gap through research, updating and innovation yield through the production, disseminate and exchange of knowledge. This role has been illustrated as the fundamental step in the process of addressing health and social disadvantage (Anderson, 2008).

Table (11.1) summarises Aboriginal health publications from 1987 to 2003. It shows that most of the research studies describe the problems without proposing solutions or providing new knowledge about the situation (Anderson, 2008).

Table (11.1) Aboriginal health publications, 1987–2003

Australia	Original Research			
	All	Measurement	Descriptive	Intervention
1987-88	19	2 (11%)	17(89%)	0
1997-98	80	6(7%)	60(75%)	14(18%)
2001-03	101	9((%)	79(78%)	13(13%)

Source: (Sanson-Fisher et al., 2006)

Searching Aboriginal and Torres Strait Islander health worker journals gives a more up-to-date picture of Aboriginal health publications from 2006 to 2011. It shows that despite increases in the overall number of publications, especially in the year 2008 through to the year 2010, most of these research studies still only describe the problems present without proposing interventions or solutions as explained in Table (11.2)"

The research must re-focus on generating knowledge and analysing problems. This might be achieved in such a way as to review the required practices in order to be actively addressing the

health gap between Aboriginal and non-Aboriginal Australians (Brough et al., 2004).

Table (11.2) Aboriginal & Islander health worker journal publications, 2006–2011

Aboriginal and Islander Health Workers Journal Publications (2006-2011)			
Years	**All Publication**	**Descriptive**	**Intervention**
2006	112	103	9
2007	109	96	13
2008	122	106	16
2009	71	58	13
2010	95	74	21
2011	62	48	14

Source: (Aboriginal & Islander Health workers Journal, 2006-2011)

This research was different from other studies because it explored further specific problems in the sector while, at the same time, proposed solutions to those problems. The research and the model developed proposed the expansion of the use of IT for continuing health informatics, educational and training programs.

It is designed to be used as a standalone self-directed learning resource with one unique facet that is culturally sensitive to the intended targeted learners, which could be used by Aboriginal and Torres Strait Islander health workers at their practice locations.

This study is at the beginning of the process, and there is need for further research to provide a greater understanding of the issues related to Aboriginal and Torres Strait Islander health worker professional development, and about the use of Information Technology as a new approach for their education with emphasis on the Aboriginal cultural issues in the development of Health informatics program for Aboriginal health workers.

The study established a sound approach for further action, such as the recommendation of improvements to the current model and the production of additional programs for different topic areas.

It is hoped that the outcomes and the recommendations of this study will be taken into consideration when developing Aboriginal health workers' continuing education and training strategies in future.

11.1.1 Qualitative Interview

Since the number of participants in the research interview was limited, their views can be called suggestive and not representative of the whole Aboriginal and Torres Strait Islander health workers educator, and the generalisations derived from the data in this study would therefore be limited.

The qualitative data obtained through the interviews of the ten participants in the study, of varying backgrounds, described their understanding of the barriers that are holding back the process of Aboriginal and Torres Strait Islander health worker continuing education, and the recommendations they provided show their suggestions for the improvement of the program development in order to close the Australian Aboriginal health gap.

The data was complemented and supported by documentary analysis. Together these data sources offered insights into the current barriers for Aboriginal and Torre Strait Islander health workers in advancing with their continued education.

Results of the current study are consistent with the positive results demonstrated by other studies which have shown that there is a deficiency in the current continuing education of Aboriginal and Torres Strait Islander health workers. The findings from this study suggest that the CD-ROM/USB drive could be used as an alternative method for updating Aboriginal health workers' knowledge, and the suitability of using IT as a model source for continuing education for Aboriginal and Torre Strait Islander health workers.

11.1.2 Design and development of Interactive multimedia software

The primary concern of this study was to develop an interactive multimedia model contextualised within a culturally-appropriate approach and to explore the different stages of model development. The CD-ROM developed in this study was based on various pedagogical approaches and learning theories deemed suitable for adult education.

(Mooney and Bligh, 1997b) emphasised the need for collaboration featuring the expertise of technologist with the expertise of medical educators, clinicians and basic scientists in efforts to design and develop innovative approaches towards medical education, that when used in tandem, utilise IT to its full potential for maximum educational value.

The study has drawn attention to the difficulty of developing cultural appropriate informatics programs that can be delivered on common multimedia storage drives including CD-ROM/USB

drive and used by Aboriginal and Torres Strait Islander health workers at their own places of work and study.

The diversity of the research into educational pedagogy, interactive multimedia technology; Aboriginal cultural and medical information suggested to me that it would be very difficult to draw all of these ideas and concepts together and make a final program based on them. However, the data gathered from the interviews was helpful and much of the literature was supported and provided sound basis upon which to build a model.

Also other major concerns faced the model development are:

- New developments and knowledge may quickly date the contents of the software training program. Solving of this problem could occur through provision of informative links in order to allow the utilisation of the vast information resources on the web as a logical way forward for maintaining the currency of training resources (Williams and Harkin, 1999).

- Managing computer software can sometimes seem complex for users with beginner-level computer skills. This concern could be resolved through the development of program instruction on hard copy to accompany the CD-ROM model.

11.1.3 Formative evaluation for the planned CD-Rom model

The evaluation results indicate that the program in general met the goals outlined in the original project objectives. The evaluation results confirm the study hypothesis that interactive multimedia CD-ROM/USB drive health informatics could be used as an alternative material source for updating Aboriginal and Torres Strait Islander health workers' knowledge.

The positive response of participants in this study provided reasons for the continued exploration of the different ways to bridge the health gap between Aborigine and other Australians through using Information Technology in a culturally-appropriate way.

11.2 Limitation

As mentioned in Chapter one, there are a number of several factors that share in the limitation of the findings in the study:

The principal limitation of this study is the small number of stakeholders in total that participated, the low response from the invited participants, and the lack of availability of people who could be involved. Despite the diversity in the participants' backgrounds, the limitation in their number is indicative that their responses are not representative of all issues concerning this important topic, and the generalisations derived from the data in this study would be limited.

This low response from Aboriginal and Torres Strait Islander health workers could be explained as a response to the impact of the past research practices on Aboriginal Australian which still persist until now, as Aboriginal people world-wide have been over-researched with little

thought given to culturally safe methods of engagement (Bessarab and Ng'andu, 2010; Smith, 2006).

- A further limitation in the study is that the designer and author of the software carried out all the research.

Alessi and Trollip (2001) suggested that a team generally has more creative ideas than an individual and is more demanding of higher standards. Project team for the preparation of CD material that is designed to help learners engage with content and participate in learning activities should include people with expertise in instructional design, programming, graphic arts; and usually requires the services of an educational designer and one or more content experts (Alessi and Trollip, 2001; Geissinger, 2001).

While I was able to gain other expert opinion and advice from Aboriginal training centre staff and two Aboriginal heath workers, I believe the development of interactive multimedia health informatics software needs collaboration between several people.

- Also interview results show that computer access could be one of the most prominent problems for implementing the planned model for Aboriginal and Torres Strait Islander health workers.

- The restriction in the geographic area in which the research takes part is another limitation factor that should be considered.

11.3 Conclusion

11.3.1 Answering the research questions

Research question 1

Can an interactive multimedia self-paced program be developed as a source of health education information to support Aboriginal and Torres Strait Islander health workers in their roles of prevention and control of Communicable Diseases?

The first research question was answered by exploring the current state of Aboriginal and Torres Strait Islander health workers' continuing education using qualitative interviews and documentary research. This revealed the presence of gap represented in the form of inefficient, unsustainable and culturally inappropriate methods for the current Aboriginal and Torres Strait Islander health workers' continuing education program.

The variety of data gathered supported the initial goal of the study. It supported the concept of using a practical solution to fill the gap in Aboriginal and Torres Strait Islander health workers' continuing education, through the adaption of the interactive multimedia technology as an alternative new approach for delivery continuing informatics program for them.

The has research shown that an interactive multimedia technology can be used as an alternative way for delivering information in a culturally-appropriate form for Aboriginal and Torres Strait

Islander health workers, and that the delivery model could be efficient regarding its content, and sustainable, meaning it has continuity and cultural appropriateness imbedded in its design.

Research question 2

What are the key factors that need to be considered in order to develop culturally-appropriated software, and to be present in an associated care delivery model?

This question was answered by the research. The data gathered from the interviews and that gleaned from the literature explored the main key factors that impact the development of a cultural appropriate, interactive, multimedia and informative health program for Aboriginal and Torres Strait Islander health workers.

It could be classified under four major categories, cultural, Information Technology, learning aspects, and interactive multimedia factors.

Also there is need to consider Aboriginal learning styles in the development of interactive multimedia resource for Aboriginal and Torres Strait Islander health workers health workers.

11.3.2 Major contribution to knowledge of research

The development of an interactive multimedia health informatics CD-ROM aimed at disseminating knowledge and raise awareness about Tuberculosis amongst Aboriginal and Torres Strait Islander health workers has been developed. CD-ROM was evaluated, in both educational and design aspects, using expert reviews drawing on individuals from various backgrounds.

The study input was the following:

1) Review the current Aboriginal and Torres Strait Islander' continuing education

The study contributes to the exploration of the current gaps in Aboriginal and Torres Strait Islander health workers' continuing professional education.

2) Identification of key factors for develop a cultural appropriate interactive multimedia health informatics program

This study contributes in identifying an appropriate pedagogical approach, model development guidelines and cultural issues which should be considered in the development of any interactive multimedia educational program for Aboriginal learners.

3) Model development

The findings provide a detailed descriptive framework, and a new approach for cultural appropriate educational program development, to be used by Aboriginal health workers' educator and program manager and training organisation seeking for improvement.

The development process involving design, authoring of the software, and evaluation as demonstrated in this study.

4) Model Significance

Applying the interactive multimedia cultural appropriate design, based on those identified factors in the study, provides the following:

1- Program design and multimedia contents prepare Aboriginal health workers to deal with issues related to the control and prevent of Tuberculosis.

2- Program provides medical information and clinical aspects of dealing with people's suffering from Tuberculosis.

3- Program develop a source of information which can be an ongoing educational training program for Aboriginal health workers especially those in remote and rural areas.

4- Program approach population health through emphasising the need to improve living conditions, nutritional status, environmental conditions and any others socioeconomic factors those contribute towards a particular disease.

11.4 Recommendations for Further Development & Research

Various recommendations arising from analysis of data gathered during the study, but they are derived from a single purpose, that is, how to improve Aboriginal health workers' continuing education and support them in their complex roles, especially in remote and rural areas. They are as follows:

Recommendation 1

Further clarification of the concept and appropriate measurement of the need for interactive multimedia self-paced health informatics programs as a source of continuous professional development particularly for rural and remote areas, as this may help support further study that contributes to resolving health inequities.

This clarification could achieved through further research and study to explore and examine the potential and limitations for using the interactive multimedia self-paced software as a source for information in supporting Aboriginal and Torres Strait Islander health workers.

Recommendation 2

A study with appropriately powered sample size, validation of assessment tools, and pre-intervention knowledge measurement in the future may be able to confirm findings declared in this study**.**

Recommendation 3

This research suggests that involvement of Aboriginal and Torres Strait Islander health workers in developing the strategy and program for their continuing education is crucial for any improving in their education.

Recommendation 4

Developing continuing education program for sustainable health worker continuing education involves participation by the community and acknowledgment of the impact of the culture.

Recommendation 5

The needs assessment for model development should not only be done during the beginning stages of model development but a repeated needs assessment are likely to reveal unanticipated needs, and if acted upon will improve the model (Sisson et al., 2010).

Recommendation 6

The program's instruction and content should present in hard copy form to give a preliminary idea and information about CD-ROM before users begin using it.

Recommendation 7

Developing contextualised program content and methodologies that can respond to the unique Aboriginal culture present in different geographical areas across the country would be beneficial through finding cultural resources from the elders of each community.

Recommendation 8

Furthermore, it has been suggested that prior to advocating certain new western medicine in the educational program, in order to promote it to Aboriginal communities, first the medicine in question should in terms of why it is the best choice.

Recommendation 9

Develop a reliable and applicable evaluation design for each stage in the development of interactive multimedia health informatics software.

Recommendation 10

This study takes account of the opinions and perceptions of Aboriginal health workers educators, trainers, coordinators and manager. For the future, a more feasible and appropriate outcome evaluation design should be developed using an appropriate cooperation process with Aboriginal and Torres Strait Islander health workers and communities to achieving realistic and valid outcomes for the project.

Recommendation 11

A further evaluation for the Interactive multimedia CD-ROM program should proceed in the form of a pilot test and formative evaluation with Aboriginal and Torres Strait Islander health workers to indicate if they would be able to learn from the program at a faster rate than they would from traditional paper-based education in terms of raising their ability to accurately diagnose and treat TB.

Recommendation 12

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The effectiveness of health informatics program can be determined by measuring the health workers' achievement regarding the program objectives. It is desirable to assess health workers knowledge before, during and after using the program and inform them about their own progress.

Recommendation 13

(Sisson et al., 2010) suggested the following guidelines in developing Interactive multimedia models as educational resources:

1. Principles of curriculum development should be addressed when developing educational resources, starting with a needs assessment.

2. Principles of adult learning should be considered.

3. Model should be designed to demonstrate the educational effectiveness of their intervention, both on an individual and programmatic level.

4. The training organisation has important role for model evaluation, sustaining, repeating the need assessment, update the content over a long period of time.

Recommendation 14

Designing complex multimedia requires a team effort because a good result requires many different skills.

Recommendation 15

For model design the study suggested the following:

- Designers should first determine what outcomes that are trying to achieve and then select elements and media well suited for these outcomes, and only when these elements support a learning need.

- Consistent navigation elements clarify what to do next, and learners should always be able to tell where they are and how to get to where they want to go.

- Always provide ways for learners to get help with the technology and with questions about the content.

- The learner can determine when to use additional media (as video, animation, audio).

- More research and design resources might be forthcoming.

Recommendation 16

Finally design effective culturally-appropriate health informatics software using interactive multimedia requires the cooperation of medical educators with the software technologists.

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13.0 APPENDICES

13.1 APPENDIX: LETTER OF RECOMMENDATION FOR THE STUDY

Queensland Government

Queensland **Health**

Multimedia Model for supporting Indigenous Health Workers in Preventing Communicable Diseases

Proposed by

Faeka El Sayed ● PhD Researcher ● Faculty of Business

University of Southern Queensland ● Toowoomba ● Queensland ● Australia

To Whom It May Concern

Indigenous health workers are playing a critical role in the delivery of primary health services to our indigenous communities in Australia, especially in remote and rural areas. In order to be a quality, skilled workforce, they must be appropriately trained and adequately, continuously supported through provision of education and skills transfer as well as professional support.

Universities are playing an important role in bridging the Indigenous health gap through research, updating and innovation.

The research study **"Multimedia Model for supporting Indigenous Health Workers in Preventing Communicable Diseases"** proposed by researcher **Faeka El Sayed** is aiming at facilitating Indigenous Health Workers to maintain a high quality of skills and knowledge concerning dealing with communicable diseases and aimed towards improved health services.

The scheme proposes developing continuing health informatics, educational and training programs. Those tools are to be used at Indigenous Health Workers' practice locations.

The research/study explores specific problems in the sector while, at the same time, proposing solutions to those problems.

We would like to express our support for this research as it is likely to be a valuable addition to our programs and services.

Terry Appo

Indigenous Public Health Officer

(Communicable Diseases)

Southern Regional Services

Darling Downs Public Health Unit

3 Bell Street, Toowoomba, 4350

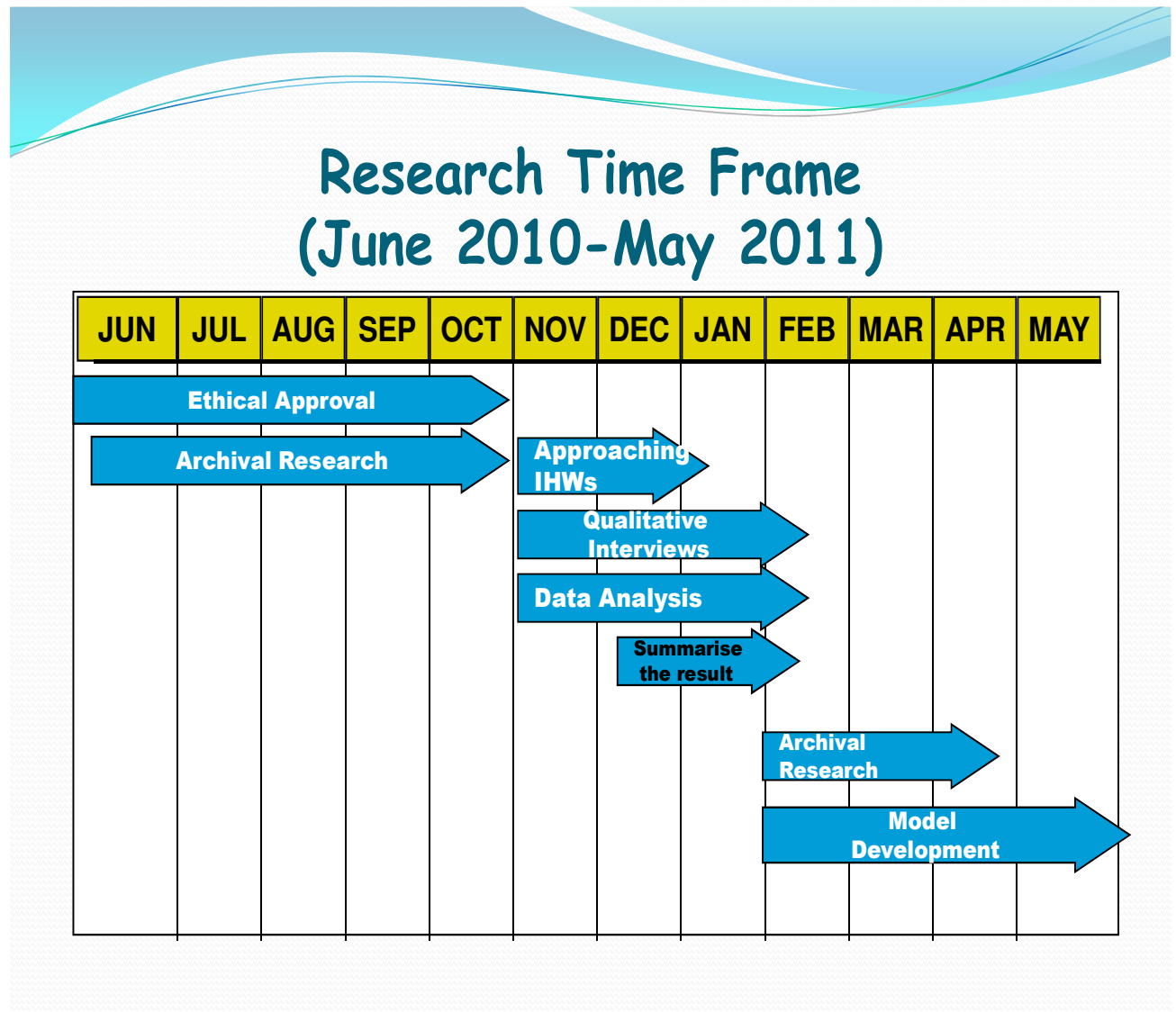Dr. Penny Hutchinson

Public Health Medical Officer

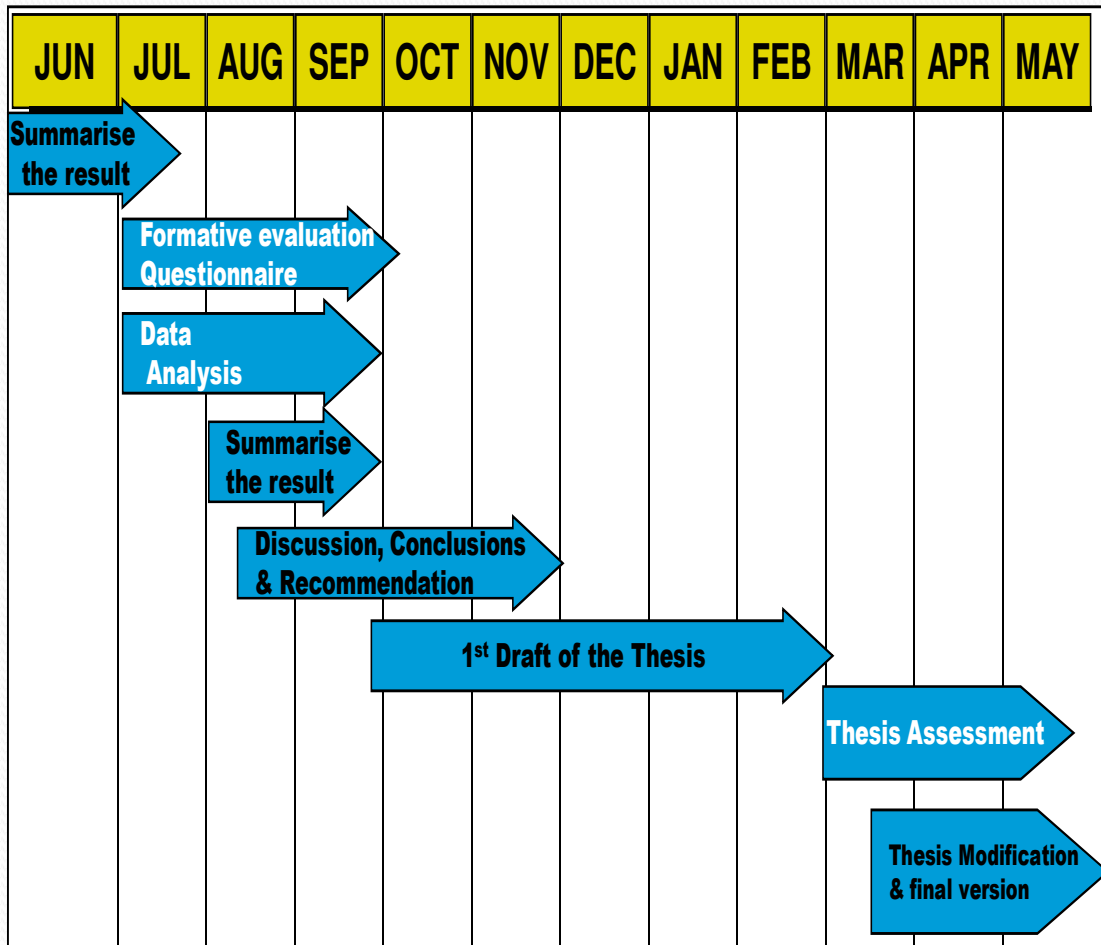Southern Regional Services

Darling Downs Public Health Unit

3 Bell Street, Toowoomba. QLD. 4350

Phone: (07) 46319842

13.2 APPENDIX: RESEARCH PLAN AND MILESTONE

Research Time Frame
(June 2010-May 2011)

JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY

Ethical Approval

Archival Research

Approaching IHWs

Qualitative Interviews

Data Analysis

Summarise the result

Archival Research

Model Development

Research Time Frame
(June 2011-May 2012)

JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY

Summarise the result

Formative evaluation Questionnaire

Data Analysis

Summarise the result

Discussion, Conclusions & Recommendation

1st Draft of the Thesis

Thesis Assessment

Thesis Modification & final version

Research Time Frame

Stage	Tasks	Start date	Finish date
Stage 1	Literature review	Jun 2009	Dec 2009
	Research proposal for PhD confirmation candidature	Jun 2009	Jun 2010
	Ethical clearance	Jun 2010	Jul 2010
Stage 2	Approaching stakeholders	Jul 2010	Aug 2010
	Data collection: Qualitative Interviews	Aug 2010	Oct 2010
	Data analysis	Aug 2010	Oct 2010
	Summarize the result of Stage 2	Oct 2010	Jan 2011
Stage 3	Archival research	Feb 2011	April 2011
	Developing a preliminary design for training model	May 2011	Jul 2011
Stage 4	Design formative evaluation Questionnaire	Aug 2011	Aug 2011
	Data collection	Aug 2011	Sep 2011
	Data analysis	Sep 2011	Oct 2011
	Summarize the result of stage 4	Nov 2011	Nov 2011
Stage5	Interpretation and Analysis	Nov 2011	Nov 2011
Stage 6	Discussion, Conclusions & Recommendation	Dec 2011	Jun 2012
	1st Draft of the Thesis	Dec 2011	Jun 2012

13.3 APPENDIX: INTERVIEW GUIDE

Using a qualitative in depth interview to identify key factors that would impact multimedia model development as perceived by Aboriginal and Torres Strait Islander health workers, and the level of access they have to IT resources.

The purpose of these in depth, open-ended interviews is to learn from the experiences and opinion of current Aboriginal and Torres Strait Islander health workers' educator in order to better understand their training needs and features that would make training more attractive to participants.

Since the interview will be used as the primary data collection for the study so it will be formalized and semi-structured. The discussions addressed the training organization's perceived need for, and willingness to integrate, our proposed training program into their courses

The main aims for the interview will be to:

- gain consent, explain research purposes, and procedures

- Generate the base line data, find out the current Aboriginal and Torres Strait Islander health workers' training program and assess the availability of IT resources

- Identified specific needs of Aboriginal and Torres Strait Islander health workers, could direct the model development and establish suitable learning material which can be used in the research model

Participant will be asking about:

A) **Aboriginal and Torres Strait Islander health workers' professional backgrounds and their training program**

- What is the motivation for Aboriginal and Torres Strait Islander health workers to participate in any kind of post graduation training?

- How do Aboriginal and Torres Strait Islander health workers keep themselves professionally updated? And what educational resources and training opportunities are currently available?

- How often Aboriginal and Torres Strait Islander health workers attended a continuous training program after graduation?

- Have they ever needed to travel away from their home for training purposes?

• Does travelling away from home to attend continuous education program affect their families' life?

B) Information Technology resources

• What are the IT resources available in your place of work, (especially in remote and rural areas)?

• To what extent do Aboriginal and Torres Strait Islander health workers depend on Information Technology in their everyday work?

• What level of access do Aboriginal and Torres Strait Islander health workers have to IT resources?

C) Their views about the design of a Self-Paced training model

• Are post graduation training program available? What is Aboriginal and Torres Strait Islander health workers' educators' opinion about the need for post graduation training program?

• What type of continuous training program do Aboriginal and Torres Strait Islander health workers prefer, (face to face or self paced training)? And how the training program can be made attractive and valuable to them?

• What are the most important skills and knowledge to be gained from a training program?

• Do Aboriginal and Torres Strait Islander health workers' educators believe that the proposed multimedia model (CD-ROM) serves a useful purpose in furthering their professional update? *How*?

• What are the key factors that would impact multimedia model development?

• Are there any culture or practical obstacles prevent Aboriginal health workers from using Multimedia model as a training program and source for information?

Finally, do you have any other comments or suggestions about training program related to Aboriginal and Torres Strait Islander health workers?

13.4 APPENDIX: PARTICIPANT INFORMATION GUIDE

USQ
AUSTRALIA

University of Southern Queensland

The University of Southern Queensland

Participant Information Sheet

TO: Aboriginal and Torres Strait Islander Health Workers

Full Project Title: Multimedia model for supporting Aboriginal and Torres Strait Islander Health Workers in preventing communicable diseases

Principal Researcher: Faeka El Sayed

I am a PhD student at the School of Information Systems, Faculty of Business, University of Southern Queensland currently conducting a research project on development of a multimedia model for supporting Aboriginal and Torres Strait Islander Health Workers.

I would like to invite you to participate in this research project, which is aiming at facilitating your professional training using a multimedia model. The more your input and involvement in the program design of the model the more productive those activities will be. The invitation in form of flyer has been placed in Aboriginal and Torres Strait Islander health workers' educators work place.

Please read this Plain Language Statement carefully. Its purpose is to explain to you as openly and clearly as possible all the procedures involved so that you can make a fully informed decision as to whether you are going to participate. Feel free to ask questions about any information in the document. You may also wish to discuss the project with a relative or friend or your local health worker. Feel free to do this.

Once you understand what the project is about and if you agree to take part in it, it is asked that you sign the Consent Form. By signing the Consent Form, you indicate that you understand the information and that you give your consent to participate in the research project.

1.   **Purpose of Research**

The purpose of this research is to explore the key factors needed to develop a cultural appropriated, self paced program to facilitate training of Aboriginal and Torres Strait Islander Health Workers and development of a

preliminary multimedia model that aids and informs them to management and prevent communicable diseases. The program is using Tuberculosis as a model. This project is a part of a doctoral study.

Previous experience has shown that in the changing environment in which the health care system operates, training of health sector workers should be adequately and constantly upgrading their skills in order to keep them up-to-date with changes. There is an increasing need for "just in time" training, which is available on demand. Using Information Technologies is a hopeful strategy for improving training of Aboriginal and Torres Strait Islander Health Workers and the quality of care provided within their communities.

2.   Procedures

Participation in this project will be Interviewed by the researcher and Invited to a pilot study which followed by feedback questionnaire.

1- Qualitative interviews

- Interview will take one hour.

- The interviews will be to gain consent, explain research purposes, procedures, and to generate base line data.

- Interviews will be semi structured with open ended questions, which give participants the opportunity to respond in their own words.

- All interviews will be stored as audio recordings and transcribed.

The aims of the interviews are to:

- Determining what resources and training opportunities are currently available and being utilized by Aboriginal and Torres Strait Islander health workers.

- Determining the key factors need to develop a cultural appropriated, self paced, continuous medical education and training program for Aboriginal and Torres Strait Islander health workers to keep them professionally updated.

- Talk about the Availability of IT resources.

- Identify the presence of any cultural obstacles from using multimedia model in Aboriginal and Torres Strait Islander health workers training.

To ensure that research is reliably monitored:

- Regular reports will be sent to the supervisor from the researcher.

- Interview responses will be thematically content analysed and the themes will be validated by an independent researcher against the original transcripts.

- To ensure that the interactive multimedia model content will be present an appropriate level of primary care, the learning content will peer reviewed.

- Formative evaluation for the model will be carrying out using expert review.

By participating in the study Aboriginal and Torres Strait Islander Health workers' educators will help in:

- Improving Aboriginal and Torres Strait Islander Health workers' capabilities and knowledge.

- Share in a new experience which plans to extend the traditional classroom training mode into a new learning environment.

- Support the health workers to build up self confidence through using new learning technologies.

- At the end of the study all the results will be available to all participants.

- The expected interactive multimedia self paced training program, as a source of continuous information about Tuberculosis, will be available to all participants.

There is no any risks to participants as a result of participation in this research project

3.   Confidentiality

Data collected will be kept in a locked filing cabinet in the university premises for at least seven years after completion of the project in accordance with NHMRC guidelines, and only the researcher and supervisors will have access to the results and data

All information you provide will be confidential and you will not be identified in any written material. A pseudonym (false name) will be assigned to each participant so that response will remain confidential.

4.   Voluntary Participation

Participation is entirely voluntary. **If you do not wish to take part you are not obliged to.** If you decide to take part and later change your mind, you are free to withdraw from the project at any stage. Any information already obtained from you is not possible to withdraw as you are not identifiable.

Your decision whether to take part or not to take part, or to take part and then withdraw, will not affect your relationship with the University of Southern Queensland

Before you make your decision, the researcher will be available to answer any questions you have about the research project. You can ask for any information you want. Sign the Consent Form only after you have had a chance to ask your questions and have received satisfactory answers.

5.   Queries or Concerns

Should you have any queries regarding the progress or conduct of this research, you can contact the principal researcher:

Faeka El Sayed

Faculty of Business , School of Information Systems
483 West Street, Darling Heights, 4350
Tel: 07 4635 5605
Mobile: 0458120962   Email: W0106566@umail.usq.edu.au

If you have any ethical concerns with how the research is being conducted or any queries about your rights as a participant please feel free to contact the University of Southern Queensland Ethics Officer on the following details.
Ethics and Research Integrity Officer
Office of Research and Higher Degrees
University of Southern Queensland
West Street, Toowoomba 4350
Ph: +61 7 4631 2690
Email: *ethics@usq.edu.au*

13.5 APPENDIX: CONSENT FORM

USQ
AUSTRALIA

University of Southern Queensland

The University of Southern Queensland

Participant Information Sheet

TO: The Educators of **Aboriginal** and Torres Strait Islander Health Workers

Full Project Title: Multimedia model for supporting Aboriginal and Torres Strait Islander Health Workers in preventing communicable diseases.

Principal Researcher: Faeka El Sayed

Student Researcher:

Associate Researcher(s):

- I have read the Participant Information Sheet and the nature and purpose of the research project has been explained to me. I understand and agree to take part.

- I understand the purpose of the research project and my involvement in it.

- I understand that I may withdraw from the research project at any stage and that this will not affect my status now or in the future.

- I confirm that I am over 18 years of age.

- I understand that while information gained during the study may be published, I will not be identified and my personal results will remain confidential.

- I understand that I will be audio taped

- I understand that the tape will be kept in a locked filing cabinet in the university premises for at least seven years after completion of the project in accordance with NHMRC guidelines, and only the researcher and supervisors will have access to the tape.

Name of participant………………………………………………………….......

Signed………………………………………………….**Date**……………………….

If you have any ethical concerns with how the research is being conducted or any queries about your rights as a participant please feel free to contact the University of Southern Queensland Ethics Officer on the following details.

Ethics and Research Integrity Officer

Office of Research and Higher Degrees

University of Southern Queensland

West Street, Toowoomba 4350

Ph: +61 7 4631 2690

Email: *ethics@usq.edu.au*

13.6 APPENDIX: INTRODUCTORY LETTER

Faeka El Sayed

Phone (07) 46355605

Mobile: 0458120962

Date

Dear

I am a PhD student at the School of Information Systems, Faculty of Business, University of Southern Queensland.

I am currently conducting a research project on Aboriginal and Torres Strait Islander Health Workers as a part of my doctoral studies.

The topic of my research is a Multimedia Model for supporting Aboriginal and Torres Strait Islander Health Workers in preventing communicable diseases.

The proposed research aims to identify the needs of Aboriginal and Torres Strait Islander health workers for information, in form of multimedia program, to support their roles in dealing with communicable diseases; identify key factors that would impact the program development as perceived by them; determining what resources and training opportunities are currently available and being utilized; and determining what level of access they have to IT resources.

It is hoped this research will help to deliver continuing health informatics education and training programs to Aboriginal and Torres Strait Islander health workers.

I am looking for the Educators of Aboriginal and Torres Strait Islander health workers who would like to be part of this study.

You are invited to participate in the study and the enclosed information sheet explains the research. Please take the time to read the information sheet and consider whether or not you would like to take part in the research.

If you decide that you would like to participate, please complete the consent form and return it in the enclosed envelope or give it back to Faeka (researcher).

If you decide not to participate in the study you need not respond to this letter.

Ethical approval to undertake this research has been granted by office of Research and Higher Degrees, University of Southern Queensland.

Thank you for considering participating in this research. Your time and participation are appreciated. I am looking forward to hear from you.

Yours faithfully

Faeka El Sayed

PhD student, USQ

Tel: 07-46355605

Mobile: 0458120962

Email: W0106566@umail.usq.edu.au

13.7 APPENDIX: FLYER

This project cannot be done without your help

Your input is most appreciated

My name is Faeka El Sayed and I am a PhD student from The University of Southern Queensland.

Currently I am conducting a research project on development of a multimedia model for supporting Aboriginal and Torres Strait Islander Health Workers. I am looking for the Educators of Aboriginal and Torres Strait Islander Health Workers who would like to be part of this study

The proposed research aims to identify the key factors need to develop the multimedia model from the perspective of Aboriginal and Torres Strait Islander Health Workers Educator

It is hoped this research help to delivery of continuing health informatics education and training program for Aboriginal and Torres Strait Islander Health Workers.

If you would like to express your opinion, please contact the researcher Faeka **on**

07- 46355605 Or **0428056730** email W0106566@umail.usq.edu.au

Thank you for considering my request.

13.8 APPENDIX: KEY CODES DEVELOPED IN DATA ANALYSIS

Main Interview sections	Broad Themes	Level 1 codes	Level 2 codes	Level 3 codes	Level 4 codes
Program need Assessment	- Aboriginal health workers' role	- lot of expectation - Health promotion - Their target group Aboriginal Australian people - Limitation in their code of practice	- Struggle to fulfill their roles -Gap between what they learn and what they do	- Irrelevant information - Cultural gap - Learning gap	Efficiency Acceptability
	- Aboriginal health workers' Base line of knowledge	- They are various background - Their study course very limited in duration - Western medicine	- Limitation in their background -got main experience at work		
	- Current training program (CTP)	- Mode of delivery - Duration - Topic and content	- face to face mode of delivery - Depend on the availability of the resources	- Difficult in program development - Training gap - Business perspective	

		- Training Challenges - Culturally challenges	- concern mainly on life style diseases - Resources, time, family commitment and works - Cultural gap in the current training program	- Their professional development are overlooked - Not consistent	Sustainability
Information Technology	- Availability -Literacy	- Location - Access - Confidence - User age	-Remote and rural area -Technology maintenance - Technology efficient	Recommendation for improve Information and communication technology infrastructure and maintenance - No digital divide in new generation	
Key factors for model development	- Cultural -Learning	-Language - Traditional medicine - Model design -Target group - Oral cultural	- Cultural diversity - Geographical difference - Cultural words - Medical terminology	- Involve health workers in program development - Relevant program content - Visual and cultural appropriate. - Intellectual through -Program objective	
Tuberculosis	- Isolation -Treatment compliance	- Cultural resistance - Socio economic factors	- Health promotion and support	Aboriginal health workers' role	

13.9 APPENDIX: QUALITATIVE DATA ANALYSES JOURNAL

10/03/2011

1- Two main Questions to clarify from the Interview:

-Is there a need for interactive multimedia model as a source of information for Aboriginal Health workers?

-What are the key factors need to be consider in producing a MMM for Aboriginal health workers?

2- First step in Interview analysis is that we divided the interview to 5 main section classified according to the following topics:

1) Participant selection criteria

2) Program needs assessment

3) Information Technology

4) Key factors for cultural appropriated program

5) Tuberculosis challenges

3- In depth review for each section, line by line scrutiny, to generate at the beginning as many themes as possible as:

1) Participant selection criteria

* Roles

* Experience

* Their way to understand Aboriginal culture

* Their opinion about the planning IMMM

2) Program needs assessment

* Aboriginal Health workers background

*Aboriginal Health Workers base line of knowledge

* Aboriginal health workers roles

* Current training program (CTP) delivery mode

* CTP topic and content

* CTP duration

* CTP cultural gap

* CTP challenges

* CTP irrelevant information

* CTP Business perspective

* Training gap

* Target group

* Western medicine

3) Information Technology

* Availability

* Literacy

4) Key factors for cultural appropriated program

* Health workers basic line of knowledge

* Cultural Appropriated

* Language

* Oral culture

* Traditional medicine

* Geographical influence

* Model content

* Model design

* Mode of delivery

* Information Technology

* Involvement of health worker in program development

* Teach Health worker

5) Tuberculosis challenges

* Isolation

* Treatment compliance

*Health promotion

4- Those themes has been identified from the research question, literature review, using different technique such as looking for word repetition, comparing and contrast between different interview , linking the similar codes in different interview together.

20/03/2011

During analysis of Educators Interview, the theme of (Health Promotion) came out, and so the program planning main goal went in this direction. Developing an informative program to support health workers, in their health promotion and education roles

3/4/2011

I start thinking about why Aboriginal health workers struggle to fulfill their role??

There are a lot of expectations on Health workers from side of the main stream, without real preparation for them, and without they benign ready to their roles.

25/4/2011

 Program need assessment

 First informed data was

* Aboriginal Health workers background, study very limited duration

* Aboriginal Health Workers base line of knowledge

* Aboriginal health workers roles, lot of expectation

* Current training program (CTP) delivery mode face to face mainly

* CTP topic and content, life style diseases mainly as heart diseases, diabetes, obesity

* CTP duration, not consistent, depend on available resources

* CTP cultural gap is not fit with their target group

* CTP challenges are funding resources, time, family commitment, and works

* CTP irrelevant information

* Limited code of Practice

* Western medicine

* Their target group

* CTP Business perspective

* Training gap

5/5/2011

*Program need assessment,*

<u>*Second redirected data was:*</u>

1- Aboriginal health workers study are limited maximum to 1, 2 years, they depend mainly on practical work to get the experiences and more knowledge, *"I think once they completed this study like any, I suppose health professional, like to going to workforce and work with theoretical and build on that"*. There is no real preparation for them, they are not ready enough for their role, and they have huge roles without get any continuous support in their studies, *" they will give them the program, ok that the information about the program, congratulation ,they will go, and we wonder why they have difficulty."*

2- The influence of the business perspective in developing a continuous training program for health workers *"an economical perspective from a business perspective, it is not economical attractive to go to the district because we don't see large number, for us it is much more economical to stay here and then get everybody to come to us",* their professional development is overlooked, they has no independent resources *"health workers don't receive funding for their training"*

3- There is a gap between what they learn and what they did due to the limitation of their code of practice *"we do have to remember that they are tied by such code of practice"." they have the knowledge here but in the practical they are limited and must be double check from nurses."*

4- There is a cultural gap in their current training program between what they study (western medicine) not fitting with the the cultural and socioeconomic level of their target group *"what we put in must suit the tribe of the Aboriginal world"*", this gap affect their roles as a health education and promotion.

23/05/2011 11:31 am

1- Aboriginal health workers study are limited maximum to 1, 2 years, they depend mainly on practical work to get the experiences and more knowledge. There is no real preparation for them, they are not ready enough for their role, and they have huge roles without get any continuous support in their studies.

2- There is a cultural gap in their current training program between what they study (western medicine) which not fitting with the cultural and socioeconomic level of their target group, this gap affect their roles as a health education and promotion.
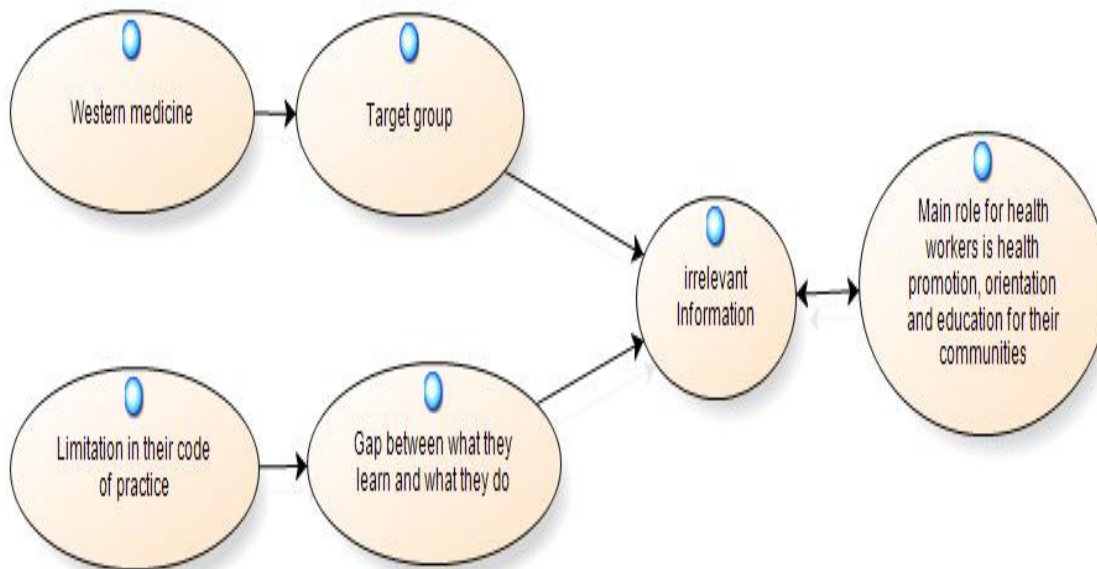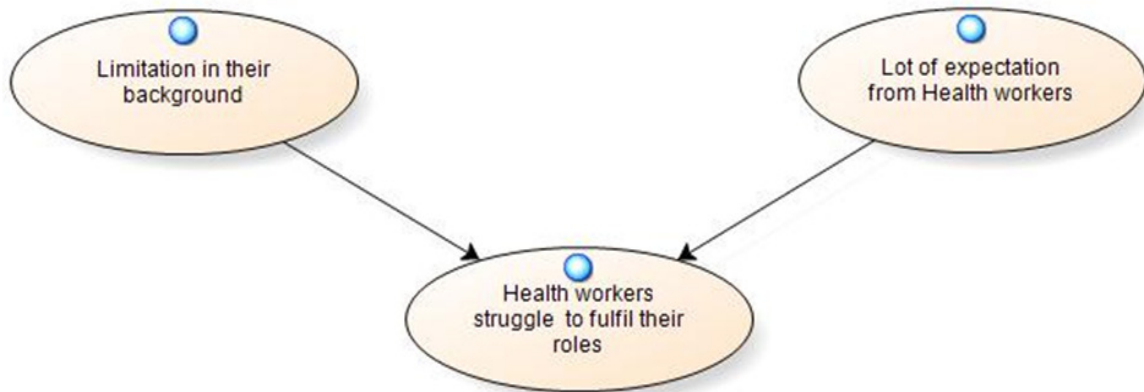
3- There is a gap between what they learn and what they did due to the limitation of their code of practice
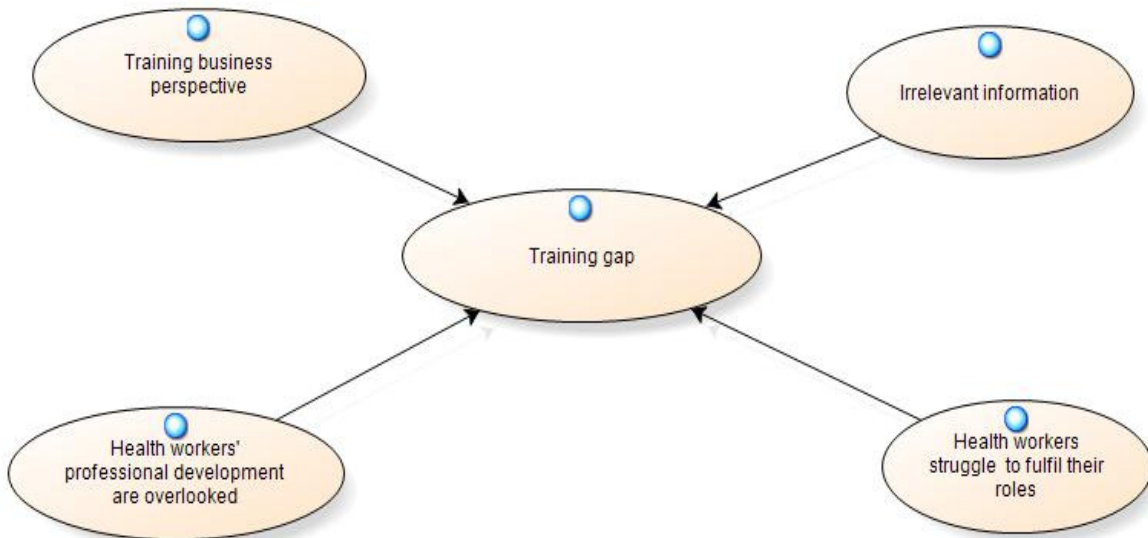
The current training gap is due to:

1- The influence of business and economic perspective on the training program
2- Health workers Professional development are overlooked
3- The current training program are deliver irrelevant information
4- Health workers struggle to fulfil their roles.

26/05/2011 10:37 AM

New themes arise:

1- Program development difficulty

2- Training the training in health sectors

3- No sustainability in the training.

Analysis of the need assessment

1- Aboriginal health workers 'role

* Support for other health workers to understand the Aboriginal culture

* The main supply for health service to the Aboriginal communities, explain to the patient what going on in their bodies why it is important to protect yourself and the other, refer the patient to the right place to get the health treatment and support.

* Main corner in revise, feedback and advice in the development of any new training program *"They have two bigger roles for the quality of their training and the experiences we put it"*

2- Aboriginal health worker background

The range of their background are different some of them have finish the high school some of them not finish the high school *"they have not gone to high school diploma",*

some of them have that qualification which is the formal training from TAFE (Technical Apply Formal Education) deliver some certificate at level 1,2,3,4 certificate or diploma *"not degree at all, certificate level, we called sub professional"*

And only a few have a university qualification. Most of them are undertaking a special training as they are doing the job.

3- Current training program

Types

There are three types of training for Aboriginal health workers:1) Formal training as Cert 1, 2, 3, 4, 2)in service training and 3) thirdly conferences, workshop and exhibition,

Mode of delivery

In all training types the program delivery is mainly face to face*," It is 90 % face to face. by that what I means , by we are sitting here, people coming to learn , the other 10-15 % is depend on sending information packs together along*"

Program duration

In formal training is minimum one year for the certificate" *course only runs for twelve months ".* For in service training and conferences duration are from 1, 2 days to one week *"depend on the topic it may be one day workshop or two days' workshop or three days workshops"*

Program content

Program topic is differing according to type of training. In formal training there are many topics all over the body systems "*we start off the training we start with all body system, then go into each system and talk about things that can go wrong. Then we talk about the medical jargon and then we break it down into what we treat this disease with, so there are many diseases that we can figure about the body,* The certificate teach them the basic knowledge "   ". In service training, workshop and conferences, the main topics are about the life style diseases and diseases where there is high mortality as Heart diseases, Diabetes, Obesity, Sexual transmitted diseases, with emphasizes on the clinical skill "*we have about disease have a very high mortality as heart disease , diabetes, obesity,"*

The content in any training is a combination of clinical and theory "*There is a combination of skills and also knowledge and also of course most important about the pathology and physiology of the disease" ,"so it is not necessary only on clinical skill there is also a lot of theory."*

Program development

For In service training and workshop or conferences, program development is carry out by the Aboriginal health workers trainers "*find out what training the health workers need and based on what they need I develop the training or if I cannot develop it by myself I let other people to develop the training",* which depend mainly on Aboriginal health workers to revise, feedback and advice on the new planning program "*I make sure when I develop the training , that I actually let the health workers to tell me and give me feedback of what I have done." "I have my ideas but I can't, I don't know if they are correct or efficient effective until I discussed with Aboriginal Health workers, because who am I? "* mainly regarding the cultural appropriate of the program material" *making sure that health workers has actually look at the material and they say yes that is culturally-appropriate"*

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4- Current training problems

Cultural challenges   + Lack of deep understanding for Aboriginal cultural= cultural gap

Irrelevant Information

Professional development challenges

There is no sustainability

Training business perspective

Training gap

Gap between what they learn and what they do + Western Medicine + Limitation in their code of practice

Health workers Professional development are overlooked

Target group + the socioeconomic level of their target group

Limitation in their background

Lot of expectation

Is there a need for the planning model?

Yes due to the presence of the following problems in the current training program: 1) Cultural gap, 2) Learning Gap, 3) No sustainability

Cultural gap: Majority of the participant show that there is a cultural gap between the current training program and the health workers and their target group

There is a cultural gap in the current training program; as it is planned for all Health workers all over Qld *"we have the same product for north, south west or east of Qld"*, unrespect to their difference tribe origin *"We can all categorized them according to one stop shop but they are all very different according to where they growth up, what land they are based on, what family affiliation they are? "*, and their difference cultural and language *"but would not be required by our government health system to actual to learn the culture or the language "*.

Learning gap: All the participant was point to that there is a gap between what they learn and what they do

There is a limitation in their code of practice" *the QLd guide to practice of health workers is very limited", "we do have to remember that they are tied by such code of practice"* and they study mainly the western medicine *"we used very much the western medicine", "so we don't necessarily going into bush medicine or other medicine because that is really not the scope of the health workers"* which not suit with their target group *"this is important as health workers when communicate with patients that they communicate in a way that patient understand what they are talking about" ,"what we put in must suit the tribe of the Aboriginal world." ,"How affected to be cut off from their culture practice ".* **That lead them to feel that most of the information they got it is irrelevant** *"read a lot of information irrelevant".* **The Lack of this sort of cultural appropriate health information has a negative effect in their health promotion and education role for their own communities** *"they need to have access to that sort of information or different way to explain to the patient what going on in their bodies,".*

No sustainability

Their Continuing professional development is limited to on face to face workshop or attending conferences and exhibitions *"In service training and thirdly conferences and exhibition, that all"* , Which has been overlooked *"for health workers we don't do a lot and may be this something that we should include because at the moment we don't , we don't do anything"* , subjected to funding approval *"health workers don't receive funding for their training", "health workers don't receive funding for their training", "they are essential relying on the district to support their training,".* Also the presence of other challenges which prevent them from attending the training program as travel, work and family commitment *"they did not coming to training for two reason first one is financial reason , they don't have the resources or permission to have fund of district to travel or the other reason is the family commitment"* . The economic and business perspective influence the program development and planning *"economic must play a role.", "it is much more economical to stay here and then get everybody to come to us".* All that lead to limitation and no sustainability in their continuous support and their continuing professional development *"there is no sustainability, that the key."*

<u>Is the planning model relevant to the job need?</u>

Yes because the planning model will solve the current problem by:

There is no sustainability

Training business perspective

Training gap

Target group + the socioeconomic level of their target group

Lot of expectation

30/05/2011 12:49 PM

Is the planning model relevant to the job need?

Yes because the planning model will solve the current problem, how?

The development of the planed program will caring about the program will be:

1- Cultural appropriate program

Most of the participants emphasized on the need for cultural appropriate program for Aboriginal health workers *"we try to make it cultural appropriate" "I think that the history side and culture side would really help" "we need to be very culture sensitive to what they learn and how they learn"*

2- Appropriate language

We need to used in the planned program an appropriate language to be fit with all the target group *"the language certainly has to be also appropriate," "So we have to make sure that the language we have been used is actually appropriate at the target"* . Since the target group are different cultural with different languages and different background, , and it is difficult to know   all their languages *" in Qld we are aware that we have different language yes very much sure" ," there are so many Aboriginal languages" ," they are different tribe and have some background history".* Most of the participant expressed the preference for using the picture and diagram as a way for communication *"I think we go back to words like stroke or diabetes, we can explain that, we can used pictures.", " a visual pictures making it in cultural appropriate, having the cultural drawing there" ,"some sort of diagram to put in it how they feeling in their own words", "may be even drawing diagrams and things like that may be more engaging", "take attention more by making things very simplistic and also including a photograph of people that they know".*

3- Relevant information

4-Sustainable program

From the business perspective it will be economic and continuing support as it will not depend on available fund. It can be used by the few health workers in the remote areas to support their health promotion and education role, and it can be used also by training organization with large

number of health workers. It will develop the same software frame, and can be used for other disease.

5- IT acceptable

There is no need for high computer literacy; the basic knowledge will be fine as it will be software on CD-ROM just clicking the title of the requested information need to know about it.

14/ 7 / 2011

Assessment results

These results support the study and show that there is need to another way to support ATSIHWs' continuous education and training. Is the planning model relevant to the job need? And How It could be a sort of solution for the above finding problems?

it would be a primary stone in the education foundation bridge and a useful way in solving the current ATSIHWs' continuous education and training problem. The development of the planed program will caring about the program will be relevant; sustainable program, efficient and cultural appropriate. It will be an educational source of information program, with attractive components, provide an important knowledge and skills, and it will be a useful method in supporting health workers in their health promotion and education roles within their own communities

From the business perspective it will be economic and continuing support as it will not depend on available fund. It can be used by the few health workers in the remote areas to support their health promotion and education role, and it can be used also by training organization with large number of health workers. It will develop the same software frame, and can be used for other disease. It will be IT acceptable as there is no need for high computer literacy, the basic knowledge will be fine as it will be software on common multimedia storage drives including CD-ROM/USB drive just click the title of the requested information need to know about it.

13.10 APPENDIX: CONSTRAINTS

HARDWARE

Computers: PC	**Details and comments**
RAM:	8-16 RAM
Monitor resolution:	480-640 color
Sound Card:	8- 16 bit
Network:	
Processor:	33-66Mhz
Hard Drive capacity:	
CD-ROM:	Double speed
Modem speed:	
Computers: Macintosh	
RAM:	
Monitor resolution:	
Sound Card:	
Network:	
Processor:	
Hard Drive capacity:	
CD-ROM:	
Modem speed:	
Computers: Other	
RAM:	
Monitor resolution:	
Sound Card:	
Network:	
Processor:	
Hard Drive capacity:	
CD-ROM:	
Modem speed:	
Comments: Use this area to provide other information that will help define the hardware constraints, such as distribution of different types of computers, their accessibility, and so on.	video card 1024x768 with 65,536 color

Source (Alessi and Trollip, 2001)
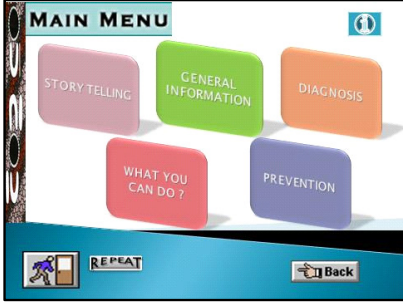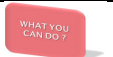
SOFTWARE

Computers: PC	
Operating system, including release no.:	
Browser, including version no.:	
Word processing:	
Spreadsheet:	
Network:	
Authoring system required:	Power point software
Testing system required:	
Other:	
Computers: MAC	
Operating system, including release no.:	
Browser, including version no.:	
Word processing:	
Spreadsheet:	
Network:	
Authoring system required:	
Testing system required:	
Other:	
Computers: Other	
Operating system, including release no.:	
Browser, including version no.:	
Word processing:	
Spreadsheet:	
Network:	
Authoring system required:	
Testing system required:	
Other:	
Comments: Use this area to provide other information that will help define the software constraints, such as use of integrated packages, such as Lotus Notes, firewall software, security restrictions, and so on.	Need Window media player

Source (Alessi and Trollip, 2001)
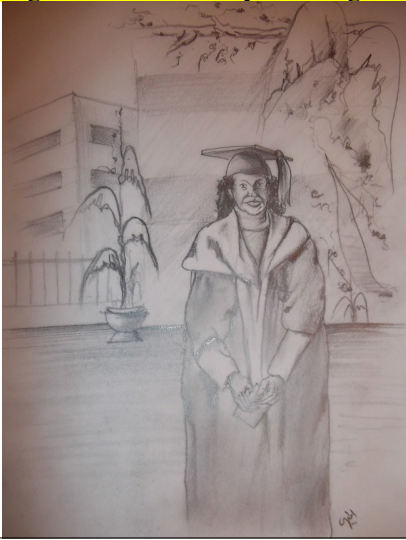
13.11 APPENDIX: STORY BOARD

Hypermedia storyboard
Health Workers Education program-Tuberculosis

Title: INTERACTIVE MULTIMEDIA SELF-PACED HEALTH PROGRAM	*Storyboard Number 1*

Project details

The screen template is the same in all the model with indigenous pattern in the left border special for the title and module 1

Navigation

Button	**Link to: Are you sure you want to exit**	**Action: exit**
Button Next	**Link to: next slide in the presentation**	**Action: go to slide 2**
Button REPEAT	**Link to: Audio file Introduction**	**Action: repeat the introduction**

Text

Colour: black	**Size: 54**	**Font: Comic San Ms**

Audio	*Video: NA*
Source: Recording MP3/1	**Source**
File: Introduction	**File:**
Description: general information about the model and its content and how to used it	**Description:**

Hypermedia storyboard
Health Workers Education program-Tuberculosis

Title: Main Menu	**Storyboard Number 3**

Project details

Navigation

Button	**Link to: Slide 4**	**Action: Start story presentation / Module 1**
Button	**Link to: Slide**	**Action: Start Module 2/ General information**
Button	**Link to: Slide**	**Action: Start Module 3/ Diagnosis**
Button	**Link to: Slide**	**Action: Start Module 4/ what you can do**
Button	**Link to : Slide**	**Action: Start Module 5/ Prevention**
Button	**Link to: Slide**	**Action: move to External links slide**
Button:	**Link to:** *Are you sure you want to exit*	**Action: Exit**
Button:	**Link to: MP3 Audio file /slide 3**	**Action: Repeat the instructions/ Slide 3**
Button:	**Link to: Previous slide**	**Action: go to slide 2**

Text

Color: White	**Size: 23**	**Font: Comic San Ms**

Audio	**Video**
Source: Recording MP3/3	**Source**
File: Main Menu	**File:**
Description:	**Description:**

Hypermedia storyboard

Health Workers Education program-Tuberculosis

Module 1- STORY OF TALIA & PETA

Title: *Module one story of Talia & Peta*	*Storyboard Number 4*

Project details:

Navigation

Button	**Link to**: slide shows Story one	**Action**: Start story presentation / Module 1
Button	**Link to:** main menu	**Action:** go to main menu
Button	**Link to:** Slide	**Action:** move to External links slide
Button:	**Link to**: Are you sure you want to exit	**Action:** Exit

Text: MODULE ONE STORY OF TALIA & PETA

Colour: Black, Bold	**Size:** 47, UPPER CASE	**Font:** Comic sans MS

Audio		*Video*
Source:		**Source**
File:		**File:**
Description:"*Module one, story of Talia and Peta*"		**Description:**

Hypermedia storyboard
Health Workers Education program-Tuberculosis
Module 1- STORY OF TALIA & PETA

Title: *Module one story of Talia & Peta*	*Storyboard Number* 4.1

Project details: Picture Map of Yarrabah

Navigation: *Continuing Video show slides. Its duration Time adjust according to the audio file length.*

Button	Link to:	Action:
Button	Link to:	Action:
Button	Link to:	Action:

Text

Colour:	Size	Font

Audio	*Video*
Source:	Source
File:	File:
Description: "*Once upon a time, not long ago, there was a young health worker named Tina, who lived in a small remote Aboriginal community called Yarrabah in northern Queensland. It is an Aboriginal community situated approximately 53 kilometers by road from Cairns*"	Description:

Hypermedia storyboard

Health Workers Education program-Tuberculosis
Module 1- STORY OF TALIA & PETA

Title: Module one story of Talia & Peta	*Storyboard Number 4.2*

Project details: Picture view of Yarrabah

Navigation: Continuing Video show slides. Its duration Time adjust according to the audio file length.

Button	**Link to:**	**Action:**

Text		
Colour:	**Size**	**Font**

Audio	*Video*
Source:	**Source**
File:	**File:**
Description: *"It has a population of approximately 2,600 people inhabitant, 96.9% identified as Aboriginal or Torres Strait Islander. The majority of the Yarrabah workforce was engaged as either laborers or as community and personal service workers,but like other remote Aboriginal communities, there is low labor force participant, most home are overcrowded and in disrepair, and nutritional health is poor."*	**Description:**

Hypermedia storyboard

Health Workers Education program-Tuberculosis
Module 1- STORY OF TALIA & PETA

Title: Module one story of Talia & Peta	*Storyboard Number 4.3*

Project details: Picture of Talia wearing a graduation clothes (black clothe and hat) standing in front of building and some tree. The background is university building from outside.

Navigation Continuing Video show slides. Its duration Time adjust according to the audio file length.

Button	Link to:	Action:
Text		

Colour:	Size	Font
Audio		*Video*
Source:		Source
File:		File:
Description: "*After Talia finishes her study in TAFE and got her certificate, she returns back to her community as a register health worker. She was very ambitious to help her community*"		Description:

Hypermedia storyboard
Health Workers Education program-Tuberculosis
Module 1- STORY OF TALIA & PETA

Title: Module one story of Talia & Peta	*Storyboard Number 4.4*

Project details: Picture Talia has paper and pen in her hand surrounded by peoples from her community. The background will be Push desert

Navigation Continuing Video show slides. Its duration Time adjust according to the audio file length.

Button:	Link to:	Action:
Text		
Colour	Size	Font
Audio		**Video**
Source:		Source:
File:		File:
Description: "*She making a list of the health problems in her town, Talia realized that some of the health concerns have changed, and the Aboriginal residents continue to suffer from high rates of illness*"		Description:

Hypermedia storyboard
Health Workers Education program-Tuberculosis
Module 1- STORY OF TALIA & PETA

Title: *Module one story of Talia & Peta*　　　*Storyboard Number* *4.5*

Project details: Picture Talia with 3-4 small kids who suffer severe cough, thin, appear unwell. The background is the same as in slide 4.4.

Navigation Continuing Video show slides. Its duration Time adjust according to the audio file length.

Button:	Link to:	Action:
Text		
Colour	Size	Font
Audio		**Video**
Source:		Source:
File:		File:
Description: "*She recognizes that one of the biggest problems was that the continuous persistent cough that lasts for many weeks affected the whole family member especially the young kids*"		Description:

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Hypermedia storyboard

Health Workers Education program-Tuberculosis

Module 1- STORY OF TALIA & PETA

Title Module one story of Talia & Peta	**Storyboard Number** 4.6

Project details: *Two pictures of Talia in the same slide first one she read and look like she try to understand something (Talia sitting alone, has paper in her hand, thinking, the other picture she stand and she discover something and there is a light bulb beside her head). The background is the same as in slide 4.4*

Navigation *Continuing Video shows slides. Its duration time adjust according to the audio file length*

Text		
Colour:	*Size*	*Font*

Audio	Video
Source:	*Source*
File:	*File:*
Description: She starts to ask and investigate what are the causes of the health problems and she find that Tuberculosis is a wide spread between the Indigenous communities"	*Description:*

Hypermedia storyboard

Health Workers Education program-Tuberculosis
Module 1- STORY OF TALIA & PETA

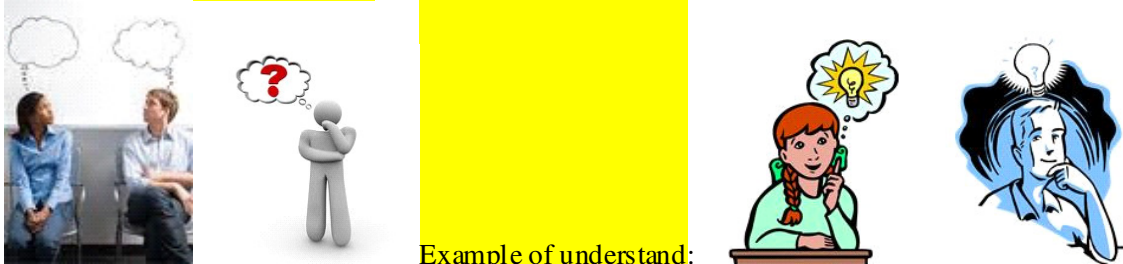*Title: Module one story of Talia & Peta*   *Storyboard Number 4.6*

Project details: Two Picture of Talia in the same slide first one she read and look like she try to understand something (Talia Sitting alone, has paper in her hand, thinking, the other picture she stand and she discover something and there is a light bulb beside her head).
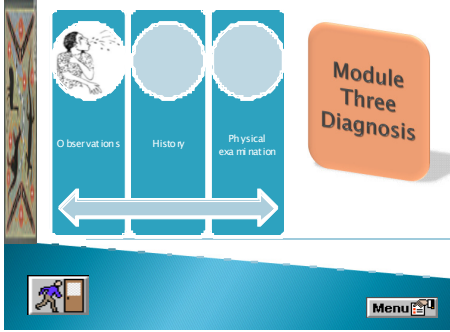The background is the same as in slide 4.4.
Examples pictures of Thinking :

Example of understand:

Navigation Continuing Video show slides. Its duration Time adjust according to the audio file length.

Button:	Link to:	Action:

Text		
Colour	**Size**	**Font**
Audio		**Video**
Source:		Source:
File:		File:
Description: "*She starts to ask and investigate what are the causes of this health problems and she find that Tuberculosis is a wide spread between the indigenous communities*"		Description:

Hypermedia storyboard	
Health Workers Education program	

Title: Tuberculosis / Diagnosis module	Storyboard Number: 1

Project details

* The Frame is the same with new indigenous pattern in the left border special for diagnosis module

* The module title the same shape from the main menu put on the right side from the frame and adapted in size with the inserted graphic

Drawing

* Insert three pictures in the inserted graphic:

1- person cough (Patient): pale with dark hair

2- the same Patient talk with health worker who write a note and listen

3- health worker put his hand over patient head and take other hand(look like he examine the patient

Navigation

Button	Link to: Are you sure you want to exit	Action: exit
Button	Link to: main menu	Action: go to main menu

Text: Module Three Diagnosis		
Colour: black	Size 36	Font Lucida Sans Unicode
Text Observation History Physical examination		
Colour: black	Size 20	Font Lucida Sans Unicode

Audio	Video
Source:	Source
File:	File:
Description	Description:

Hypermedia storyboard

Health Workers Education program

Title Tuberculosis / Diagnosis module/ Symptoms	Storyboard Number 2

Project details

Using the same frame

Dawing the same patient , men pale with dark hair, and tan face, stand in front without top with pant short, his chest too skiny , coughing, hold cigarette in his hand, and did not put his hand over his mouth so the sputum go outside, other hand hold a tissue with blood spot on it

Navigation

Button	Link to: Are you sure you want to exit	Action: exit
Button	Link to: main menu	Action: go to main menu
Button Next	Link to: next slide in the presentation	Action: go to Diagnosis/History slide

Text

Colour:	Size	Font

Audio		Video
Source:		Source
File:		File:
Description:		Description:

13.12 APPENDIX: STORIES

Introductory story: Tina & Betty

➢ Once upon a time, not long ago, there was a young woman named Tina, who lived in a small remote Aboriginal community called **Yarrabah** in northern Queensland. It is an Aboriginal community situated approximately 53 kilometers by road from Cairns.

➢ It has a population of approximately 2,600 people inhabitant, 96.9% identified as Aboriginal or Torres Strait Islander. The majority of the Yarrabah workforce was engaged as either laborers or as community and personal service workers,but like other remote Aboriginal communities, there is low labour force participant, most home are overcrowded and in disrepair, and nutritional health is poor.

➢ After Tina finishes her study in TAFE and got her certificate, she returns back to her community as a register health worker. She was very ambitious to help her community.

➢ She making a list of the health problems in her town, Tina realized that some of the health concerns have changed, and her people continue to suffer from high rates of illness.

➢ She recognizes that one of the biggest problems was that the continuous persistent cough that lasts for many weeks affected the whole family member especially the young kids.

➢ She starts to ask and investigate what are the causes of this health problems and she find that Tuberculosis is a wide spread between her communities.

➢ And because Aboriginal beliefs about health as in supernatural causes of disease, they think that they are suffering from sorcery, that discourage them to come to the clinic early and that lead to more widespread of the disease and deteriorate of the patient.

➢ Tina understands that this cultural disparity is often considered to create barriers to early effective clinical treatment. Tina find also that even with the presence of health care and treatment by the health providers; her peoples still suffer from persistent of Tuberculosis symptoms which is persistent cough which sometime associated with bloody sputum.

➢ Tina began to call mothers together on weekend afternoons at the community centers to ask them about how they manage in case of Tuberculosis in the family and to teach them about Tuberculosis, types, spread, prevention.

➢ She describes how the microbe spread by sneezing, spitting in public and or talks, TB germs can be sprayed into the air.

➢ Anyone close by can breathe the germs into their lungs; but you cannot get TB from shaking hands or from food, dishes, linens or other objects.

➢ She told them that When the TB germs got into your body, they went "to sleep." "Sleeping" TB germs do not hurt your body or make you sick, person present without any symptoms. This is called **"latent TB infection"** or "**LTBI**." LTBI can last for a short time or many years.

➢ You got sick from TB when the germs "woke up" and started to grow and hurt your body. This is called "active TB disease."
➢ People with TB disease may have 1 or more of these **symptoms**:
Losing weight, loss of appetite and feeling tired or weak;
Severe persistent coughing for 3 weeks or longer, pain in the chest, coughing up blood or brown colored material from your lungs;
Night sweat, pale, fever and chills.

➢ Tina emphasis on the important of early detect the disease, prevent it by vaccination, treat and isolate the patient

➢ She explained all what she got from information about Tuberculosis in her studies. After while she find that nothing changes and the same problem still persist.

➢ Tina decided to go talk to Betty, a wise old woman whom everyone went to for advice. Tina explained her problem to Betty.

➢ "I think your problem is this," she said. "You started with what you were taught in your health training, instead of with what the peoples in the community already know. You must learn to see things through their eyes."

➢ "How do you mean?" asked Tina.

- Betty said" People may consider this cough as a cold which may be caused by a variety of natural events, such as contact with an infected person, lack of food, cold weather or bad hygiene. They believe that whatever of this cough, the common curative remain the same: resting, consuming liquids, keeping warm. You should explain to them the different between normal flu and Tuberculosis" which consider a white illness.

- Also Peoples in this community, even people like the outdoor living but they are living close to each other. It is difficult to convince any one of them to be isolated from the community especial when there is no any has a severe symptoms and need for that isolation.

- Also the tobacco problem which is main influence factors for Tuberculosis and other chest diseases. Tobacco use is now a normal part of everyday life for the peoples in this community. Tobacco role in bringing peoples together is more important than it is in any other community. Smoking is used as a way to strengthen family relationships and friendships. Not joining in can make people feel like they are not part of the mob. So it is hard to stop smoking and stay stopped.

- "No wonder my teaching failed!" said Tina. "Why didn't they tell me? I tried to encourage them to express their ideas."

- "Maybe you spoke your own new ideas too quickly and too strongly," said Betty. "The women do not like to contradict you."

- "Then how can I teach them?" asked Tina.

- "Begin with what they know and believe, and let them share with you in your planning. Build on that," answered Betty.

- Tina start to develop a community-based programs that promote healthy living that involve help people quit smoking, improve housing living and ventilation.....as an important step in improving the wellbeing of her community

THE IDEA OF THIS STORY HAS BEEN ADAPTED FROM ETHNOGRAPHIC CASE STUDY IN NT BY EIRIK J SATHRE (SAETHRE, 2007).

What are bacteria?

Tania in her first community based program, decided to bridge the gap in knowledge and see what answers the people wanted?

The first thing the people asked was what are the causes of this disease? How their bodies become affected and become ill and weak.

The main cause of the Tuberculosis occurs in the bacteria named Mycobacterium Tuberculosis.

So what does bacteria look like? How can you see it? How will Talia explain the meaning of bacteria to her own people especial if it's something that you are not able to see?

Talia decided to use the culture knowledge basis, the peoples existing knowledge.

Talia first pulled a piece out of a microscope and looked through it, like holding a pair of reading glasses over an object. She found a mosquito and put it under the glasses to show how much bigger it becomes and let the people see it. The people were convinced that a magnifying glass could show them things invisible to the naked eye.

Talia let the people try to see living things in the water with their naked eyes, of course they couldn't.

So Talia put a drop of water under the microscope

The people were shocked to find things in the water.

Talia did the same with other objects like hair and started to magnify them gradually thus giving their people a good picture of the comparative sizes they are going to look at.

Now they are ready to teach about the life cycle of mycobacterium which causes this severe bloody sputum.

Talia used diagram and started to teach the life cycle, which begins on these bacteria entering the body, it is spread from person to person through the air and is called cross infection.

When a person with pulmonary TB coughs, sneezes, or speaks droplet nuclei containing tubercle bacilli are expelled into the air.

When people inhale droplet nuclei containing the tubercle bacilli, TB transmission occurs.

How these bacteria act within the body and how the body gets sick?

Bacteria enter through the alveoli of the lung. The body defends itself by sending cells (know as macrophages) to destroy bacteria or inhibited.

A small number of Bacteria are still active inside the macrophage cell, which are release later and spread through the blood stream to more distant tissues and organs.

They could affect other organs in the body but the lungs are the most affected organ

The body starts to defend itself again by send more white blood cells and macrophages leading to the formation of a granuloma.

At **this point,** the person has latent TB infection (LTBI).

A person with LTBI is not regarded as a case of TB and cannot spread the infection.

In Some cases when the body is weakened and unable to defend itself, the Tubercle bacilli overcome the body's defense and begin to multiply, which result in the progression from LTBI to TB disease. Thus can occur soon or many years after infection.

Who are the most likely to become infected?

Close contact between those with infectious TB are at the highest risk of becoming infected. They may be roommates, family members, co-workers or friends.

Weak people such as kids, those who suffer from other chronic diseases such as diabetes or those with low immune systems like HIV.

Alcohol and drug abuse

Also people who are passing cigarettes and pipes from mouth to mouth around a campfire

Their people were very excited about this type of education and the lots of new information which built on what they already knew and respects their thinking.

THE IDEA OF THIS STORY HAS BEEN ADAPTED FROM CASE STUDY IN NT BY RICHARD TRUDGEN (Trudgen, 2000).

Compliance with treatment

Talia began the community based program on weekend afternoons at the community centre. She starts the program by asking those attending to share their experience or their concern.

A young mother said "a few months ago, my nine year old son got a severe fever, constantly coughing and sweating at night", I took him to the doctor in our community, but that doctor did nothing and just gave him some medication I gave him this medication, which had no immediate effect and even his five year old brother experienced the same symptoms, this medication is useless, the doctor should have sent him to hospital".

Talia asks "what medication did the doctor give you?"

"Panadol and other two different capsules and then he told me to take my son home".

Talia asks" Did you give your son any of the medicines?"

"Yes, I gave him the Panadol", she replied.

Talia asks "Do you know what the Panadol is for?"

"Yes it is to make his temperature go down and to make him feel better" she answered.

Talia asks, "Did the Doctor tell you about your son's diagnosis?"

"Yes he told me it is Tuberculosis"

Talia asks, "Did you know what Tuberculosis was?"

"Yes, it is a sickness that makes people very ill and weak; with severe cough and sometimes people spit out blood".

Talia asks, "Did you give him the capsules?"

"Yes, two times, but with no apparent results and he got sicker and sicker"

"And why didn't you continue to give him the capsules?" Talia asked.

"Because he was so sick, those drugs did not completely cure him at the beginning and I didn't know what it would do to him"," If the doctor really wanted him to get better he could give him the right medicine. If my son took it just once then it would make him better immediately", Talia: did you know what those capsule where?"

"Yes they where antibiotics"

Talia: "Do you know how antibiotics work, or how they can make you better?"

"No, it is white medicine, I know its name and all that but I don't know how it works"

Talia thinks a while, (this young mother could use all the correct English terminology but she did not know the meaning of the key words).

She received a medication; she gave her son one or two tablets and threw the rest in the bin. (This is because she sees no relationship between the medicine and the condition).

Talia said "We have discussed before what are bacteria and we saw it and know how and where it can affect our chest.

Today we will see why in Tuberculosis we need to continually use the treatment for a long time to completely eradicate the bacteria from our body.

After a few weeks from taking the drugs, you won't be contagious and you may start to feel better. It might be tempting to stop taking your TB drugs.

But it is crucial that you finish the full course of therapy and take the medications exactly as prescribed by your doctor.

Stopping treatment too soon or skipping doses can allow the bacteria that are still alive to become resistant to those drugs, leading to TB that is much more dangerous and difficult to treat.

Achieving a cure for TB takes about six to eight months of daily treatment.

To ensure thorough treatment, it is often recommended that the patient takes his/her pills in the presence of someone who can supervise the therapy. This approach is called DOTS (directly observed treatment, short course). In this approach, a health care worker administers your medication so that you don't have to remember to take it on your own.

THE IDEA OF THIS STORY HAS BEEN ADAPTED FROM CASE STUDY IN NT BY RICHARD TRUDGEN (TRUDGEN, 2000).

Barlett, B 1995, *Aboriginal Health Worker' Guide to family community and public health*, 0 9596881 1 0, Central Australian Aboriginal Congress Publication, Central Australia.

Coulehan, K, Brown, I, Abbott, F, Anbins, B, Christie, M, Gaypirra, W, Gorham, G, Guyula, H, Lowell, A, Marrnanyin, B, Mitchell, A, Patel, B & Spain, B 2005, *Sharing the true stories: Evaluating strategies to improve communication between health staff and Aboriginal patient. Final project report*, Stage 2 report, Cooperative Research Centre for Aboriginal Health, Darwin.

Trudgen, R 2000, *Why Warriors Lie Down and Die*, Fifth edn, 0 646 39587 4, Aboriginal Resource and Development Services Inc, Australia, Darwin.

13.13 APPENDIX: FORMATIVE EVALUATION QUESTIONNAIR

Formative Evaluation

Please take a moment to complete this evaluation form. Your comments are important to the instructional technology as we strive to improve the program. Your comments will be appreciated.

Project Title: Interactive multimedia self-paced program for supporting Aboriginal and Torres Strait Islander Health Workers in preventing communicable diseases, (Tuberculosis)

Reviewed by: --

For each of the statements below, please indicate the extent of your agreement by placing a tick in the appropriate box where

1 = strongly disagree to the concept (SD)

2 = somewhat disagree to the concept (D)

3 = undecided (U)

4 = somewhat agree to the concept (A)

5 = strongly agree to the concept (SA)

QUESTIONS	1	2	3	4	5
Introduction of the Program					
Title of the program is attractive					
The Title of the program is telling what the program is about					
The objectives were clearly stated.					

The purpose of the program was clearly stated					
Presentation of the Information					
The computer instructions were clear					
The information is presented in a meaningful way					
Program is well planned, logical and easy to understand					
The material was well organized and presented in a systematic manner					
It is clearly indicated when new topic are being introduced					
It is clearly indicating where to look for direction					
The technique for presenting information is consistent					
The written text on the screens was easy to read					
The graphic were clear					
The quiz is very helpful					
Feedback after the quiz is consistent and appropriate					
Learner Control					
The screen button remind the user of things that can be done					
The position, appearance and function of buttons are clear and consistent					

Program structure let the user able to make better sequencing decision					
Main menu is easy to access throughout the program					
Menu lists throughout the program are clear					
Program content					
The information is correct					
The content was relevant and up-to-date					
Information given were sufficient for professional educational needs					
Some information are not covered					
Program provided more information than text or lecture					
Program provided too much detailed information					
Attitude					
I found program content stimulating					
I would like to spend more time using the program					
Compared to class method training the program is more effective					
I prefer the program because it is done at learner space and time					
The stated objectives were met					

Program Design					
The layout is clear and consistent.					
Graphics and other media elements are meaningful and add to the project.					
The text is easy to read and contrasts with the background.					
The navigation button are simple and easy to understand					
The graphics, sounds, and text used in the program help to better understand the concepts					
The screen buttons are visible					
Providing Help					
Procedural help stated clearly in the initial direction of the program					
Program allowed return to main page at all times					
Ending of the Program					
Program gives the option to exit at any point					
Program provided a final message to confirm the exit					
Suggestions					
Availability to all health workers should be increased					

Make similar programs for other topics					
Increase the amount of information in the program					
Program work well as is					

What do you recommend to improve the program?

On a scale of 1 to 5 (5 being the highest), How would you rate this program?

GENERAL COMMENTS: Please feel free to express any criticism or comments regarding the program

13.14 APPENDIX: RECOMMENDATIONS

	Recommendations
1	Further clarification of the concept through further research and study to explore and examine the potential and limitations for using the interactive multimedia self-paced software as a source for information in supporting Aboriginal and Torres Strait Islander health workers.
2	A study with appropriately powered sample size, validation of assessment tools, and pre-intervention knowledge measurement in the future may be able to confirm findings declared in this study.
3	The involvements' of Aboriginal and Torres Strait Islander health workers in developing the strategy and program for their continuing education is crucial for any improving in their education.
4	Developing continuing education program for sustainable health worker continuing education involves participation by the community and acknowledgment of the impact of the culture.
5	The needs assessment for model development should not only be done during the beginning stages of model development, but repeated needs assessments are likely to reveal unanticipated needs.
6	The program's instruction and content should present in hard copy form to give a preliminary idea and information about CD-ROM/USB drive before users begin using it
7	Developing contextualised program content and methodologies that can respond to the unique Aboriginal culture present in different geographical areas across the country would be beneficial through finding cultural resources from the elders of each community
8	Prior to advocating certain new western medicine in the educational program, in order to promote it to Aboriginal communities, first the medicine in question should in terms of why it is the best choice.
9	Develop a reliable and applicable evaluation design for each stage in the development of interactive multimedia health informatics software.
10	A more feasible and appropriate outcome evaluation design should be developed using an appropriate cooperation process with Aboriginal and Torres Strait Islander health workers and communities to achieving realistic and valid outcomes for the project.

11	A further evaluation for the Interactive multimedia CD-ROM/USB drive program should proceed in the form of a pilot test and formative evaluation with Aboriginal and Torres Strait Islander health workers to indicate if they would be able to learn from the program at a faster rate than they would from traditional paper-based education.
12	The effectiveness of health informatics program can be determined by measuring the health workers' achievement regarding the program objectives. It is desirable to assess health workers knowledge before, during and after using the program and inform them about their own progress
13	Principles of curriculum development, Principles of adult learning should be addressed and considered. Model should be designed to demonstrate the educational effectiveness of their intervention. The training organization has important role in continuing model evaluation.
14	Designing complex multimedia requires a team effort because a good result requires many different skills.
15	For model design the study suggested the following: • Designers should first determine what outcomes that are trying to achieve and then select elements and media well suited for these outcomes, and only when these elements support a learning need. • Consistent navigation elements clarify what to do next, and learners should always be able to tell where they are and how to get to where they want to go. • Always provide ways for learners to get help with the technology and with questions about the content. • The learner can determine when to use additional media (as video, animation, audio). • More research and design resources might be forthcoming.
16	The main challenge for model development is to combine the efforts of medical educators with the software technologists in a way to design culturally-appropriate health informatics software using interactive multimedia

13.15 Appendix: A DETAIL DESCRIPTION FOR FIGURE 1.3

The small white arrows represent the relation between The Queensland Aboriginal and Torres Strait Islander Health Council & Indigenous health workers and the Indigenous communities as both are part and originate from Indigenous Communities.

The Small Black arrows are represented the cooperation and support from the Federal Government and Queensland Health services and Plans(FGQHP) to The Queensland Aboriginal and Torres Strait Islander Health Council & Indigenous health workers. FGQHP provide Indigenous health workers by training and educational program aiming for improvement of primary health care for Aboriginal communities.

The large black arrow represents the effects of well a trained health workforce in improvement for Primary health care services, which consequently will lead to improving in Aboriginal and Torres Strait Islander Australian health, **represent by the large white arrow**.
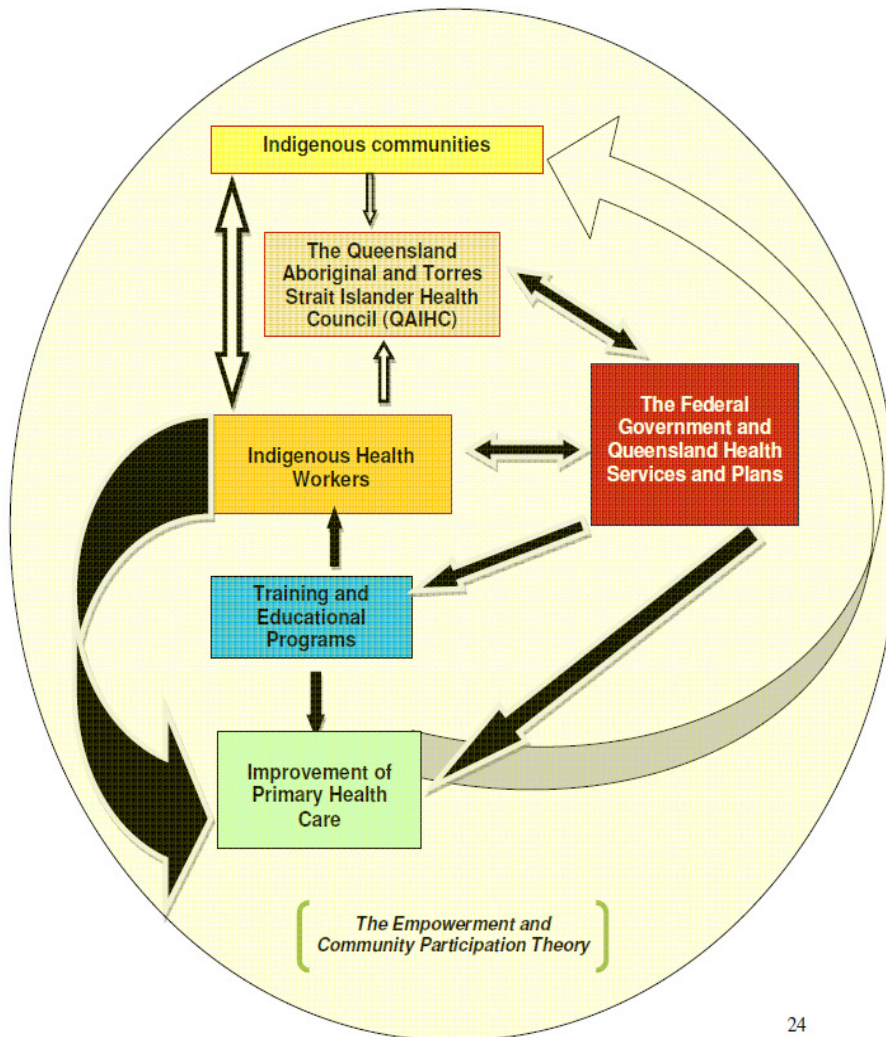

Figure (1.3) Empowerment and Community Participation Theory, Illustration by F. El Sayed