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Interactive TV and Learning among Pre-Adolescents: An Analysis of Innovation, Communication Technologies and Education

By

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Che-Sheng Chao

Autumn, 2010

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DECLARATION

I hereby declare that the work presented in this thesis is my own and has been developed under the joint supervision of both Professor Frank Webster and Dr. Petros Iosifidis and any other assistance as stated and referenced in the thesis accordingly.

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ABSTRACT

Interactive TV, a new media service based on an amalgamation of traditional TV watching and Web-based features, has turned consuming TV programmes and value-added services into an individual and interactive experience.

This research aims to stimulate thinking about the changing role of interactive TV as it moves from a passive medium to a more active medium, enabling learning opportunities for young adults previously confined to the personal computer (PC) domain. This new paradigm of interactivity for education and learning offers personalised and innovative ways to learn that differ from learning in traditional academic courses.

To ensure that TV-based learning is adequately supported, the research provides teaching and learning materials through electronic media. A Taiwanese educational TV multimedia home platform (MHP) programme entitled 'Follow Me after School', which is composed of science topics, reference materials, study quizzes and interactive functions, is used to facilitate teaching through screen-based media and stimulate youths' after-school learning activities.

Joshua Meyrowitz's 'situational' approach is adopted to form the methodological framework of this work. The framework incorporates a set of quantitative questionnaires and the formation of youth groups to watch interactive TV's edutainment programmes. The methodology also involves qualitative data-collection methods, such as participant media activities recorded on a guided, open-end, diary-style form and multitasking analyses, to provide in-depth understanding of learners' experiences in the new media environment.

Drawing on new technologies' involvement in children's educational and social experiences, this research focuses on pre-adolescents in Taiwan and presents a scenario demonstrating that although well-designed interactive TV has highly elevated technological capabilities, it cannot change the fact that children's TV watching at home is mostly a social and shared activity. Watching TV is a major part of routine activity in a family environment, neither complemented by nor substituted for PC-related behaviours in certain time, space and social-cultural conditions.

LIST OF ABBREVIATIONS

ATSC--- Advanced Television Systems Committee

BBC --- British Broadcasting Corporation (UK)

CD --- Compact Disc

COFDM--- Coded Orthogonal Frequency Division Multiplexing

CTS --- Chinese Television System (Taiwan)

CTV --- China Television Company (Taiwan)

CTW --- Children's Television Workshop

DVB --- Digital Video Broadcasting Project

DVD --- Digital Video Disc

e-Learning --- Online Learning

EPG --- Electronic Programme Guide

ESA --- Entertainment Software Association

fMRI --- functional Magnetic Resonance Imaging

FTV --- Formosa Television (Taiwan)

HDTV--- High Definition Television

ICTs --- Information and Communication Technologies

IM --- Instant Messaging

IP --- Internet Protocol

IT --- Information Technology

ITV --- Independent Television (UK)

iTV --- Interactive Television

MHP--- Multimedia Home Platform

MP3--- MPEG-1 Audio Layer 3

MSN --- The Microsoft Network

MSNBC --- A TV channel sponsored by Microsoft and NBC Universal

NBC --- National Broadcasting Company (USA)

PC --- Personal Computer

PS2 --- The PlayStation 2 Game (Sony)

PS3 --- The PlayStation 3 Game (Sony)

PTS --- Public Television Service (Taiwan)

PVR --- Personal Video Recorder

QPSK--- Quadrature Phase-Shift keying

QAM--- Quadrature Amplitude Modulation

SPSS --- The Statistical Package for the Social Sciences

STB --- Set-top Box

T-commerce – Television commerce

T-Learning---Television Learning

TTV --- Taiwan Television Enterprise (Taiwan)

VCR-- Video Cassette Recorder

VOD--- Video on Demand

Chapter 1 Introduction

How to Think About TV in the Techno-cultural Age

Television has long been a landmark in the living room of couch-potato viewers who spend a lot of time in front of it. TV keeps its audience informed about the latest developments in politics or the economy, and offers an endless series of programmes which intend to entertain.

Television is considered a public medium used to provide mass communication in which information is generally seen as 'a technology-mediated, institutionalized, mostly one-way process with little or no interaction between the sender, the mass communication institution, and the receiver, the large, heterogeneous and dispersed audience' (Mihaly, 2002, p.69). In this sense, TV watching is a passive and non-interactive activity for mass audiences.

With old media transforming into so-called 'new media' as we enter the era of digital convergence, major changes in the way we consume information and entertainment are anticipated. Audiences today have more viewing options due to enrichment from the multi-channel television design enabled by the information technology (IT) revolution, which activated the transformation of the television environment. Mihaly's conception of mass media feeds into a problematic argument of the audience as passive, and this is the issue for which I will address my concern.

As audiences expect more choice and greater freedom about when and where they access information via new technologies such as interactive TV, television transformation is bound to affect communication relationships. Searching for information and demanding a more personal and customised service constitute a very active process that requires both mental and physical

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energy; however, when applying this active-watching motivation and behaviour to the TV realm, it becomes questionable whether even the most active audiences take advantage of the huge array of content provided by digital media (Olsson, 2006, p.116).

The emergence of these new interactive functions and services raises the fundamental questions addressed in my thesis: How do children and young people behave and respond to the role of television in their daily life? Should they be familiar with digital media to encourage positive attitudes towards interactivity in TV uses? Can they find ways to engage with TV and digital technologies for learning purposes? These questions have brought up concern as to whether the educational content of interactive TV can indeed satisfy the learning intentions of the new generation with their requisite digital skills.

1.1 Interactive Television: Panacea or Tool for Learning from Home?

Abundant definitions of interactivity exist, some of which are 'orientation to interactivity is a personality characteristic' (Heeter, 2000, p. 11), interactivity is defined as 'the communicator and the audience respond to, or are willing to facilitate, each other's communication needs' (Ha and James, 1998), and 'interactivity refers to the ways that new technologies have been designed to be more responsive to consumer feedback' (Jenkins, 2006, p.133). Among all definitions the most basic is that communication is in some sense bilateral, rather than simply one-way. In terms of mass communication, today's viewers can become involved in media content via a certain degree of programme control. Interactive television thus provides a platform for skilled and energetic active

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viewers to manage contents using a technologically advanced system.

The definition of interactive TV includes a number of techniques with which 'the viewer can make programming choices and produce user input' (Jensen and Toscan, 1999, p.16). In this simple definition of interactive TV, the traditional concept of TV watching, viewers' one-way receiving sequential programmes, for example, 'to start, interrupt, continue, or complete a reception' (Vorderer, 2000, p,22), appears to be wishful marketing thinking regarding 'two-way communication', 'more choice', 'personal control' and 'input and feedback'. These all are indicators of interactivity in television applications from both a hardware and a software perspective that differ from the notion of traditional TV watching as only one-way communication (Dijk and Vos, 2001, p.446).

From TV producers' and educators' perspectives, interactive TV combines the appeal of traditional television-watching habits with more individual and interactive features such as those currently available on the Web. It offers new opportunities for audience members, who can directly access relevant information and other services with just one click of the red button on the remote control to interact with designated content.

From TV consumers' perspective, interactive TV has reflected consumer desire to incorporate a new continuum form of TV using three gradually interactive behaviours: Consumers move from the very narrow meaning of *traditional interactivity* (surfing channels rather than just turning the TV on and off, changing volume and channels) to *simple interactivity* (requesting video on demand or changing programme sequence via recording devices) to *high interactivity* (taking advantage of cross-media interaction by very active behaviours and heavily relying on new digital technologies, such as electronic

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programme guides (EPGs), easy-to-use interfaces for organisation of personal programmes, or walled gardens services to watch live football games from different camera angles simultaneously).

Interactive and enhanced television challenges the capabilities of the media, at least potentially incorporating users' interaction and participation. At the same time, it claims new modes of content production that rely on the convergence of the Web (e-learning via the Internet) and TV (television learning via the remote control) and the consumer desire for more personalised and advanced, perhaps more fascinating, applications.

However, user interactivity with interactive TV is a complex process, since different watching environments may either improve or degrade users' experiences with interactive TV. Chapter 2 argues that, to understand the nature of technological innovations and especially television's transformation, there is a need to situate technology in a social and historical context. TV may now allow more personal and interactive services; however, watching television at home still occurs in a social place mediated by programme flow and family organisation of time and space. In my opinion, research into interactive TV as 'new media' should seek to go beyond the technical features of 'interactivity' to argue that any watching of TV (traditional or interactive) for learning purposes at home is typically determined by social relations within the family environment.

1.2 Interactive TV for Youths' Education:
From Passive Viewers to Active Learners

Television's two-way communication and interactive features have now emerged from hype to reality, but how are these new features suited to the new

generation for learning? My initial interest in this learning area developed in the context of different contemporary technology uses in children's and young people's lives.

In Chapter 3, I examine the rich digital world, which creates vast new opportunities for the young generation. Children live in an arena of negotiation and rapid change; '*becoming* and *generationing* are important to understand children's role in consumer society' (Johansson, 2004, p.3). For today's young adults, norms and behaviours are changing much faster than they have in the past because of rapid developments in the information and communication fields. Technological determinist scholars such as Don Tapscott and Marc Prensky called the current generation the 'Net Generation' and 'Digital Natives'—in other words, the native speakers of the new digital language of computers, video games and the Internet (Prensky, 2006, p.29; Tapscott, 1998, p.40). The belief is that digital natives growing up in the new media environment may well be physically different from their parents, who grew up in the analogue era and can be dubbed 'Digital Immigrants'. The young generation is attached to the Internet, computers and video games and accepts new media more easily and more positively than older people. It follows that interactive TV with Internet-like potential may boost the learning desire of the young generation.

Nevertheless, I question the overly simplistic notion of the 'Digital Generation' in which young adults can use any digital tool through multitasking behaviours or create a new style of playful learning. The potential impact of cultural and socio-economic factors on young people of different ages and variations within age groups will influence the levels of access and technology skills within a proportion of generations, not a whole generation of young people (Bennett et al., 2008, p.779). These technological determinist approaches ignore

different variations within digital generations and that new media gadgets often co-exist with traditional media and do not necessarily replace them. To overcome this limitation and in an attempt to address the learning function, I suggest that children be considered in the context of social, economic and political environments, as well as social learning environments, according to content, style and form. One should also examine how young people learn from contexts outside of formal educational settings and styles, especially the at-home informal learning environment, which is mostly informed by TV watching. By focusing on learning, this thesis attempts to observe the changing behaviours of individuals and small communities associated with, and the different situations involved in, watching television (Wenger, 1999, p.7).

Before interactive television, the medium of television had already been used for informal educational purposes. Even though the traditional linear television broadcast combines audio and visual content vividly (compared to the single-sensory experience of radio or printed media such as books), it still does not provide feedback or allow users to interact with the content provider.

Television learning (T-learning), short for TV-based interactive learning, involves interactive access to video-rich learning materials primarily within the home, through a TV or screen device more like TV than personal computers (PCs) (Prario and Dosi, 2004, p.69; Bates, 2003, pp.66-72).

Educators have anticipated the evolving role of interactive TV because personalised services can create new opportunities for learning geared specifically to the digital generation. In direct contrast to traditional TV's one-way communication, interactive TV can potentially offer new ways to enable high-quality and interactive learning modules (Atwere and Bates, 2003, p.5).

The potential of interactive TV for learning can be seen in three potential phases of development. In the first phase (traditional TV era), people would access educational content via a linear video requested by the viewer. In this phase, various activities with learning potential tend to be available at different times and relate to TV programmes. The second phase would involve the ability to search for video clips of learning content. In this phase, learners could simply use the remote control to search for their favourite programmes using the EPG function. The third phase of development would be fully or highly interactive, much like the Internet, where children and young people could pace and control their learning. Moreover, depending on the design of the digital system, learners could answer questions or request content from the interactive system via a connection to an information databank.

Educators also anticipate the presence of at least one TV set in every home, with people feeling comfortable using it. Therefore, digital TV with interactive functions could open up many possibilities for TV-based distance learning. Moreover, television programmes often act as the main entertainment resource, thereby providing another way of learning. This leads to the popular term 'edutainment'. Edutainment is used to enhance the quality of children's programmes with eye-opening characters and easy learning. Let us elaborate on this notion.

1.3 Edutainment: Education and Entertainment Blend Together for Easier Learning

Television is typically regarded as an 'entertainment medium' or 'entertainment machine', but can TV's orientation towards entertainment coexist

with its learning potential?

The term 'entertainment' is normally used for describing the style of a programme whose content the TV producer intends to be amusing and entertaining (Wallden and Soronen, 2004, p.7). With a focus on TV as a socialising medium, most of the deliberate exposure of people to television 'is motivated less to seek information, as such, but in search of something generally referred to as "entertainment"' (Tannenbaum, 1980, p.1).

This passive-watching behaviour reflects that the viewer is most likely to be easily entertained by such programmes. Passive watching involves audiences who do not normally seek out informational programmes. In this context, the general trend towards increasing use of entertainment TV, especially if children have difficulty distinguishing between the purposes of television watching at home, is considered a problem (Russell, 2000, pp.389-400). Hence, many educators have integrated educational material in entertainment-oriented programmes to generate a healthy and educational performance (Messenger-Davies, 1989, p.139).

In his social learning theory, Bandura defined 'entertainment-education' as 'the process of purposely designing and implementing a media message to both entertain and educate, in order to increase audience knowledge about an educational issue, create favorable attitudes, and change over behavior' (Singhal and Rogers, 1999, p.xii). The intention of social learning theory is to see how entertainment media, such as soap operas from which viewers may easily adopt certain behaviours if they see the actors as role models, can be redirected to judge the programme's appeal that can help viewers recreating TV material to express themselves (Fisherkeller, 2002, p.31).

However, defining entertainment is not always straightforward, because

being entertained is typically a subjective experience that involves a complex psychological process. With regard to how much entertainment is appropriate for young people, it is my view that one needs to consider television and entertainment in the broad sense of young people's optimal pleasure in the learning process, assuming an enjoyable activity with creative flexibility for TV watching. In the context of my research, 'edutainment' refers to entertaining programmes which are primarily meant for educational purposes, a hybrid mix of education and entertainment that relies on visual materials, narrative or game-like formats and informal styles of learning at home (Wallden and Soronen, 2004, p.8; Damasio and Quico, 2004, p.3).

1.4 Interactive Television: The Promise of Technical and Designed Innovation for Learning, But How Can We Test It?

If edutainment is appropriate for different types of learning (content and software scenarios), how does it provide interesting and authentic learning rewards for young people? Given that edutainment has been popular in conventional TV, can interactive TV make learning a more interesting or fascinating experience? Should learning in informal learning environments be expanded to include learners making coordinated use of digital devices? Does interactive TV provide some kind of function as a 'playing device' for young learners? These are some of the questions this research will address.

I have argued that interactive TV promises that some youth will be prepared to shift their usage behaviour from the Internet to interactive TV. However, one must consider that interactive TV and other digital media are 'technologies of

representation'; they are situated in social and cultural contexts and 'cannot be considered merely as neutral tools for learning' (Buckingham, 2007, p.vii).

Therefore, this research focuses on the significance of media technology and education development in Taiwan and aims to contribute meaningful information that will aid in both theoretical understanding and practical application.

1.5 Globalised Screen Culture in Taiwan

The globalised screen culture is now a central aspect of worldwide youth culture. We are seeing a widening transformation of the culture of TV watching and youths' media usage outside of school.

Taiwan's educational system has been influenced not only by technological advancements, but also by the Chinese culture and Confucianism, which encourage diversity in education and stand for hard work, effort, persistence and cultivation of rigorous learning attitudes (Chou and Ho, 2007, p.346). The country's education reforms placed significant pressure on students to reach a higher academic level, starting from primary school. On the positive side, with the 'One Standard, Multiple Textbook Policy' proposed in 1999 (MOE, 2007), each primary school has the freedom to choose its preferred textbooks for Mandarin, mathematics, science, English and other topics; the goal is to scaffold a flexible curriculum design. On the negative side, school-age children may find it difficult to digest various textbooks that are provided by the school in an effort to foster greater appreciation for knowledge variety through either parents' supervision or after-class extracurricular activities.

Taiwan, like many industrialised countries, has opened up opportunities for children's learning in this fast-changing world. In January 2009, Taiwan was

ranked 25th in the world and 4th in the Asian region in the ICT Development Index, which captures the level of advancements in information and communication technologies in more than 150 countries, with comparisons of progress made between 2002 and 2007 (ICT, 2009; Lin, 2009). Children and young people access the Internet for various reasons, ranging from surfing Web sites for homework purposes to accessing information to facilitate more active and interactive ways of learning.

In a competitive learning environment in which parents are extremely concerned about their children's ability to do well in school and achieve high grades, education has become a source of anxiety for both children and parents. Parents often pay disproportionate amounts of money for their children's educational services and goods (e.g., expensive private tuition or fancy PC facilities). Therefore, children have no choice but to put a great deal of their learning effort towards not just the arts or sports activities, but also English, mathematics and science outside of normal schooling.

Although many information and communication technologies (ICTs) occupy a good deal of time in children's daily life in Taiwan, 56.2% of children still spend their leisure time watching TV (Lin, 2007). However, the power of new technologies has built up hope for advanced learning in which Taiwanese children not only have access to and use new media, but also indulge in watching television. According to the white paper published by the Taiwanese Ministry of Education, mass media have become the second education curriculum for children and youth, a situation that threatens the position of schools as the first education system (MOE, 2002, p.4). The white paper argued that the number of hours spent by adolescents on new media (computer games and surfing the Internet) has been on the increase in recent years and children still spend half

their leisure time watching television. How the digital technology of interactive TV is appropriated within everyday practices in Taiwan among children and their families as 'the audience' to create a natural role for recipients is worth close examination in media research.

My thesis is intended to examine this hidden meaning and to analyse the quality of TV transformation in terms of TV watching. Associated educational elements will be pursued with a clear understanding of the impact of the fundamentally cultural, social and contextual nature of both learning about media and media use in everyday life.

1.6 Towards Media Literacy and Learning: The Concepts Relate to the Study

'The term "media literacy" refers to the knowledge, skills and competencies that are required in order to use and interpret media' (Buckingham, 2003, p.36). Media literacy is the cultural valve for audiences, a common experience of pleasure in criticising media, and a transformative and creative effort with media (Burn and Durran, 2007, pp.1-6). Interpreting a TV programme, for instance, not only requires us to understand the 'language' of TV's interpreting striking images and unusual sound effects which attract visual attention (Messenger-Davies, 1989, p.70), but the ability of audiences at different ages to decode television is also an integral part of children's daily lives within their social relationships. As I mentioned above, watching TV as a social learning process can be assessed by focusing on content, style and form. This research elaborates how the term 'media literacy' can be made to mean the influence of watching TV in practice on knowledge retention and the social

learning environment.

Via contemporary digital technologies and the concomitant ways of thinking of specialist practices, children and young people encounter more learning experiences outside school as part of their popular culture and complex thinking than they do at school (Gee, 2004, pp.3-5). Gee (2004) suggested that learning is partly a practice effect in which knowledge is acquired by an instructed process via overt instruction. Moreover, learning also is considered a situated environment in that children need to be guided by masters (tools and technology) to form cultural learning processes that they better understand when they use that knowledge and those skills in time and on demand (Gee, 2004, pp.11-13).

What is hard about learning is the ability to apply information to a range of different scenarios; this involves complex and technical ways of thinking, ultimately altering and reflecting original knowledge. As I am concerned with a more elaborate kind of learning experience by adding interactivity to television, the experimental questionnaire design was prioritised to probe testers' retention of knowledge first, then their attitude gaining from the process of retained knowledge and, most important, their anticipated future use in an effort to detail the interactive application. I also draw these threads together by using a media diary to look at how cultural learning processes are organised to bridge children's time and space after their school learning schedule to complement the retention of knowledge.

The discussion so far has centred on areas involving social and educational features from the transformation of TV in our everyday life. The next section examines in more detail the purpose of the research.

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1.7 Purpose of the Thesis

Television programmes can now be transmitted via terrestrial, cable and satellite channels as well as over the Internet. Such technological developments are normally accompanied by changes in TV viewing habits; for instance, the video cassette recorder (VCR) enables viewers to watch their favourite programmes at any time of any day, while the marriage of the 'TV set' to the Internet provides opportunities for new forms of entertainment like those arising from interactive TV. Youths are familiar with the content of television and tend to associate it with enjoyable experiences, as they appreciate the medium's power to entertain. The development of new visual technologies used in interactive TV makes it possible to provide audiences with more command and interactivity and, thus, with the ability to customise the broadcast interface to fit their needs and their variety of viewing and learning styles.

Digital TV has been used in learning to some extent, but use of the multimedia home platform (MHP) in the television learning process is genuinely novel, because interactive television applications are still under development and their interactive modes are still pending. To accelerate the push for MHP, since 2005, the Taiwan government has provided financial support to establish interactive services through trials on some children's educational TV programmes (DVB, 2005).

This study employs experiments based on a popular Taiwanese TV series for children, *"Follow Me after School"*—an edutainment MHP programme for the young generation produced by the Public Television Service (PTS) in Taiwan. The research adopted a multi-method approach for field investigation in April 2008 to form the methodological framework of the thesis, which incorporates a

combination of –

(a) quantitative questionnaires completed and returned by 253 students from 8 classes of the 5th grade (11-12 years old) of two primary schools (i.e., 4 classes each) in Taichung City. The students were divided into two groups, each watching either traditional or interactive TV edutainment programmes (i.e., 2 traditional and 2 interactive programmes for each school); and

(b) different qualitative data collection methods such as having participants record their media activities of one week on a guided, open-end diary-style form (i.e., 124 randomly selected students from 1 traditional and 1 interactive class in each school). The multitasking evaluation analyses were intended to provide a deeper understanding of the learners' experiences in the new media environment.

Questionnaires were used to test for effects from the three fronts of knowledge, attitude and behaviour on the traditional vs. the interactive group (123 vs. 130 participants) by adopting a selected 30-minute episode for viewing by students. The null hypothesis was to assert that interactive TV does not make a difference in students' test performances. More detail about this approach is provided in Chapters 4 and 5, but here I would like to concentrate on a counterintuitive result which showed that the group watching the traditional TV programme had a significantly more positive attitude-test result than the group watching the interactive-interface programme, which means that interactive TV has not sufficiently triggered audiences' positive attitude towards TV programmes to date.

Moreover, while I regard the reception of media activities by children as a hermeneutic process, the situational approach based on media diaries has allowed me to utilise and generalise multiple variables on media activities, space and time to study children's behaviour in different given social situations of 'where one is

and who one is with' (Meyrowitz, 1986, p.viii). Testers' three common circumstances in TV watching time (watching with parents, watching with siblings and watching in the living room), derived from the media diary analyses, reveal that watching TV for Taiwanese children (11-12 years old) at home should be seen as a routine, symbolic activity and 'a fundamental feature of social life, on a par with productive activity, the coordination of individuals, and coercion' (Thompson, 1995, p.16). Pre-adolescents basically conform to established social settings by accepting TV's presence in the living room first, by having mediated interactions under a cluster of rules, resources and social relations with family when watching TV (Thompson, 1995, p.12) and by yielding to parents' coercive power over some watching behaviours within the limitation of space and time to access TV. We therefore need to consider that TV is probably satisfactory for edutainment. However, the social setting of a public space in the home and the natural dynamics of one-to-many broadcasting and co-viewing behaviours may result in a viewer state of mind that is inappropriate for individual and interactive learning.

This study is organised as follows. The literature is reviewed in two distinct chapters that separate TV as a medium in transition with interactivity features and how the audience thinks about TV as a learning and literacy process (see Chapters 2 and 3). Chapter 2 contains an analysis of the relevant theory and literature on the meaning of new media and interactivity, and the transformation of TV, from a number of different perspectives, including technological, social, psychological and semiotic perspectives. Chapter 3 provides a review of the literature on the so-called Digital Generation and pre-adolescents' lives with regard to learning and education. Research into the effects of TV on youth is also examined. The method for investigating the experimental design and testing the

research questions and hypotheses is articulated in Chapter 4. Chapter 5 contains detailed information about the results of statistical analyses based on the collected data, while the final chapter provides a summary of the main arguments and a discussion of the practical implications of the thesis.

Chapter 2 Literature Review I

Television and the Dynamics of Innovation: Its Technological and Social Meanings

Chapter Overview

This chapter contains a discussion of how technological and social changes drive innovation in television. While television itself is an ongoing development process embedded with historical, social and user contexts, interactive TV may be seen as a 'new medium' from a technological perspective; however, it still acts as a social medium for families under the traditional TV communicative environment.

The first section of this chapter will provide a brief description of new media and how interactivity appears as a particular focus of new media research.

The second section contains a discussion of the transformation of television from early one-way communication to the two-way communication of interactive TV made possible by the introduction of different interactive functions. By categorising the evolution of different interactive behaviours with television, I strongly question the notion that interactivity in the realm of TV is only one technological outlook for a few users within the industry rather than a platform for the majority of consumers.

The third section provides an examination of the social meaning of TV watching and its pattern in the watching environment among family members to explain Raymond Williams' (1975) concept of the TV programme flow and co-viewing flow at home.

The final section presents a discussion of mediated communication at home that involves family members' co-viewing behaviours using the three interaction

types (face-to-face interaction, mediated interaction and mediated quasi-interaction) stressed by John Thompson (1995). Also examined is Erving Goffman's (1959) explanation of the public / private region to expand young people's public / group TV-watching and private / personal Internet-using behaviours. All these will be discussed at the end of this chapter.

2.1 New Media: Interactive TV as a New Way of Watching Television?

With the promise of multiple programme channels, enhanced visual and audio quality and more flexible interactivity in the communication process, interactive TV provided by a digital television system inspires audiences to proclaim this a 'new medium' based on its technological features. These features can provide audiences with personal services for learning and entertainment purposes from either broadcast or on-demand materials. However, new services with more personal interactivity from interactive TV are undergoing uncertainty because watching television has been traditionally regarded as family activity for group enjoyment (Michelle et al., 1991, p.1412; Morley, 1992, p.155). Rice (1999) argued that all communication forms (from face-to-face to new media) combine different attributes, meanings, controls and consequences. If we think of interactive TV as an idealised new medium, 'to better understand new media, we must also better understand traditional communication forms, by unconfounding their attributes (whether socially constructed or material) from their artifactual and idealized forms' (Rice, 1999, p.32).

In the introduction, I state my intention to investigate the innovations of interactive TV through both a technological and social process. Before

discussions on technological developments and the social shaping of TV into a domestic diffusion process, the first section will provide an analysis of the meaning of new media and interactivity that is closer to my theoretical framework and that captures the interactive functions interwoven into television development.

New Media: Technological Development and Social Process

My thesis focuses on the changing media environment for children and young people in Taiwan, this being central to developments in current access and use for new media at home. Thus, 'new media' in the study include multi-channel cable TV, digital TV (more specifically, interactive TV), the Internet, personal computer (PC)-related activities (e.g., social networking programmes and online games) and TV-linked videos and games.

Contemporary discussions of new media have been given significance because they concern not only new media's technological characteristics but also the social practices associated with their use. A single definition can hardly encompass the variety of meanings the term 'new media' has today. From the perspective of technological characteristics, Williams, Rice and Rogers (1986, p. 9) defined new media as telecommunications, computing, and new services that 'combine together'; Flew focused on digitisation and convergence, which are two keys to understanding new media (Flew, 2002, p.17). Thomas suggested that reproducibility and distribution are two different concepts in terms of new media; he also indicated that for the media consumer, the logics of reproduction are from artistic reproduction of re-presented images, objects or ideas to 'code' as the meaning of digitisation (Thomas, 2002, p.82). 'New media' as a subject 'is

becoming the preferred term for a range of media practices that employ digital technologies and the computer in some way or another' (Dewdney and Ride, 2006, p.20). Scholars concluded that most computer-based utilisations and services are regarded as applications of new media. Manovich (2001) argued that when we refer to 'new media', we mainly mean those media technologies that come from digital distribution and exhibition rather than production (Manovich, 2001, p.19). New media are understood to include 'the use of new communication technology for old or new purposes, new ways of using old technologies' (Marvin, 1988, p.8). Bolter and Grusin also argued that presenting new digital media as one medium is another remediation. 'Digital media remediate their predecessors, a spectrum depending on the degree of perceived competition or rivalry between the new media and the old' (Bolter and Grusin, 2000, p.45).

'"Newness" is a relative notion with regard to both time and place. What is new today is old tomorrow, and what is new in one cultural context may be unknown or outmoded in another' (Jankowski, 2002, p.35). When television goes digital and interactive, slogans such as 'push the red button for interactive feature' (BBC, 2009b) and 'to help passive viewers become active learners' (Love, 2001, p.1155) broaden the traditional 'old TV' with more 'new imaginary' performances. Television has intensified the diversity of historical and cultural sentiment in people's life, and we can hardly think of new media as only a simple classifier for new or old features. Therefore, I refer to Lievrouw and Livingstone (2002), who have made several statements on the meaning of 'new media' in relation to information and communication technologies and their associated social contexts for television development, which include:

1. the artifacts or devices that enable and extend our abilities to

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communicate;

2. the communication activities or practices we engage in to develop and
   use those devices; and

3. the social arrangements or organisations that form around the devices
   and practices (Lievrouw and Livingstone, 2002, p.7).

To further retrieve different viewpoints regarding this definition, it is important to realise that the development of interactive TV as new media has appropriated some of the qualities and relationships from past media forms. Following this section, the theoretical concepts of interactivity will be discussed in details.

Interactivity: As a Variable in Empirical Investigations

Interactivity is a variable that requires a comprehensive range of skills that swing across users and media (Sims, 1997, p.157). Interactivity levels are fairly stable or measurable across time in the transformation of media technologies, but can vary with individual perceptions. How does interactivity influence learning? How do young people use and learn self-regulatory skills in technology-based environments? These are the kinds of basic questions that must be addressed in the area of interactivity with new media to facilitate learning and motivation in human behaviours.

Jensen (1998) suggested that, from the sociological perspective, interactivity is 'the relationship between two or more people who, in a given situation, mutually adapt their behavior and actions to each other' (Jensen, 1998, p.188). Therefore, one-way communication is much inferior in the complex information age. Contrarily, interactivity enables participants to actively communicate in a

two-way form which meets the time demands of participants (Downes and McMillan, 2000, p.173).

While Rice (1984) approached new media as communication technologies that 'allow or facilitate interactivity among users or between users and information'(Rice, 1984, p.35). Rafaeli (1988) said that 'interactivity is an expression of the extent that is given a series of communication exchanges' and especially the extent to which later transmissions or messages react in relation to earlier messages (Rafaeli, 1988, p.111). Steuer suggested that interactivity means that 'users can participate in modifying the form and content of a mediated environment in real time' (Steuer, 1992, p.84). Two important capabilities created by interactivity are user control and responsiveness. User control allows the learner to determine the topics or services in the network, and users can respond to programmes selected and keep the service in order, while responsiveness points to the learner who reacts to previous messages or acknowledges prior responses. The level of interactivity in new media has been examined via three factors: speed of interaction, range of media and mapping of controls in the mediated environment (Steuer, 1992, pp.85-86).

In a similar analysis, Williams et al. (1986) declared that interactivity is 'the degree to which participants in a communication process have control over, and can exchange roles in, their mutual discourse' (Williams et al., 1986, p.314). A range of concepts of interactivity is based on several levels. For instance, Damarin (1982) introduced six levels of interaction, watching, finding, doing, using, constructing and creating, to form the instructional goal between learners and computers (Damarin, 1982, p.5). Rhodes and Azbell (1985) proposed three forms of interaction for computer-assisted interactive video—reactive, coactive and proactive—which depend on a wide range of programme options (Rhodes

and Azbell, 1985, pp.31-33).

Taken together, these definitions suggest a desirable interactivity among participants and content that is reciprocal by eliminating only one-way technologies and mediated experiences, results in positive learning through improved technologies and provides cost-effective access to education. 'Interactivity learning is a necessary and fundamental mechanism for knowledge acquisition and the development of both cognitive and physical skills' (Parker, 1994, p.1). Beyond discussion of interactivity boundaries among different levels and forms, how the interactivity enters the realm of the learning environment depends on its content, style and form.

It is important that I narrow my focus and keep the analysis manageable given the above discussion surrounding the concept of interactivity related to the study. Thus, in the next section, the TV industry's own orientation towards its technological diffusion along with different types of interactive television will be examined, while I also deal with an exact identification of what is meant by interactivity in digital television.

2.2 Television's Technological Movements

In this section, I will look at television transformation from the technological front. The old boxes of TV, from black-and-white to colour, have had a profound influence on our everyday life, affecting our organisation of time as well as our relationships within the home. During the past few decades, the so-called 'information society' has changed rapidly and technological innovations such as digitalisation have become drivers for multimedia convergence among text, data, audio and video sectors. Hence, the television industry is entering the new world

of the digital period, which not only offers enhanced visions but also presents a supposed abundance of programming choices and interactive profiles.

John Ellis (2000) offered an explanation of the theory of 'eras' in UK history with respect to changing television 'ecology'; he divided television history into three distinct eras: the era of scarcity, the era of availability and the era of plenty. Many countries, including Taiwan, have followed a similar pattern. The era of scarcity occurs in the beginning of the one-size-fits-all medium, for example, the BBC in the UK where pre-decided and mass-broadcast programming was the only alternative. The era of availability began when commercial television was introduced to the UK by Independent Television (ITV). BBC2 and Channel 4 were later launched; therefore, viewers had more available choices. Finally, audiences are effusive about the era of plenty, where choices are not entirely reliant on scheduled television transmissions and the programming provided represents as many genres as possible. 'Interactivity is therefore likely to produce new forms of audiovisual material, and it will begin to stretch broadcasting rather than replace it' (Ellis, 2000, p.174). Ellis described a universal situation in all countries, including Taiwan, in which TV has extended a greater array of options for viewers.

Television has also been successful in merging with new forms of technology, such as the remote control, which can increase the viewing speed by 'zapping', 'zipping' or 'surfing' and can allow viewers to gain access to different channels or to 'specific parts of an interactive presentation' (Lury, 2005, p.106). The implications of the video tape recorder, later the digital video disc (DVD) recorder, mean that television content can be converted into an exhibition technology for films via a time-switching function. In addition, children are accustomed to playing video games on the television screen; they also use video

camcorders and digital cameras which rely on television technology. 'These other technologies have been expressions of culture production that are very much connected to the cultural production thesis. Television can no longer be seen simply as technology of reception, but has integrated these elements of productive activity into its social and technological apparatus' (Marshall, 2004, p.92).

Television started in most countries as a national medium dominated by government broadcasting programmes designed to reach mass audiences. It then transformed into providing cable and satellite services with the addition of commercial competition. As a result, the capacity of TV channels has gone into overload. In the modern media market, digital convergence, from terrestrial to cable and from analogue to digital, has created scenarios for television that are diverse and unpredictable. While the introduction of digital technology has certainly shaped some technological outlooks of TV, I will describe how digital TV is constructed and managed into television development.

More Than One Kind of Television

Digital TV is a new technology for transmitting and receiving broadcast digital signals that create a new TV scenario (Hesmondhalgh, 2002, pp.223-230; Bollier and Foote, 1998, p.3). 'Standards for digital television include not only the formats for the physical media but also for the broadcast stream itself' (Ide et al., 2002, p.3). Audiences can take advantage of and enjoy digital TV via a new digital TV set or by connecting to a set-top box. As the European standard of digital signals, the Digital Video Broadcasting Project (DVB) is designed to receive programmes and digital data (DVB package) using various

media-compression techniques, such as QPSK (satellite), QAM (cable) and COFDM (terrestrial), so as to bring high-quality pictures and sound to satisfy market trends (DVB, 2009b) .

This new form of television which embraces characteristics of interactivity not only enriches the capacities of channels' receiving but also adds many valuable capabilities similar to functions on the Web. The two-way interaction of digital television encourages audiences to push the remote control's red button for different kinds of feedback. By separating the original TV screen into small screens loaded with multiple channels or adding more Flash contexts, audiences can view enormous amounts of information at the same time. The simultaneous presentation of visual and auditory information comes from the dynamic but fleeting capacity of video images and advanced multimedia technology to allow audiences to create associational links within and across texts, images and other interactive functions—some topics explored in multiple ways using a number of different concepts and issues. Burn and Parker used the term 'multimodal texts' to analyse the different forms of sounds and images in film and television, seeing new transformations and combinations of communication 'modes' among the digital formats of technologies in computing and screen-based devices that could be referred to as convergent interactive TV (Burn and Parker, 2003, p.9). Boddy (2004) argued that three competing applications of digital television—improved image quality (digitised signal), multiple standards (such as the DVB system in Europe and Taiwan and the Advanced Television Systems Committee (ATSC) in America) and enhanced interactivity—activate new paradigms and incompatible scenarios of television watching that still resonate with audience images dating nearly to the analogue age (Boddy, 2004, p.89).

To narrow the new media transition of television, I would further discuss

Gripsrud's indication that three major consequences of digitisation --convergence, increase of transmission capacity and interactivity--have created radical changes in television's transformation (Gripsrud, 2004, p.213).

Convergence

The development of digital electronic storage and transmission encourages the idea of integrating major components of human expressions, images, words and music, which are converted into binary code read and stored by computers (Hesmondhalgh, 2002, p.199; Owen, 2000, p.18; Pagani, 2003, p.4). Digitisation makes it possible to translate television signals into those of the preferred language of the computer; likewise, it is possible to watch the same content on a PC or TV (Levy, 1999, p.5). Hence, digital television allows standard television to be enhanced with 'Internet-like' capabilities. This, in turn, not only elevates the interactive motivation with TV hardware and programme software, but also provides the audience with cinema-like viewing experiences with advanced picture and sound quality (Flew, 2002, p.23; Owen, 2000, p.9).

Increase of Transmission Capacity

With digital compression, millions of bits of data space can be saved, and only when necessary are the pictorial and audio elements refreshed by digital compression which increases the channels and frequencies quantitatively (Parsons and Frieden, 1998, p.82). By increasing the channel capacity, changes in the nature of the signal have had substantial effects; for example, high definition television (HDTV) broadcasts a higher image quality at the same bandwidth

(Pagani, 2003, p.57).

Interactivity

In addition to storage control, quality transmission and digital compression of existing channels broadens viewers' choices. Interactive programmes enhance the primary characteristics of 'adding layers of depth to what is happening on the screen' (Pagani, 2003, p.123). The term 'interactivity' is frequently used to describe new media as 'interactive media' (Dijk, 2001, p.11). Digital TV's multicasting ability gives viewers choices among television programmes broadcast from the same station at the same time. For example, with multicasting, viewers can choose to watch news, sports, sitcoms or children's programming broadcast from the same station at the same time. It also provides more options for consumer interactivity, giving viewers more opportunities to gain access to additional programme materials or even non-programme-related resources (e.g., videos, audios, texts, graphics, maps, Internet services) and to save them to their computer's hard disks or set-top boxes using the personal video recorder (PVR) to achieve the time-shifting effect needed.

Dijk and Vos (2001) argued that different dimensions of interactivity should be appropriate for a plurality of interaction and communication types among users and machines in different space and time:

1. Human-human interaction (face-to-face communication)

2. Human-medium-human interaction(mass communication, telecommunication and computer-mediated communication)

3. Human-medium interaction (human-computer interaction) (Dijk and Vos, 2001, p.448).

Television acts as a medium for mass communication mostly through the human-medium-human interaction type, while in contrast, the PC dominates in the human-medium interaction process. Due to the convergence of information and communication technologies (ICTs), interactive TV that combines TV with Internet facility will create more complex communication processes among users, interactive content and machines.

Via reviews of digital convergence and interactivity, this study attempts to explore the invention of interactive TV and to examine its relationships with television's original affinity. Moreover, I will explain different styles of interactive TV and classify three different interactive behaviours found in interactive TV systems to determine whether the new apparatus that mediates the interface between TV and different audiences in terms of traditional television's productive process is affected.

Interactive Television: On the Edge of Revolution

Digital TV accelerates the convergence of the computer, telecom and media industries; the digital TV terminal thus 'represents a potential residential hub to a number of information, entertainment, and transaction services' (Galperin, 2004, p.10). As for interactive TV, it is just one aspect of the technological outlook on digital TV, and 'digital television makes interactive television easier to implement, but it is not interactive television per se' (Clark, 2006, p.7).

Interactive television (iTV) is a two-way interactive service provided through television that gives audiences more choices, more control and more customisation of their viewing experiences (Atwere and Bates, 2003, p.7;

Gawlinski, 2003, p.4). There is no generally agreed upon framework for describing different types of interactive TV, some of whose developing innovations and functions are explained below, including enhanced television, electronic programme guides, walled gardens and the Internet on television (Gawlinski, 2003, p.7; Swan, 2000, p.11).

Enhanced Television

Enhanced TV is designed to handle any type of content, whether texts, graphics or videos, overlaid in regularly displayed video content and accessed interactively. The enhanced content, a sort of super-text system synchronised with the programme stream, enables viewers to access data during the programming, including services such as up-to-date news bulletins, weather reports and interactive programme order service catalogues (Jensen, 2005, p.91).

Enhanced TV services make existing television programmes better by allowing viewers to interact with programmes via selection of additional information desired or other content in more quantity; these interactions appear in the form of data laid over live images. The interactivity with the television programme occurs in close conjunction with information that is proven to be immensely compelling. Therefore, from the perspective of the designer, enhanced television can add value to the programme itself, 'even changing the viewer's experiences of it' (Gawlinski, 2003, p.18). Enhanced TV provides educators with optional tools to create interactive learning content that can expand their capabilities to reach out to audiences and help them learn new information (Bellotti et al., 2008, p.69).

Electronic Programme Guides (EPGs)

The core task of the EPG is to illustrate to audiences what's on TV; it effectively replaces text-based television guides (Gawlinski, 2003, p.7). Viewers can utilise the remote control to select EPGs' teletext-style services for a listing of favorite channels or previous programmes to watch again, a service that can also work as a reminder system that prompts viewers when their favourite programmes are on. EPGs have potential to become the Web portal of television for users to enter the system easily (Jensen, 2005, p.90). With hundreds of channels from TV resources, advanced EPGs support more sophisticated searches, create detailed programmed information and provide efficient recommendations for viewers (Mihaly, 2002, p.70).

Walled Gardens

A typical walled garden is a collection of content and services from the same TV company's platform or several content providers' presentation of different programmes on the same screen (Gawlinski, 2003, p.13). For example, the BBC interactive service can display many channels on the screen, including BBC1, BBC2 and BBC News, at the same time for viewers to utilise a variety of viewing options. The Wimbledon tennis games have been broadcast for several years through a digital interactive service that allows tennis fans to watch the men's or women's final matches simultaneously from the same 'Walled Gardens service' (BBC, 2001).

Internet on Television

Internet on TV is referred to as a television-based Internet access system which enables viewers to carry out activities normally performed on a PC through a television set (Jensen, 2005, p.92). Viewers can enjoy Internet services from the television, with the TV screen replacing the PC monitor to fulfil PC capabilities such as online chat, e-mail, multi-player games and television commerce (T-commerce) (Curran, 2003, p.12). MSNBC (a channel sponsored by Microsoft and NBC), for instance, was designed for the hybrid TV / PC platform, where information is concurrently updated for both the PC and TV screen so that viewers can just 'log on' to the latest news (Papathanassopoulos, 2002, p.185).

With the convergence of push (users' sending messages to a receiver) and pull (users' connecting with content providers for information) technology for the Internet on TV (Dutton, 1999, p.275), viewers can be engaged in conversations with programme content, hosts or even other viewers to extend 'the viewing experience beyond the passive into a truly embedded interactive form' (Jensen, 2005, p.93).

These discussions of different categories of interactive TV foster further exploration of interaction methods between users and TV programmes. A distinguishing characteristic of interactive TV is its ability to allow audiences to interact with television programmes via the following methods (Pagani, 2003, p.96):

1. Changing the content that appears on the screen –

Viewers can access background information, watch associated content at the same time as the main image or activate more than two windows on the same television screen for simultaneous viewing.

2. Providing information and feedback directly through a return path –

The cable and Internet protocol (IP) system accesses information by a fibre

line, while the terrestrial system uses a telephone line connected to a set-top box. Viewers can, for example, push the remote control's interactive buttons to cast 'votes' on many kinds of questions, such as educational on-screen quizzes designed by the programme producer.

In addition to combining different categories of interactive TV with different usage methods, Masthoff and Pemberton (2005) suggested that three broad types of interactivity be developed in the interactive TV system to meet different kinds of interactive functions (Masthoff and Pemberton, 2005, p.3) (see Figure 2-1).

1. Distribution Interactivity

'Distribution interactivity has as its object the entire programme rather than the programme content' (Masthoff and Pemberton, 2005, pp.3-4) (corresponding to EPGs). The EPG allows viewers to investigate a description of current or upcoming programmes by a specific function designed to select a variety of distributions. 'In this way the viewer won't be misled into making a wrong choice, but can still see what they are missing' (Masthoff and Pemberton, 2005, p.3).

2. Extra-programme Interactivity

With extra-programme interactivity, viewers' focus is neither the programme nor the content, but some other activity available via the television set (corresponding to the walled gardens and the Internet on TV). The source of extra-programme interactivity would include local events, news, sports, cinema listings and so on, as well as specific television-related information, for viewers to jump into the extra-programme interactive environment (Masthoff and Pemberton, 2005, p.4).

3. Intra-programme Interactivity

Intra-programme interactivity services allow viewers to interact with the content of the broadcast stream without abandoning watching (corresponding to enhanced TV). Intra-programme interactivity allows viewers to choose between options along a programme's progression, for example, to vote for a contestant in a talent show (Masthoff and Pemberton, 2005, p.5).

Interactive Functions	Corresponding Types of Interactive TV
Distribution Interactivity	Electronic Programme Guides
Extra-programme Interactivity	Walled Gardens, Internet on TV
Intra-programme Interactivity	Enhanced TV

Figure 2-1: Three Types of Interactivity in the Interactive TV System

These interactions and interactivity between users and TV programmes have become the key elements that describe much of the learning associated with interactive TV. Important aspects in the development of interactive TV based on learning scenarios are the options and considerations which support the required learning outcomes and educational purposes. In the next section, I will address the following questions: How can different interactive behaviours with TV support interactivity or learning? What type of user interaction is more typical or efficient when dealing with traditional TV and interactive TV, respectively?

The Evolution of Different Interactive Behaviours with Television

Those studies on both new media and interactivity affecting innovation adoption were useful in initiating my analyses to describe the three interactive

behaviours discussed below from different technological determinism perspectives that have shaped the innovations of interactive TV. Although levels of interactivity are not easily tested with an experiment, measuring how much media the audience is actually involved with by reviewing the media diary or questionnaire of compared groups can help us learn more about the three TV watching interactive behaviours discussed below.

Traditional Interactivity

Technological development and digital convergence endow audiences with more opportunities to communicate with TV, such as zapping the channels for favourite programmes as a common viewing strategy; I define this kind of basic interactivity as 'traditional interactivity'. To deepen this concept, some scholars have used the similar term 'lazy interactivity' to describe traditional interactivity (Jensen, 2004, p.129; Mihaly, 2002, p.70). Lazy interactivity is defined as a 'low-attention-span paradigm designed for television viewers', that is, interactive applications intended for quick decisions, short attention spans, handheld remotes and instant gratification (Jensen, 2004, p.129; Mihaly, 2002, p.70). Lazy interactivity requires a simple interface involving minimal viewer effort, while most audiences go into an almost stick-on-it-like state of minimal skills that must be taken into account in evaluating their lazy behaviours.

Interactivity of this type has its roots in audiences' minds with an in-between ambiguous position, that is, neither active nor passive, referred to as the period of interactive enlightenment. Consequently, lazy interactivity, one kind of physical process, classifies simple turn-on or turn-off behaviours as interactive actions that enable the audience with more potential kinetics to control an

invisible viewing flow.

Moreover, traditional interactivity indicates a view-only status, and viewers have no control over and cannot dynamically adjust the programme's content. More channel options appear to be the main feature of interactivity, used by viewers to surf or watch several programmes at once. Thus, characteristics of behaviours like these do not fit Steuer's argument of interactivity as 'users can participate in modifying the form and content' (Steuer, 1992, p.84). Behaviours from this kind of interactivity will continue to be the basic and easy viewing strategy for viewers who think of television strictly as an entertainment source. Users who enjoy three-broadcasting-channels surfing or fifty-cable-channels surfing may both belong to the traditional interactivity category, considering that their individual needs and motives are met in this communication process.

Simple Interactivity

Simple interactivity, the second type of viewing behaviour, is designed to ignite users' energy to gratify their mental thinking by transferring that thinking into realisation. The word 'simple' here indicates more strength than the previous 'traditional' in the process of transitioning to interactivity.

Simple interactivity provides viewers with basic media player controls and remote orientation tools, such as video on demand (VOD) services. Channels with common themes can be selected according to different packages and services from different television platforms, through which viewers can further interact with television companies by texts or phones. Hence, the practices of this type of interactivity have actually evolved from the analogue television period; for instance, depending on their preferences and budgets, parents may

concentrate on niche programmes (e.g., children's packages) when selecting from among subscription alternatives. In addition, viewers frequently use the time-shifting abilities of video recorders to store and review special or missed programmes. Similarly, Jensen used 'local interactivity' to describe this as 'interaction between the viewer and content downloaded to the individual set-top box or based on user requests through a return channel' (Jensen, 2005, p.91). Therefore, simple interactivity involves more distributional interactivity that creates customised watching materials or styles.

Simple interactivity may exist in both the traditional era when users with more vigour tend to create different programme flows for themselves and in the digital era when users may access the EPG interface for more flexible and easier programme watching.

High Interactivity

High interactivity, which is also known as inference-based interactivity, has smoothly converted physical and mental kinetics of previous interactivity types into motivational and lively behaviours and intentions for users without any delay, while heavily relying on new digital technologies such as enhanced television and walled gardens services.

Inference-based interactivity aims to include interactive capabilities similar to those of a PC together with complementary intelligent viewing. For instance, viewers are allowed to customise their own channels (Mihaly, 2002, p.10) and store or skip programmes (Sargeant, 2003, p.3) using PC-like operational behaviours. By using interactive features of the remote control—with mechanisms such as question answering, information acquiring and voting

enabled—viewers generate a new media culture that both materialises and strengthens the relationship between 'users' and 'producers' and efficiently incorporates audiences into new television formats (Marshall, 2004, p.69).

To sum up, high interactivity is much closer to the computer-based media sphere and heavily relies on digital technologies (more enriched system interfaces and users' further motivational involvement), which have been appropriated for everyday practices in alignment with ICTs and netiquette.

For the moment, however, I want to look into technological determinism's blind spots regarding the technology / user relationship in more detail. On one hand, interactivity facilitates positive learning and motivation in human behaviours, and it is basically much superior to one-way communication in the so-called 'information age' because interactivity engrosses the human mind more powerfully than any other form of expression. On the other hand, 'interactivity and choice are not universal benefits; many people do not have the energy, desire, need or training to engage in such processes (Rice, 1999, p.29). Watching traditional TV is a passive behaviour, because we cannot control or organise the content that comes from the broadcaster. While interactivity is added to television innovation as the 'new medium' that holds different potentials for users' freedom and domination, three different styles of interactivity within interactive TV indeed seem to create more freedom to control the television's programme sequences. Nevertheless, television has been a major influence in shaping the political, cultural, social and technological trends with the watching environment and society. On the dynamic of innovation in the case of interactive TV, its transformation sits on the edge of revolution, or perhaps evolution. As TV moves into new technologies and, thus, uncertainties, 'the industry is rushing towards an era of plenty whilst the majority of viewers are still coming to terms

with an era of availability' (Ellis, 2000, p.162). Interactive TV has changed the relationship between viewers and suppliers, and there will no longer be the mass communication referenced by Ellis in his eras of scarcity and availability.

Those three different types of interactive behaviour within TV communications thus lead to asking questions such as 'Which new technology can make any differences from the old in the sense?' or 'Should we believe that this new technology is any different from all the new technologies that went before?' (Robins and Webster, 1999, p.5).

Interactive TV, especially in terms of the behaviour of high interactivity, provides a fresh technological outlook, but issues like what kinds of programmes will be suitable to deliver interactivity, what kinds of audiences will accept this new technology and what kinds of viewing leisure and environments viewers can involve should all be taken into account as significant variables. To continue the examination of contemporary debates about technological production of interactive TV, the technologies from interactive TV consumption and their social use are discussed in detail in the following paragraphs.

2.3 Television's Social Diffusion and Use: The Flow, Co-Viewing Pattern and Mediated Communication

The preceding discussion of the 'new' style of television—interactive TV—indicates the commencement of a diffusion process in television history after advancements in information and communication technologies. New media usually start their diffusion from a technological perspective in terms of basic

hardware and software; however, the situation gets more complicated when more options are put into practice. Basically, diffusion is one kind of social change, for which four main elements of the diffusion process (innovation, communication through channels, over a certain period of time and members as a social system) were described by Everett Rogers (Rogers, 1995, pp.1-37). Interactive TV has undoubtedly changed the outlook of traditional TV via an innovation, by which certain users retrieve information from it and perceive this innovation as an instructional process of human-machine communication. While digital TV with enhanced functions has been promoted and tested in the market for more than ten years, its audience scope as users who are truly involved with this social system is still under debate and contributes to an uncertain future.

Interactive television, from the global perspective, is still being cultivated as the first phase of diffusion through technological determinist publicity, more in central cities than rural areas and in more industrially developed countries than in less industrially developed countries. Consequently, 'the new media is a social construct that partly reflects the communication-related concerns and hopes of a culture at a given time' (Krotz and Hasebrink, 2001, p.246). A dynamic interweaving of activities between producers and consumers is a process of innovation that is not simply determined by the force of technological changes but by the peculiarity of individual choices (Silverstone and Haddon, 1996, p.44). Moreover, Robins and Webster demonstrated their concerns from the political perspective in which technological developments and uses are determined by their structures (articulating particular social values and priorities) and mediated by capitalist social relations (Robins and Webster, 1999, p.4).

Before Chapter 3's discussion of young people as early adopters of digital devices in the learning environment, we must acknowledge that the computer-based new media, which have achieved truly an important place in children's and young people's lives, appear to be significant everyday tools for them. The extent to which parents are involved with children's and young people's television viewing and computer literacy, and their attitude toward new media adoption, also plays an important role, although adolescents, relatively speaking, have more opportunities to engage with new media outside the family than younger children do. Moreover, even though children and adolescents become early adopters of new media, their extrinsic motivation to use new media strongly depends on their parents' attitude, economic condition, and knowledge of new media, with their schools, the social context of their life and most important, the interaction pattern among family members also playing a role (Ling and Thrane, 2002; Krotz and Hasebrink, 2001, p.259; Vered, 1998, p.46).

The new wave of technology in television is promising to transform the old-fashioned analogue technology into a two-way medium which allows the viewer to determine what and when to watch. 'Interactivity', as previously discussed in the television context, is therefore understood to cover services that include video on demand, T-commerce, interactive programme guides and enhanced television. Interactivity creates a situation in which viewers, as new and early adopters, can actively request information from programme providers, rather than simply unilaterally accepting broadcasters' solicitations; this helps those among today's audiences who are impatient with television's linear flow and increasingly use the limited opportunities available to them to avoid the necessity of following the intentions of programme producers.

For passive one-way viewing strategies used in broadcast television, there is certainty of a low degree of response from its machine and interface design; in contrast, when viewers can participate in interactive communication, they will receive options that result in different user behaviours. In addition, by taking part in the learning flow of TV content, users receive and comprehend the message conveyed through the process of interactivity from programme designers or services, which creates a meta-process situation.

'All innovations combine good and bad effects regardless of the intention of the innovator or how well designed they are' (Berkun, 2007, p.139). If audiences cannot understand the functionality and practicality of interactive television, then its attractiveness will certainly be lower. What's more noteworthy is that interactive TV allows for interactive uses, but it is the participant who decides how much interactivity to employ on any given occasion (Vorderer, 2000, p.26). Do users want interactivity from television? 'What sort of information has increased' in this interactive communication process (Webster, 2002, p.26)? I will propose two methods to elaborate on the two inquiries, one of which is an experimental design for testing whether interactive functions can work on the TV device. The other is a 'situational approach' (see Chapter 4) to understand whether the intention of owning or watching a TV is not only to have the device in the living room, but also to have access to a medium to assemble social, economic, cultural and political spaces in our everyday life so that families with children under age 12 in Taiwan can join together because of it (Silverstone, 1994, p.25). The second part of my methodology, analysis of the media diary, records the TV flow statistically by calculating testers' space and time management towards TV or other new media while looking at television's current social diffusion.

In the next section, I will discuss the technological perspective on television as a domestic medium and how the complex and dynamic shifts have shaped the reality of TV in our daily life.

Social Shaping of a Technology: TV Broadcasting

Raymond Williams indicated that television 'depended on a complex of inventions and developments in electricity, telegraphy, photography and motion pictures, and radio' to bring news and entertainment to our everyday life (Williams, 1975, p14). Television, especially the broadcast technological system, is not a stand-alone technological device (such as a PC or MP3 player), which requires 'a far higher level of diffusion and interoperability of components to operate' (Garnham, 2000, p.70). From previous discussions, we have seen a movement in the media environment that is concomitant with remediable digital convergence. What should we think about the role of traditional television and information technologies in everyday life? We must examine this role not only from the technological perspective, but also from the standpoint of historical and cultural settings populated by media.

In this section on the social shaping of TV, I start from the historical and traditional point of view to explain television's meanings in our everyday life. Next, I explain how the broadcast television system manages programmes' content to facilitate audiences' time control of viewing and, thus, formulate a proper watching flow. Finally, mediated interactions across space and time in public or private places are discussed.

Television: The Context of Domestic Everyday Life

Television presents daily real events, a sport's final game or an election's live updates, by setting up an anteroom as arena (Williams, 1989, p.97) or the 'Roman Circus', where viewers can be involved with public events by watching, chatting, screaming, crying or sleeping.

Acting as an object in the visible and hidden ordering of everyday life through the flow of programmes' sequence, television has spearheaded a communication revolution which has deeply influenced family lives in recent decades. Television is also a principal source of news, information and entertainment for viewers, while many of their opinions and attitudes, as well as their values and patterns of behaviour, are developed from this kind of programme flow (Silverstone, 1994, p.19). Since the TV screen is smaller than the cinematic screen, viewers usually construct a more equal and private relationship with it; moreover, television is a heterogeneous medium, which means it not only supplies largely factual and fictional content, but also behaves as a kind of mirror and relays movements from the outside real world (Crisell, 2006, pp.2-3). 'The alienating effect is magnified by the fact that the TV screen reduces all images to the same visual quality' (Miller, 1971, p.124).

Mundorf and Laird (2002) showed that viewers enjoy watching television as a part of their socialising in groups; by discussing news events or the latest popular sitcoms, a sense of 'virtual community' is built (Mundorf and Laird, 2002, p.583). Gauntlett and Hill (1999) asked long-term diarists, as audience members, about the role of television in everyday life. Their research allowed people to discuss what TV means to them in more depth and to present their personal points of view, thus generating a variety of different meanings regarding

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'television' (Gauntlett and Hill, 1999, p.112). According to their research, some viewers see TV as 'electronic wallpaper'; in contrast, it is frequently seen as a beneficial 'window of the world' that provides entertainment and companionship, especially for audiences who live alone. However, conflicts in the feelings of audiences sometimes show up; on one hand, they tend to think of TV as a source for enjoyable conversation topics or simply as a comfort for the lonely or isolated, while, on the other hand, they sometimes feel guilty about watching television instead of doing something they consider more meaningful (Gauntlett and Hill, 1999, p.119).

Other studies have drawn attention to the relationship between genders in the family. Morley (1986) pointed out that men usually dominate at-home TV programming viewing styles and choices (Morley, 1992, p.147). Meyrowitz used the term 'situational androgyny' to describe the power of TV to reshape the traditional relationships between men and women, and children and parents, and 'television and other electronic media bring this world into the home and change both the public and domestic spheres' (Meyrowitz, 1986, p.223). Lull's research focused on the domestic context of television's reception within a household and often adopted an ethnographic methodology to examine gender differences within a family in terms of TV viewing habits. Television not only acts as a technological medium that transmits information in bits, but more important, it is a social medium by which 'audience members communicate and construct strategies to achieve a wide range of personal and social objectives' (Lull, 1990, p.172).

In addition to informing and teaching children, television provides hours of instant after-school entertainment for children and young people; thus, watching it is frequently regarded as a 'cultural ritual' (Marsden, 1980, p.120) that viewers

repeat and incorporate into their regular micro-social activities, then elevate to macro-social ceremonial culture rules. 'Children integrate various aspects of their mental and material realities into a manageable sphere of entertainment, forming a consolidation of attractions' (Lull, 1989, p.151).

There is considerable evidence showing that although new media attract young people's attention, television still retains much importance in their lives. Sonia Livingston conducted a wide-scale empirical project in 11 European countries to explore the effect of new forms of media in the lives of youths aged 6-17. She found that, on average, most young people spend two and a half hours every day in front of the TV screen, and even those who use the second most media still average about two hours per day watching TV (Livingstone, 1999, p.4).

Watching TV is usually the main media activity for involvement with family members, and watching television with others is still a popular family activity or co-viewing behaviour (Kotler et al., 2001, p.38; Alexander, 1994, p.285; Brody et al., 1980, p.219) which appears to be a dominant habit in people's everyday life because television consumption essentially relies on its universal, low-cost accessibility and its efficiency to afford hours of entertainment with little effort needed from audiences (Mundorf and Laird, 2002, p.583).

Researchers have also emphasised children's attitudes towards television watching, which remain completely immutable, since children usually absorb millions of images from television depending on personal choices or who receives parental comments and supplements to video information (Evra, 2004, p.35; Bienvenu, 1969, p.117). In addition, co-viewing with siblings or peers also has a significant influence on children's response to different kinds of television content (Kotler et al., 2001, p.39; Nathanson, 1999, p.125).

Under these circumstances, the context for television watching is an essential component for children's television experiences, which affect the minds of the future generation to varying degrees. My main goal here is to examine the process of new media diffusion into the everyday life of children and young people through in-depth research. For instance, under which conditions does TV watching still exist in the media-rich world around the young generation? Moreover, what are new media users' relationships (interactive TV) with old media consumption (TV as domestic device) among Taiwanese young people's media activities? The most important addition to be made to what we have said about TV in our everyday life is how the metaphor of 'flow' constructs TV watching behaviours.

To sum up, it is important to place the home experience within context of its members' interaction with the TV watching environment. What I will discuss in the next section, then, is the concept of 'flow' around the relationship between the medium of TV and the audience.

The Metaphor of 'Flow' at Home

Now I would like to use Raymond Williams' (1975) concept of flow to examine the historical development of sequences and services that set out to put the audience in control as stable and fixed, and how these programmes' sequences have contributed to shape past developments, while continuing to affect future possibilities for audiences despite the increasing flexibility of more options orchestrated by programme makers (Williams, 1975, pp.91-92).

Broadcasting emerged first as radio sound and then as television and represented a major investment by media creators, who were devoted to making

the distribution of television attractive through deliberate actions such as establishing fixed time slots for programmes in an effort to attract more audiences.

Television is strongly linked to the original meaning of broadcasting—an agricultural metaphor that means spreading seeds into broad circles by hand as a sowing transition from centre to periphery (Gripsrud, 1998, p.20). The original concept behind radio broadcasting was to transport sound via smaller, more rugged and less expensive radio machines during World War II, while, television—intended to make moving images from a distance seem possible (Williams, 1989, p. 13)—would be further beneficial to not only deliver sounds but also moving images outside people's binocular view (Webb, 2005, p.xii).

With advanced and amazing new technologies evolving day by day, television has been steadily improved, from receiving signals from the broadcast system to broadband transmission of cable and satellite, and from black-and-white to colour big-screen home theatres.

Raymond Williams emphasised the complex relationships between television technology and social context by viewing them only as 'technological determinism', not because of the technology of television itself, but because of the interests of participants who made decisions about how the technology was used. Broadcasting was not only 'a form of mobile privatisation', but also the productions filed (different content, such as news or sports), transmitting problems (relying on the event) and economic support (commercial support or public financial system) would come together to comprise a heavy investment in a particular model of social communications (Williams, 1975, p.26).

Williams also declared that communications fill an already existing social need, and new technologies fall into existing social conditions that determine

their form (Williams, 1975, p.26). The notion of 'mobile privatisation' refers to a relatively new pattern of everyday life associated with urban historical and industrial society in general as much as the specific use of communication technologies: 'on the one hand mobility, on the other hand the more apparently self-sufficient family home'. The spectator in the visual spaces produced by cinema, video cassette recorder (VCR), TV or PC is in the presence of 'tele-visual' conditions. Thus, when the historical development of the tele-visual quickly departed from its origins as 'mass media', there was continuity at another level in the mediated communication systems (Friedberg, 1993, p.2).

The black box in one corner of the home is called 'television', for which sequential videos with attached sounds are edited by TV producers, distributed and received in households as part of a broadcaster's programme schedule. The TV morning news wakes us up by telling us what has just happened, including live reports or announcements of today's big issues or events, along with weather forecasts and other conveniences. Homemakers sometimes watch cooking programmes to learn new dishes in the mornings, while children usually anticipate watching cartoon programmes after school at around 4:00 to 5:00. The evening news at 6:00 or 7:00, accompanying dinner, draws the whole family's attention to watch and discuss its content. Finally, a series of regularly broadcast sitcoms further grabs their fans' hearts and minds and leads them into the stories. Flow as programming strategy is applied to a generalised audience which is estimated a very specific way (Uricchio, 2004, p.166). Jennifer Bryce (1987) focused on the family's organisation of time for watching TV. 'The sequencing of viewing, its place in the mesh of family activities, reflects a choice, an organisation, a negotiation process about which very little is known' (Bryce, 1987, p.122).

Television plays a central role as the common currency and lingua franca for social media activities at home throughout the globe, in which children born in different countries may have different contexts of television use with different parental approaches towards how to watch TV properly (Seiter, 2000, p.241). Broadcast TV assumes that nuclear families from around the world tend to get oriented to its designed programme flows, making it a key element of universal domestic consumption that occupies a prominent place in virtually every home (Armes, 1988, p.40; Corner, 1999, p.15). 'This conception of the family-as-audience determines a series of attitudes to what is legitimate material for broadcast TV' (Ellis, 1992, p.115).

Home has been a natural habitat for television viewing within the interpersonal communication environment. The orthodox television sets in the living room from the early days have been turned into different technological apparatuses that proliferate TV-screen looking devices converged with new inventions.

TV viewing's patterns and behaviours are strongly determined by dimensions of time, place and social context, and it is exactly on those dimensions that TV's productions and consumptions have a great impact. The ways of watching TV are connected to participants' everyday life. They involve informal or local settings where children and young people are tied to pre-existing patterns of TV watching and interpersonal communications with their family, but not in the same way that outside the living room is linked to a cybernetic commodity, such as lurking on the Internet or playing virtual-reality PC games in their personal world.

If television's flow has influenced audiences' watching behaviours strongly, can interactive TV still maintain the metaphor of flow in the system? How can

interactive TV's interactivity work in the current TV system of linear sequence flows? More important, however, the co-viewing flow at home affects young people's personal media behaviours and family members' interactions in the TV watching situation; I will extend this argument in the next section.

Mediated Communication at Home: Bridging of Time and Space

Based on the social impact of the growing diffusion of television, I have discussed social relationships initiated from watching TV as a family activity and audiences' co-viewing behaviours with the metaphor of programmes' sequence flow and family's 'together flow' at home. Media consumption generally takes place in the family using TV sets and watching behaviours develop under a complex social setting (cohesion and dispersal, authority and submission, freedom and constraint) via sub-systems of family members' relations (Silverstone, 1994, p.33). Now, I will focus on how the development of communication media affects 'patterns' of social interaction at home with the media diaries used to probe these issues.

The deregulation policy of television in general can be understood as a consequence of technological changes and a shift of political and ideological climate globally (Iosifidis, 2007, p.33). Therefore, young people at home are entering into a rich mediated environment in which the audience has more choices than ever before. The world of global television, including broadcast, cable and satellite, and the Internet are quickly eroding barriers to international information service networks, while digital distribution enables television programmers to concentrate on their domestic markets and transmit their signal

worldwide.

The rise of narrowcasting of TV programmes, cable and satellite services and interactive TV has changed the way by which the audience shares spectacles with others. The development of communication media created new forms of actions that can be taken from a distance and interactions between machines and people, as well as new kinds of social relationships across space and time. TV can reproduce co-presence in time by instantaneous events that carry audiences through space, while the performance or story can also reproduce co-presence in space by transferring events which happen at the same place through time.

However, home is not only 'the physical domain'; 'the level of services, convenience, space and structure have to be congruent with the needs and desires of the dweller', while 'the social domain' with the presence of family and friends also helps define a place as home (Sixsmith and Sixsmith, 1990, p.20). As Judith and Andrew Sixsmith (1990) indicated, 'home is not something that is given directly from the environment, but is a function of the person-place dialectic' (Sixsmith and Sixsmith, 1990, p.24).

Goodman (1983) thought of 'TV as a tool for understanding family interaction', and she argued that TV can work as 'a companion, scapegoat, mediator, boundary marker between family members, to schedule other activities, as a reward or punishment, as a bartering agent' (Goodman, 1983, p.406). Pitkin (1985) expressed that family 'is a system of relationships that change over time' and, therefore, we should study the process of the family rather than its composition (Pitkin, 1985, p.16). Moreover, Tomlinson suggested that 'the experience of the world in one's living room has to be understood as a particular modality of connectivity' (Tomlinson, 1999, p.155). Tomlinson's notion of mediation, a matter of bridging time and space in communication, can be

recognised as 'the process of passing through a medium and the consequences for the nature of experiences which flow from this intervention' (Tomlinson, 1999, p.155), while the mediated experience appears to be 'the kind of experience we acquire through mediated interaction or quasi-interaction', and this points to the interaction pattern in the household (Thompson, 1995, p.82).

One striking characteristic of TV is that it gives audiences the illusion of face-to-face relationships with the performers, presenting so-called 'para-social interaction', a face-to-face relationship between unknown spectators and public performers, especially the encounter between TV screens and the routine taken for granted by domestic viewers. As Horton and Wohl proposed that audiences are usually 'subtly insinuated into the programme's action and internal social relationships', para-social interaction ambiguously transforms audiences into a group which observes and participates in the TV show by turns (Horton and Wohl, 2006, p.1).

John Thompson offered more detail concerning forms of action and interaction created by the media and distinguished three types of interaction modes: face-to-face interaction, mediated interaction and mediated quasi-interaction. These interaction modes are analytically distinguishable by their spatiotemporal potential (Thompson, 1995, p.82; Thompson, 2005, p.3).

First, face-to-face interaction takes place in the context of co-presence, is dialogical and interpersonal and usually involves a multiplicity of 'symbolic cues'; for instance, words can be supported by gestures, facial expressions and changes in tone to convey or interpret messages to/from others. Second, mediated interaction, which describes the communicative mode of letter, telephone and e-mail, is also dialogical, but its spatiotemporal context is extended beyond face-to-face interaction, meaning that it is 'stretched' across

space and may sometimes be stretched out or compressed in time as well. Last, mediated quasi-interaction refers to mass media, such as newspaper, radio and television, which is also extended in space and time, but is one-way or monologic. However, Thompson pointed out that senders and receivers within this kind of interaction, nevertheless, form bonds which transcend the fact of interaction.

When TV watching behaviour occurs in a public space with co-viewing activities at home, face-to-face interactions among family members will mainly involve a communication process, which is consistent with the central meaning of TV as a social medium at home. Traditional TV uses mediated quasi-interaction for a passive and easy-watching form; however, interactive TV enables two-way communication between viewers and TV content via interactive functions that affect user experiences and participants' activities, which creates the mediated interaction.

To look into those interaction patterns among family members and space at home, I will pursue my examination of TV watching and family relationships further. It is quite common through our daily interactions at home to communicate with our family members in public regions, usually the living room or dining room, and have our different aspects and behaviours recognised. As Erving Goffman explained, there are two regions in which we perform in the physical settings (Goffman, 1959, p.114). The first is the front region where the performance is given; having our activities within this public region embodies certain invisible standards, including matters of rules and manners. For example, children may feel relaxed and at ease when watching TV alone at home; however, when watching includes parents' or siblings' involvement, the mediated quasi-interaction among them comes into play. In these circumstances, with TV

watching a public activity of the family, children would maintain moral conduct that is socially accepted within the family.

The second region, in contrast to the front region, is the private region where we perform daily, the backstage or back region, an area of response opposite to the front region. It is where our suppressed feelings show up and also where we intentionally reject the actions taken in the front region. In other words, children may feel free to read their favourite magazines, watch their favourite TV programmes and phone friends more comfortably in their own rooms because they serve as the back region.

Goffman also distinguished three types of co-presence in public places: the gathering, the situation and the social occasion (Goffman, 1963, pp.13-22). In his opinion, the gathering contains at least two or more people together, while the situation is referred to as a full spatial environment with all entering members who attend the gathering. The social occasion encompasses the wider social affairs and is bounded by place and time, typically facilitated by fixed equipment.

Goffman's theory basically provided a description of how we interact with one another in day-to-day life and how we develop a system to help express feelings that struggle with our front region. If watching TV is a household social event with face-to-face interactions with family members in the front region of the home, how would audiences act in the back region with more personalised communication?

The Internet has led children to a situation in which they can communicate and interact with people from a wide variety of cyberspace areas that act as back stages. When analysing Goffman's theory in reference to media as the Internet or interactive TV, we can see that the lines between the front stage and back stage

are blurred. When we connect to the Internet, or tailor and control TV programmes for our personal and interactive uses from an interactive TV platform, Goffman's notion of symbolic interaction must be modified to express the ideas of complex communication between performances from the front and back regions and between physical space (social events and watching TV together) and virtual space (private events and surfing the Internet).

In summary, all social interactions take place between co-present participants and mediated environments. However, we need to carefully think about and attend to participants of the young generation. Young people are surrounded by technological gadgets and have much energy to enhance knowledge of their back stage, which thus indicates that watching TV still plays a crucial role with or without various forms of electronically mediated communication. The following chapter will further illustrate the young generation's uses of new technologies within the wider context of changing knowledge and educational developments. Furthermore, TV as an informal learning medium for educational purposes will also be discussed in depth.

Chapter Summary

This chapter presents a discussion of the transformation of television through its technological and social meanings, including the following major points:

1. The meaning of 'new media' is related to information and communication technologies and their associated social contexts for television development. From a technological viewpoint, interactive TV embraces the characteristics of interactivity, and it not only enriches the capacities

of channels' reception but also adds many valuable functions similar to those provided on the Web that create more complex communication processes among users, interactive content and machines.

2. By explaining different styles of interactive TV and classifying the three different types of interactive behaviours in the interactive TV system, I strongly question that the new apparatus of interactive TV mediates the interface between TV and different audiences, a transformation that is not revolution, just evolution. The kinds of audiences that will accept this new technology and the kinds of viewing leisure and environment viewers can involve should be taken into account as significant variables for measuring youths' learning.

3. The broadcast television system manages programme content to facilitate the audiences' time control of viewing and, thus, formulates a preferred watching flow; this form of passive one-way viewing stems from the linear programme's flow. However, mediated interactions in public spaces (e.g., the living room) will create a unique meaning of the 'television set' in the socialising process at home.

In the next chapter, the argument regarding the young generation as the audience and its learning through television will be extended to traditional TV and interactive TV.

Chapter 3 Literature Review II

Children and Pre-adolescents as Audiences:
Learning through Television

Chapter Overview

This chapter provides a discussion of key/pertinent issues regarding the relationships between young audiences and learning. First, I examine changes in young people's learning behaviours with a certain degree of skepticism towards the digital generation, multitasking and social networking, and how these phenomena can be incorporated into a TV-based learning environment. Second, research on the concepts of learning and media literacy and the impact of learning outside of formal schools will be reviewed to illustrate home-style learning in contexts outside of formal educational settings. Third, I will move on to the study of television learning, specifically to argue that 'edutainment' may be regarded as a type of positive motivation for young people insofar as it can relax audiences while embracing interactivity and encouraging a heuristic style of learning. Fourth, recent work on audience research will be considered to relate the effects of media to both social conditions and psychological needs. Finally, subjects related to audience interpretation, cognitive abilities and the nature of multimedia in text-reader relationships are examined so as to understand the semiotic form and content of television more thoroughly.

3.1 The Net Generation and Digital Natives Myth

This section provides a summary of recent changes in the social roles of children and young people, and then explores the possibility that those changes are related to media communications. First, the terms 'children' and 'young people' in my research basically have similar definitions and can be used interchangeably; both refer to people under the age of 18 (between childhood, youth and adulthood). Age, however, is usually adopted as a marker of learning development and cognitive ability to process mass media. Children's personality, gender difference, social status and other unique characteristics make it difficult to define a single prototype of what children or young people look like. Therefore, when I make generalisations about children and young people in my study, I have taken into account various research definitions, including 'younger children' and 'older children', 'children' and 'young people' and 'older children' and 'pre-adolescents' (Strasburger and Wilson, 2002, p.12).

Children and pre-adolescents inhabit a world of digital communication systems and cyber networks. They have grown up in a screen culture, watching TV for several hours each day. In addition, they spend a huge amount of time on new media such as computers, video games and mobile phones, in contrast to little time on traditional media like books, radio and, in some cases, even television. These children and pre-adolescents may be differentiated from those defined as the 'TV', the 'plugged-in' and the 'wired' generation (Crook, 1999, p.362) just a decade or so ago.

Tapscott declared young people to be the 'Net Generation', in which 'children are more comfortable, knowledgeable, and literate than their parents about an innovation central to their society' (Tapscott, 1998, p.1). The Net Generation was born between 1982 and 1991; children and pre-adolescents of the Net Generation are, therefore, comfortable and proficient using technology in an

increasingly intense digital environment (Oblinger and Oblinger, 2005, pp. 2.1-2.20).

Palfrey, Gasser (2008) and Prensky (2006) used the term 'Digital Natives' to describe the young generation that has grown up in a digital world as native speakers of the digital language of computers, video games and the Internet (Palfrey and Gasser, 2008, p.7;Prensky, 2006, pp.29-30). In contrast, 'Digital Immigrants' are their parents and teachers, many of whom have adapted to the new digital environment, but are still naive about networked digital technologies such as the Internet, no matter how fluently they may speak the digital language. According to Prensky's arguments, Digital Natives can receive information randomly through their multitasking behaviours, create and consolidate information in new ways when they are networked and accept visual graphics naturally—unlike Digital Immigrants, who tend to retrieve information in a linear manner one item at a time and think of texts as the main communicator (Prensky, 2006, p.29).

From birth, young children now are deeply engaged in practices related to popular culture, new media and information technologies, and are thus able to develop a wide range of skills, knowledge and understanding of each. Evidence reveals that Digital Natives have grown up in a screen-based digital environment in which media are inextricably part of young people's lives (Burnett et al., 2006, p.12). One report exploring young people and the new media environment found that young people from ages 6-17 spend 5 hours a day on new media, including almost all watching TV (99%), two-thirds playing computer games (64%) and one-third (36%) using a personal computer (PC), with more than an hour spent two to three days a week in their leisure time (Livingstone and Bovill, 1999, p.4). Another report on teenagers' usage of the Internet in America indicated that 87% of all those aged 12-17 are consistently online, while only 66% of adults use the

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Internet (Lenhart et al., 2005, p.1). From another perspective, a survey from the Nielsen Company (2008) found simultaneous usage of the TV and Internet in the same homes, which indicates that television viewing and online video streaming are complementary activities. 'The heaviest users of the Internet are also among the heaviest viewers of television' (Robertson, 2008). Moreover, a survey on Taiwanese children's (aged 3-10) playing activities generated the so-called 'Electric Children of Three Types': 56.2% of children spent their leisure time watching TV, 20.9% used computers and 16.7% played video games (Lin, 2007).

Parents and other family members build a scaffold for this learning environment, either implicitly or explicitly, and children become involved in familial, social and cultural practices which cultivate their cognition of the role of media and technologies in society, while they learn to absorb digital tools, such as personal computers (PCs), to obtain and incorporate computer and digital skills early on. As Battro (2004) has demonstrated in his study of 'the click option', the basic unit of digital skill is the use of a 'mouse' to understand the computer's language in the form of symbols on the screen. Globalised users interact with computers via a network of click options in this so-called 'digitalese', which appears to be the new mode of communication in the complex and dynamic process of education (Battro, 2004, p.90).

While technological determinism and media-centric approaches indicate that it is social change via technological innovation and the use of cultural contexts that define children and young people as the Net Generation, information and communications technologies (ICTs) are now reproduced in almost every domestic, leisure or office setting involving education (Hugonnier, 2007, p.137). If we compare ICT environments between the young generation's private lives and teachers' practices in the classroom, 'classrooms seem to be the

last bastion against such changes' (Facer et al., 2003, p.231). Facer (2003), therefore, reinforced children and young people's expertise outside the classroom by using a wide range of learning resources that involve 'depth' rather than 'breadth'. In contrast, for learning via selected activities from the school system, there is seldom adequate time for effective student involvement (Krotz and Hasebrink, 2001, p.261), and very frequently the activities students reject or do not recognise are chosen by their teachers, creating 'breadth' rather than 'depth' in learning. This situation reflects that children have a variety of choices for becoming familiar with new media from home—beyond their school's control, teacher's supervision/intervention or classroom organisation's limitations (Wellington, 2001, p.237). This leads us to further consider two media behaviours appearing in young people's rich media activities: social networking and multitasking.

Social Networking and Multitasking

Exposure of the young generation to more media may increase young people's ability to process what they hear, read or see. Millions of young people are signing up for social networking sites such as Facebook, writing and maintaining blogs, sharing photographs through Flicker, participating in video image exchanges like Youtube and, above all, forming social communities using different online messaging services such as MSN and Skype. Some evidence shows that more than twice as many children aged 10 to 12 in the US reported using social networking sites in 2007 (female 27%, male 17%) as did in 2006 (eMarketer, 2008), and social networking sites collectively grew 47% year over year (Bausch and Han, 2006). UK's Ofcom research also showed that almost half

(49%) of children aged 8-17 who use the Internet have set up their own profile on a social networking site (Ofcom, 2008, p.8).

The changing methods by which young people are accessing technologies to communicate with and to learn from each other are creating diverse social effects. Young people connect with their peers and others interested in the same topics via network technologies of the Internet, and many are seising that interactive opportunity with enthusiasm and creativity (Wartella et al., 2003, p.7). The most common uses of social networking services are: viewing content and finding information, authoring and uploading personal content and adding or sharing third-party content from the Internet (Fraser, 2007, p.6). Children and young people are learning from peers and online friends who share interests and establishing e-friendships, both of which support their physical relationships.

Opportunity and environment play important roles in current media uses for the young generation. Through media multitasking behaviour, the young generation often accesses more than one medium at a time (e.g., online while watching TV, watching TV while using a mobile telephone), meaning that they manage to pack increasing amounts of media content into the same amount of time every day (Wolf, 1999, p.34; Roberts et al., 2005, p.53). The most significant study on multitasking behaviour, *Generation M: Media in the Lives of 8-18 Year-Olds,* was designed and analysed by the Kaiser Family Foundation in collaboration with researchers from Stanford University. The report generated was based on a survey conducted for six months in 2004 among 2,032 samples (youths aged 8-18 who were in the 3rd to 12th grade in the USA). The survey was intended to elicit information about media uses in everyday life and revealed that multitasking has been changing the amount and nature of American young people's media uses, indicating that bedrooms especially had become multimedia

centres. Fifty-eight percent of the children reported media multitasking for most or some of the time when reading, 63% when listening to music and 65% when using a computer (Roberts et al., 2005, p.36). Whereas this report reflects American youth's perspective on media multitasking, it may also reveal a general trend on this front throughout the world. However, in different cultures and under different social developments, this trend may not apply because America is one of the most media-rich countries in the world.

Is the digital generation really different from previous generations? Do social networking and multitasking behaviours really define the new generation's stereotype, or is this just the myth of technological determinism?

I would argue that the Net Generation or Digital Natives may be more influenced by technological changes than the previous generations, but those changes have affected adults as well. While Tapscott, Prenskey and other technology boosters simply separated two sets of binary oppositions between technology differences (TV vs. the Internet) or between generations (the Baby Boomers vs. the Net Generation) (Buckingham, 2007, p.87), these technological determinists ignored that new technologies often co-exist with old media and do not displace old media completely (as explained in Chapter 2). For example, the evidence from research conducted by Livingstone and Bovill (1999) indicated that young people watch TV as their main media activity (Livingstone and Bovill, 1999, p.4). Moreover, it is important to note that the meanings and uses of technologies vary within the context of other social, economic and political developments in different countries and societies (Buckingham, 2006, p.12). Take playing video games as an example; video and computer games would generally be described as a young people's and children's medium (Buckingham, 2006, p.11). However, Entertainment Software Association (ESA)

research showed that more 'old people' play computer and video games, and the average age of game players is 35 (ESA, 2008; Buckingham, 2006, p.11). Research also has found that users under 18 years old are making up less of the social networking and blogging audience, whereas the 50+ age group is accounting for more of the audience (Nielsen, 2009, p.5). In addition, Facer (2003) demonstrated further that those who are engaged a great deal with ICTs constitute only a small percentage of the young people, and young people's day-to-day relations / interactions with family and engagement with other sorts of work and play are 'far more significant than their lives on the screen' (Facer et al., 2003, p.229). Hence, we need to explore in detail the phenomenon of cultural and social differences between family-positioned children and children in relation to ICTs.

Notably, however, Digital Natives have been described with generalisations; '[i]t may be that there is as much variation *within* the digital native generation as *between* the generations' (Bennett et al., 2008, p.779). My research concentrates on a sample of the generation of 11- to 12-year-olds; their socio-economic and cultural factors will differ from Digital Natives who are college students. Moreover, Buckingham argued that children and young people experience inequalities in access to media among different social groups. Gender, class or forms of 'social capital', from Bourdieu's explanation, cause different attitudes and orientations towards media (Buckingham, 2002, p.79; Bourdieu, 1984, pp.63-96). The questionnaire from public versus private primary school students and the media diaries to observe testers' social relationships with family members, space and time, according to TV and new media, will test this concern.

Second, I believe that the myth of multitasking includes three variables: time (how to arrange the time sequence by each task), quality (what kind of

multitasking behaviours influence working quality since multitasking generates different feelings under different scenarios, for instance, doing homework or listening to music) and the ability to think and organise correctly from the perspective of time and quality control. Psychologist Marois (2006) found evidence of a 'response selection bottleneck' that occurs when the brain is forced to respond to several stimuli at once through functional magnetic resonance imaging (fMRI) experiments. As interpreted from brain scans, multitasking leads to time lost as the brain determines which task to perform (Dux et al., 2006, p.1109). Furthermore, research on cognitive control in media multitasking behaviours between heavy and light multitaskers led to the surprising result that heavy multitaskers perform worse on designed multitasking evaluations (Ophira et al., 2009, pp.1-5).

If the digital-rich environment has shaped the young generation into Digital Natives who conduct multitasking behaviours and social networking communications, how are these technologies changing the cultural and geographic boundaries between the physical (interpersonal relations with family and peers) and the virtual (social networking via the Internet) worlds with regard to children's media usage at home after school? Have youths simply mastered multitasking to rapidly switch their use modes or moods for multimedia, or is this phenomenon just due to popular trends? Even though the Digital Natives may be well versed in the functional grammar of multimodal media, 'the ability critically to engage with and reflect on those images requires an altogether different set of skills' (Huijser, 2006, p.28). Has interactive TV provided a similar way for youths to quickly move multiple tasks into a TV-based learning environment? These questions constitute the main focus of my experimental research.

My future intention is to study different learning styles among the young

generation and these young people's social / individual uses, choices and controls in media practices. Let's now attempt to extend these observations to young people's lives after school, especially focusing on the concepts of learning and media literacy related to my research.

3.2 Learning and Media Literacy: The Ability to Retain Knowledge from TV

Technology offers enormous opportunities for learning and education, enabling members of the young generation with their access to technology to have a far greater chance of achieving their potential. The computer, for example, is a transformative technology in the home because it offers a marvellous learning platform for children, who actually feel it is more authentic and natural than events in the classroom (Wellington, 2001, p.235; Buckingham, 2007, p.32). Seymour Papert (1996) once extolled what he called 'home-style learning', in which computer innovation enriches the home culture and creates one kind of successful learning by allowing people to live in a spontaneous and motivated culture (Papert, 1996, p.41). The home-style learning is 'self-directed, spontaneous and motivated in ways that "school-style learning" is not' (Buckingham, 2007, p.38). However, how do young people learn to use the media outside formal school to communicate with others and express themselves? And how do they refer to their learning skills and knowledge as social activities to elaborate media literacy towards television and new media? At this point, I will focus on the meanings of learning and media literacy within the scope of my research.

Noble indicated that the root of the word 'learn' is identical to that of 'teach' etymologically and both words originate from the word 'lore', which is the body of facts, or folklore. Learning is finding a way along a specific path (Noble, 1983, p.102). Consequently, the word 'learn' involves people in teaching and understanding the folklore of today.

The argument presented here will be that, based on folklore, the media do guide children as viewers to look through the world. The development of new media, through improvements to a wide variety of communication and network technologies, has allowed information to appear in different media forms, such as figures in graphs, live images in videos, characters in texts and sounds in audios, via different multimodal platforms emerging in our daily lives.

Educational media technology is the design science that can be characterised in terms of functions, goals and adaptations that differ from the science of nature (Simon, 1996, p.5). If the idealised learning purpose could align with educational goals towards TV media, young people will be able to retain new knowledge and invoke a degree of media literacy.

Eco has told us, 'If you want to use television for teaching somebody something, you have first to teach somebody how to use television' (Eco, 1993, p.96). From this perspective, teaching adults and young people a critically oriented education recognises the fact that television is contributory. Eco argued that television can teach us to 'switch on our critical freedom' (Eco, 1993, p.107). 'Education about the media should be seen as an indispensable prerequisite for education with or through the media' (Buckingham and Burn, 2007, p.323). Therefore, if we want to use television and interactive TV to teach, we cannot regard TV for learning simply as a neutral means to deliver knowledge, and we should not use it in merely functional literacy or instrumental learning. We also

need to equip learners to understand and critique media by constructing critical literacy (Buckingham and Burn, 2007, p.329).

Literacy emerges in the sense that children gradually develop as learners in everyday activity settings, including in terms of participant, purpose and style of interaction (Tharp and Gallimore, 1988, p.101). Pask (1975) considered learning and teaching together as the 'conversation theory' of the learner through self-learning and self-explanation, and teach-back as the conversation within particular topics that contributes to making knowledge explicit (Pask, 1975, p.33). Young people meet new technologies and applications in the service of learning or learner support. This complex set of new media will have different kinds of impacts (cultural, intellectual, social, practical) on the experience of learning (Laurillard, 2005, p.72). Laurillard argued that the learner masters skills and enjoys the learning process; this applies to teachers through the conversational framework that applies to people 'through action, practice, adaptation, reflection' (Laurillard, 2008, p.45).

However, learning is the complex, nuanced and preferred term to describe a range of different concepts. In conversation theory, having knowledge is not only the storage of representations, but also is understood as a process to construct external representations of knowledge to specify between how to perform the procedural knowledge and why the conceptual knowledge exists (Scott, 2001, pp.343-360).

Gee explored the theory of learning built into video games by sketching three areas of research: the new literacy study (learning multimodal media not only as mental achievements but also as social and cultural practices); the situated cognition study (human learning not just received inside people's head, but embedded in a material, social and cultural world); and the connectionism

(learners think best when their intelligence is dependent on pattern recognition) (Gee, 2003, p.8). By elaborating Gee's discussion, some game learning principles can be determined, including identity (the learner makes a new identity by making a commitment), interaction (the learner acts and makes decisions by giving feedback and discovering new problems) and smart tools and distributed knowledge (the learner has skills and knowledge to understand when and where to contribute his or her distinctive skills in the learning process) (Gee, 2005, pp.33-37).

In previous discussions of young people's and children's uses of digital resources (e.g., computer games, the Internet), these resources have been primarily viewed as intended for leisure activities. Usually, they are treated by formal educational institutions as beyond the domain of valuable educational experiences. In other words, current digital technologies are now interposed with a family environment as part of young people's and children's main social and cultural lives.

Wenger (1999) advanced the social theory of learning, expressing that learning is not a separate activity in which 'there are times in our lives when learning is intensified: when situations shake our sense of familiarity' (Wenger, 1999, p.8). Lave and Wenger (1991) also proposed that the initial participation in a culture of practices can be observed from the periphery or 'legitimate peripheral participation'. The participant moves from the role of observer, as learning and observation in the culture increases, to a fully functioning member in the process of learning. The progressive movement towards full participation enables the learner to piece together the culture of the group and establish an identity as he or she makes sense of knowledge (Lave and Wenger, 1991, p.122).

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In my thesis, from the angle of television-watching behaviours and media activities, I will define social learning according to its content, style and form, and take a close look at how young people learn from contexts outside of formal educational settings and styles, particularly their home's informal learning environment. Through previous reviews and discussions towards this end, my study attempts to take a close look at how young people learn from television. I also look into issues such as whether interactive learning by interactive TV overwhelms pre-adolescents, who may have become accustomed to being passive in front of the traditional broadcast learning. Interactivity through technological functions on TV learning contributes to knowledge retention; an indication 'presents an image of the learner actively collaborating with the medium to construct knowledge' (Kozma, 1991, p.179). Based on Laurillard's argument, using digital technologies to capture and share learning designs turns 'teaching into the reflective, adaptive and collaborative design process that would make education a learning system' (Laurillard, 2008, p.58). How can interactive TV make a learning system to create this educational design process? Within the scope of my research, the new medium of interactive TV is hard to measure and test in long-term learning scenarios. Therefore, the questionnaire used in this research was prioritised to check learners' retention of knowledge mostly as 'functional literacy' (Buckingham and Burn, 2007, p.329). The questionnaire also asked about testers' anticipated future use of interactive TV in an effort to detail TV's learning application.

The following section provides an examination of how television affects the learning of children, and how it impacts their informal learning development and educational performance with the addition of interactive functions.

3.3 Television Learning: Interactive TV Creates a Potential Learning Tool

Not all of the technologies and activities associated with youths are situated in a formal educational setting; many of them are actually embedded informally in the young generation's day-to-day life. Television has been used for informal educational purposes for decades, in the form of edutainment programmes (like USA's *Sesame Street* and UK's *Tellytubbies*), school TV, and educational distance learning programmes (such as those broadcast by the National Open University on the Taiwan public television station). Moreover, television has long offered some educational content, both formally with curriculum-like programmes and informally via informative documentaries and quiz programmes broadcast every day.

In using media for educational purposes, Buckingham discussed two processes to 'demystify' the hidden meanings of media in Britain (Buckingham, 1993, p.285). One is media literacy to determine how media institutions operate and what structuralism and semiotics derive from the media. In contrast, the second process of media education involves "'popular' rather than 'high' culture, [and] is situated in a very different position in terms of the relation between school culture and the culture of the home or peer group'(Buckingham, 1993, p.285). There is no clear evidence that children in Taiwan have concrete TV literacy to determine what they can learn from TV, but instead peer groups, especially parents, 'educate' them on how to watch and what they can watch as TV education. My thesis will assess children and young people's TV literacy (Buckingham, 1990, pp.3-15) correlated with cross-media practices (Burn, 2007, p.48) to determine how television learning can be realised.

Educators in particular may be very much concerned about young learners' acceptance of new television technologies, such as interactive TV, and their willingness to use those technologies as part of their learning strategies will be the key focus of TV learning experiences.

The most distinguished and extensively researched example of an educational television series is *Sesame Street*, which is a product of Children's Television Workshop (CTW), a non-profit organisation creating educational children's programmes that have run on public broadcasting stations around the world. Results indicated that pre-school children who had frequently watched *Sesame Street*, whose long-term positive effects have been confirmed by researchers, were rated as better ready for school than their non- or low-viewing classmates, indicating that educational television can indeed enhance children's vocabulary volume (Rice and Woodsmall, 1998, p.420), reading ability (Zill, 2001, p.115) and literacy and numeracy skills (John et al., 2001, p.1347).

Lemish indicated that two different styles of educational television have emerged, the first of which takes the form of educational television employing outstanding television teachers 'who led the educational process with the assistance of less trained teachers in the classes themselves' (Lemish, 2007, p.167).

The other style of educational television, to compete with commercial television, emphasises its high-quality format, which works as a complement to rather than a substitute for classroom teachers. The new style of educational programme reflects a dramatic transformation — 'from focusing on school instruction to a wider scope of offering children quality television that broadens their intellectual horizons and challenges them in an enjoyable way' (Lemish, 2007, p168). However, those two concepts usually overlap or their boundaries

are to some degree blurred; thus, the discussion of educational television may require understanding of edutainment-style television programmes, as introduced in the next section.

Edutainment: An Attractive Form of Television Learning

Media-related entertainment activities are now accessible almost everywhere during any of the young generation's leisure time. Television, for example, is the most convenient source of entertainment for children; they can learn from TV and it acts as a better time filler than other activities, such as fiction, games, quizzes, sports, variety shows, etc. (Christopherson, 2008, p.79; Sheldon, 1998, p.77; Messenger-Davies, 1989, p.135). The aforementioned development of learning trends indicates a growth in home education; not only does TV provide entertainment recourses, but it also accommodates entertainment-enhanced products that parents purchase to supplement schooling, such as best-selling books, PC-learning educational software and other new learning tools, which all evolved from entertainment applications (Wolf, 1999, p.91).

According to Dyer, '[e]ntertainment is a guiding principle in the making and receiving of the arts and media' (Dyer, 2002, p.1), and Langer defined entertainment as 'any activity without direct physical aim, anything people attend to simply because it interests them' (Langer, 1953, p.403). Entertainment can also be described and experienced as a 'reception phenomenon' from the user's point of view; entertainment offers psychological relaxation, variety and diversity of fun and joy, and stimulation (Bosshart and Macconi, 1998, p.3). Feeling entertained involves a complex state of mind constructed and exposed by

various physiological (materiality and existence as being there), psychological (personality, emotions and cognitions as being thus), and social (sociality and coexistence as being with) dimensions (Vorderer et al., 2004, p.391; Bosshart and Macconi, 1998, p.4). Moreover, entertainment is a pleasure-seeking behaviour in which 'each audience ultimately develops unique standards for choosing what it considers to be the most desirable means for satisfying its pleasure needs' (Mendelsohn, 1980, p.20). I tend to narrow these definitions to understand entertainment in TV programmes' content, where viewers are entertained by professional designers and entertainers that interest young people and give them some level of relaxation and pleasure.

To attract and secure audience participation, entertainment has increasingly taken on different media genres; using some form of entertainment can facilitate and make the learning process more attractive. In contrast, TV producers tend to convey apparent education-oriented messages in their programmes but still conduct the fundamental entertainment pedagogy to raise TV rating and earn more financial support.

As Chapter 2 indicated, historically, TV watching is an important media activity in the family; however, parents sometimes worry that too much entertainment received through television content will impair and displace other valuable activities for their children (Murray, 1993, pp.9-22; Howard, 1998, p.57). As a consequence, the enjoyable and positive packaging of media messages in new forms or genres that originate in the entertainment industry has manifested significant popularity using similar names, including 'infotainment', 'edutainment' and 'entertainment-education' (Singhal and Rogers, 1999, p.9). Media convergence exceeding current technology forms has generated 'this kind of blurring boundaries between objective (factual) media content and subjective

(entertaining) intentions and representation' (Matyus, 2008, p.6).

'Infotainment', the synergy of information and entertainment sectors, suggests that information technologies and new media merge together in the telecommunications industry by transfusing entertainment into every domain of life, from work to education, politics to culture (Kellner, 2003, p.1). Stevenson argued that the fast-changing media culture is more individualised and less homogeneous, with popular and political elements usually intertwined into infotainment, such as soap operas that address popular political issues, in order to attract maximum media exposure (Stevenson, 2001, p.73). Moreover, infotainment goes behind 'education in the Disney fashion' to make learning a 'fun' process (Robins and Webster, 1999, p.208).

Similarly, 'edutainment' is an eclectic mix of education and entertainment created with the help of modern communication technology for educational purposes. Edutainment is a neologism that came into use as a genre of educational television programming in the 1980s and 1990s (Rodney, 2008, p.1), a sector which has grown into a narrow pedagogic space at the margins of multimedia, not only with children's TV channels but also with interactive PC programmes.

Lastly, 'entertainment-education' combines communication and education theory with entertainment pedagogy to conduct programming via informing the public about a social issue or concern (Singhal and Rogers, 1999, p.xii).

Let's examine further the social learning theory, which illustrates the entertainment and education combination that we have been considering. Social learning theory, which has deeply influenced entertainment-education theory, involves people's learning from social contexts that include observational learning, imitation and modelling concepts; it can be characterised as the

connection or transition between behaviourist learning theories and cognitive learning theories (Bandura, 1977, p.22; Ormrod, 1999, p.7).

Learning would be exceedingly laborious, not to mention hazardous, if people had to rely solely on the effects of their own actions to inform them what to do. Fortunately, most human behavior is learned observationally through modeling: from observing others one forms an idea of how new behaviors are performed, and on later occasions this coded information serves as a guide for action. Because people can learn from example what to do, at least in approximate form, before performing any behavior, they are spared needless errors (Bandura, 1977, p.22).

Understanding how TV affects learning is significant because children, especially young children, do learn a lot from television programmes. For example, some television programmes combine entertainment and education to help children distinguish numbers and letters in sequence, human characters and shapes, musical sounds and vocabulary of foreign languages and more (Fisch, 2004, pp.32-52). Children learn a great deal simply by observing other people and, therefore, television characters often act as role models for children to examine. With television acting as an entertainment medium, children observe the television rules for moving images, such as cutting from one scene to another and close-up shots, in the same way the camera does. Therefore, '[t]elevision's way of representing the world can affect the way growing children see the world generally' (Messenger-Davies, 1989, p.7).

By discussing with learners and siblings the rewards and consequences of various behaviours seen in social contexts and the media environment, children can recollect sequential events and develop enriched skills in spatial relations from television viewing. Bandura suggested that the environment reinforces the

modelling in learning; therefore, lots of children may generate a learning model or just imitate other people from their groups by showing satisfaction or behaving vicariously (Bandura, 1986, p.47). Whereas television watching is usually part of family activities, especially for children, some problems emerge since children not only learn to observe all possible behaviours depicted (both appropriate and inappropriate), but also naturally tend to assume the evaluative standards and values that the programmes adopt (Ormrod, 1999, pp.1-17).

As a result of previous research, we see the transformation of entertainment into different forms for young people's learning, and undoubtedly public opinion indeed focuses more on the negative influences from a variety of entertainment that children absorb via television (Holtz-Bacha and Norris, 2001, pp.123-140; Comstock, 1995, p.101). When it comes to entertainment for learning from television, we must consider two typical models of television markets. One is the public TV system, such as the BBC service from the UK, funded principally by an annual television license fee that supports high-quality programmes, and the other is the commercial market of the US, in which many commercially funded, private broadcasters coexist with few public television broadcasters and raise needed funding from commercial advertising. Both systems provide entertainment for TV watchers; however, the function and intention of the entertainment provided serve different priorities.

BBC public service television is intended to operate as a unique institution aloof from commerce to create standard broadcasting that 'allowed for an emphasis, explicitly called for by the legislators, on broadcasting as a means of education as well as entertainment' (Webster, 2002, p.169). 'To enrich people's lives with programmes and services that inform, educate and entertain' has been reflected in much BBC content. Different styles of programmes are designed to

educate as well as entertain the audience, and this is considered most important because it creates intellectual or other value, in contrast to pure entertainment (BBC, 2009a).

American TV watching is a different story. 'Network television provides the structure for the commercial system of television dominant in the United States' (Kellner, 1990, p.73). Network systems pay studios to produce programmes, while advertisers pay the network a fee based on the size of audiences. Therefore, Kellner thought networks played the role of 'television overlords' in the early age of American media history. Network television powerfully centralises programme production, studios, advertisers and commercial ratings companies so as to generate huge revenues. This is why the US has circulated such a large number of TV programmes and films in the entertainment style via advertising networks. As Postman argued that 'entertainment is the super-ideology of all discourse on television' in American culture, TV becomes the medium for information packaged as entertainment to suit all discourse, '[f]or the message of television as metaphor is not only that all the world is a stage but that the stage is located in Las Vegas, Nevada' (Postman, 1985, p.92).

With the Internet culture overtaking the old television culture, Digital Natives can learn, seek for and indulge in any peculiar information concomitant with entertainment. For example, learning simulations help children and young people think about complex phenomena via a transparent process and make learning effective without needing to go below the screen surface (Turkle, 2004, p.97).

Forsaking the approach to entertainment of the UK from the perspective of public values and of the US's infelicitous trepidation, my research will not so much debate entertainment's positive or negative effect, but rather discuss why

entertainment is re-conceptualised as a type of motivation and how entertainment activities can relax people while at the same time embracing interactivity and a heuristic style of learning.

Learning through Interactive Television

Interactive television opens new learning opportunities for which new forms of education are needed. In this section, I will explain the new concept of television learning (T-learning) in which television programmes and learning content are combined. 'T-learning, a shorthand for TV-based interactive learning, means interactive access to video-rich learning materials primarily within the home, through a television or a device more like a TV than a personal computer' (Bozoki et al., 2007, p.65).

Television has not really been used for interactive functioning systems, as broadcasting generally did not allow interaction between viewers and programmes. However, digital television, and in particular its potential for interactivity, does—via hardware and software built into screen devices or TV receivers and connections with other telecommunications systems like cable, satellite and telephone. It also opens up the possibility of personalised learning schedules, with hundreds of programmes to be offered in parallel (Olsevicova et al., 2007, p.2) In addition, as mentioned in Chapter 2 regarding the functions of the electronic programme guide (EPG) for digital TV, adaptive informal learning experiences for individuals and groups of learners alike have resulted in a heightened interest in the potential of television for education.

In contrast to traditional one-way transmission models of teaching, learning technologies employed in the convergence theory have typically been

characterised as student-centred at all levels; for example, e-learning combines the Internet and learning that offers learners more flexibility with training available at the learners' convenience (Marshall et al., 2003, p.137; Cloete, 2001, p.172).

TV is more widely accepted across society than computers, and T-learning based on the development of digital TV could offer various forms of interactivity. As a consequence, interactivity is considered an important aspect of the process of learning, allowing television to create new interactive learning opportunities in the home (Bates, 2003, p.27).

Bates (2003) suggested quite good reasons why it is important to consider the position of interactive television as a learning device:

1. Most viewers have access to a television set in their homes.

2. Not every household has a computer or is connected to the Internet.

3. Television is a long-term, traditional and easy-to-use device.

4. Audiences are prone to believe content from television.

5. Television has the potential to reach more audiences and to offer more learning opportunities than traditional learning institutions (Bates, 2003, p.26).

Programmes produced by broadcasting organisations usually have different targets and purposes established by the production companies or educational institutions. Tony Bates suggested two types of educational television, *educational broadcasting* and *instructional television*, in his description of diversified television environments (Bates, 1995, p.61).

Educational broadcasting, as traditional TV with the addition of an educational intention, reaches a large audience across the country through its national network of different technologies, including terrestrial transmission,

cable service, satellite systems and others. For the purposes of this discussion, educational broadcasting is the general form of TV communication that is directed to every place and everyone who may be interested in watching or learning.

In comparison, instructional television is the 'narrowcast' broadcast system that is distributed by video conferencing, video discs or any other multimedia technologies (Bates, 1995, p.88), Interactivity in instructional television is essential; a live interactive lecture provides learners with flexible actions such as stop, start, pause, rewind and fast forward to control the learning content (Zajc et al., 2006, p.1). Drawing conclusions from previous studies, interactive television services evolve into narrowcast and interactive services for learning purposes.

Some studies have looked into digital TV for educational learning purposes. For instance, it has been found that digital interactive TV can increase learning dialogues that enable intuitive answering of questions and easy navigation within and between educational content (Kromker and Kunert, 2003, p.3). The dissemination of T-learning services will depend on their effectiveness (whether accesses to the services are affordable and easy to use for customers) and reliability (whether viewers understand the types of learning resources and methods of learning from home) (Sancin et al., 2009, p.10). Of note is that independent learners form the most successful learning group, which is more active when provided with additional context-relevant information by an interactive TV system (Olsevicova et al., 2007, p.5). However, Demasio and Quico performed a comparison experiment in which children enjoyed learning with TV programmes but demanded less individual and more community-based learning (Damasio and Quico, 2004, p.6).

According to the research on television learning, we may need to further

consider users' behaviours within the learning system. In an online e-learning situation, learners get involved in learning experiences mainly on their own initiative; in contrast, T-learning audiences have traditionally been viewers used to accessing television simply as a passive entertainment medium. Therefore, to make T-learning objects more attractive and effective for learners, personalisation for the variety of audiences and audiences' active attitudes are essential elements in the field of television learning (Lopez et al., 2006, p.2). Interactive TV offers potential for increasing learning opportunities related to the availability of a return channel through the two-way system by creating different pedagogical approaches. Different types of learning skills as well as different effective teaching methods must be taken into consideration and investigated. Television for learning is based on the didactic key elements of learning dialogues between programme content and learners, as well as on the specifics of interactive technological devices (the set-top box and remote control). For instance, the educational broadcasting's learning style, the content sequences and learning potential need to be handled carefully. Even though instructional television's learning style can make the TV a 'smart machine' by providing monitor operation and performing adjustments as needed, the appeal here is an awareness of the audience, with more emphasis on the young generation: Are they operating with a learning attitude that makes them more able to plan, implement and evaluate interactive functions designed on television? To answer this question, the next section includes a more in-depth analysis of the audience.

3.4 Paradigms of Audience Research toward Children and Young People

The concept of media audiences as mass audiences, not only children and young people, can involve and utilise the process of mass communication. Audiences in general have acted as potential consumers of media materials; hence, more empiricist communications and market-oriented research has been conducted, such as quantitative and objective analyses regarding viewer ratings, to determine the effects of different communication types upon audiences (Gunter, 2000, p.1; Masterman, 1985, p.215).

The orthodox television audience research has taken advantage of two normative paradigms between the perspectives which have emphasised the power of messages based on the 'hypodermic' theory to 'inject' ubiquitous audiences as 'zombie viewers' (Winn, 1985, p.13) and the con perspectives which have stressed that audiences can create an active engagement with the media via the uses and gratifications theory (Morley, 1989, p.16).

However, this does not provide a clear understanding of the complexities of television and its audiences with dichotomous audience analysis like above, nor is it possible to provide further insight into more qualitative and objective media consumption (Ang, 1993, p.155) from only one side of the audience analysis, as noted by Ang. New digital television technologies, as mentioned earlier, will open up whole domains of special-interest communications, narrowcasting rather than broadcasting, while the competitive advantage of multiple options from different channels will cause social fragmentation as well as changes in audiences' viewing behaviours (Neuman, 1992, p.115; Iosifidis, 2007, p.76). I have suggested that audience research for TV be based on situational settings, and studying individuals conditioned by social and psychological structures is the key to understanding television and its audiences (Levy and Windahl, 1984, p.51).

In the following sections, I will take up this point and illustrate how the content of multimedia TV furnishes narratives and representations that serve as learning devices. First, I will consider the ways by which multimedia combine audio and video functions that create different cognitive processes for audiences. Second, I will consider the TV material itself and any adjustments of social meaning and life around children and young people.

From Social Psychological Perspective into Multimedia Text Research Paradigm

With the aim to argue for the young generation's 'active' relationship with media, the following paradigm for audience research is largely established through experiments related to the effects of media on children and young people, especially with a focus on television violence. This research also emphasises the role of 'intervening variables' which mediate between media and audiences, and between stimuli and responses (Buckingham, 2000, p.106).

Thus, the cognitive process by which children make sense of media represents the individual differences among these intervening variables. For instance, researchers Doubleday and Droege (1993) were interested in the cognitive developmental process associated with different stages of children: pre-schoolers (2-5 years), young children (6-8 years) and older children (9-12 years). Basically, younger viewers more attuned to watching television are likely to 'fill in' television programmes with regard to attention and comprehension cognitive activities due to their limited general knowledge about television (Doubleday and Droege, 1993, p.32).

Psychological researchers have increasingly moved away from a

behaviourist perspective to a constructivist with cognition perspective that uses schemas, scripts, sets of plans or experiments as a 'micro aspect' to concentrate on audiences' mental processing and cognitive development (Buckingham, 2000, p.107). Moreover, this paradigm uses experiments such as visual and audio elements to study children or young people's cognition, emotions and social skills developed over each stage, as the interactivity of new media combines more of those visual and audio elements adopted in the cognitive development in young people's learning. Implications of the themes for psychological analysis will be discussed later.

Visible Fictions of TV: Concerning Audiences' Attention

Television creates a new visibility for the public sphere that combines visual and audio images. Therefore, the transformation of visibility is powered not only by sounds and actions, but also by express and widespread transnational cultures, lifestyles and new technologies, such as digital television (Featherstone, 1995, p.77).

Previous research on Digital Natives emphasises trans-cultural audiovisual languages of youths, which go beyond verbal language only. Youths do not just use forms of visual, musical and bodily expressions; moreover, the manner of expression they think appropriate for shared positions of audiovisual aesthetics and feelings should also be considered (Niesyto et al., 2003, p.463).

Television is an effective tool for expressing abstract meanings and concepts that are usually produced and conveyed with words. Under this

circumstance, to make an abstract concept concrete, the role of animation and visual experimentation is important; however, the constraint here is how to combine texts with moving images and substantial objects like animation. Nevertheless, television for educational functions in the learning process could be helpful in making difficult ideas for cognition straightforward and concrete (Bates, 1995, p.69).

Television is often described as a medium of 'relaxation' that demands little concentrated attention but is more concerned with variety and diversion of content (Kubey, 1996, p.221). Although in fact video is a complex chain of developments in image and sound reproduction, a viewer relaxed at home is frequently cast as someone who has the television switched on but pays little attention to it. Especially in the commercial television market, the rating system 'assumes that active viewing is the exclusive model of spectatorship' by counting the operating TV sets rather than viewers who really pay attention (Altman, 1986, p.41). Therefore, the intermittent soundtrack, by using 'sufficient plot' or 'informational continuity' (Altman, 1986, p.42) from time to time during the sequence flow of TV programmes when the image is not visible, often serves to underscore and imitate actions on the screen to draw viewers' attention (Ellis, 1992, p.129; Armes, 1988, p.161).

As a result of information coming from audio and video, young people are exposed constantly to a wide range of information sources located in many different places, such as advertising, Internet or television channels, which produce a message overload and make paying attention to all the noises more challenging than ever. There must be recognisable continuity in various types of visual, audio and multimedia styles for individual audiences to accept the

watching of interactive TV. To fathom those different media receiving environments, I will emphasise further the situational effects and uses of media within the broader context of social and interpersonal relationships in the audience learning environment.

Social Meaning-Making Practices on Audiences

The paradigm for social meaning-making practices emphasises stronger media uses within the broader context of social and interpersonal relationships in media and culture studies, including how children interpret an educational programme, for instance, and what they choose to say about the programme with their peer groups and adults. Therefore, the 'macro aspect' research will indicate critical perspectives on the medium seen as children's 'social actions' and motivations (Buckingham, 2000, p.107).

Hodge and Tripp (1986) applied a 'social semiotic' approach analysing not only the effect of audience data, but also the constructional children's programming. They conducted research on children's TV viewing by focusing on relationships between school practices and after-school activities, while thinking of children's watching television as a social practice and stressing that knowledge collection in children's media environment must account for the social dimensions that influence the activities of their media consumption. 'The social dimension has not been neglected, because it is as a social problem that television has presented itself as demanding research' (Hodge and Tripp, 1986, p.8). Now that the aforementioned children and young people have access to a variety of media from their after-school environment, the social dimension for them is not only involved with media learning, pleasure and practice, but also

shaped by different learning environments and social regulations. 'Children are, by their very participation in society, constrained by the existing social structure and by societal reproduction' (Corsaro, 1997, p.18). Also, following previous textual analyses of multimodal multimedia for learning purposes, we need some way to analyse media literacy of television by understanding how children and young people 'read' media texts from television (Burn, 2007, p.47).

Therefore, social semiotic research can let us understand what young people from different environments actually receive when the media send a message. Does the message make the receivers interpret it differently? Are environmental differences more important than media forms (Eco, 2005, p.238)? All these concerns will be accounted for in my empirical investigations described in Chapter 4.

In the research of youths, some researchers speculate upon socialisation not merely as something which adults can influence, but also as a fact that young people will act as an 'active audience' through self-socialisation where they intend to present their behaviours to peer groups and also to show themselves off (Buckingham, 2000, p.107). Willis studied how young people use 'cultural commodities' (e.g., television, music or fashion) to create 'symbolic work', which ends up elucidating and recreating an alternative vision of audience members who dominate and are active in using new media and departing from traditional communication activities (Willis, 1990, p.5). Fisherkeller (2002) argued that young people develop their recognition of TV construction and critiques by watching TV regularly with family and peers, while sharing opinions on programme content casually to 'learn about TV culture from TV culture itself' (Fisherkeller, 2002, p.7). Buckingham further suggested a full 'social account' of the relationship between children and the media through a broader understanding

of social, institutional and historical changes in audiences (Buckingham, 2000, p.116).

Crook (1999) used the term 'cultural psychology' to refer to electronic media as the creation that involves locating events and experiences in the broader context of human culture (Crook, 1999, p.362). This provides a different view concerning the media effect on the causality of children's behaviour differences. Three different research foci from Crook, 'individual actions', 'interpersonal exchanges' and 'the ecological settings', define recurring concerns by cultural psychologists. First, individual human competence is seen as rooted in cultural artifacts. Those actions coming from audience activities are re-mediated by using new cultural tools (both technological and symbolic); electronic media, such as PCs (technological) and TV (symbolic), work as appropriate resources for learning contexts 'in which our individual exploratory activities are potentially re-configured by new media'. Second, social interaction is highlighted by the cultural perspective as central to human experience and development of interpersonal experiences, and audiences are able to create and negotiate the cultural sign systems among tools, spaces and rituals. Here, new technologies potentially mediate new forms of social interactions, and we have to understand new experiences that make sense for young people (Crook, 1999, p.369).

Finally, interactions and social actions occur within the environment that supports our living. This approach, therefore, is imputed to external concerns of environments by social practices instead of internal processes, for instance, the traditional cognitive analysis. 'How human action is coordinated with cultural environment' will provide different viewpoints on questions and research about children using electronic media (Crook, 1999, p.369), while this perspective also reflects that previous study of the role of TV has often been concerned with the

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dynamic relationships between household members and television watching flows.

The audience research paradigm provides us with different roots in stimulus-response by an experimental design whose goal is to find correlations between television design and young audiences' TV watching environment. In the next chapter, I will discuss conceptual theories and the methodological design of my theory involving studying the young generation's TV watching relationship with other new media.

Chapter Summary

This chapter provides an overview of children and young people in this fast-moving, technological environment as television audiences, along with discussions on their uses of TV as a learning medium, which includes the following points:

1. Young people are familiar with digital technologies and are creating new styles of interaction with new media. However, the consequences for the so-called 'digital generation' depend not only on how young people use new technologies, but also on the degree of variation from social, economic and political developments.

2. With young people's after-school learning environments taken into account, interactive TV offers potential to increase learning opportunities related to edutainment subjects; however, we still need to evaluate television with interactivity that raises learning opportunities.

3. Concerning the audience research based on situational settings, studying individuals conditioned by social and psychological structures is the key to

understanding television and its audiences.

4. The psychological approach to multimedia emphasises the process of audiences' engagement with media, while taking the constraint of combining texts with moving images and sounds into consideration.

5. The semiotic approach and cultural psychology identify young people's TV viewing and new media usage as a social practice that emphasises how individual action is mediating within social interaction and the environment.

Chapter 4 Research Methods and Designs
Charting a New Experiment: The Multi-method Evolution

Chapter Overview

The purpose of this chapter is to examine, via a TV watching experiment, young people aged 11-12 in Taiwan regarding their ways of using new media at home and to understand their general knowledge of these new media. First, I describe the details of my fieldwork experiment's design process, which included in-depth interviews with science teachers, pre-stage technological prototype setup, grouping testers to watch designed edutainment TV programmes and respond to a questionnaire survey and one week's collection of media diaries. Second, by examining technologies of the interactive TV practices of young adolescents, the questionnaire addressed the performance of interactive TV programmes for learning on viewers' knowledge, attitude and behaviour. Third, the media diaries worked as situational sketches to understand pre-adolescents' domestic environments for media activities and correlations with screen-based activities, such as TV watching and Internet surfing.

4.1 Experimental Background

To obtain a fuller understanding of the research background, the first part of this section deals with the development of interactive TV in Taiwan. It is therefore sensible to present an overview of my experimental situations in terms

of why the experimental TV programme was chosen and how it fit into my research design.

Five terrestrial broadcasters (CTV, CTS, FTV, PTS and TTV) in Taiwan began broadcasting digital television programmes in July 2004, adopting the European Digital Video Broadcasting-Multimedia Home Platform (DVB-MHP) as the transmission standard for digital terrestrial broadcasting. 'At its simplest, MHP can be described as a set of instructions that tell the operating system on a digital TV receiver how to deal with an interactive TV application it has received' (DVB, 2009a). The national public broadcasting station (PTS), the only public terrestrial television station funded by the Taiwan government, shared funding from government agencies to allow the other four commercial terrestrial broadcasters to join the pilot MHP application production to accelerate the push for the DVB-MHP standard in the digital TV market in Taiwan (DVB, 2008).

To encourage television learning for children and young people, PTS has been using DVB-MHP to create an interactive version of some comprehensive educational programmes, one of which is called 'Follow Me after School', to explore the young generation's learning (PTS, 2001). PTS is a public state-funded company which provides not only a number of conscientious programmes, in addition to entertainment shows, but also certain programmes with educational meaning for children. 'Follow Me after School' is an appropriate edutainment programme fitting my empirical research to test and verify previous theoretical arguments.

Accordingly, I will now introduce the distinguishing features of the experimental programme. In the interactive edition of the 'Follow Me after

School' series, more plentiful illustrations and Flash-looking text information are provided during the broadcast, while its design shows more information-added and Internet-look-alike information than its original programme edition, where the audience can get in-depth information and take some learning quizzes as the show moves along. The main concept and intention of this programme is for viewers to 'explore' inside the information of the topic formulated in every episode. In the traditional edition, the hosts aim to expose a discussion started with a humorous opening. The MHP version, trying to make the interactive function of the interface follow the same design concepts as the original programme via abundant visual and textual presentations, and interesting questioning and answering, further improves the audiences' sense of participation and strengthens their impressions of programme content.

Contents of the interactive edition have been divided by the programme designer into four major categories; viewers can access them by pressing the interactive button from the remote control, as follows:

1. *Inside Information for Exploration* — This function provides relevant information to strengthen original content (e.g., traffic maps, books, Web sites) regarding the episode topic. Audiences can choose to watch particular information which interests them.

2. *Retrieval of Programme Summary* — Retrieval summarises and sorts out content in an episode, so that audiences can check out needed information or refresh their memories about content shown earlier.

3. *Tests from Content Viewing* — Three multiple-choice questions with a ten-second countdown to answer are designed in accordance with the content of the programme to elevate viewers' learning motivation.

4.   *Direct Feedback on Programme Host* — The audience can comment on the host's performance with specially designed Flash logos by using the remote control to select one of several options, such as 'Good Job!', 'Not Bad!', 'Be Careful!', to cheer the audience up and balance the watching atmosphere.

Figure 4-1: An Example of EPG on the Interactive Version of Episode; the four logos of heart-shape leaves represent the four main interactive functions to be selected by user using the remote control.

4.2 Methodology

Throughout my theoretical research, I have been concerned about whether interactive TV can work as an evolution of 'new media' for learning purposes, while debating the scenario that Digital Natives use many personal computer (PC)- and Internet-related technologies frequently but TV watching behaviours still seem to dominate their main daily media activities. The multi-method approach is thus adopted as a field investigation tool to form the methodological framework of my study to explore whether the complex phenomena of media activities among young people have any special meanings, and whether television with interactivity added that transforms the specific contexts of the TV watching experiences has changed traditional mainstream TV watching behaviours. The use of quantitative and qualitative approaches provides a better understanding of research problems than the use of just one approach (Creswell and Clark, 2007, p.18; Meetoo and Temple, 2003, p.2; LeBlanc, 2002, p.4; Yamaguchi et al., 2005, p.5). 'Different methods have different strengths and they may in fact be looking at different aspects of reality' (Meetoo and Temple, 2003, p.2).
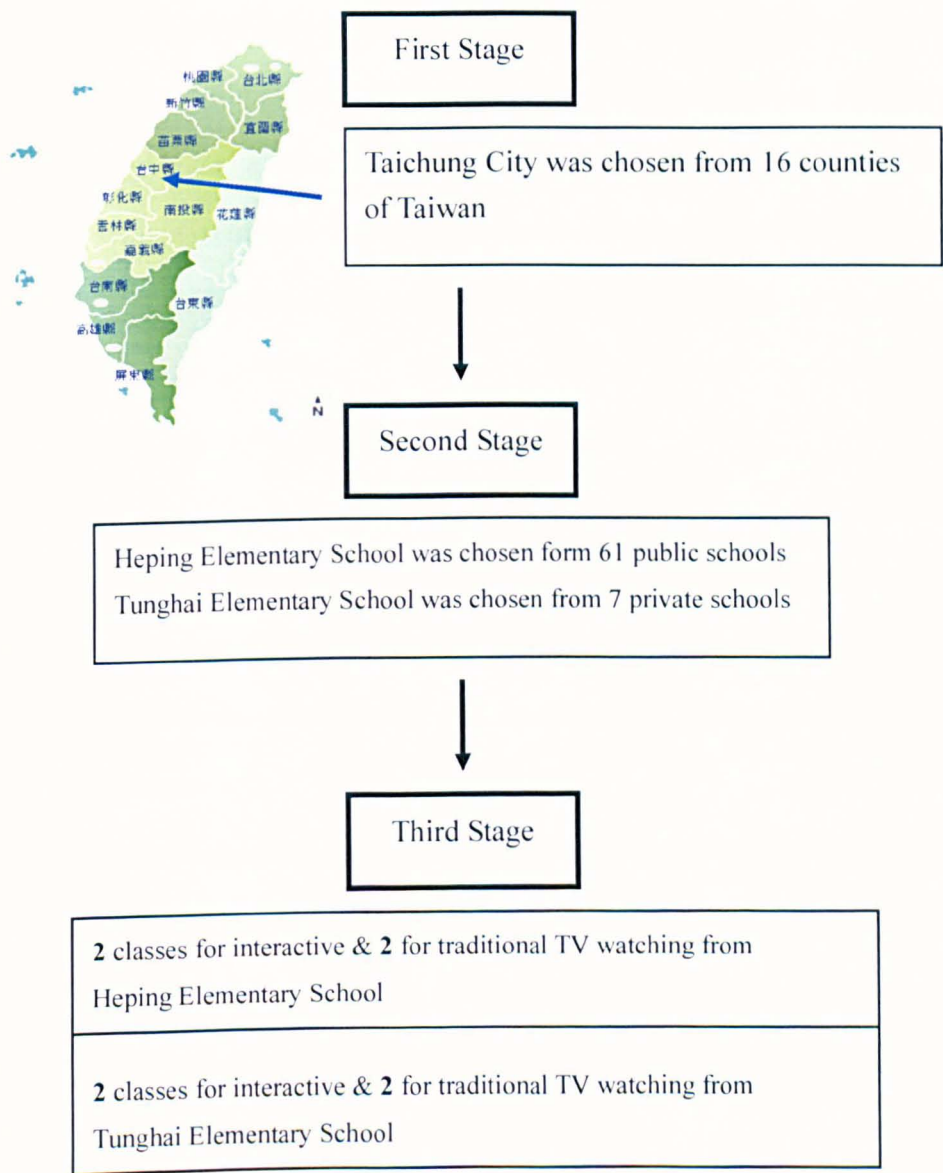
To follow a more standard research methodology, the multi-method approach incorporates a set of in-depth qualitative interviews and quantitative questionnaires followed by separating youths into groups to watch interactive TV science programmes. It also includes different qualitative-style data-collection methods, such as participants recording media activities on a guided open-end diary-style form for a week, and multitasking analyses together to provide a more solid understanding of learners' TV watching behaviours and their experiences in the new media environment. I will also examine how the approach discussed

above is operationalised during my fieldwork among young people and in their learning environment, where my sampling methods and perspectives on the combined approach to the study will be introduced and explained.

Multi-stage Sampling

Based on the detailed experimental programme and appropriate illustration of the multi-method approach, the first step is to set out a multi-stage sampling strategy to facilitate the entire fieldwork. Multi-stage sampling involves selecting a sample in several stages to represent the population in an experimental study (Whittemore and Halpern, 1997, p.153; Scott and Smith, 1969, p.830). To narrow the sample size, Taichung City was chosen as the electoral sub-divisions of clusters in the first stage, which is sampled from Taiwan's 16 counties. Then, every student of the 5th grade in 68 primary schools in Taichung City was surveyed, as these students represent all 5th grade students in Taiwan. Second, two different social levels of primary schools, public and private, were differentiated among the electoral sub-divisions. Third, a total of 8 classes, 4 from public and 4 from private, were sampled from within the two different types of primary schools (61 public and 7 private) (see Figure 4-2).

Figure 4-2: Multi-stage Sampling

First Stage

Taichung City was chosen from 16 counties of Taiwan

Second Stage

Heping Elementary School was chosen form 61 public schools

Tunghai Elementary School was chosen from 7 private schools

Third Stage

2 classes for interactive & 2 for traditional TV watching from Heping Elementary School

2 classes for interactive & 2 for traditional TV watching from Tunghai Elementary School

In-depth Interviews

To follow up with the samples selected, in-depth interviews (Legard et al., 2003, p.138) were planned and evaluated to explore the points of view and perspectives of testers' teachers first, where pedagogical teachers helped to

criticise and interpret the programme's content with needed cooperation from experimental teachers.

My research aims to understand the situation of learning experiences in the young generation prompted by the new media environment, where interactive television plays a major role. To achieve this goal, a responsive evaluation was processed with a statistical analysis conducted afterwards, which applies to elementary schools located in the centre of Taiwan, Taichung City.

Interview Participants

The goal of my interview setup was to explore in depth the teachers' points of view, feelings and perspectives on the chosen experimental episode to obtain information useful in understanding the questionnaire design and designing in-depth interviews.

Two primary school teachers, Mr. Chung-Da Wu and Mrs. Yue-Zhi Li, who come from selected experimental schools, and one junior high school teacher, Mrs. Shen Huang, who understands the pedagogy and development of recent science teaching, were first sent the experimental footage (in digital video disc (DVD) format) for watching during January 2008.

To receive teachers' support during the experimental process and to better understand their comments about the episode 'The Agar Picking Challenge' from the series 'Follow Me after School', as well as to learn their methodology of incorporating science subjects into television learning for the questionnaire design, I asked three teachers a series of open-ended questions.

Interview Questions

After you have watched the episode, *'The Agar Picking Challenge'*:

1. What age do you think is appropriate for the main target audience for this episode?

2. What is it about this episode that makes the teaching successful? Why?

3. In your opinion, do you feel that students understand the topic better as a result of using television as the learning tool? Explain with specific/detailed examples, if possible.

4. If you've used other technologies and/or teaching methods to cover similar scientific concepts, do you find that this programme design helped you cover the topic more quickly/easily, less quickly/easily, or at about the same rate? Please explain the reason(s).

Interview Report

'"Follow Me after School" is an appropriate programme for children's community and cultural exploration, as it focuses on Taiwan's various natural, historical and economic resources that are related to current pedagogical topics'.

Mrs. Shen Huang, Science Teacher

After watching it in DVD format, three teachers (Mrs. Li, Mrs. Huang and Mr. Wu) all agreed that the content of the programme is suitably tailored for the target audience of 3rd to 6th grade primary students in Taiwan.

Linn and Hsi (2000) indicated that successes which 'scaffold' science

materials for students should enable them to integrate their knowledge from everyday life. The 'pragmatic pedagogical principles' offer perfect learning that synthesises a rich set of practical and instructional experiences with students to deal with new practical problems (Linn and Hsi, 2000, p.xxxiii).

The arrangement of primary schools' science education teaching materials under Taiwan's new nine-year mandatory education policy follows the regulations of the so-called 'One Standard, Multiple Textbook Policy' proposed in 1999 that allows teachers the right to choose textbooks (MOE, 2007). In other words, implementation of the compulsory education system features a diversity of teaching materials. Despite the specialised permanent teaching guidelines set up by the Ministry of Education, educators in each primary school are allowed to edit and select teaching materials by themselves, instead of having access to only one version of textbooks as before the launch of the new policy.

To ensure that children pass the 'Basic Competency Exams' for entering junior high schools, parents and primary school students always worry that one version of teaching materials may not be sufficient and, under these circumstances, the interviewees all agreed that this episode would provide students with supplemental information beyond that offered by regulated materials from standard or extra-curricular schools.

'The Agar Picking Challenge' acts as a special topic presented with a new teaching style that can provide audiences and teachers with creative learning and thinking, where by using a 'thematic approach', it is a great way to cover a variety of topics related to a major discussion thread for science teaching.

Mr. Chung-Da Wu, Science Teacher

The interviewees considered that picking a topic flexibly from the whole selection of teaching materials would be desirable for students. Thus, there are Web links to a variety of resources with which PTS can help students develop lectures that are challenging, exciting and fun to prepare.

However, Mr. Wu appeared to challenge whether this so-called 'interactive platform' on the television device would indeed fulfil primary school students' learning needs, because in his opinion e-learning by computers would work better. The doubt expressed by Mr. Wu drove me to embed and examine the question regarding whether interactive TV can indeed improve students' learning effect in my experimental design.

As Question 4 was asked, three teachers were eager to express their desire to use information technology for science teaching and learning through computers or the Internet. In addition to the traditional teaching in classrooms, the teachers also instructed their students by checking related Web sites, educational films and TV programmes as teaching-supported resources.

To sum up, high-quality productions of television and multimedia programmes for children, as well as creative and interesting works, can broaden students' horizons and expose them to different cultural perspectives. The three interviewed teachers all looked forward to offering interactive functions on TV for special effects.

4.3 The First Part: TV Programme Watching Experiment

Research Questions

The intention of my research questions was to record an experimental

investigation to reflect the significance of television learning on young people, where I specifically examine the knowledge, attitude and behaviour tests from the designed TV programme and discuss the juncture between the individual characteristic (age, gender, educational level on science grade) of the testers and their interactive / non-interactive perspective on edutainment TV programmes.

The following three research questions have been considered in an attempt to sketch out different scenarios:

Q1: Will interactive television programmes elevate young adults' learning motivation, influence their level of interest and increase their viewing knowledge of the content and design?

Main Focus (Knowledge Test): Audiences' understanding level of the episode by comparing the presence or absence of interactive functions

Q2: Does the experience of playing entertaining PC games or online activities ignite young adults' fondness for interactive TV or equip them with a more positive attitude toward interactive TV?

Main Focus (Attitude Test): Audiences' fondness level of the episode comparing the presence or absence of interactive functions

Q3: How is the interactive television media consumed and how does it fit into the typical and ordinary learning style of young adults or even change their future viewing behaviours?

Main Focus (Behaviour Test): Audiences' behaviours regarding how differently they accept the programme after watching an episode with or without interactive functions added

Research Participants and Experimental Design

Details of research participants and the experimental design will be presented in this section. The main research participants for the TV watching experiment were students aged 11 and 12 from two primary schools as testers, divided into two groups with each group containing around 30 students, in the unit of a class; it is a nonequivalent-group design based on classes (Reichardt and Mark, 1998, p.219):

1. *Traditional Group*: Testers were asked to watch the traditional programme.

2. *Interactive Group*: Testers were asked to watch the same programme with an interactive interface.

The experiment focused on the role of television in learning, including passive and interactive capabilities, by exploring the young generation's learning patterns through engaging questionnaires as the control data to compare against records of a one-week media diary. Participants from all test groups watched the chosen experimental episode, '*The Agar Picking Challenge*', and two major concerns for each session assessed were their evaluation results with or without interactive functions by quantitative questionnaires and qualitative diaries.

Experimental Environment

Since the live versions of the same episodes had already been broadcast, the original footage had to be transferred to testable conditions for the experimental environment.

Although children watch traditional TV every day, introducing new media such as interactive TV and having them catch its essence in just a short period of

time before the start of the experiment was difficult. 'Audiences must be conceived as being psychologically activated in their use of media and the way they react to media content' (Gunter, 2000, p.45). Therefore, the experiment was conducted in a daily production format and made testers feel the same as they do during their usual television watching experiences.

In the experimental setting, after watching the programme in a controlled environment, testers of different groups were asked to indicate how much mental effort or attention was needed. Technical explanations of the laboratory experiment follow.

Pre-experimental Design:
Determination of Interactive Tools to Be Used

To facilitate conceptualisation of the experimental system, several aspects were taken into consideration for determining the experimental tools to be used in the televised environment, according to the purposes of my design:

1. Traditional group: The TV programme, which controls the sequence of content, with viewers only having access to the on and off switch for content delivery by the experimental controller, was broadcast by the standard digital set-top box from a PC system so that viewers could watch it in a way that was similar to their usual viewing habit (see Picture 4-1).

2. Interactive group: The same content was delivered by the PC system, but it was connected to an MHP-functional set-top box. The viewers' level of interactivity increased when four exploratory functions were enabled (from pressing the remote control's buttons per the controller's request), while they watched instructions in a designed sequence to gain access to

extra information delivered by the experimental controller (see Picture 4-2).

My research intended to construct a prototype where the two different platforms indicated above would give viewers access to the same content (see Figure 4-3).
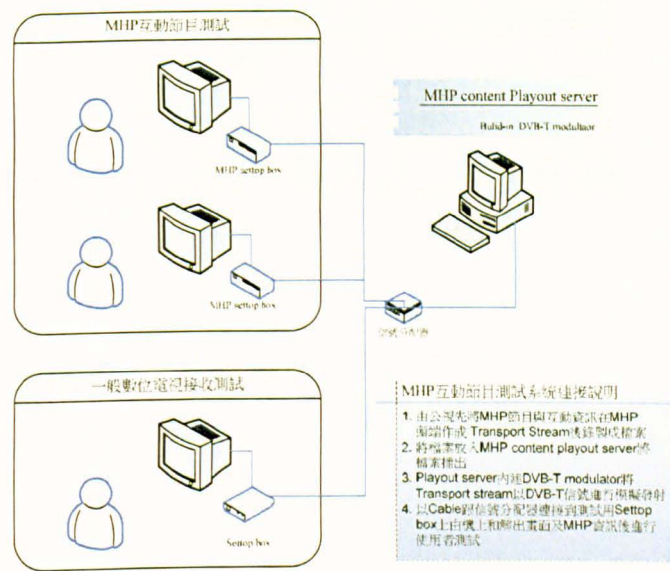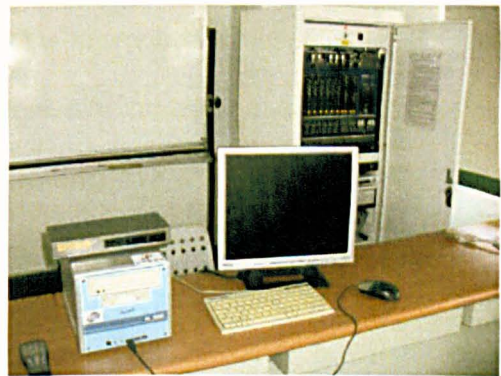

Figure 4-3: MHP Interactive Television Programme Test Prototype
In the upper-left portion, the MHP set-top box is able to decode and transmit signals with interactive functions enabled; in the bottom-left portion, the standard set-top box can only deliver traditional signals in the original content.

Picture 4-1: The experimental equipment established in one of the schools

Hardware: Shuttle *X* Desktop PC (Pentium4 CPU 1.80 GHz, 736

MB RAM)

Software: Microsoft Window XP SP2

Stream Xpress (DTC-300 Mpeg2 transport stream player)

Picture 4-2: Two Types of Set-top Box

Top: The DVB Set-top Box (the small one)

Bottom: The Set-top box with an MHP server (SAMSUNG DTT Series)

Experimental Process

My experimental process contained several steps, the first of which was the pre-test stage prior to the main test, which ensured obtaining accurate and relevant experiences. The next step was the main test, which integrated previous experiences while putting my research hypothesis, 'if the interactivity is not given, then the three research concerns' outcomes do not occur', into the two comparison groups for testing. The last step of the experimental process was to formulate a testable questionnaire which consolidated my research questions.

Figure 4-4 shows the process flow of questionnaire design for the TV programme watching stage that I constructed and organised.
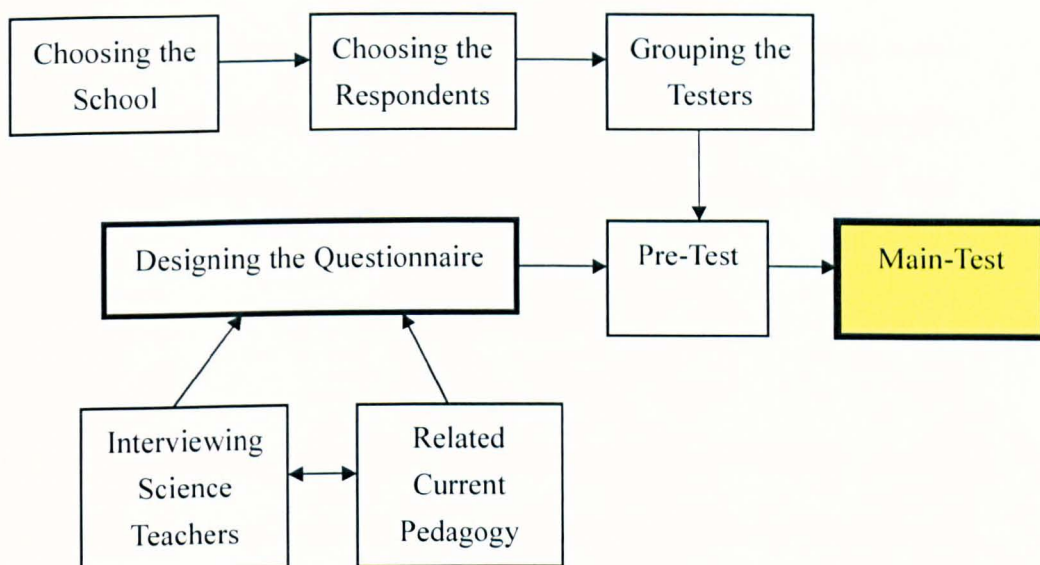
Figure 4-4: Process Flow of Questionnaire Design for the TV Programme Watching

Pre-test[1]

The selected episode was adopted from PTS as the pre-test experiment aiming to gain unexpected experiences, with extra clinical observations collected first to provide a guideline for further questionnaire design. It was appropriate to process the same task for the pre-test, as it would give me accurate data, and also I needed to assess the testers and plan the well-organised activities for the main test.

To cut down the time required for the main test, I sought help from eight students of the same age to carry out the pre-test. This provided a good alternative for me to record informal observations on independent learning since

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[1] I use the term 'pre-test' instead of 'pilot survey' in my experimental development. 'The main distinction between a pre-test and a pilot survey is that pre-tests do not involve testing all aspects of the planned main survey, but may be limited to subsets of the protocol, instrument, sampling etc' (Stopher et al., 2006, p.36).

students would not feel pressured to speak in front of a formal class. Thus, it was a very effective and useful process in this stage because the pre-testers could give feedback to me directly, which provided adequate materials for my final experiments.

Main-test

The TV watching experiments of the two chosen schools—Heping Elementary School to go first, and Tunghai Elementary School to follow—were held on the 24th and 25th of April 2008 in Taichung City. A total of 253 students from 8 classes of the 5th grade of the two primary schools (i.e., 4 classes each) were divided into two groups that watched either traditional or interactive TV science programmes (i.e., 2 traditional and 2 interactive classes for each school).

1. *Traditional Groups (as the control groups)*: Testers were asked to watch the traditional programme and fill in the questionnaire after the show.

2. *Interactive Groups (as the experimental groups)*: Testers were asked to watch the same programme with an interactive interface and fill in the questionnaire after the show.

Before playing the thirty-minute programme using the experimental system, I took ten minutes in each section to explain what interactive television is and how the remote control's various functions work on TV to demonstrate its difference from usual TV watching behaviour (see Picture 4-3). I passed around the remote control to the audience so that audience members could experience it and perform some simple tests using it. Since the audience was primary school students, my introduction to them was mainly intended to convey a picture of 'what to watch' — the programme's name and a brief content description, 'how to watch' — the 'i' logo appearing in the upper right corner of the screen (see

Picture 4-4) indicating that the MHP system is receiving interactive information from providers regarding four interactive areas and 'when to watch' — when to interact with the programme content via the remote control. The total showing time for the experimental programme was 30 minutes (see Pictures 4-5 and 4-6). The main difference in students' watching was that I controlled the remote on the interactive button to demonstrate each of the four major interactive categories for the interactive groups, while just letting the traditional group watch the standard TV programme as they usually did. After their watching was completed, I took several minutes to explain how to fill out the questionnaire in each group to make sure testers all understood the logic and wording of the listed questions. Specifically, I gave children more detail about the measurable questions (the Likert rating scales) in terms of how the ranking works in order of their preferences, for example. I also asked the children just to provide their class and student number, and not their name, to ensure testers' privacy throughout the experiment.

Picture 4-3: I was explaining how to use the different functions on the remote control for the interactive programme before testers' watching.

Picture 4-4: The '*i*' logo on the upper-right of the screen means that the set-top box is receiving interactive information.

Picture 4-5: Students were watching the programme in Heping Elementary School.

Picture 4-6: Another scene of the experiment in Tunghai Elementary School

Questionnaire Survey

A significant operational point in this study was to investigate the effect of visual and audio aids for TV images developed on the screen as a multimedia learning tool; the experimental questionnaires were designed to initiate and arouse users' interest in responding accurately, while the evaluation results were transformed for later data analyses.

The involvement of testers, representative of general viewers, in this experimental programme was expected to derive and validate three viewpoints: First, the intentions behind having testers view the episode were to increase testers' knowledge level from the programme's scientific content and to strengthen testers' screen-based digital literacy via the programme's interactive functions. Second, testers' attention increase, ignited by previous knowledge gaining, may have led to attitude changes (e.g., better attitude towards learning from TV content, more positive response to interactive functions). Finally, testers' behavioural styles and the degree to which they are exercised may have influenced their attitudes, either positive or negative, towards both the content and the formats of the episode. 'The analytical challenge was to conceptualize how different patterns of question-and-response could be jointly analyzed in the context of the theoretical model of interactivity, involvement, and outcomes' (Williams et al., 1986, p.172).

Design of Questionnaire

The Design

Three main topics, *knowledge*, *attitude* and *behaviour*, were the

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questionnaire's keynotes under three corresponding research directions: audiences' understanding level of the episode by comparing the presence or absence of interactive functions; audiences' fondness level of the episode comparing the presence or absence of interactive functions; and audiences' behaviours regarding how differently they accept the programme after watching an episode with or without interactive functions added.

Based on my formulated objective, the research design followed the three indicated perspectives to look at 'whether the programme has an interactive design that makes a difference' as the independent variable, and 'learning effect', 'degree of learning satisfaction', and 'future viewing behaviour' as the response variables (see Figure 4-5).
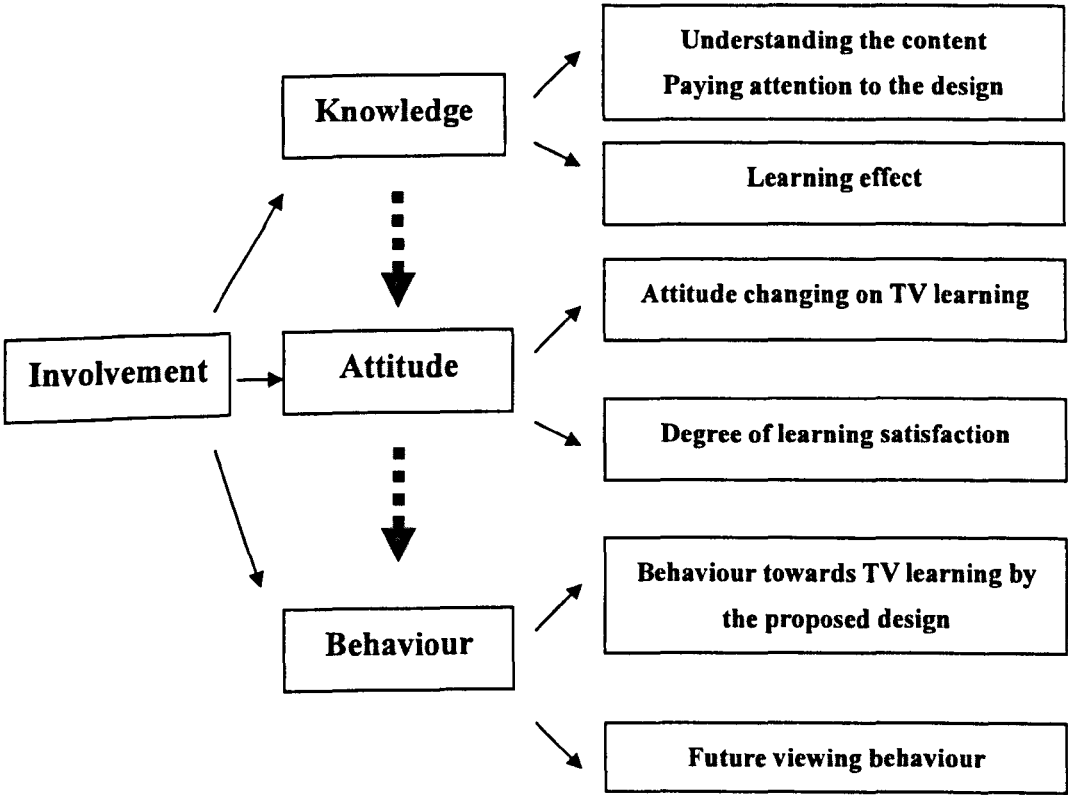

Figure 4-5: The involvement of testers was expected to derive and validate three perspectives.

The Experimental Episode Summary:

The Agar Picking Challenge

The northeastern coast of Taiwan is surrounded by green mountainous terrain and beautiful seaweed that attract many tourists. The programme's new host, Xiao-Zhong, starts his trip from Gong-Liao township on the northeastern coast to explore and introduce various scenes of tropical fish, and to collect agar from under the sea and make it into delicious agar jelly desserts.

To abide by the design of research questions, the science topic of the selected episode and the three perspectives for study from the questionnaire, a total of 24 questions, some of which interactivity-wise apply only to the interactive group, were tailored for the two groups, with interactive design and without.

Part I: Questions No. 1 through No. 13

(Questions No. 1 through No. 10 are the same for both groups, while Questions No. 11 through No. 13 only apply to the interactive group.)

Main Focus: Audiences' understanding level of the episode by comparing the presence or absence of interactive functions

How to evaluate testers in terms of their understanding of the programme was not straightforward; therefore, I set up some intriguing question points that emerged from the episode in the form of a nominal questionnaire (see Appendixes A and B), so that testers were meant to select the correct answer

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from the given multiple choices. Higher objectivity was obtained here with students who had different levels of media literacy, paid varying levels of attention to the programme's content, and had different proficiency levels in science; for instance, the first question on the questionnaire, 'What is agar jelly made from?', asked the testers to select an answer from among four choices (nori, aonori, raw agar or kelp). An indicator was assigned to each question to record whether it was correctly answered (1 = correct, 0 = incorrect). A new variable that summed the counts of correctly answered questions, from 0 to 13, was created as a measure of 'learning effect of knowledge', where differences in knowledge score come from the same programme but different watching styles (traditional vs. interactive). Certain statistical analyses were conducted via SPSS software to compare the two different groups to realise how well and how differently testers were able to understand the episode on the two different kinds of TV platform.

Part II: Question No. 1

Main Focus: Audiences' fondness level of the episode comparing the presence of absence of interactive functions

Presentations of the programme with different interface designs via new media may influence testers' attitudes towards their satisfaction with viewing. Therefore, to quantify testers' responses, the five-point Likert scale was adopted for questions in this part. For example, the question, 'how satisfied are you with the programme?', could be answered with a score of 1 as extremely boring through 5 as very interesting. The score (1 to 5) for each of the five sub-questions was recorded and the average was calculated as a measure of testers' attitudes

(levels of interest), while I used SPSS to compare the two groups to understand

how their fondness may change due to different interface designs.

Part III: Questions No. 2 through No. 8

(Questions No. 2 through No. 7 are the same for both groups, while Question No.

8 is only for the interactive group.)

Main Focus: Audiences' behaviours regarding how differently they accept the programme after watching an episode with or without interactive functions added

Questions in this part aimed to determine whether the addition of interactive

functions to the programme would make testers change their current watching

mode or affect their future viewing behaviours, such as recommending the

programme to others, searching for the programme's Web site and emailing

related information to their social groups, considering printing information from

related Web sites, or even asking parents to buy a digital set-top box to receive

interactive television programmes.

Again, a five-point scale was used, with a score of 1 as very unlikely and 5

as most definitely. To compare the two groups with or without interactivity, the

score (1 to 5) of each of the six questions was recorded and the average was

calculated as a measure of possible changes in testers' future behaviours.

Multitasking Evaluation

Subgroup and Computed Variables in Media Use

The second component of my literature research emphasised the value of

different systematic strategies to understand the depth and range of research

questions asked regarding the multitasking and learning outcomes among young-generation professionals. For example, assume the young generation of 'Digital Natives' often combines access to different media rather than using a single medium. I would thus try to determine how closely heavy media behaviour with one medium is connected to low or no use of other media by Taiwanese young people.

To complete the picture, media behaviours were classified into five areas (polyattentiveness, one thing at a time, social networking, multitasking and media environment) to probe users' media sensibility (see Figure 4-6).

The competency levels of multimedia sensibility, observed by utilising two appraisal tools—a multitasking questionnaire (attached to the previous TV watching questionnaire) and a one-week media diary (to be explained in the next part)—focus on understanding and interpreting youths' senses of participation within a context in which simultaneous media usage occurs. Groups of data were defined by the questionnaire and media diary using the newly computed variables.

The questionnaire began with queries about TV watching, which were straightforward and easy to answer, followed by the multitasking questionnaire (see Appendix C), which was designed to measure children's media environment and their multitasking behaviours based on seven multiple-choice questions and to better engage the respondents' attention and have them share their individual scenarios more comfortably. Five different multitasking evaluation decks were processed from all the testers to obtain a sketch of their environmental discourse and interpersonal communication with TV, PC and other media, which implied sensitivity to their ecology of space and place. The following decisions were made while designing these questions:

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1. Polyattentiveness vs. One Thing at a Time Aspect

Polyattentiveness, the ability to watch or listen carefully to more than one thing at a certain time, comes from John Cage's dancing style which indicates that performance with openness allows the audience's equal attention to any aspect of the making of art; this kind of style also facilitates shifting the audience's attention to formerly hidden aspects and combinations simultaneously (Copeland, 1983, p.321).

According to this aspect, Question No. 1, 'Which TV watching behaviour best describes yours?' is thus designed to unravel testers' TV watching behaviours, where five different answers are formulated for their response, including 'watching your favourite programmes at a certain time period', 'watching your favourite programmes while at the same time watching other programmes during commercial breaks', 'using the remote control frequently to surf all programmes for one of interest', 'watching TV programmes with my family that we all like to watch' and 'seldom watch TV'.

In comparison with the first question, the design of Question No. 2, 'We can benefit from computers for many things; for example, we can watch TV programmes or share footage from other people (such as with YouTube). What kind of media behaviour below best describes you?', is intended to highlight the young generation's media culture as an active audience, combining different TV programme watching behaviours either through a TV set or video footage from a PC shared with other people. Hence, 'watch this kind of programme every day from a computer instead of from traditional TV', 'sometimes watch this kind of programme from a computer; however, I still prefer watching traditional TV programmes', 'tried watching this kind of programme from a computer before, but seldom watch it this way now due to poor Internet speed and display quality'

and 'never try watching this kind of programme from a computer' are listed as the four possible answers from which testers choose to describe their new media consumption.

2. Social Networking Aspect

To get a clearer picture of targeted testers' social networking behaviour via their frequency and quantity of using corresponding social networking tools such us MSN or Skype, Questions No. 3 and No. 4 are asked to describe 'How often do you use IM (instant messaging) tools, such as MSN or Skype, to contact your family or friends?' and 'How many contacts does your IM (such as MSN) have?', respectively.

3. Multitasking Aspect

Experimental questions for this aspect were organised to apply the theoretical research on the current digital generation's multitasking behaviours to their different uses of media. Question No. 5, 'Some people watch TV while talking on the phone; some do their homework while listening to MP3 music; some browse the Internet while reading comic books; and some even play PC games while chatting with friends. Which multitasking behaviour below best fits yours?', with four choices provides two routes of answering for testers. Those who answered 'do multi-tasks all the time', 'do multi-tasks based on mood' or 'can only do one thing at a time, since too many concurrent media activities would distract my attention' moved on to Question No. 6, 'Which media activity below do you most possibly conduct in multitasking mode?' Question No. 6 was designed to further understand testers' multitasking content, including listening to music, watching TV, reading and doing homework, and using the computer. Those who answered 'never do any of the above activities' jumped to Question No. 7 directly.

4. Media Environment Aspect

Question No. 7, 'What equipment below exists in the place you study?', was formulated to determine the facilities setup of the young generation's studying environment, which may affect their media activities or behaviours. The multiple-choice answers included television, PC, video game player, DVD, video cassette recorder (VCR) or audio player like MP3 or radio.
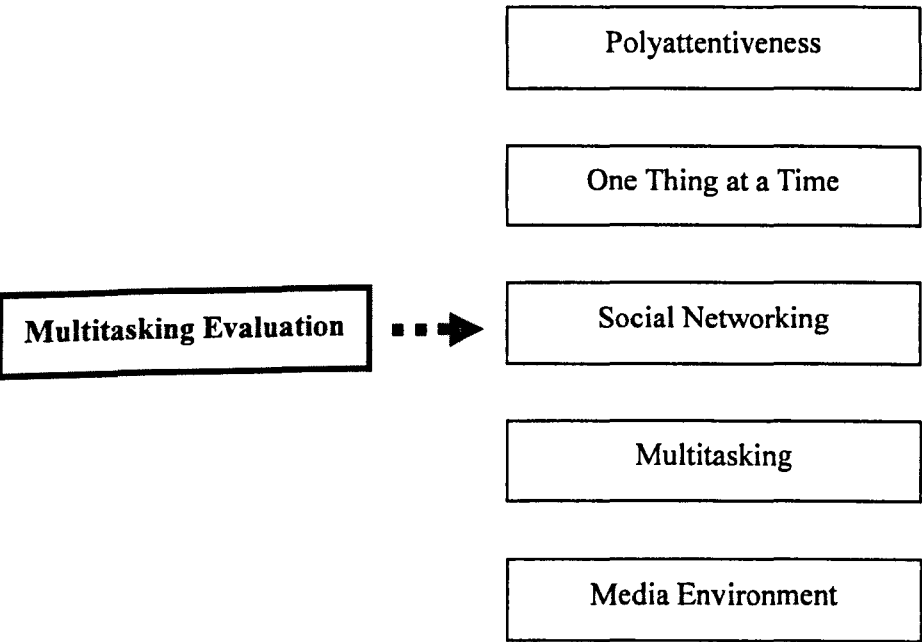

Figure 4-6: Different Aspects of the Design on the Multitasking Questionnaire

4.4 The Second Part: Media Diary for One-Week Collection

The performance of interactive television based on three directions of tests (knowledge, attitude and behaviour) combined with deployment of a multitasking evaluation questionnaire to provide observations on my experimental setting unravelled intuitive feedback from this testable programme regarding media behaviours. This, together with the qualitative media diary,

helped to echo and test my previous hypothesis regarding providing empirical evidence of how new the 'new media' really are in practical terms of social and cultural behaviours and what place new media hold in the young generation's media environment.

The questionnaire was the most straightforward tool to assess the empirical reality of testers' reactions; the media diary helped to explore more intangible terrain outside the experiment. With the diary, testers could think clearly and record what they captured from 'little experiences of everyday life' (Deacon et al., 1999, p.71; Wheeler and Reis, 1991, p.339).

A long-term and large-scale research project by the Kaiser Family Foundation looked at the media generation between 8 and 18 years of age; a media diary indicated the amount and conditions of media exposure, the types of content or activities engaged in, as well as various demographic and personal characteristics of the media generation. My fieldwork, inspired by the Kaiser Foundation research, similarly adopted the media diary method to observe the activities of sample groups of children in Taiwan (Robers et al., 2005, p.5).

By keeping a media diary, I wanted testers to become aware of how much media they are exposed to, including activities they might not normally think about, such as glancing through a magazine at tea time or casually surfing the Internet while phoning friends. In other words, the one-week media diary was intended to allow testers to pay more attention to their behaviour than they normally would to delineate what their media exposure is really like. While there was more than one single source of information in terms of what testers said about how they feel while TV watching and media multitasking, the media diary was used to surmise and reconstruct children's electronic activities from their

inner experiences to invoke rich and valid data (Kubey and Csikszentmihalyi, 1990, p.57).

The media diary (see Appendix D for weekdays and Appendix E for the weekend) provided both researchers and testers with a feel for what a 'typical' week is like for testers media-wise. Two issues need to be considered here:

1. What is the pattern of a typical week for children in terms of media usage?

2. What is a typical week of media usage related to testers' TV watching environment?

To sum up, the media diary was intended to yield a situational sketch and get a sense of what media children are typically exposed to by choice or circumstance. Although testers may have had a few days when they were not exposed to any media, or just had their PCs on, the activity participation part of the media diary was mainly intended to see whether children are 'actively' or 'passively' exposed to media.

Classification of Media Activities

First, I classified the young generation's activities, especially under Taiwan's social circumstances for children and young people, into the following activities:

- Watching TV
- Visiting Web sites by PC
- Doing homework by PC
- Playing computer games

- Playing video games (PS2/PS3, Wii)

- E-mailing someone by PC and chatting on instant messaging (MSN)

- Watching DVDs/videotapes

- Listening to music (radio)

- Listening to MP3 (iPod, Walkman)

- Reading books, magazines and other printed media

- Other computer-related activities and using mobile phones

Questions in the Diary

The one-week media diary covered testers' extracurricular media activities, using thirty minutes as the observation unit with coverage from 6 PM to 10 PM during weekdays and 8 AM to 10 PM during weekends.

The questions in the media diary were organised as follows:

1. Were you doing any media activities during the 30-minute observation period? (yes/no)

2. What was your main media activity? (select one answer from listed media activities, as above)

3. Who was with you? (select one from below)

   - Alone

   - Mother or father

   - Sisters or brothers

   - Friends

   - Grandparents

   - Teachers

   - Someone else

4. Where were you doing the chosen media activities? (select one from below)

- ■ Bedroom (personal room)

- ■ Living room (public room at home)

- ■ Friend's house

- ■ School

- ■ Public place (extracurricular school, library)

- ■ Somewhere else (community's receptions)

Diary entries were explained to and coordinated by parents and classroom teachers, starting from the day the TV watching questionnaire was completed in the school. To minimise the possibility of receiving invalid data, I asked the classroom teachers to pass out each day's diary on one printed form to students and to remind students to return the completed diary form the next day; the total process of media diary collection was completed in a one-week period.

The combination of a quantitative questionnaire and qualitative media diaries can help in observing and understanding media exposure and how it takes place in the wider context of media consumption in youth culture. The next chapter will present the results and findings.

Chapter Summary

This chapter focused on measurement of audiences' behavioural involvement through a questionnaire administered after the audiences watched an interactive TV or standard TV programme. In addition, a one-week media diary was used to understand and observe situational settings in the micro-geography of the testers' home.

1. This chapter explains the multi-method approach used to study Taiwanese young people's learning from TV and their environment of media uses outside formal primary schools.

2. The main purpose of conducting an experiment for my thesis was to explore whether the independent variable, 'whether the programme has an interactive design that makes a difference', produced any effect on the knowledge, attitude and behaviour of children aged 11 to 12 in Taiwan.

3. The experiment was based on comparisons of respondent groups who were exposed to different combinations of TV watching followed by administration of the main-test questionnaire and multitasking questionnaire to probe the respondents' media sensibility.

4. To better understand the role of media in the young generation's life, the media diary was designed to observe and establish the range and extent of youths' media uses and consumption for a period of one week.

Chapter 5 Experimental Results and Findings from the Multi-method Research

Chapter Overview

This chapter contains a discussion of the results and findings from the multi-method research. Note that data were collected from a TV watching questionnaire and multitasking evaluation to formulate the multiple variables on TV learning from knowledge, attitude and behaviour perspectives. The findings of multi-variable analysis revealed that interactive TV for learning purposes does not achieve statistical significance with regard to the TV watching effect: Adding interactivity to the TV platform does not improve positive learning. In addition, the qualitative-style media diary used 'conditional prediction', meaning 'the description of the conditions under which certain social changes may take place', to describe changes in the structure of social situations related to the widespread use of new media and their interworking with TV watching within the media environment of pre-adolescents' families in Taiwan (Meyrowitz, 1986, p.332).

5.1 Formative Evaluation from Multi-variables

A multi-variable method was used to access all the different forms of variables required to shed light on TV learning and a household's media experiences. The first approach of analysis involved making comparative assessments of potential variations induced from televised learning. Assessments of degree focused on a variety of terms from knowledge tests, attitude gaining and behavioural measures towards experimental content and production (Williams and Stanford, 1977, p.86). The formative evaluation (see Figure 5-1)

attempted to account for the combined influences of media, contexts and audiences using corresponding variables to observe effects on young people's knowledge, attitude and behaviour.

Figure 5-1: The Multi-variable Approach of Evaluation

Media Variables + Context Variables + Audience Variables =   Effect

Content Variations	Viewing Frequency	Sex, Grade	Knowledge
Platform Variations	Viewing Environment	Media Background	Attitude
New Media Variations	Media Activities	Social Background	Behaviour
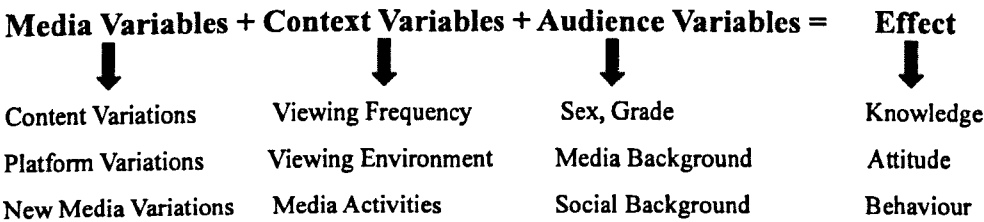
Burns called the first period of approach the 'Formative Evaluation', the 'development and evaluation of whole program (system) success, in development and evaluation of program segments and as an integral part of any process segment for learners in terms of the learner receiving information about learning success', which refers to assessments undertaken during the analysis of experimental multi-variables on samples of the targeted audience (Burns, 1977, p.120).

To test whether interactive TV may have profound effects on knowledge, attitude and behaviour changes, I excavated three different categories of variables to examine how the consideration of different scenarios affects the outcome of television learning. The three variable sources (see Figure 5-1) were: media differences (content, platform and new media), context conditions (viewing patterns, environment and activities) and audiences' background differences (age, media usage and social status). In addition, multi-variable testing involved changing many different variables simultaneously to demonstrate statistical significance. Therefore, it is useful to begin this discussion with general background data descriptions (see Section 5.2). Then, the formative evaluation

will be examined using three subjects: TV watching questionnaire (see Section 5.3), school-type analysis (see Section 5.4) and multitasking evaluation (see Section 5.5). All the collected data were entered in SPSS software for in-depth analyses.

5.2 General Background Data

The classification data were analysed to provide background information about the sample. In this section, I provide general background information on the testers regarding audience-related variables, which include participant type, gender percentage, science grade, time spent watching TV and time spent surfing the Internet every day. A summary of the results is as follows:

1. The main test experiment had a total of 253 student participants. There were 123 students (accounting for 48.6% of all participants) assigned randomly to watch a live programme of traditional TV and complete a corresponding questionnaire. The remaining 130 students (accounting for 51.4% of all participants) were assigned to watch the same programme with the interactive interface (multimedia home platform (MHP)-electronic programme guide (EPG)) and finish their corresponding questionnaire at the end (see Table 5-1).

Table 5-1: Participant Distribution of Two Experiment Groups
for the Multi-method Fieldwork

Group Type	Frequency	Percent
Traditional Group	123	48.6
Interactive Group	130	51.4
Total	253	100.0

2. Among the 253 experimenters, 127 were male, accounting for 50.2% of all participants, while the 126 females account for 49.8% (see Table 5-2).

Table 5-2: Gender Percentage

Gender	Frequency	Percent
Male	127	50.2
Female	126	49.8
Total	253	100.0

3. According to participants' school grades in the science area (which correspond to scientific subjects of the experimental programme), on a scale of 0~100, 7.5% were below 60; 7.2% were between 60~69; 15.5% were between 70~79; 19.8% were between 80~89; and the remaining 50.0% were above 90 (see Table 5-3).[2]

Table 5-3: Participants' Grades in Science

Grade Range	Frequency	Percent
Below 60	19	7.5
60-69	18	7.2
70-79	39	15.5
80-89	50	19.8
Above 90	126	50.0
Total	252	100.0

4. When it came to participants' average time spent watching television every day, 4.4% watched no television; 24.3% watched less than 30 minutes; 40.2% between 30 and 60 minutes; 12.7% between 1 and 2 hours; and 18.3% more than 2 hours. This means over 30% of the participants watched TV

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[2] Notice that there is one student's data missing on this item.

more than one hour each day (12.7% of 1 to 2 hours plus 18.3% of more than

2 hours equals 31.0%, from Table 5-4).[3]

Table 5-4: Participants' Time Spent on Watching Television Every Day

TV Watching Time	Frequency	Percent
No watching TV activity	11	4.4
Less than 30 minutes	61	24.3
Between 30 - 60 minutes	101	40.2
1 to 2 hours	32	12.7
More than 2 hours	46	18.3
Total	251	100.0

5. For participants' time spent surfing the Internet every day, 12.7% did not

browse the Web at all; 36.7% surfed the Internet less than 30 minutes; 28.7%

between 30 and 60 minutes; 7.6% between 1 and 2 hours; and 14.3% more

than 2 hours (see Table 5-5). When compared with TV watching, which had

31.0% for more than one hour (12.7% of 1 to 2 hours plus 18.3% of more

than 2 hours equals 31.0%, from Table 5-4), participants spent less

time surfing the Internet than on other media activities, with only 21.9% of

them doing it for more than one hour every day (7.6% of 1 to 2 hours plus

14.3% of more than 2 hours equals 21.9%, from Table 5-5).[4]

Table 5-5: Participants' Time Spent on Surfing the Internet Every Day

Internet Surfing Time	Frequency	Percent
No Web-browsing activity	32	12.7
Less than 30 minutes	92	36.7
Between 30 - 60 minutes	72	28.7

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[3] Notice that there are two students' data missing on this item.
[4] Notice that there are two students' data missing on this item.

1 to 2 hours	19	7.6
More than 2 hours	36	14.3
Total	251	100.0

5.3   Test Results Analysis of the TV Watching Questionnaire

Research / Statistical Hypotheses under Comparisons

In Chapter 2, we noted that interactive TV has elaborated on the 'new media' in the diffusion process of TV history by adding interactivity to TV and putting edutainment into programme content to create opportunities for the young generation's learning. To date, for learning purposes, we have no objective means of understanding whether audiences who watch interactive television differ in significant ways from those that do not. The research purpose behind deploying the TV watching questionnaire was to analyse and validate previous theoretical research and to determine whether any new findings or explanations could be derived. A secondary purpose was to seek potentially conflicting theory from earlier literature reviews (Gunter, 2002, p.211; Hansen et al., 1998, p.227).

To re-formalise the research question and make a precise declarative statement, hypotheses testing was used to enable a statistically sound prediction of the outcomes. Two hypotheses were required in the testing process: a null hypothesis and an alternative hypothesis (Lewin, 2005, p.223). The null hypothesis assumed that there is no real difference between two variables; in contrast, the alternative hypothesis assumed that there is a difference between two variables.

In the experiment, I examined hypotheses on knowledge, attitude and behaviour through t-tests from two aspects to discover whether predictions from alternative hypotheses appear significant (Lewin, 2005, p.223). The t-test generally plays a major role in verifying hypotheses by comparing two experimental groups, which is 'commonly used to determine whether the mean value of continuous outcome variable in one group differs significantly from that in another group' (Browner et al., 2006, p.66).

First, we manipulated how much interactive television each tester was exposed to; in other words, half the audience in the experiment was assigned to interactive-function enabled television (*experimental group*, as the interactive group), while, the rest were exposed to no interactive functions at all (*control group*, as the traditional group). Second, the study looked at effects from different independent variables (or Xs), the main one of which concerned whether there is an interactive design, on audiences' learning effect (knowledge), degree of learning satisfaction (attitude) and future viewing behaviour (behaviour). Three outcome variables, also called 'dependent variables' or 'Ys' in a statistical sense, were also examined to discover any special relationships between Ys and Xs via certain statistical modeling.

I will begin by discussing the knowledge test results and findings from the questionnaire analysis.

(1) Knowledge Test Results and Findings

The first part of the questionnaire aimed to identify audiences' knowledge level of interactivity options introduced by the MHP for digital TV. The interface

of interactive programmes delivers content through the MHP service, while traditional programmes only deliver standard content designed for the usual TV watching behaviour. More attention should be paid to audiences' learning effect under these circumstances. Attitude development and possible future viewing behaviour are also key issues discussed in my research.

Learning is a dynamic process and I am concerned about the platform (traditional/ interactive) through which participants of edutainment programmes can most effectively increase their knowledge test performance. Based on my observations of different aspects of the learning outcome, the first research hypothesis addressed viewers' learning effect from interactive television in a contemporary media environment.

The null and alternative hypotheses on viewers' knowledge test (K-test) were:

Null hypothesis: There is no difference between the means of K-test scores from the traditional and interactive group.

Alternative hypothesis: There is difference between the means of K-test scores from the traditional and interactive group.

In the knowledge test, I used a t-test to compare means within two groups (see Table 5-6). Since the difference in means from the K-test was not statistically significant at alpha = .05 (p=.807>.05), there was not enough evidence to reject the null hypothesis, and thus we can conclude that, statistically, the learning outcomes (knowledge scores) from the traditional and interactive groups do not differ.

The K-test indicated that the interactive group did not differ from the traditional group in terms of knowledge gained from the programme. Therefore, one can say that interactive lectures in television learning do not provide more effective learning results than the standard TV watching situation does.

(2) Attitude Test Results and Findings

The second test examined changes in students' attitudes and beliefs about the new interactive platform for television learning and connections between those changes. According to Fishbein and Ajzen (1975), attitude is defined as 'a learned predisposition to response in a consistently favorable or unfavorable manner with respect to a given object' (Fishbein and Ajzen, 1975, p.6). It is necessary at this point to explain 'attitude', which plays a decisive role in determining motives for media use, in connection with learning outcome. Attitude affects the behaviour or behavioural intentions of audiences as they face new media. Therefore, it was hypothesised that attitudes towards interactive television as a useful learning medium tend to have a positive relationship with acceptance of new media.

The null and alternative hypotheses on viewers' attitude test (A-test) were:
Null hypothesis: There is no difference between the means of A-test scores from the traditional and interactive group.
Alternative hypothesis: There is difference between the means of A-test scores from the traditional and interactive group.

Table 5-6: T-Test Analysis on the TV Watching Questionnaire

T-Test Topic	Test Result	Statistical Significance	Interpretation
Knowledge Test (K-test)	p-value = .807	No (p-value>.05)	The mean difference of K-test was not significant at alpha=.05 (p=.807>.05); there is not enough evidence to reject the null hypothesis.
Attitude Test (A-test)	p-value = .048	**Yes** (p-value<.05)	The t-test rejects the null hypothesis and so confirms the scientific hypothesis that A-test in the traditional group (M=4.1938; SD=0.85945) showed higher mean scores than those presented from the interactive group (M=3.9803; SD=0.83331).
Behaviour Test (B-test)	p-value = .322	No (p-value >.05)	The mean difference of B-test was not significant at alpha=.05 (p=.322>.05); there is not enough evidence to reject the null hypothesis.

In the attitude test, I used a t-test to compare means within two groups (see Table 5-6), which showed that the difference in means between A-test scores from the traditional and interactive group was statistically significant at alpha = .05 (p=.048<.05).

Based on the t-test, the null hypothesis is rejected so as to confirm the scientific hypothesis that the A-test conducted in the traditional group (mean = 4.1938; standard deviation = .85945) indicated higher mean scores than those in the interactive group (mean = 3.9803; standard deviation = .83331). The 95% confidence interval of the difference between the two means is (.00176, .42521), which excludes zero, and thus further strengthens the t-test result.

Therefore, based on the test results, it would not make sense to assume that interactive functions have changed young people's attitude towards TV programmes. It is important to stress that traditional TV programmes can still invoke audiences' positive interest and attitude for learning purposes.

The findings from the A-test scored with a 5-point scale (from strongly disagree = 1 to strongly agree = 5) indicated that interactivity appears to generate little enthusiasm in testers' attitude towards television learning (T-learning). This is surprising, because typical thinking about the interactive learning environment is that providing an enjoyable experience is essential to the learning process. However, the traditional group with standard usability and their learning from TV watching showed that adding interactivity to TV content design did not increase testers' learning interest.

(3) Behaviour Test Results and Findings

One final perspective to be checked was whether audiences access media through different platform designs to fulfil specific needs. The emergence of the so-called 'new media' requires technical understanding, as end-users not only need to have knowledge regarding how to operate each medium, but also need to demonstrate the motivation to select a medium among new types of media. The behaviour test was used to observe whether the addition of interactive functions to the programme would make testers change the current watching mode or affect their future viewing behaviours. We, therefore, investigated how awareness and persuasion may affect interaction or involvement with the programme, which is a measure of how qualified the respondent is.

The null and alternative hypotheses on viewers' behaviour test (B-test) were:

Null hypothesis: There is no difference between the means of B-test scores from the traditional and interactive group.

Alternative hypothesis: There is difference between the means of B-test scores from the traditional and interactive group.

In the B-test, again I used a t-test to compare means within two groups (see Table 5-6). The difference in means from the B-test was not statistically significant at alpha = .05 (p=.322>.05); thus, there is not enough evidence to reject the null hypothesis, and we can conclude that, statistically, users' viewing behaviours with regard to the traditional and interactive group are not different due to the enabling of interactive functions.

Ajzen and Fishbein indicated that 'attitude could explain human actions' and can function as a crucial predictor of behaviour (Ajzen and Fishbein, 1980, p.13). This study's findings showed that interactive TV has no significant relationship with any of the variables considered, such as recommending this programme to others, searching

for more information from programme's Web site, or emailing and printing related information from the Web site. Neither the traditional programme nor the interactive version appreciably altered the testers' watching behaviour. Therefore, one can conclude that the design of interactive TV is not able to ignite viewers' positive intentions to embrace the new style of learning interface.

Based on the quantitative questionnaire's results, it is concluded that the traditional TV watching groups have more positive knowledge, attitude and behaviour scores than those of the interactive TV watching groups. Thus, in the following section, I observe whether viewers' social status (from public / private school) results in any differences on learning effects.

5.4 School Types and Learning Effects

The purpose of this section is to take an in-depth look at whether participants' school types have any effect on their learning, based on the observation results from comparison groups. Coleman and Hoffer argued that private schools, through school selection procedures or self-selection mechanisms, can attract students with better academic potential than public schools can (Teddlie et al., 2000, p.160; Coleman and Hoffer, 1987, p.87), which makes it sensible to elaborate on this topic to some extent.

The differences among social classes in terms of media access and usage at home may shape different learning environments for children. Table 5-7 presents the experimental samples by school type, public or private, along with the media environment outlook for children's study rooms in Taiwan. Proportions of testers from public or private school having media devices such as a TV, personal computer (PC), game player, telephone, digital video disc (DVD) player or audio player are calculated; for example, 48 of the 129 testers (0.37, or 37%) from public school have a TV in

their study room, as do 22 of the 120 testers (0.18, or 18%) from private school.

The results showed that private school students seem to have more limitations on their access to visually oriented media devices (e.g., TV, PC, game player, DVD player) since the proportions of testers having them appear lower in this group; however, the parents of private school students allowed more use of the telephone and audio player in the study room than public school parents, as can be seen in Table 5-7.

Table 5-7: Media Environment Outlook of Testers' (from Public or Private School) Study Room

	Proportion of testers from public school having the left listed media device	Proportion of testers from private school having the left listed media device
TV	0.37	0.18
PC	0.56	0.36
Game Player	0.15	0.09
Telephone	0.47	0.48
DVD Player	0.22	0.13
Audio Player	0.50	0.57

In the following section, any special relationship between students' learning effects and the school system (public or private) they come from will be explained. The statistical method of Pearson's Chi-square test, which examines whether there is an association between two categorical variables (Field, 2005, p.125), is adopted to determine any significant correlations between the following experimental variables and school type:

(1) Attitude Test Results vs. School Type

First, the Chi-square test was used to check the correlation between attitude test results and school type in both the traditional and interactive group, where the null hypothesis is 'the school composition of primary students has no correlation with their attitude on TV learning'.

According to the Chi-square test, in the traditional programme environment, there exists a correlation between students' attitude and where they come from (public or private school) that is statistically significant, and as the data show, students from public school have a better attitude test result than those from private school ($\chi2=25.821$). In contrast, in an interactive programme environment, there is no statistical evidence (p=.074) to demonstrate a correlation between the test result and school type (see Table 5-8).

Watching TV after school has become the main entertainment source in children's media environment. This finding tells us that public school students are more accustomed to the traditional TV watching style than private school students. According to Table 5-8, public school students spend more time watching TV because of easy access in their study rooms. Attitude towards traditional TV watching has relatively deeper roots in the minds of public school students.

(2) Internet Using Behaviour vs. School Type

Using Pearson's Chi-square test to check the correlation between surfing the Internet for more than one hour each day and school type, the null hypothesis is 'there is no correlation between the school type and the amount of time that a participant surfs on the Internet'.

Table 5-8: Chi-Square Correlation Test Analysis vs. School Type

Chi-Square Correlation Test Topic	Test Result	Statistical Significance	Interpretation
Attitude test score vs. School type in Traditional Group	$\chi2 = 25.821$; df = 15; p-value = .040	Yes (p-value < .05)	There exists a correlation that is statistically significant between students' attitude and their school type (public or private school); as the data show, students from public school have a better Attitude Test score than those from private school.
Attitude test score vs. School type in Interactive Group	$\chi2 = 24.763$; df = 16; p-value = .074	No (p-value > .05)	There is no statistically significant correlation between the Attitude Test score and school type.
Watching TV for less than 30 minutes each day vs. School type	$\chi2 = 5.743$; df = 1; p-value = .018	Yes (p-value < .05)	There exists a correlation that is statistically significant between students' TV watching time of less than 30 minutes and their school type (public or private school); as the data show, students from private school have a higher percentage of watching less TV than those from public school.
Watching TV for more than 2 hours each day vs. School type	$\chi2 = 23.976$; df = 1; p-value = .000	Yes (p-value < .05)	There exists a strong correlation that is statistically significant between students' TV watching time of more than two hours and their school type (public or private school); as the data show, students from public school have a higher percentage of heavily watching TV than those from private school.
Surfing the Internet for less than 30 minutes each day vs. School type	$\chi2 = 7.337$; df = 1; p-value = .008	Yes (p-value < .05)	There exists a correlation that is statistically significant between students' Internet surfing time of less than 30 minutes or no activity and their school type (public or private school); as the data show, students from private school have a higher percentage of being poor in Internet surfing than those from public school.
Surfing the Internet for more than one hour each day vs. School type	$\chi2 = 14.106$; df = 1; p-value = .000	Yes (p-value < .05)	There exists a strong correlation that is statistically significant between students' internet surfing time of more than one hour and their school type (public or private school); as the data show, students from public school have a higher percentage of heavily surfing the Internet than those from private school.

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According to the Chi-square test result, there exists a strong correlation between students' Internet surfing time of more than one hour (i.e., heavy Internet users) and where they come from (public or private school) that is statistically significant (p=.000), and as the data show, students from public school have a higher percentage of heavily surfing the Internet than those from private school (see Table 5-8).

This finding has several explanations: First, public school students have no severe restrictions on Internet usage unlike private school students, who experience more parental involvement and regulation. Second, assuming more family funding support, private school students in Taiwan may need to attend to more extracurricular activities than public school students do, which makes private school students less able to spend the amount of time surfing the Internet at home that public students spend. Finally, private schools have provided a mature computer environment with Internet connections for student access directly from school; in contrast, computer equipment has a lower penetration rate in public schools and, thus, students should be more eager to use the Internet at home.

(3) TV Watching Behaviour vs. School Type

Finally, I used Chi-square tests to check the correlation between watching TV for more than two hours each day and school type. The null hypothesis is 'there is no correlation between the school type and the amount of time that a participant watches TV'.

According to the Chi-square test ($\chi 2$=23.976), there exists a strong correlation between students' watching TV more than two hours and where they come from (public or private school) that is statistically significant (p=.000), and as the data show,

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students from public school have a higher percentage of heavy TV watching than those from private school (see Table 5-8). The finding is consistent with the previously discussed Internet using scenario, where public school students have more TV watching time at home than those from private schools.

The following section considers children's media use from the perspective of multitasking behaviours, with the results based on the multitasking evaluation questionnaire analysis (see Appendix C).

5.5 Results Discussion of Multitasking Evaluation Questionnaire

The target here is to explore results from the multitasking evaluation questionnaire (see Appendix C) in which we consider multitasking from the following directions: (1) TV watching behaviour; (2) social networking behaviour; (3) polyattentiveness behaviour; and (4) media environment.

(1) TV Watching Behaviour

1. Regarding TV watching behaviour, 36.9% of participants watched their favourite programmes while at the same time watching other programmes during commercial breaks; 25.3% watched their favourite TV programmes at certain time periods; 16.1% used the remote control frequently to surf all TV programmes and then to choose the one of interest; 14.1% usually watched TV programmes with their family; and only 7.6% seldom watch TV (see Table 5-9).[5] The finding suggests that children mostly prefer to watch their personal favourite programmes,

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[5] Notice that there are four participants' data missing on this item.

while it is a common behaviour to change from one channel to others during commercial breaks. Some participants also liked to watch their favourite programmes (cartoons or sitcoms) only at a certain time period. Interestingly, parents may control programme content or sequence when their children watch television together with family members and, thus, 'I usually watch TV programmes with my family that we all like to watch' ranks third among answers to this question.

Table 5-9: Which TV watching behaviour best describes yours?

TV Watching Behaviour	Frequency	Percent
Watching your favourite programmes at certain time period	63	25.3
Watching your favourite programmes while at the same time watching other programmes during commercial breaks	92	36.9
I use the remote control frequently to surf all programmes, and would watch one of my interest	40	16.1
I usually watch TV with my family on programmes we all like to watch	35	14.1
I seldom watch TV	19	7.6
Total	249	100.0

2. Most participants accepted watching TV from an Internet-based platform via PC. More than 61.4% sometimes watch TV programmes from the computer; however, they still prefer watching traditional TV programmes. In addition, 18.5% of participants have never tried watching TV programmes from computers; 13.3% have given up watching TV programmes using the Internet due to quality issues; and only 6.8% watch TV programmes from computers instead of traditional TV

every day (see Table 5-10).[6]

Table 5-10: We can benefit from computers for many things; for example, we can watch TV programmes or shared footage from other people (such as YouTube). What kind of media behaviour below best describes you?

Media behaviour that best describes you	Frequency	Percent
I watch this kind of programmes everyday from computer instead of from traditional TV.	17	6.8
I sometimes watch this kind of programme from computer; however,I still prefer watching traditional TV programmes.	153	61.4
I tried this kind of programme from computer before, but seldom watch it this way now due to the poor Internet speed and display quality.	33	13.3
I never try watching this kind of programme from computer.	46	18.5
Total	249	100.0

(2) Social Networking Behaviour

1. Regarding the behaviour of social networking using a computer, 41.4% of participants contact friends by instant messaging (IM) only on weekends and holidays; 32.5% seldom use IM tools; 14.9% use IM tools every 2 to 3 days; and only 11.2% use IM tools when they turn on the computer every day (see Table 5-11).[7] The results here indicate that the so-called 'Digital Native' phenomenon is not taking hold in Taiwan with this stage of children; 73.9% of participants (41.4% plus 32.5%, from Table 5-11) only use IM tools on the weekend or seldom use IM tools at all. Only one-tenth (11.2%) or so of the participants connect to an IM tool every day.

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[6] Notice that there are four participants' data missing on this item.
[7] Notice that there are four participants' data missing on this item.

Table 5-11: How often do you use IM (instant messaging) tools, such as MSN or Skype, to contact your family or friends?

How often do you use IM tools	Frequency	Percent
Daily, when I turn on my computer	28	11.2
Every 2-3 days	37	14.9
Not often, only during the weekend or holidays	103	41.4
Seldom use	81	32.5
Total	249	100.0

2. Moreover, 36.9% of participants seldom use IM contact; 31.3% have contact with fewer than 10 people; 21.3% have contact with more than 20 people; and 10.4% have contact with between 10 and 20 people (see Table 5-12).[8] The results, again, show that in Taiwan most people at age 11 do not utilise IM software too much.

Table 5-12: How many contacts does your IM (such as MSN) have?

How many IM contacts do you have	Frequency	Percent
More than 20 people	53	21.3
Between 10-20 people	26	10.4
Under 10 people	78	31.3
Seldom use	92	36.9
Total	249	100.0

(3) Polyattentiveness Behaviour

In terms of the participants' multitasking behaviour, 36.9% conduct two media activities at the same time, depending on their mood and the importance of their work;

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[8] Notice that there are four participants' data missing on this item.

22.9% do not participate in any listed media activities; while 22.1% only engage in one media activity at a time because they worry about distractions, and 18.1% do indeed perform multi-tasks all the time (see Table 5-13).[9] These findings reveal irregular inflections, in which only approximately one-fifth of the testers perform multitasking behaviours all the time (18.1%), and approximately another fifth never perform multitasking behaviours (22.9%). Moreover, about one-fifth of the testers (22.1%) only perform one media activity at a time, while most testers (36.9%) perform more than one media activity simultaneously, depending on their mood. Technological determinism has clearly overstated the multitasking behaviour of the young generation, since, based on the fieldwork analysis, only 18.1% of participants confirm that they are multitaskers all the time.

Table 5-13: Some people watch TV while talking on the phone; some do their homework while listening to MP3 music; and some browse the Internet while reading comic books. Which multitasking behaviour below best fits you?

Multitasking behaviour that best fits you	Frequency	Percent
I can do multi-tasks all the time	45	18.1
I sometimes do two media activities at the same time but it depends on my mood and importance of my work	92	36.9
I can only do one thing at the same time, since too many media activities concurrently would distract my attention	55	22.1
I never do any of the above activities	57	22.9
Total	249	100.0

Excluding the 57 participants who skipped this question (selected 'I never do any

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[9] Notice that there are four participants' data missing on this item.

of the above activities'), 40.8% of participants prefer listening to music as their first multitasking priority, followed by using the computer (26.0%) and watching TV (20.9%), while only 12.2% of participants choose reading and doing homework as their main multitasking mode (see Table 5-14). These findings support Mayer and Moreno's perspective that redundancy effect will be generated if different methods are used concurrently to convey the same message, which increases cognitive load. As a learner faces repeated information presentations at the same time, he or she must unavoidably deal with all the information confronted, resulting in higher cognitive load (Mayer and Moreno, 2002, pp.87-99). That is why listening to music (40.8%) becomes participants' first multitasking choice as the only audio involvement during media activities. The computer as the main multimedia device also converges with other visual and audio activities so that testers tend to do lots of things when using the computer. TV watching ranks third in prioritisation of multitasking behaviours, while only a few participants chose the option of reading and doing homework.

Table 5-14: Which media activity below do you most possibly conduct in multitasking mode?

Most Possible Media Activity in Multitasking Mode	Frequency	Percent
Listening to music	80	40.8
Watching TV	41	20.9
Reading and doing my homework	24	12.2
Using computer	51	26.0
Total	196	100.0

(4) Media Environment

Participants were asked whether they have any of the listed seven media

equipment in their study environment. Among them, 53.4% have audio players (MP3, compact disc (CD) player or radio); 47.0% have a telephone; 46.2% have a PC; 28.1% have a TV set; 18.1% have DVD players or video cassette recorders (VCRs); and 12.0% of participants have video game players in their study rooms (see Table 5-15).[10] Based on Sweller's research, the cognitive load theory explains the multimedia environment by using a series of dual-task (visual and audio) methodologies, and the quality of interactive design will be greater if attention is paid to the role of different tasks and limitations of working memory (Sweller, 2006, pp.353-357). The finding from participants' media environment proves that parents or children themselves mostly put 'one-task only' devices (telephone and audio player) in their study rooms. The PC is the convergence device not only for entertainment but also for educational purposes; it also may be used for certain visual tasks like checking Web sites and audio tasks such as listening to music. Not surprisingly, 46.2% of participants have a PC in their study rooms. In addition, TV has both entertainment and information-sharing functions; 28.1% of parents place a television set in their children's study environment, a lower penetration rate than the PC. The entertainment orientation of video game players and DVD players results in a relatively lower percentage of their appearance in study rooms.

Table 5-15: What equipment below exists in the place you study?

Equipment Existing in Your Study Room	Frequency	Percent
Have TV set	70	28.1
Have PC	115	46.2
Have video game players	30	12.0

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[10] Notice that here a participant may have more than two types of the listed seven media equipment, while there are 249 participants providing this information after de-duplication (with 4 missing still).

Have telephone	117	47.0
Have DVD players or VCRs	45	18.1
Have audio players	133	53.4

To sum up, in this section, I have considered the above four multitasking evaluation cases of media technologies' effect on children's social life and behaviour. In the following section, I will extend this discussion thread to uncover more specific scenarios (hidden variables), from comparison of the two experimental groups, and derive more findings on children's learning.

5.6 More Findings on the Three Tests (K-Test, A-Test and B-Test)

In this section, I look into the effects of specific variables derived from the questionnaire analysis, including (1) poor science students (grade below 70), (2) surfing the Internet more than one hour each day, (3) watching favourite TV programme at certain time period and (4) light multitaskers, on the three tests (knowledge, attitude and behaviour). The statistical method adopted is the t-test, used to reveal any significant differences between the traditional and interactive groups.

(1) Participants with Poor Science Grades (below 70) vs. K-Test

The first study was intended to identify whether television is participants' most important learning source of information, while a main concern was whether interactive TV can improve the low-grade students' learning results. On average, 11 participants with poor science grades from the interactive group presented better scores on the K-test (mean = 9.72, standard error = 0.14084) than the 24 participants

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from the traditional group who had poor science grades (mean = 9.25, standard error = 0.20189); however, this difference was not significant according to t-test at alpha = 0.05 ($p=0.139>0.05$) (see Table 5-16).

This result suggested that students with poor science grades paid a certain amount of attention to the interactive content through four different MHP-information functions (mean=9.72>9.25). Even though the result is not significant (also, the sample is too small), the interactive programme design to strengthen students' knowledge base in science still has much room for improvement.

Table 5-16: More T-Test Analyses on the Three Tests

T-Test Topic	Test Result	Statistical Significance	Interpretation
Participants with Poor Science Grades (below 70) vs. K-Test	p-value = .139	No (p-value > .05)	On average, 11 participants with poor science grades from interactive group presented better scores on the K-test (Mean = 9.72, Standard Error = 0.14084) than the 24 participants from traditional group in poor science grades (Mean = 9.25, Standard Error = 0.20189); however, this difference was not significant according to t-test at alpha = 0.05 (p=0.139>0.05).
Heavy Internet Users: Surfing the Internet for More Than One Hour Every Day vs. K-Test	p-value = .036	Yes (p-value < .05)	The K-test in the traditional group (M=9.83; SD=0.38755) showed higher mean scores than those presented from the interactive group (M=9.39; SD=0.91933).
Traditional TV Viewers: Watching Favourite TV Programmes at Certain Time Period vs. A-Test	p-value = .023	Yes (p-value < .05)	The A-test in the traditional group (M=21.58; SD=4.52235) showed higher mean scores than those presented from the interactive group (M=18.77; SD=4.91081).
Light Multitaskers: Sometimes Using Two Media at the Same Time Depending on Mood and Work Performance vs. K-Test	p-value = .047	Yes (p-value < .05)	The K-test in the traditional group (M=9.85; SD=0.36162) showed higher mean scores than those presented from the interactive group (M=9.58; SD=0.78480).

(2) Heavy Internet Users (Surfing the Internet for More Than One Hour Every Day) vs. K-Test

As described in previous discussions, interactive TV provides a new medium which broadcasts content that converges with Internet functions. To check whether children with heavy Internet usage get accustomed to watching interactive TV and benefit from its design, this section takes an in-depth look at whether the two independent populations (traditional / interactive groups) have different performances on measures of heavy Internet use.

For heavy Internet users, 23 participants who surfed the Internet for more than one hour every day from the traditional group presented better scores on the K-test (mean=9.83, standard deviation=0.38755) than the 31 participants from the interactive group who surfed the Internet for more than one hour every day (mean=9.39, standard deviation=0.91933). Again, a t-test at alpha = 0.05 was used to compare means within the two groups and, in this case, the difference was statistically significant (p=0.036<0.05) (see Table 5-16).

The result and finding here have shown that heavy Internet users differentiate their media behaviours towards watching TV and using a PC; although heavy Internet users have in-depth knowledge of PC functions, they do not regard interactive TV and the PC as the same with respect to fulfilling their media requirements. The traditional TV programmes' design (mean=9.83>9.39) still seems to work best for the digital generation.

(3) Traditional TV Viewers (Watching Favourite TV Programmes at Certain Time Period) vs. A-Test

In this section, testers from different experimental groups (traditional / interactive) who prefer watching traditional TV will be analysed to see if any significant difference in the attitude score towards television learning is presented.

For traditional TV viewers, 31 participants from the traditional group who watched favourite TV programmes at a certain time period presented better scores on the A-test (mean=21.58, standard deviation=4.52235) than the 30 participants from the interactive group who watched favourite TV programmes at certain time periods (mean=18.77, standard deviation=4.91081). Again, t-test at alpha = 0.05 was used to compare means within the two groups and in this case the difference was statistically significant (p=0.023<0.05) (see Table 5-16).

The results and findings indicated that participants become accustomed to watching favourite TV programmes with a fixed broadcast schedule organised by the broadcasters (mean=21.58>18.77). They also have a more positive attitude towards traditional programmes, making the 'new media' of interactive programmes not attractive enough to draw the significant attention expected.

(4) Light Multitaskers (Sometimes Using Two Media at the Same Time Depending on Mood and Work Performance) vs. K-test

In this section, I discuss testers from the traditional and interactive groups who are categorised as 'light multitaskers' (sometimes using two media at the same time depending on mood and work performance) and check whether any significant effect on their knowledge performance is shown. For light multitaskers, 40 participants from the traditional group who sometimes use two media at the same time, depending on mood and work performance, presented

better scores on the K-test (mean=9.85, standard deviation=0.36162) than the 50 participants from the interactive group who sometimes use two media at the same time, depending on mood and work performance (mean=9.58, standard deviation=0.78480). Again, t-test at alpha = 0.05 was used to compare means within the two groups and in this case the difference was also statistically significant (p=0.047<0.05) (see Table 5-16).

The results and findings suggested that light multitaskers feel more comfortable watching traditional programmes. Although the interactive programme provided additional information and a multi-interface watching experience, it did not improve light multitaskers' knowledge test scores (mean=9.58<9.85) in the experiment; in contrast, the traditional programme allowed light multitaskers to more easily concentrate on the content.

The finding also indicated that viewers are limited with respect to the amount of quantitative information they can receive from TV design (visual and audio dual tasks). The light multitaskers could only receive information from live broadcasts acceptable to them; this raises the question of choice fatigue for interactive TV with multiple information resources presented at the same time on the same screen.

The questionnaire analysis from the perspectives of knowledge, attitude and behaviour yields a compelling impression of how interactive TV may indeed impinge on television learning and understanding. Therefore, in the following section, testers' media experiences from everyday life, especially TV watching, will be further studied.

5.7 Situational Approach: The Media Diary Results

As described in earlier chapters, social changes and technological developments have initiated a shift in the media environment of young people's life; I utilised an experimental questionnaire to examine television messages from different TV designs and found that traditional TV still has tremendous value. The second part of my research methodology involved using media diaries to collect summative records to look beyond specific TV messages and examine how TV and various media may create different 'situational geographies' with situational behaviours and patterns in Taiwanese children's and young people's family life (Meyrowitz, 1986, p.235. p.308).

Qualitative media diaries involved a total of 121 participants (half of the testers joined the process), which allowed us to generalise the multiple effects of clusters of variables belonging to media's platform and context, as well as pre-adolescents' characteristics regarding the media's situational conditions. In contract to the first stage of formative evaluation, the 'summative evaluation' was an after-the-fact assessment used to determine whether the questionnaire results and correlated media activities' data do indeed realise some intended or unintended effects.

In the first stage of formative evaluation, I found that testers in the traditional group have a positive attitude towards experimental TV programmes, which makes it worth conducting summative research to answer the question, 'Do Taiwanese young people watch TV at home following certain trends or rules (social situations) that are related to their family members and viewing places (physical situations)?' A hypothetical equation was derived for the general multi-dimensional case of simultaneous variation from media situations. (See Figure 5-2 for the evaluation equation.)

The statistical method of Pearson's correlation (Hinton, 2004, pp.262-275)

was adopted to measure the strength of linear associations between two variables among the three main categories of media diary data (10 different media activities, 6 different interpersonal relationships with media and 6 media-involved places), with each day broken down into 30-minute periods for a week (see Appendix D for weekdays and Appendix E for the weekend).

Figure 5-2: Generalised Form of Hypothetical Equation

Media Involving + Viewing Pattern + Viewing Place = Media Behavioural
Frequency   & Habit   Objective

10 Media Activities   6 Interpersonal   6 Media-involved
                        Relationships   Places

⬇   ⬇   ⬇   ⬇

Watching TV + with Parents & Siblings + in the Living Room = TV Watching Evaluation Model

From the Pearson's correlation test results, four variables, *TV watching time (weekdays and weekend)*, *watching with parents*, *watching with siblings* and *media activities in the living room*, produced strong correlations and evidence of the TV watching pattern, which means these variables should be considered together when formulating the evaluation model.

Conditional Prediction

Since most of the pair-wise correlation coefficients from the four variables were positive, it indicated that conditional prediction provides a more effective method for understanding TV watching behaviour.

I, therefore, designed a prediction method based on the term 'conditional

prediction' from Joshua Meyrowitz (1986, p. 332) to describe conditions under which certain social changes from TV watching patterns still act as main household events in children's family life that may influence their learning condition from television.

If variable Xs (the number of times during the weekend that the participant used which media with which family members) change or are involved in a certain way, variable Y (the number of times during the weekend that related media activities take place in the living room) will probably respond in a predictable way. 'Conditional prediction is an explanatory device that can be used to describe how changes in behaviour took place in the past (retrodiction), how they take place now, and how they may take place in the future' (Meyrowitz, 1986, p.332).

A good bit of the effective research emphasises establishing correlations rather than proving causality. Hence, to understand children's TV watching behaviours, certain assumptions regarding their media exposure must be established. Multiple linear regression analysis, to learn more about the relationship between several independent variables and the outcome variable in my experimental data (Hinton, 2004, p.270), was adopted to derive certain equations which utilise TV viewers' three common conditions (watching with parents, watching with siblings and watching places). This was combined with results from 121 participants' one-week media diary to predict their media activities in the living room which met or measured an acceptable TV watching pattern during the weekdays and weekend.

In the previous section, I analysed multiple variables which showed a significant correlation with respect to TV watching patterns at home. Linear regression was used to estimate the structure and effect of behavioural plus

topographical factors (with whom and in which places) in TV watching situations. A final equation, as formulated below, was able to provide a way to understand which social indicators, such as watching TV with any family or in a specific place, best predict children's viewing time and pattern, and whether they will be adopted and absorbed into Taiwanese society (see Figure 5-3 and Table 5-17).

Figure 5-3: Generalised Equation of TV Watching in Taiwan based on the Experiment

$$Y= 2.411 + 0.277 \times X1 + 0.326 \times X2 + 0.187 \times X3$$

(Total times of media activities taking place in the living room on the weekend)

=

2.411

+ 0.277 × (the total number of hours of watching TV on the weekend)

+ 0.326 × (total times watching with parents and grandparents on the weekend)

+ 0.187 × (total times watching with siblings on the weekend)

Table 5-17. The Multiple Correlation and Regression Analysis

Coefficients[a]

Model		Un-standardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.446	.830		4.151	.000
	The number of times during weekend (in unit of 0.5 hour) that the participant watches TV as main media activities	.486	.062	.579	7.785	.000
2	(Constant)	2.747	.801		3.429	.001

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	The number of times during weekend (in unit of 0.5 hour) that the participant watches TV as main media activities	.369	.065	.440	5.638	.000
	The number of times during weekend (in unit of 0.5 hour) that the participant joins related media activities with parents or grandparents	.331	.082	.315	4.028	.000
3	(Constant)	2.411	.790		3.052	.003
	The number of times during weekend (in unit of 0.5 hour) that the participant watches TV as main media activities	.277	.072	.331	3.840	.000
	The number of times during weekend (in unit of 0.5 hour) that the participant joins related media activities with parents or grandparents	.326	.080	.311	4.081	.000
	The number of times during weekend (in unit of 0.5 hour) that the participant joins related media activities with brothers or sisters	.187	.069	.217	2.721	.007

a. Dependent Variable: The number of times during weekend (in unit of 0.5 hour) that related media activities take place in the living room

Results from the media diary showed that my prediction method recognised children's TV watching patterns at home with a certain prediction accuracy achieved. The estimation of media activities taking place in the living room provides predictive clues to the viewer's level of TV exposure; what counts more here is to look into how the three key factors (total TV watching time, watching TV with parents and watching TV with siblings) play their roles in the open

space of the living room.

TV is clearly relevant to how children learn about the outside world, and it structures space and time for audiences to get involved smoothly, while the audiences themselves also structure space and time to form a group in the household for participating in this kind of communication process. 'The group presents itself as such, in its volume and structure, are the secularized form' (Bourdieu, 1990, p.108). The generated formula can explain and work as the *Habitus* from Bourdieu's term, which 'serves to determine for individuals the course of acceptable action in a given field' (Horvat, 2003, p.6). It also outlines a clear symbolic characterisation of the social life in Taiwanese families, while the empirical data generated through the formula can transfer abstract numbers into testable rules to demonstrate my theoretical approach. In other words, I developed an approach to present a 'symbolic form' among family members, space and time, stemming from the media diary data which give rise to the meaningful symbolic form as indicated (Thompson, 1995, pp.12-18). Television probably plays a lesser role in family life; however, based on my research findings, the symbolic meaning of it demonstrates the pervasive feature of social life around television.

The focus here is that we can take advantage of this generated formula (as symbolic form) to predict children's TV consumption scenarios to explain their TV watching of the past, present and future. It will be demonstrated from the prediction process that mediation processes developed by family members are determined according to the family's TV time management, the location of the TV set and its accessibility. The organisation of the home viewing environment does play an important role in TV's influence on children's learning.

Chapter Summary

This chapter presented the quantitative results of my experiment and fieldwork, which helped me derive the following five conclusions:

1. According to the TV watching questionnaire findings, only the attitude test (A-test) showed a statistically significant result at alpha = .05 (p=.048<.05), indicating that the traditional group had a higher mean score on attitude questions than the interactive group, which means that interactive TV has not significantly triggered audiences' positive attitude towards TV programmes.

2. Students from public school had a higher percentage of heavy Internet surfing than those from private school. Moreover, students from public schools had a higher percentage of heavy TV watching than those from private schools. These findings can serve as evidences that private school students seem to have relatively limited time to access TV and the PC.

3. As the multitasking evaluation questionnaire indicated, 36.9% of participants watch their favourite programmes while at the same time watching other programmes during commercial breaks. More than 61.4% sometimes watch TV programmes from the computer, but they still prefer watching traditional TV programmes. In terms of social networking behaviour, 41.4% contact friends by instant messaging (IM) only on weekends and holidays; in contrast, 36.9% of the total participants seldom use IM contacts. Regarding multitasking behaviour, 18.1% can indeed perform multiple tasks at all times, and 40.8% prefer listening to music as their first multitasking priority. With regard to their media environment, 53.4% have audio players, and 28.1% have a TV set in their study room.

4. Heavy Internet users and light multitaskers from the traditional group had

better knowledge test scores than those from the interactive group, which provided evidence that these testers still think of TV as a media device that is different and separate from the PC despite TV's enablement of PC-like interactive functions. Moreover, heavy users and light multitaskers also tend to separate TV as a traditional watching device from other multitasking devices, such as the PC.

5. A final equation derived from the media diary findings was able to provide a symbolic form for us to understand which social indicators, such as watching TV with any family members and in the public living room, best predict pre-adolescents' TV viewing time and pattern in Taiwan society.

Chapter 6 Discussions, Conclusions and Implications
A Situational Approach to the Cultural Experiences of TV

The research findings shed new light on the somewhat paradoxical relationship between new media and conventional media consumption in everyday life. In this thesis, I have provided theoretical research for the conceptualisation of interactive TV as a 'new medium' and for the emergence of different types of interactive TV users. 'The new technological options are culturally and socially transformed into institutional structures and everyday practices' (Krotz and Hasebrink, 2001, p.260). Interactive TV has appropriated some of the qualities and relationships from past media forms, but it will not revolutionise the media experience, which is critical in reaching the young generation through interactive learning. The media experience has evolved; and cross-platforms exist between old and new media since the transformation process of TV and new media takes place according to individual dispositions, special conditions of culture and concrete social situations (Krotz and Hasebrink, 2001, p.260).

I have discussed three of the principal tenets of digitisation, including convergence, increased transmission capacity and interactivity, from technological movements to create interactive TV that, in principle, would yield different consequences for the young generation's learning. To examine this further, I constructed an experiment that enabled me to differentiate three types of interactive behaviour: traditional, simple and high interactivity. I was interested in determining whether different levels of interactivity led to different forms of learning among children. Interactive TV programming allows us to combine something new (level of interactivity) and something old (watching of

linear and unexpected programmes) to measure its effects on pre-adolescents'
educational learning.

Based on the experimental results, one can conclude that the design of
interactive TV does not significantly ignite positive behaviours towards the new
style of learning interfaces. Hence, in the conclusion, I will first point out the
design drawbacks of the selected multimedia home platform (MHP) programme
used in the experimental process. Next, I will discuss the term 'interactivity', at
which time I will consider what kind of specific interactivity has existed in TV
watching conditions. Third, although interactive TV had little positive effect on
learning, when putting an emerging content type in interactive form into the TV
watching ecology, I will argue that a conventional TV watching situation will not
be sufficient to provide experiences similar to those the new interactive service
can offer children and young people (e.g., more personal and private watching
conditions at home) due to TV watching's co-viewing form in which family
members get together at the same time and in same space. Note that I also
collected and organised three interconnected areas—TV watching process,
family domain and learning scenario—to determine how children act as situated
audiences by understanding the television literacy in the family. Finally, the
limitations of this study and further directions for future research will be
discussed.

In the following section, I address the technical problems that emerged
during the experimental process and elaborate on the corresponding suggested
solutions.

6.1 Drawbacks of the Programme Design and the Experimental Process

As the experimental finding showed, the conditions of watching TV indicated that new media had little positive effect on learning. The interactive design of the experimental programme provided the users with limited navigation options to maintain their positive attitude and behaviour towards interactive TV. Thus, I will illustrate several technical problems which emerged during the experimental process.

One involved a usage profile of the MHP programme, '*The Agar Picking Challenge*', with experimental interactive content that had been divided by the programme designer into four interactive programme guides, which seemed to provide an organised and fresh outlook for viewers. However, the presentation of the electronic programme guide (EPG) made the original video image shrink in size to only one-fourth of the original screen size to accommodate the new text-based interactive interface concurrently, which turned out to interfere with the audience's ability to pay attention to different simultaneous messages from the live programme. Moreover, even though viewers showed an active interest in interacting with the content, the content was not as vivid as that which the Internet platform can support through multimode information on the personal computer (PC); only a little extra information was provided from the interactive processes of this MHP television programme. Also, due to the technical limitation of terrestrial live broadcasting, the programme's streaming could not be interrupted for easier multitask-mode watching; in sum, viewers were required to divide their attention among several tasks concurrently, such as extra information and the original content on the screen at the same time—something that unavoidably intruded on the overall learning experience. Finally, the interactive design of TV programmes must promote viewers' active participation

to engage them. 'The more interactive the system, the greater the chance should be of establishing a "meaningful conversation" between the user and the programmer' (Rockwell and Bryant, 1999, p.247). However, during the watching process of the experiment, the interactive group viewers sometimes had to wait for several seconds for the receiving server to establish or terminate the interactive session; this might diminish the viewers' desire to follow through the interactive information.

Moreover, the effort to process edutainment programmes relies to a great extent on the educational content integrated into the TV narrative and processing (Lemish, 2007, p.170). The two cognitive processes (content and narrative) are important elements in viewers finding a programme appealing. If the interactive features cannot overcome the capacity limit of viewers' functional memory, viewers will lose confidence and reduce their attention. In short, the experimental programme contained several drawbacks, such as poor timing, lack of decision-making information and features that interrupted viewers' attention, suggesting that we should improve interactive features (e.g., the content might be made semi-transparent on the screen for easier watching) to deliver more environmentally friendly content and designs on the screen in the future.

Nevertheless, the findings from Chapter 5 raised a foundational concern about the audience's expectation with regard to the kind of interactivity to experience in the TV watching process, from which I draw certain implications in the following section.

6.2 Do Audiences Desire Interactivity when TV Goes Interactive?

Before putting forth my beliefs about interactivity in the television ecology, I will refer to my theoretical research and experimental findings which indicated that the audience will usually make some interactive moves *before* viewing, such as selecting, skipping and recording interesting programmes, or *between* viewing, such as switching channels during commercial breaks or searching for extra information from the EPG in between the programmes' watching flows, without affecting the viewing, but not *during* these flows. It seems that the more interactivity is involved in the watching process, the more conflict may appear to distract the audience's attention or detract from its enjoyment.

Vorderer (2000) discussed the confusion and ambiguity that surrounds the term 'interactivity'. On one hand, computer scientists have emphasised the *interactive machines*' potential to create computer capabilities, employing the narrow meaning that a machine may respond to a user and a user may respond to a machine in a way that allows the user to view, train or correct the content during the process, while technological determinists tend to overstate this criterion to determine the extended capacities of interactive TV, like high-interactivity behaviours, to foster a variety of opportunities for viewers to interact with machines. On the other hand, the sociological domain of interactivity stresses different degrees of interactivity, concentrating more on how the mutual orientation of different individuals develops in social and individual issues through which relationships between groups and communication processes exist (Quiring, 2009, p. 909; Vorderer, 2000, pp.23-26).

Audience activity is a variable process and does not clearly establish a dichotomy between ritualised and instrumental TV use (Rubin, 1984, p.76). In considering children's television watching as a social practice and stressing the

knowledge collection in children's media environment, the social dimensions that influence the activities of their media consumption must be taken into account. With the combinations of modalities represented in TV between ritualised and instrumental use, Hodge and Kress emphasised that 'social control rests on control over the representation of reality...whoever controls modality can control which version of reality will be selected out as the valid version in that semiotic process' (Hodge and Kress, 1998, p.147). Therefore, television literacy is 'a set of social practices which are inevitably plural and diverse,' while children and young people try to understand not only the TV itself, but also their watching relationship with the TV (Buckingham, 1993, p.284).

Even though children are actively exposed to media, their extrinsic motivation to use TV depends on their parents and their social, cultural or mediated environment (Krotz and Hasebrink, 2001, p.249). It can be difficult for several family members to agree on how to handle the interaction process through only one decision, which may make the interactive TV process less enjoyable and efficient.

Because of the transformation of new technologies and gadgets that surround young people, they have injected different meanings into TV watching styles; for example, some supersession of TV watching behaviours may occur with functional TV watching's content from other devices, such as a PC, mobile or portable machine. Based on the media diary of situational findings, the organisation of the home viewing environment does play an important role in the effects of TV on children's learning. Television, along with its social usage, has a complex history with different kinds of interpretations, but it has always been shown in a radical way among the proliferation of new media (Williams, 1975, p14). Thus, with elaboration on the symbolic form of TV, I believe that my

research formula has proven that the family TV watching environment still exists in this media-rich world, while interactivity is used to describe the specific capacities of TV or media users that are related to 'what sociology has called interaction' (Vorderer, 2000, p.24). The symbolic form of television watching at home has caused certain interactions 'by becoming part of a relatively stable cluster of rules, resources and social relations' (Thompson, 1995, p.12). 'As such, interaction is a specific form of social action, a form that is guided by the presence of others, even if this presence is only imaged' (Vorderer, 2000, p.24).

The functionality of TV has created symbolic interaction in the Taiwanese media environment. The white paper published by the Ministry of Education in Taiwan argued that the ultimate goal of media education is to build a healthy media-access environment with enhanced 'liberation' and 'empowerment' of children and young people from media through media literacy mechanisms (MOE, 2002, pp.13-15). The 'liberation' refers to the freedom that allows the minds of children to wander free among the information maze and obstacles constructed by the media. When free from domination by the media, children can become 'active players' in society and learn how to express their own interest in public affairs through the media. 'Empowerment' means encouraging children to choose, differentiate and assess media with their content independently, and 'through rational thinking and constructive dialogue, to influence and monitor the media for better content' (MOE, 2002, p.13), which would establish critical literacy within children's social interaction and social learning.

In the meantime, this kind of social interaction and social learning also is what John Thompson described as 'the mundane character of receptive activity' such that 'the reception of media products is a routine, practical activity which individuals carry out as an integral part of their everyday lives' (Thompson, 1995,

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p.38). It is also a theoretical study of 'mediated quasi-interaction' that 'creates a certain kind of social situation in which individuals are linked together in a process of communication and symbolic exchange' (Thompson, 1995, p.84). Moreover, children, as the situated audiences, by learning and interaction are becoming members of the community of practice; an individual is developing social identity collaboratively with family members, which is the process of social learning in a TV watching context and experience, an obvious communication and social interaction that has existed in this aura around family (Brown and Duguid, 2000, pp.137-143).

Computer science and technological determinism use the narrow meaning that interactivity between TV technology and users' intention does not fully support these complex communications and interactions, and usually it is only when children have their own television sets to watch alone that they can increase their personal interactive watching intentions. However, children's age basically forms a barrier to having their own TV, and even though children may have their own TV, they still mostly prefer watching TV in a group when family members are together. Based on the questionnaire, no evidence emerged that children are abandoning traditional TV watching forms, with 31.0% of participants watching TV, which is more than the 21.9% who surf the Internet every day. Why hasn't the interactive characteristic of the Internet replaced the conventional medium of TV in the Digital Generation? An answer to this question may be provided by this study, wherein habit strength was found to be a significant predictor of all types of TV consumption in the family environment. Old and new media often co-exist with new technologies, which may change the uses or functions of old technologies, but using behaviours rarely completely displace each other (Buckingham, 2007, p.91).

Although pre-adolescents, who are 'new media' users, are becoming accustomed to checking emails or chatting with friends via social networking tools, they still have the habitual consumption patterns and routinisation of viewing with respect to TV as the conventional medium (O'Sullivan, 1991, p.171). Thus, these habits come from TV programme flow, which also creates a 'virtual community' (Mundorf and Laird, 2002, p.587), initiating viewers' group discussion of the news, sitcom characters or latest episodes as the mediated quasi-interaction process to create para-social interactions involving time and space. 'Interactivity is not something that either exists or does not exist. Instead, there is a continuum that acknowledges different degrees of interactivity: continuous interaction with the media being at one extreme and having the potential only to start or stop a reception at the other extreme' (Vorderer, 2000, p.25). Downes and McMillan enhanced this idea and believe varying levels of interactivity exist in the communication environment. 'Each of the message dimensions (direction, time and place) and the participant dimensions (control, responsiveness and perceived goals) seem to be continual' (Downes and McMillan, 2000, p.173). However, even these dimensions have existed on the low end of the continuum through one-way communication and a process with relatively little control. Viewers may still perceive that they are participating in interactive communication, such as television developing a 'sense of place' to create presence in this virtual community (Downes and McMillan, 2000, p.168). This kind of virtual community is based on the public space at a front region, as Chapter 2 indicted, such that children and young people cannot get away from this 'public territory'. In the following section, more detail and discussion of this topic will be pursued.

6.3 Territories of the Public Space at Home as Social Rituals

So far, I have discussed how the living room (public place) has become a front region of the home, according to the theoretical perspectives of Erving Goffman. 'Territories' are the settings in which actions take place and individuals play their roles in symbolic interactions (Julsrud, 2005, p.98; Goffman, 1963, p.79). The space of territories has created a ritual in which children and young people constantly seek to balance themselves by using 'ritual behaviours' (Julsrud, 2005, p.99) and participating in activities always organised in relation to certain technologies and rituals (Crook, 1998, p.192). Television is not only a visual medium, but also 'one with a physical materiality all of its own and a wide range of symbolic functions' (Morley, 2007, p.282).

According to Goffman, basic human action via face-to-face interaction takes place everywhere within a social institution. The experimental findings indicated that even though 28.1% of the testers have their own TV set in their private rooms, the use of a fixed physical space such as the living room still yields a situational condition regarding children's TV watching at home; '[s]ocial integration has to do with interaction in contexts of co-presence' (Giddens, 1984, p.142). Anthony Giddens indicated that no matter how far-flung the space created by electronic communications, long journeys or population migrations, 'none of these phenomena alters the fact that contexts of co-presence were always the main "carrying contexts" of interaction' (Giddens, 1984, p.143).

I use the notion of 'time-space distanciation' from Giddens to indicate that the media enable individuals to communicate across extended stretches of space and time (Giddens, 1995, p.90). With 'distanciation', Giddens meant 'to get at

the processes whereby societies are "stretched" over shorter or longer spans of time and space'.

Giddens argued that, according to historical development, every social system is replaced by distance or proximity in time-space, and it is crucial 'how time-space distanciation is involved with the generation of power' (Giddens, 1995, p.91), while following the concept of control of time and space yields a fundamental source of power. We may consider a scenario in which a child grows up at home, has the chance to learn the medium of TV, watches its programmes with parents and later possesses a TV set in his or her private room, which builds up a social dispute and negotiable process of touching the TV and facing new media (Crook, 1998, p.203). Home creates the boundaries between 'insiders' and 'outsiders' and between the sense of belonging and commitment from parents and 'the exercise of control over space and over the "rules" governing home life' (Allan, 1989, p.145). Hence, time-space organisation via parents' 'territory of operation' in the household has become 'the legitimate control of a domain' (Giddens, 1995, p.92), or the 'symbolic power' by which one's family are constantly involved in communicating with one another and exchanging information to create symbolic forms (Thompson, 1995, p.16; Bourdieu, 1989, p.20).

As Chapter 3 indicated, contemporary developments of media indeed present new opportunities for children's learning from home. However, these developments only reflect one side of the story, and other perspectives should be considered as well, for example, 'in the political economy of children's culture, the social and cultural policies and practices that regulate and define childhood, and the everyday social realities of children's lives' (Buckingham, 2007, p.91; Webster, 2002, p.11). Serfaty-Garzon suggested that the fundamental

characteristics of a dweller's control of situation at home provide basic experiences, and the physical distinction of inside or outside by 'generating order' controls the dwelling space that distinguishes an 'inside' as opposed to an 'outside' between those spaces. Moreover, the members' hidden or visible pattern exists in the space in that 'the dwelling is essentially what ensures secrecy and visibility' between the private and public rooms (Serfaty-Garzon, 1985, pp. 65-86). These perspectives have relied on the observation of the visible and invisible territory of children's life in this situational territory.

Use of the situational approach from Meyrowitz to pose the question of the extent to which the medium of television supports or weakens the traditional relationship between social situations and physical locations has illustrated how new media are changing the structure of social situations, while the basic and unchangeable social situations of the TV watching condition are also revealed. Young people and children have to rely significantly on parents' political, cultural and economic situations to face new media. We, therefore, have frequently seen parents set the rules on their children's access to video game players or TV sets even in the children's own 'territory'.

Electronic media have been breaking down the boundaries in our lives, which makes social and physical locations become blurry. Meyrowitz presented the media ecology with insightful analyses of the dynamic interaction that transcends the limitations of focusing only on media content while opting for a situational approach to communication and culture. Nevertheless, I do not totally agree with Meyrowitz's arguments regarding electronic media's impact on our 'sense of the place' in which 'the logic of situational behaviors has much to do with patterns of information flow' (Meyrowitz, 1986, p.308). Meyrowitz once re-interpreted Goffman's symbolic interaction which suggested that information

flows can change our roles and self-identity (Julsrud, 2005, p.102). In my view, he somewhat overstated electronic media's technological extension and evolution, such as television's restructuring of the relationship between physical place and social space.

Television may not be able to distinguish between invisible 'here' and 'there' inside the TV screen, but it obviously strengthens the visible space as viewers get involved. New media may broaden young people's vision and learning beyond the screen of the physical place; in contrast, the pattern of information flow by the mass medium of television has existed in the limitation of social space, for instance, the TV set's location in relation to the viewers (Andreasen, 2001, p.17), the restrictions on the remote control as an input device (Clark, 2006, p.29) and family members' interaction and intervention through co-viewing (Nathanson, 1999, p.137; Bryce and Leichter, 1983, p.321). Although in the desirable interactive TV programmes viewers could individually arrange the content they want to see, that content is mostly produced by unexpected providers. There has been a huge increase in interactive productions in past years, but the nature of TV watching is still the same, with either the 'traditional' or the 'new'.

My point here is that television for interactive learning purposes should take two types of spatial order at home into account: the arrangement of people in space and the arrangement of space itself (Hillier and Hanson, 1984, p.33). The media diary's findings enable us to learn from this arrangement of space and time in which television has created its own 'technological symbolism' in the household among other 'new media' (Morley, 2007, p.288).

My argument suggests that television will not function as the perfect 'new medium' to enhance children's and young people's personal learning

opportunities; nevertheless, the degree of TV watching activity depends on what different situations bring to children's and young people's encounter with the media. Several major themes have been interwoven throughout my thesis, including demographic factors such as age (11-12 years old), social status (from public/private schools) and family environment (patterns of access to media), which all help to explain the ritualised and instrumental TV use at home.

Now I reflect further on the concept of interactive TV itself. Chun argued that interactive TV is 'fluid, individualized, connectivity, a medium to distribute control and freedom' (Chun, 2005, p.1), whose interaction techniques must fit the relaxing environment at home that surrounds the TV set, as well as many 'noises' associated with programme content and audiences. According to the findings of Kubey and Csikszentmihalyi, people watching TV together with family report 'feeling significantly less challenged, less skilled, more relaxed, less alert, less strong, and less active' than those family interactions without TV watching (Kubey and Csikszentmihalyi, 1990, p.110). However, '[i]nteractive services tend to be one-on-one, disrupting the natural dynamic of one-to-many broadcasting' (Clark, 2006, p.25). A large part of current interactive TV design has to do with creating a non-intrusive and more personal, efficient interaction technique that matches these requirements (Ellis, 2000, p.176).

In the meanwhile, the empirical data have strongly supported my thesis that in the future the relative importance of television for children's entertainment and education will increasingly rely on group watching in a public region of the home. 'Interactive television is likely to play a minor role in learning outside of traditional educational broadcasting' and the high expectations for children's learning from interactive television will be not be met (Clark, 2006, p.38).

Moreover, the viewing skills regarding traditional and interactive TV not

only contain skills as abstract as cognitive skills, but also they cannot be separated from the complex social milieu of children's making sense of television. To reflect on previous observations and theoretical research, I have collected and organised three interconnected areas to form a conclusion of how children act as the situated audience in the family by three different processes (semiotic, cognitive and social), three different domains at home (physical, personal and social), and three different learning scenarios (identity, practice and communities), as shown in Figure 6-1 (Sixsmith and Sixsmith, 1990, pp.23-24; Crook,1998, pp.189-193; Wenger, 1999, pp.3-7). That is, what happens in television watching depends on the sense-making of children as they engage with the television watching environment. Interactive TV's production is constructed from pre-designed 'interactive' practices in which children and young people are seldom able to express their creativity. The combination of theoretical and multi-method research on television literacy has shown that, on one hand, children as isolated viewers receive television information created for them, and generate their own interpretation of it; on the other hand, they are audiences within a wider social context of learning under political and economic conditions at home (Burn, 2009, pp.1-23).

In the next section, I discuss how the multi-method approach is utilised during the experimental process and address certain limitations of my theoretical practice.

Figure 6-1: The Television Watching Process Distributed into Three Family Dimensions by Three Different Learning Scenarios

Television Watching Process	Family Dimension at Home	Learning Scenarios
The Semiotic Process	**Physical Domain**	**Identity**
TV was designed for viewing of audio and video content from a distance with a remote control to make selections. Children decode this symbol system of TV and learn the viewing skills through a psychological participation process.	Home is a place of comfort and ease. Family members usually form habitual consumption patterns and routinisation of viewing with respect to TV as a conventional medium.	Learning is becoming a way to accept television's narrative and form by understanding that we exist in the context of family and society.
The Cognitive Process	**Personal Domain**	**Practice**
TV is clearly relevant to how children learn about the outside world, and they develop their own cognition of it via co-viewing with others.	Home is constructed by multiple spaces to afford both private and public behaviours among family members, while acknowledging their personal identity. Children and young people play their roles in symbolic interactions seeking balance within the family through ritual behaviours.	Learning is doing through practice of different media. TV could create the easy and passive watching behaviour that sustains mutual engagements in action.
The Social Process	**Social Domain**	**Communities**

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TV is a social medium to receive entertainment and information in the negotiation and arrangement process of a family event.	An individual is developing social identity collaboratively with family members in the TV watching environment.	Learning is belonging in which the arrangement of space and time from television creates its own 'technological symbolism' in the household among other 'new media'.

6.4 Limitations of My Study and Suggestions for Further Research

This exploratory study contained several limitations, from which I derive suggestions for improvement in further research. First, the scope and depth of the programme tested was restricted by the constraints of the time period for constructing its MHP version during my study. While more interactive programmes with improved designs have been aired in the TV market each year, these programmes should be able to provide different interactive perspectives and experiences.

Second, the study suggested that the controller, who acted as the examiner controlling the interactive function sequence, dominated the remote control in the group watching experiment. Even though every tester had a chance to touch the interactive features via the remote control before the experiment, they still needed to follow the controller's arrangements. To create an ideal interactive system, a truly 'meaningful conversation' between the user and the programme was supposed to have been constructed. However, the selected programme for interactivity testing purposes seemed designed improperly with regard to some interactive functions with expectations not met, a situation that might have frustrated the viewers. On the one hand, the response options for the content and

interactivity might not be established well enough; on the other hand, testers under experimental limitations were controlled by the examiner, which resulted in not as many viewers as desired engaging in a conversation with the content. To improve real watching conditions, we should provide more opportunities for individual testers to 'practice' and 'play' with the machines before the main test.

Third, this study was limited to laboratory conditions, which were not sufficient to understand the normative viewing behaviours of the children in the context of their everyday life (Kubey and Csikszentmihalyi, 1990, p.39). So far, we have not been able to test the interactive TV learning functions in a public, high-traffic, large-family situation, which is, in fact, a critical next step for further understanding of the role of TV watching as the foundation of entertaining experiences at home. While we plan to chase this direction in future research, we can still set up two comparison groups to test interactive TV learning in the classroom and at home by probing different television learning environments.

The final limitation of my thesis is that it emphasised TV watching and mediation in the situated public place of the living room through recordings in media diaries, rather than actually utilising the factors that influenced whether and how parents mediated, such as demographics, accessibility and engagements, in more detail. This would be helpful in exploring how such factors affect the mediation styles and media literacy practices of parents to advance, and perhaps better tailor, recommendations for parents to use TV as a learning device.

This investigation has demonstrated that children's TV watching at home is an appropriate social behaviour among media activities and that the innovation of interactive TV will not revolutionise the consumption of traditional broadcast TV.

APPENDIX QUESTIONNAIRE

Appendix A: TV Watching Questionnaire for Interactive Groups

Follow Me after School Programme Research Questionnaire

Episode: *The Agar Picking Challenge*

The purpose of this survey is to understand the public's interest in interactive television programmes, to evaluate the ways by which an array of television programme designs, activities, and procedures might help the youths to understand fundamental interactive television programmes, and also to use your inputs for solving certain problems. I strongly believe that your participation will benefit the future development of interactive television for the learning purpose.

Part I

Based on the television programme you just now watched, please relax and answer the following questions by checking an " V " mark in the box:

1. What is agar jelly made from?
   - ☐ Nori
   - ☐ Aonori
   - ☐ Raw agar
   - ☐ Kelp

2. Where is the location of agar picking in today's episode?
   - ☐ Dan-Shui Township, Taipei County
   - ☐ Gong-Liao Township, Taipei County
   - ☐ Wu-Chi Township, Taichung County

3. What percentage of oxygen on earth is produced by Algae?
   - ☐ 10 %
   - ☐ 20 %
   - ☐ 50 %

4. What is the most common colour of raw agar under the sea?

☐ Green
☐ Blue
☐ Black
☐ Red

5. Where does agar grow?
   ☐ Fertile flatland
   ☐ Well-irrigated hill
   ☐ Warm inter-tidal ocean zones

6. How do workers handle the agar first after it's been collected?
   ☐ Expose it to the sun
   ☐ Rinse it under running water
   ☐ Boil it in hot water

7. To make agar jelly, how long should agar be boiled in hot water approximately?
   ☐ 10 minutes
   ☐ 20 minutes
   ☐ 30 minutes
   ☐ one hour

8. What substance in agar causes agar jelly to be formed?
   ☐ Gelatin
   ☐ Protein
   ☐ Minerals
   ☐ Starch

9. What kind of Algae does Agar belong to?
   ☐ Chlorophyta
   ☐ Phaeophyta
   ☐ Rhodophyta
   ☐ Euglenophyta

10. Why does agar appear to be yellowish and white-ish?
    ☐ The effect of dyeing
    ☐ Its original colour
    ☐ The effect of sun exposure

☐ The effect after boiling

11. Where else is possible to find agar in Taiwan?
    ☐ Kuan-Tu Mangrove Reserve area in Taipei
    ☐ Dong Shan River in I-Lan County
    ☐ The Wetland area in National Museum of Marine Biology Aquarium

12. Besides the Northeast coastline in Taiwan, in which city is agar also found?
    ☐ Penghu
    ☐ Nantou
    ☐ Yunlin

13. Which one of the following books was not recommended by the programme?
    ☐ Insectivorous Plants of Taiwan
    ☐ Water Plants of Taiwan: Wetland Ecosystem
    ☐ The Journey of Grass: Looking for Water Plants

Part II

How satisfied are you with the programme? In a 5-point scale (from Strongly Disagree = 1 to Strongly Agree = 5), please rate the programme as a whole based on the following questions: (For instance, you may choose 5 if you are very satisfied with this programme; on the contrary, you may choose 2 or even 1 if the programme makes you feel very bored. There is no exactly right or wrong answers; please answer the questions according to how you really feel.)

1. The episode 'The Agar Picking Challenge' from 'Follow Me after School' I just watched is...

Extremely dissatisfied satisfied	1	2	3	4	5	Very
Extremely boring interesting	1	2	3	4	5	Very
Extremely dislike enjoyable	1	2	3	4	5	Very
Not useful at all informative	1	2	3	4	5	Very
Not easy to watch watch	1	2	3	4	5	Very easy to

Part III

2. How likely are you to recommend this programme to others?

Very Unlikely   1   2   3   4   5   Most Definitely

3. Would you accept watching this type of educational TV programmes like 'Follow Me after School'?

Very Unlikely   1   2   3   4   5   Most Definitely

4. Will you be searching for more information about 'Follow Me after School' from some Web sites?

Very Unlikely   1   2   3   4   5   Most Definitely

5. Will you watch the 'Follow Me after School' programme through computers and network?

Very Unlikely   1   2   3   4   5   Most Definitely

6. Will you email any interesting information you found on the 'Follow Me after School' Web site to others?

Very Unlikely   1   2   3   4   5   Most Definitely

7. Will you print out the interesting information you found on the 'Follow Me after School' Web site?

Very Unlikely   1   2   3   4   5   Most Definitely

8. How do you feel if this kind of educational programmes like 'Follow Me after School' becomes your daily homework?

Very Unlikely   1   2   3   4   5   Most Definitely

9. Will you consider asking your parents to purchase these devices for viewing 'Follow Me after School' or some other interactive television facilities?

Very Unlikely   1   2   3   4   5   Most Definitely

General Information:

1. Gender
   ☐ Male
   ☐ Female

2. The grade in Science:
   ☐ below 60
   ☐ 60~69
   ☐ 70~79
   ☐ 80~89
   ☐ above 90

3. Time spending on watching television everyday:
   ☐ No watching TV activity
   ☐ Less than 30 minutes
   ☐ Between 30 – 60 minutes
   ☐ 1 to 2 hours
   ☐ More than 2 hours

4. Time spending on surfing the Internet everyday:
   ☐ No Web-browsing activity
   ☐ Less than 30 minutes
   ☐ Between 30 – 60 minutes
   ☐ 1 to 2 hours
   ☐ More than 2 hours

5. Have you ever watched the 'Follow Me after School' programme before?
   ☐ Watched the programme frequently
   ☐ Watched the programme a few times, but not often
   ☐ Never watched it before

Appendix B: TV Watching Questionnaire for Traditional Groups

Follow Me after School Programme Research Questionnaire

Episode: *The Agar Picking Challenge*

The purpose of this survey is to understand the public's interest in interactive television programmes, to evaluate the ways by which an array of television programme designs, activities, and procedures might help the youths to understand fundamental interactive television programmes, and also to use your inputs for solving certain problems. I strongly believe that your participation will benefit the future development of interactive television for the learning purpose.

Part I

Based on the television programme you just now watched, please relax and answer the following questions by checking an " ✓ " mark in the box:

1. What is agar jelly made from?
   - ☐ Nori
   - ☐ Aonori
   - ☐ Raw agar
   - ☐ Kelp

2. Where is the location of agar picking in today's episode?
   - ☐ Dan-Shui Township, Taipei County
   - ☐ Gong-Liao Township, Taipei County
   - ☐ Wu-Chi Township, Taichung County

3. What percentage of oxygen on earth is produced by Algae?
   - ☐ 10 %
   - ☐ 20 %
   - ☐ 50 %

4. What is the most common colour of raw agar under the sea?
   - ☐ Green

☐ Blue

☐ Black

☐ Red

5. Where does agar grow?

    ☐ Fertile flatland

    ☐ Well-irrigated hill

    ☐ Warm inter-tidal ocean zones

6. How do workers handle the agar first after it's been collected?

    ☐ Expose it to the sun

    ☐ Rinse it under running water

    ☐ Boil it in hot water

7. To make agar jelly, how long should agar be boiled in hot water approximately?

    ☐ 10 minutes

    ☐ 20 minutes

    ☐ 30 minutes

    ☐ one hour

8. What substance in agar causes agar jelly to be formed?

    ☐ Gelatin

    ☐ Protein

    ☐ Minerals

    ☐ Starch

9. What kind of Algae does Agar belong to?

    ☐ Chlorophyta

    ☐ Phaeophyta

    ☐ Rhodophyta

    ☐ Euglenophyta

10. Why does agar appear to be yellowish and white-ish?

    ☐ The effect of dyeing

    ☐ Its original colour

    ☐ The effect of sun exposure

    ☐ The effect after boiling

Part II

How satisfied are you with the programme? In a 5-point scale (from Strongly Disagree = 1 to Strongly Agree = 5), please rate the programme as a whole based on the following questions: (For instance, you may choose 5 if you are very satisfied with this programme; on the contrary, you may choose 2 or even 1 if the programme makes you feel very bored. There is no exactly right or wrong answers; please answer the questions according to how you really feel.)

1. The episode 'The Agar Picking Challenge' from 'Follow Me after School' I just watched is...

Extremely dissatisfied	1	2	3	4	5	Very satisfied
Extremely boring	1	2	3	4	5	Very interesting
Extremely dislike	1	2	3	4	5	Very enjoyable
Not useful at all	1	2	3	4	5	Very informative
Not easy to watch	1	2	3	4	5	Very easy to watch

Part III

2. How likely are you to recommend this programme to others?

Very Unlikely   1   2   3   4   5   Most Definitely

3. Would you accept watching this type of educational TV programmes like 'Follow Me after School'?

Very Unlikely   1   2   3   4   5   Most Definitely

4. Will you be searching for more information about 'Follow Me after School' from some Web sites?

Very Unlikely   1   2   3   4   5   Most Definitely

5. Will you watch the 'Follow Me after School' programme through computers and network?

Very Unlikely   1   2   3   4   5   Most Definitely

6. Will you email any interesting information you found on the 'Follow Me after School' Web site to others?

Very Unlikely   1   2   3   4   5   Most Definitely

7. Will you print out the interesting information you found on the 'Follow Me after School' Web site?

Very Unlikely   1   2   3   4   5   Most Definitely

8. How do you feel if this kind of educational programmes like 'Follow Me after School' becomes your daily homework?

Very Unlikely   1   2   3   4   5   Most Definitely

General Information:

1. Gender
   ☐ Male
   ☐ Female

2. The grade in Science:
   ☐ below 60
   ☐ 60~69
   ☐ 70~79
   ☐ 80~89
   ☐ above 90

3. Time spending on watching television everyday:
   ☐ No watching TV activity
   ☐ Less than 30 minutes
   ☐ Between 30 – 60 minutes
   ☐ 1 to 2 hours

☐ More than 2 hours

4. Time spending on surfing the Internet everyday:
   ☐ No Web-browsing activity
   ☐ Less than 30 minutes
   ☐ Between 30 – 60 minutes
   ☐ 1 to 2 hours
   ☐ More than 2 hours

5. Have you ever watched the 'Follow Me after School' programme before?
   ☐ Watched the programme frequently
   ☐ Watched the programme a few times, but not often
   ☐ Never watched it before

Appendix C: Multitasking Questionnaire

1. Which TV watching behaviour best describes yours? (**Please select the closest answer**) ?

   ☐ Watching your favourite programmes at a certain time period
   ☐ Watching your favourite programmes while at the same time watching other programmes during commercial breaks
   ☐ I use the remote control frequently to surf all programmes, and would watch one of my interest
   ☐ I usually watch TV programmes with my family that we all like to watch
   ☐ I seldom watch TV

2. We can benefit from computers for many things; for example, we can watch TV programmes or shared footages from other people (such as with YouTube). What kind of media behaviour below best describes you? (**Please select one**)

   ☐ I watch this kind of programme everyday from a computer instead of from traditional TV.
   ☐ I sometimes watch this kind of programmes from computer; however, I still prefer watching traditional TV programmes.
   ☐ I tried watching this kind of programme from a computer before, but seldom watch it this way now due to poor Internet speed and display quality.
   ☐ I never try watching this kind of programme from a computer.

3. How often do you use IM (instant messaging) tools, such as MSN or Skype, to contact your family or friends? (**Please select one**)

   ☐ Daily, when I turn on my computer
   ☐ Every 2-3 days
   ☐ Not often, only during the weekend or holidays
   ☐ Seldom use

4. How many contacts does your IM (such as MSN) have? (**Please select one**)

   ☐ More than 20 people

☐ Between 10-20 people

☐ Under 10 people

☐ Seldom use

5. Some people watch TV while talking on the phone; some do their homework while listening to MP3 music; some browse the Internet while reading comic books; and some even play PC games while chatting with friends. Which multitasking behaviour below best fits yours? (**Please select one**)

☐ I can do multitasks all the time.

☐ I sometimes do two media activities at the same time but it depends on my mood and importance of my work.

☐ I can only do one thing at the same time, since too many media activities concurrently would distract my attention.

☐ I never do any of the above activities. (**If yes, please go to Question #7**)

6. Which media activity below do you most possibly conduct in multitasking mode? (**Please select one**)

☐ Listening to music

☐ Watching TV

☐ Reading and doing my homework

☐ Using computers

7. What equipments below exist in the place you study? (**multi-choices allowed**)

☐ Television

☐ Computer

☐ Video Games

☐ Telephone

☐ DVD or VCR

☐ Audio Player (MP3, Radio, etc.)

Media Diary Day # - (Please check the boxes by ✓)	5:00 PM | 5:30	5:30 PM | 6:00	6:00 PM | 6:30	6:30 PM | 7:00	7:00 PM | 7:30	7:30 PM | 8:00	8:00 PM | 8:30	8:30 PM | 9:00	9:00 PM | 9:30	9:30 PM | 10:00
1. Are you doing any media activities for at least 10 minutes during the half hour ? (activity list as below in question 2)	☐No ☐Yes (please proceed↓)	☐No ☐Yes (please proceed↓)	☐No ☐Yes (please proceed↓)	☐No ☐Yes (please proceed↓)	☐No ☐Yes (please proceed↓)	☐No ☐Yes (please proceed↓)	☐No ☐Yes (please proceed↓)	☐No ☐Yes (please proceed↓)	☐No ☐Yes (please proceed↓)	☐No ☐Yes (please proceed↓)
2. What are your main media activities? (multiple-choice)										
(1) Watching TV	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1
(2) Browsing Web sites	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2
(3) Writing Emails and Chatting on MSN	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3
(4) Doing Homework by PC	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4
(5) Playing PC Games	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5
(6) Playing Video Games (Wii, PS2, Xbox)	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6
(7) Watching DVDs	☐ 7	☐ 7	☐ 7	☐ 7	☐ 7	☐ 7	☐ 7	☐ 7	☐ 7	☐ 7
(8) Listening to Music	☐ 8	☐ 8	☐ 8	☐ 8	☐ 8	☐ 8	☐ 8	☐ 8	☐ 8	☐ 8
(9) Reading Books, Magazines, Comics	☐ 9	☐ 9	☐ 9	☐ 9	☐ 9	☐ 9	☐ 9	☐ 9	☐ 9	☐ 9
(10) Other PC-related activities, and using Mobile Phone	☐ 10	☐ 10	☐ 10	☐ 10	☐ 10	☐ 10	☐ 10	☐ 10	☐ 10	☐ 10

3. Who is with you?										
(multiple-choice)										
(1) Alone	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1
(2) Parents or Grandparents	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2
(3) Brothers or Sisters	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3
(4) Friends	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4
(5) Teachers	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5
(6) Someone Else	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6
4. At which place are you?										
(single-choice)										
(1) Living Room	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1
(2) Bedroom	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2
(3) Another Room at Home	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3
(4) Friend's Place	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4
(5) Extra-curricular Schools	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5
(6) Other Places	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6

Appendix E: Media Diary for Weekend

Media Diary Day # (Please check the boxes by ✓)	10:00 AM | 10:30	10:30 AM | 11:00	11:00 AM | 11:30	11:30 AM | 12:00	2:00 PM | 2:30	2:30 PM | 3:00	3:00 PM | 3:30	3:30 PM | 4:00	4:00 PM | 4:30	4:30 PM | 5:00
1. Are you doing any media activities for at least 10 minutes during the half hour ? (activity list as below in question 2)	☐No ☐Yes (please proceed ↓)	☐No ☐Yes (please proceed ↓)	☐No ☐Yes (please proceed ↓)	☐No ☐Yes (please proceed ↓)	☐No ☐Yes (please proceed ↓)	☐No ☐Yes (please proceed ↓)	☐No ☐Yes (please proceed ↓)	☐No ☐Yes (please proceed ↓)	☐No ☐Yes (please proceed ↓)	☐No ☐Yes (please proceed ↓)
2. What are your main media activities? (multiple-choice)										
(1) Watching TV	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1
(2) Browsing Web sites	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2
(3) Writing Emails and Chatting on MSN	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3
(4) Doing Homework by PC	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4
(5) Playing PC Games	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5
(6).Playing Video Games (Wii, PS2, Xbox)	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6
(7) Watching DVDs	☐ 7	☐ 7	☐ 7	☐ 7	☐ 7	☐ 7	☐ 7	☐ 7	☐ 7	☐ 7
(8) Listening to Music	☐ 8	☐ 8	☐ 8	☐ 8	☐ 8	☐ 8	☐ 8	☐ 8	☐ 8	☐ 8
(9) Reading Books, Magazines, Comics	☐ 9	☐ 9	☐ 9	☐ 9	☐ 9	☐ 9	☐ 9	☐ 9	☐ 9	☐ 9
(10) Other PC-related activities and using Mobile Phone	☐ 10	☐ 10	☐ 10	☐ 10	☐ 10	☐ 10	☐ 10	☐ 10	☐ 10	☐ 10

3. Who is with you?										
(multiple-choice)										
(1) Alone	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1
(2) Parents or Grandparents	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2
(3) Brothers or Sisters	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3
(4) Friends	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4
(5) Teachers	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5
(6) Someone Else	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6
4. At which place are you?										
(single-choice)										
(1) Living Room	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1
(2) Bedroom	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2
(3) Another Room at Home	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3
(4) Friend's Place	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4
(5) Extra-curricular Schools	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5
(6) Other Places	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6

Media Diary Day # - (Please check the boxes by ✓)	5:00 PM | 5:30	5:30 PM | 6:00	6:00 PM | 6:30	6:30 PM | 7:00	7:00 PM | 7:30	7:30 PM | 8:00	8:00 PM | 8:30	8:30 PM | 9:00	9:00 PM | 9:30	9:30 PM | 10:00
1. Are you doing any media activities for at least 10 minutes during the half hour ? (activity list as below in question 2)	☐No ☐Yes (please proceed ↓)	☐No ☐Yes (please proceed ↓)	☐No ☐Yes (please proceed ↓)	☐No ☐Yes (please proceed ↓)	☐No ☐Yes (please proceed ↓)	☐No ☐Yes (please proceed ↓)	☐No ☐Yes (please proceed ↓)	☐No ☐Yes (please proceed ↓)	☐No ☐Yes (please proceed ↓)	☐No ☐Yes (please proceed ↓)
2. What are your main media activities? (multiple-choice)										
(1) Watching TV	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1
(2) Browsing Web sites	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2
(3) Writing Emails and Chatting on MSN	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3
(4) Doing Homework by PC	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4
(5) Playing PC Games	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5
(6).Playing Video Games (Wii, PS2, Xbox)	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6
(7) Watching DVDs	☐ 7	☐ 7	☐ 7	☐ 7	☐ 7	☐ 7	☐ 7	☐ 7	☐ 7	☐ 7
(8) Listening to Music	☐ 8	☐ 8	☐ 8	☐ 8	☐ 8	☐ 8	☐ 8	☐ 8	☐ 8	☐ 8
(9) Reading Books, Magazines, Comics	☐ 9	☐ 9	☐ 9	☐ 9	☐ 9	☐ 9	☐ 9	☐ 9	☐ 9	☐ 9
(10) Other PC-related activities, and using Mobile Phone	☐ 10	☐ 10	☐ 10	☐ 10	☐ 10	☐ 10	☐ 10	☐ 10	☐ 10	☐ 10

3. Who is with you?										
(multiple-choice)										
(1) Alone	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1
(2) Parents or Grandparents	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2
(3) Brothers or Sisters	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3
(4) Friends	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4
(5) Teachers	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5
(6) Someone Else	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6
4. At which place are you?										
(single-choice)										
(1) Living Room	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1	☐ 1
(2) Bedroom	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2	☐ 2
(3) Another Room at Home	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3	☐ 3
(4) Friend's Place	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4	☐ 4
(5) Extra-curricular Schools	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5	☐ 5
(6) Other Places	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6	☐ 6

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