The integration of information technology in music teacher education and school music education in Taiwan

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Declaration

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed.

Hung Pai Chen

18/12/2012
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Glossary

CAI
Computer Assisted Instruction system. It is the “most common term for the interaction of a learner with a computer in a direct instructional role (Lockard & Abrams, 2004, p. 246).

E-learning
Electronic Learning. It is widely referred to as computer relevant instructional activities.

Government
The central government in Taiwan is responsible for all issues regarding the national development including the development and implementation of policies. The term “government” in this study refers to the central government.

ICT
Information and Communications Technology. ICT includes the computers and hardware or software for generating, storing, transferring, and retrieving information.

IT
Information Technology. It is defined as computers and other relevant devices for storing, transferring, and communicating data.

The Integration of IT
Shelly, Gashman, Gunter, and Gunter (2008) state that “integration by itself is defined as bringing different parts together into a whole” (p. 327). In extending this to “technology integration” they state that it is “the combination of all technology parts, such as hardware and software, together with each subject-related area of curriculum to enhance learning” (p. 327).

MIDI
Musical Instrument Digital Interface. A digital format to store and transmit the sound between digital devices or computers.
**Policy Developer**

The two policy developers in this research are people who have been involved the development of the national IT education policies and music curriculum.

**Teacher Education**

Teacher education in this research is focused specifically on primary school level music teacher education. Thus includes the teacher education programs for both pre-service teachers and professional development (in-service).

**University Professor**

The term “university professor” is used in accordance with its normal usage in Taiwan, that is, for those teaching at the Assistant Professor, Associate Professor, and Full Professor levels.
Publications during Candidature

Journal Articles


Refereed Conference Papers

Chen, H. P. (2010). Evolving policy and practice: The application of the Internet in music education in Taiwan. In L. C. R. Yip & J. S. Goble (Eds.), *Music Education Policy and Implementation: Culture and Technology* (pp. 1-5). Henan, China: Henan University, College of Arts in conjunction with the Policy Commission on Culture, Education, and Media, the International Society for Music Education.


Conference Presentations


Abstract

This research is an investigation into the integration of information technology in music education in Taiwan. It focuses particularly on primary schools, and universities offering pre-service and postgraduate programs in music education. The study’s design begins with an exploration of government policies and their implementation, followed by an examination of music teacher education, and then music in primary schools. In the process it identifies significant approaches used to promote the integration of information technology into music programs.

Following an historical examination of the development of information technology into the education system, and subsequent government policies, the researcher investigated courses in information technology pertaining to music offered by relevant universities in Taiwan. The next stage of the research involved semi-structured interviews with three groups of stakeholders: policy developers, university teachers, and primary school teachers.

Three periods of development were discerned by the researcher: the Computer Assisted Instruction Period (1986-1997), the Internet Development Period (1997-2001), and the Digital Content Period (2001 to the present). All three periods were significant for developments in school and teacher education.

An examination of information technology in nine music teacher education institutions showed that most courses were only offered as electives: they were not compulsory. In practice this has meant that music graduate who have entered the teaching profession have not necessarily received any training in information technology. Unfortunately, in-service or professional development courses in information technology for practising teachers have generally been inadequate; part of the problem has been a dearth of courses designed specifically for teachers of music. Professional development courses have predominantly been oriented towards general teaching across disciplines. The researcher argues the need for universities and those offering professional development courses to ensure that music teachers are not only skilled in information technology, but also acquainted with appropriate pedagogy for using it in teaching and learning.
The study showed that information technology has not generally been assimilated into music teaching and learning in primary schools in Taiwan. Part of the problem, as suggested by the teacher interviewees, is that music teachers are not sufficiently motivated and skilled to integrate information technology into the curriculum, and many schools are inadequately resourced. This not only highlights the need for more effective teacher training, but also for schools to give greater recognition to the importance of the integration of IT in music in primary schools.

Music education in Taiwan with respect to the integration of information technology appears to be in a relatively weak position in schools and in teacher education. Indeed, the study has also highlighted music’s relatively weak status compared to many other subject or discipline areas. In identifying specific issues, the study concludes with a number of recommendations addressed to the government and the Ministry of Education, primary school administrators, primary school music teachers, and future researchers in the field.
Chapter 1 Introduction

1.1 Background of research study

Taiwan is very receptive to the development and application of information technology (IT). The country is ranked second in the world and first in Asia in the IT Industry Competitiveness Index (Economist Intelligence Unit, 2008) and its commitment to IT has influenced many aspects of social development, including education. The government’s awareness of the contribution that IT can make to education has resulted in it launching a series of policies advocating the integration of IT in teaching and learning. This research study investigates the extent to which IT has been integrated into music education at the school and university levels; it concludes with a number of recommendations written for specific stakeholders.

Taiwan is situated in East Asia, with its nearest neighbours including Japan, China and The Philippines. Historically, the peoples of Taiwan came predominantly from different districts of South East China several hundred years ago. In its past, the country has been colonised by Portugal, The Netherlands, and Japan. In the period before the domination by Japan (1895 to 1945), Christian missionaries had come to the country and brought with them Western music. Thus, the music elements in Taiwan predominantly comprise Chinese traditional music, Western music, and Taiwanese folk and aboriginal music (Shih, 2004).

School music education in Taiwan has been significantly influenced by Japan and can be traced back to the late 1890s at the start of the Japanese colonial period (Lai, M.)
L., 2002; Lee, A. H., 2002). After Japanese Rule ended in 1945, the Taiwanese government began building a new education system based on the Japanese structure and practices whilst integrating aspects of Western education. Increasingly, Western music has been integrated into Taiwanese culture and had a strong influence on school music education (Lee, A. H., 2002). At the same time, traditional Chinese music and elements of patriotism were incorporated for political reasons into the school music curriculum (Pai, H. P., 2011).

Music education in Taiwan has undergone considerable change since significant reforms were introduced in 2001. These reforms, which responded to social expectations and national developments, resulted in new curriculum guidelines that replaced the previous Curriculum Standards (Taiwan Ministry of Education, 1993a). The new 2001 Grades 1-9 Curriculum Guidelines (九年一貫課程綱要) integrated music, visual, and performing arts (which includes drama and dance) into the Arts and Humanities Learning Area (Taiwan Ministry of Education, 1998a). (Unlike similar documents in Australia, this learning area, despite its title, is limited to the Arts only—and does not include humanities subjects such as history.) According to the published English-version of the curriculum guidelines (Taiwan Ministry of Education, 2005a):

> Arts and Humanities includes music instruction, and instruction in the visual and performing arts. It hopes to help students to cultivate an interest for the arts and encourages them to enthusiastically participate in related activities, thus
promoting abilities such as imagination, creativity, appreciation for the arts, and other abilities. (¶. 7)

The *Arts and Humanities Learning Area* is a compulsory part of the new curriculum, and schools are required to provide appropriate arts courses (including music) in every year of study. With the introduction of the new curriculum guidelines in 2001, music lost its stand-alone position as a single, separate subject in school education. In investigating the use of information technology in primary school music education, the study addresses issues arising from this new curriculum.

The study has also focused on teacher education as an integral avenue for providing future and practising teachers with appropriate skills—both technological and pedagogical—with respect to music. Teacher education, of course, is concerned with both pre-service and in-service—or professional—education. Before the implementation of the 1994 *Teacher Education Act* (師資培育法)—which preceded by seven years the 2001 curriculum guidelines—there were nine primary school Teachers’ Colleges in Taiwan. The music education departments in these colleges had trained a considerable number of music teachers for primary schools (Taiwan Ministry of Education, 1994). The 1994 Act however allowed universities also to offer pre-service teacher education programs. This strongly diversified the channels of teacher education: no longer was primary teacher training the sole province of the Teachers’ Colleges. In order to reflect this change and plan for future developments, the status of the nine Teachers’ Colleges changed, with some becoming a University
of Education, others a general University, and one merging with an existing university. Although they all now have university status, the former Teachers’ Colleges are still chiefly concerned with primary school teacher education (Taiwan Ministry of Education, 2006a), and their music departments continue to play an important role in music teacher education. This research investigated IT related courses in the music departments of what had been the Teachers’ Colleges.

The Taiwanese government encourages teachers to undertake professional development or in-service training—terms used synonymously in Taiwan—to improve their teaching. Professional development programs have included workshops, lectures, exhibitions and demonstrations and have been conducted regularly over the years. A significant number of music teachers have also returned to university to undertake postgraduate studies. Both types of training—“one-off” sessions or postgraduate university studies—were investigated for this study. Several issues were identified.

1.2 Rationale of the research

The study is an investigation into how information technology has been integrated into educational systems and the curricula in Taiwan. It begins by looking at government policies and their implementation, then focuses on music teacher education and music in primary schools. As a result, the research provides an important perspective on the development of IT integrated music education, investigates IT related training in music teacher education programs, and explores
current practices of integrating IT in primary school music education. The interrelationships of policy implementation, music teacher education and school music education are identified. This equips the researcher to provide recommendations for future approaches to the integration of information technology in school music teaching and learning.

A survey published by the Taiwan Central News Agency in 2009 showed that 69% of the inhabitants in Taiwan have access to the Internet (Taiwan Central News Agency, 2009); no doubt, the figure would be even higher today. In the field of education, the application of IT has been a remarkable phenomenon in Taiwan over the last few decades. There is no scarcity of studies that have resulted in pertinent publications related to teaching music through IT (for example, Salavuo, 2006; Trotter, 2002; Byrne & MacDonald, 2002). Unfortunately however, several research studies in Taiwan (including two by the writer) have shown that relatively few music teachers integrate IT into their teaching (Chen, H. P., 2006, 2012a; Man, 2009). This, essentially, has provided the rationale for this study: a desire to investigate more deeply the current situation and its historical antecedents with a view to understanding current practices as a basis for offering recommendations.

The aims of the research derive from this rationale. These are to investigate developments that have taken place with regard to the integration of IT into music education in Taiwan; to determine the support given to this at the teacher education and school levels; and to explore issues pertaining to the integration of IT in primary
school music programs. In the process, the researcher aims to identify particular issues that have mitigated against the successful introduction of IT into music education programs and, at the same time, suggest ways of addressing them. This is undertaken in the context of government and Ministry of Education policies and curricula, teacher education practices, and developments in schools. During the period of the research, the preliminary results have been published as journal articles and refereed conference papers.

1.3 Research questions

Based on the above, the following research questions were posed:

1. What developments in the integration of information technology in music education have taken place in Taiwan?

2. How is the integration of information technology in music supported by teacher education and professional development in Taiwan?

3. How is information technology integrated into primary school music education in Taiwan?

1.4 Location of study

This study was located in Taiwan. Chinese Mandarin was used in conducting the research and all of the official and historical documents and interview transcripts were translated into English by the researcher; four independent Chinese-English speakers assisted with translations and verifications. In translating documents from
the Ministry of Education and other organisations, consideration has been given to normal nomenclature used in Australia. In addition, important policies and phrases are presented in English and accompanied by Chinese when they first appear in the chapters of this thesis.

1.5 Scope and limitations of the research

Scope
The study investigated the integration of IT into music education in primary schools in Taiwan (Years 1 to 6) and music teacher education. This can be traced back to the 1980s when the first Computer Assisted Music Instruction system was developed in a university. Later on, Computer Assisted Music Instruction systems were introduced into middle schools, primary schools and kindergartens (Chen. H. P., & Hsieh, Y. M., 2006).

The study involved researching government policies and their implementation, music teacher education, and primary school music education in the context of the development and integration of IT into curricula. To contextualise the study within Asia, the literature review examined corresponding developments in other similar Chinese cultural communities, such as Mainland China and Hong Kong.

The study investigated pre-service primary school music teacher education in the universities as well as teacher professional development (including postgraduate and other teacher training courses). A survey was undertaken of IT courses offered at the
undergraduate and post-graduate levels in the music departments of the nine universities; all of these departments had previously been Teachers’ Colleges. These music departments had a long tradition of teacher training and a track record in curriculum development in music education. This is generally reflected in the research interests and professional endeavours of the professors.

The interviewees in this study included government policy developers, university professors from music departments, and experienced primary school teachers who hold a Master’s degree in music or music education in the field of IT. The policy developers were interviewed to obtain information regarding policies and government attitudes towards IT, music teacher education, and school music. The university professors were interviewed in particular on the place of IT in music in teacher education and in schools. The interviews with the primary school teachers predominately focused on their particular experiences and practices at the school and teacher training and development levels. The interviewees provided suggestions for integrating IT in both music teacher education and primary school music.

**Limitations**

1. This research looked for insightful opinions and significant observations on the process of the integration of IT in schools from experienced teachers rather than seeking the general view. Thus, a large-scale general survey was not applicable for this research.

2. In investigating the IT courses offered by music departments, the researcher did
not have access to the content and syllabuses of the courses because they were only provided for students and faculty within the same university. The investigation, then, has been based on the titles of the courses.

3. Due to the limitation of time and resources, this research did not involve interviewing students who were enrolled in university IT courses. The researcher interviewed the school teachers to discuss their experience in these courses.

4. Each interviewee was interviewed once.

1.6 Delimitations

The following terms are key elements of this study and are used throughout the thesis. These terms are introduced briefly in this section and are explained more explicitly in the literature review and other chapters of this thesis.

Information Technology (IT)

According to the Illustrated Focal Dictionary of Telecommunications information technology is “A wide ranging generic term covering all aspects of computing, [and] data processing systems, including hardware, software and firmware” (Mazda & Mazda, 1999, p. 316). An on-line reference database World of Sociology (2001, para. 1) states that “information technology includes developments such as computers and the Internet, as well as the myriad of applications for these developments that allow instant communication of information and automated methods for finding, sorting, and analysing information.” Thus, in this research, information technology
(IT) is defined as the use of computer facilities including all kinds of hardware, software, and firmware.

**Integration**

Shelly, Gashman, Gunter, and Gunter (2008) state that “integration by itself is defined as bringing different parts together into a whole” (p. 327). In extending this to “technology integration” they state that it is “the combination of all technology parts, such as hardware and software, together with each subject-related area of curriculum to enhance learning” (p. 327). In practice, it is the bringing together of different parts into a whole. Tomei (2007) acknowledges “the multiple perspectives of teaching and learning with technology” and discusses these with reference to their application in “formal education, ... higher education, [and] professional development” (p. vii). In the present study, the term integration is used to describe the incorporation of IT into curricula and classroom practices to enhance teaching and learning. In Taiwan, the term “資訊融入” used in the field of education is best translated as “IT integration” and in this form has generally been used in syllabuses, curricula, and educational policy documents.

**Government**

Taiwan is a unitary state. The central government is responsible for all matters regarding national development, including the development and implementation of policies. Under the central government there are city and county governments to administer local areas. With respect to the implementation of a national education
policy and the directions of educational development, the term “government” in this study refers to the central government in Taiwan.

**IT in Music teacher education**

Teacher education has an important role in promoting the integration of IT. Dawes and Robertson (1991) argue that a teacher’s knowledge of IT impacts on the use of computers in education. This underscores the importance of providing appropriate teacher education if the integration of IT into education is to be successful and widespread. This research, in focusing on primary school level music teacher education, examines pre-service teacher education programs and professional development (in-service).

**School music education**

It has been noted that after the implementation of the Grades 1-9 curriculum in 2001, the learning of music was merged into the *Arts and Humanities Learning Area*. Textbooks by various authors and publishers have since been developed for teachers and students for each year (and semester) of learning. These textbooks set out to “integrate” learning in music, the visual arts, and the performing arts; music teachers are encouraged by the Ministry of Education (and the textbooks themselves) to cooperate with other arts teachers. In some cases, school administrators assign a music or other arts specialist to teach across all arts areas. This study investigates the practices of school music teachers only with respect to the integration of IT. In doing
so it examines educational policies, music curricula, music pedagogies and their relationship to IT.

1.7 Overview of chapters

This chapter has provided an introduction to the study. Chapter Two presents the research methodology in relation to the collection and analysis of the data. Chapter Three is the literature review. Chapter Four identifies and discusses three periods of development relating to the integration of IT into music education in Taiwan with respect to official policy and curriculum documents. Chapter Five is concerned with the integration of IT in music teacher education programs at both the pre-service and professional development levels. Chapter Six deals with issues pertaining to music in primary schools. Chapter Seven, the final chapter, presents the conclusions and recommendations arising from this study.
Chapter 2 Methodology

2.1 Overview of chapter
This chapter discusses the methodology of the research. The research questions are firstly restated as well as the rationale and philosophy for choosing particular research methods. The research instruments and processes are then presented, followed by considerations such as data collection and analysis. Reliability and validity, and ethical issues are also addressed.

2.2 Research questions restated
The research questions impact on the choice of methods of the study. In this section, the research questions are restated:

1. What developments in the integration of information technology in music education have taken place in Taiwan?
2. How is the integration of information technology in music supported by teacher education and professional development in Taiwan?
3. How is information technology integrated into primary school music education in Taiwan?

2.3 Qualitative research paradigm
This study is based on a qualitative research paradigm. Denzin and Lincoln (2005) defined qualitative research as “a field of inquiry in its own right. It crosscuts disciplines, fields, and subject matters. A complex, interconnected family of terms, concepts, and assumptions surround the term qualitative research” (p. 2). Further, Creswell (2008) stated that “Qualitative research is a type of educational research in
which the researcher decides what to study; asks specific narrow questions; collects numeric data from participants; analyses these numbers using statistics; and conducts the inquiry in an unbiased, objective manner” (p. 46). The types of qualitative research are various; however, Johnson and Christensen (2008) considered that the four most important types of qualitative research are: phenomenology, ethnography, case study, and grounded theory. The purpose of this research is to investigate the developments in the integration of IT in music education in Taiwan. In addition to reviewing government policies and relevant literature, the researcher interviewed a range of experts to understand the development and practice of the integration of IT in music education. Further, the research aimed to identify the relationship among policy implementation, music teacher education and school music education with respect to the integration of IT. As a result, for obtaining the most appropriate data to inquire and answer the research questions, a qualitative research paradigm had been employed. Several approaches including grounded theory, historical research, survey and interviews were used in this study.

2.3.1 Grounded theory

Grounded theory was first articulated in the 1960s, when social researchers attempted to discover a theory from data systematically obtained from social research (Strauss & Glaser, 2008). It consists of systematic inductive guidelines for collecting and analysing data in order to build middle-range theoretical frameworks that explain the collected data. This theory also offers possibilities for advancing qualitative research (Charmaz, 2003, 2005). Cresswell (2008) explained that:
Grounded theory designs are systematic, qualitative procedures used to generate a general explanation that explains a process, action or interaction among people. The procedures for developing this theory include collecting primarily interview data, developing and relating categories of information, and composing a figure or several models that portrays the general explanation. (p. 61)

Grounded theory is based on concepts that are generated directly from the data that are collected in one or more research studies. The researcher develops an understanding of the phenomenon based on the data that they collected during the research period (Johnson & Christensen, 2004). The strategies of grounded theory include: gathering relevant data, coding data, memo writing, developing a dual self, developing a dialectical self, theoretical sampling, and computer-assisted analysis (Charmaz, 2003). In addition, in order to increase the credibility of grounded theory research, Glaser and Strauss (1967) suggested that the researcher should provide a clear statement of the research, so that the reader can identify the credibility of the data they had been given.

This research adopted grounded theory—to overview various literature sources and documents, to seek the detailed information via surveys and in-depth interviews, and establish new knowledge. The historical developments, current practices, suggested approaches for improvement, as well as a map in relation to the integration of IT in music education in Taiwan are presented.

### 2.3.2 Historical research

Historical research is one of the research methods employed in this study. Fraenkel
and Wallen (2006) pointed out that historical research is to collect, evaluate, describe, and explain the data systematically, so that the researcher can understand the accuracy of action or events in past times. Historical research is “an act of reconstruction undertaken in a spirit of critical enquiry designed to achieve a faithful representation of a previous way” (Cohen, Manion, & Morrison, 2007, p. 159). Johnson and Christensen (2008) defined that “providing answers to questions is probably one of the most logical and apparent reasons for conducting historical research” (p. 393). Historical research is also used to “identify the relationship that the past has to the present” (Johnson & Christensen, 2008, p. 393).

The processes of historical research, includes identifying the research question, collecting and evaluating source materials, synthesising the information as well as analysing, interpreting and formulating conclusions (Wiersma & Jurs, 2009). Several researchers have also presented their similar viewpoints pertaining to historical research procedure (see for example, Borg & Gall, 1989; Cohen et al., 2007; Cresswell, 2008; Johnson & Christensen, 2008; Rowlinson, 2011; Shafer, 1980).

Fraenkel and Wallen (2006) stated that it is hard for historical researchers to ensure the reliability and validity of the inferences made from the data available. However, this type of research provides a perspective for decision making regarding the educational problems and supporting the ideas for educational reform. “The value of historical research covers a wide spectrum, from providing an understanding of the past through accurate description to providing perspectives for the decision and policy formation” (Wiersma & Jurs, 2009, p. 256).
This study employed historical methods for gathering information for answering the first research question on the developments in the integration of IT in music education in Taiwan. Various research materials including official documents, policies and legislation, published works, research results, webpages and other resources were analysed; additionally, further information was sought via in-depth interviews. Furthermore, the transcriptions of in-depth interviews also had been adopted to triangulate the accuracy to ensure the credibility of this study.

2.3.3 Survey research

Survey research is “also called sample surveys, examines the frequency and relationships between psychological and sociological variables and taps into constructs such as attitudes, beliefs, prejudice, preference and opinion” (Salkind, 2009, p. 194). Wiersma (2000) identified that survey research is “broad in scope ranging from status quo studies to ex post facto research, which may be causal-comparative or correlational in nature” (p. 157). It is a more effective way to gather simple facts or report the behaviours, opinions, attitudes, and explanations. As well, it is particularly useful when the data required do not already exist, and the research questions are not susceptible to experimental trial for practical reasons such as lack of resources or ethical constraints, survey research could be used in this condition (Gorard, 2001).

Surveys commonly used in educational research for certain kinds of information related to the instruction, facilities, or student populations (Gay & Airasian, 2003). In addition, Cohen et al. (2007) suggested that survey research can be adopted in different usages for education such as test results, self-completion questionnaires, and attitude scales. The present research examined existing IT related teacher
training and obtained feedback on these courses from different groups of interviewees. Subsequently, the practice of the integration of IT in school music education was also investigated through surveying.

In order to gather detailed information about the integration of IT in music teacher education and primary school music education, this study used survey research and referred to Fraenkel and Wallen’s eight stages of survey research. These include defining the problem, identifying the target population, choosing the mode of data collection, selecting the sample, preparing the instruments, preparing the cover letter, training the interviewer, and using an interview to measure ability (Fraenkel & Wallen, 2006). The relevant approaches of this study such as in-depth interviews, sampling skills, research instruments, data collection and analysis, as well as reliability and validity measures are presented in the following sections.

2.3.4 Interviews
Interviews have also been used in this research and considered to be a useful purposeful interaction between people (Gay & Airasian, 2003). Interviews permit researchers to obtain important data they cannot acquire through observation. Fraenkel and Wallen (2006) explain that an interview is an approach in which researchers check the accuracy of observation data. Minichiello, Aroni, Timewell and Alexander (1995) insisted “interviewing is a means of gaining access to information of different kinds. It is done by asking questions in direct face-to-face interaction” (p. 62). However, they revised their views and stated that interviews do not always need to be face-to-face because of the development of telephone and other technologies (Minichiello, Aroni, Timewell, & Alexander, 2008), while a telephone interview is a process where researchers using a telephone to undertake the interview and gather
the data (Cresswell, 2008). Wiersma (2000) explained that the telephone interview is cheaper and more convenient for long distant respondents. As a result, this research predominately adopted telephone interviews via the software SKYPE in Australia, and face-to-face interviews only if the interviewees preferred this option.

This research used in-depth interviews to gather detailed data for answering the research questions. Minichiello et al. (1995) claimed:

In-depth interviewing is conversation with a specific propose—a conversation between the researcher and informant focusing on the informant’s perception of self, life and experience, and expressed in his or her own words. It is a means by which the researcher can gain access to, and subsequently understand the private interpretations of social reality that individuals hold. (p. 61)

Later on, Minichiello et al. (2008) further defined that:

The semi-structure process entails researchers using the broad topic in which they are interested to guide the interview. An interview guide or schedule is developed around a list of topics without fixed wording or fixed ordering of questions. The count of the interview is focused on issues that are central to the research question, but the type of questioning and discussion allow for greater flexibility. (p. 51)

This research conducted the in-depth interviews via three interview schedules with semi-structured questions. The interviewees were asked several questions to explain their personal viewpoints and experiences. The semi-structured questions were
expected to obtain more diverse answers from the interviewees than structured questions. Interview schedules for different groups of interviewees are presented in next section (Research Instruments). Additionally, the expert content validity was employed in this study through assessment of all questions by a select number of IT and music education professionals.

All the interviews in this research were recorded. Burns (2000) mentioned: “tape-recording is the best method, as the raw data remain for later study” (p. 429). This research recorded the content both of face-to-face interviews and telephone interviews. The transcriptions of the interviews were sent back to the interviewees to check the accuracy. All the materials in the interviews including the plain language statements (see Appendix 1 & 2), consent forms (see Appendix 3 & 4), interview questions schedules (see Appendix 5, 6, & 7) transcriptions, and the confirmation forms of transcription (see Appendix 8) were presented in Chinese Mandarin. After the data collection, research results were presented in English. The interviewees were not identified if they asked for anonymity.

2.4 Data collection and analysis

This study involved several research methods including grounded theory, historical research, surveys and interviews. Purposive sampling and snowball sampling were applied in this study to select the research items; in-depth interviewees and content analysis were adopted to collect and analyse the data. These are all detailed in this section. Furthermore, the reliability and validity of this research are also considered.

2.4.1 Sampling

Sampling is the process of drawing a sample from a population (Johnson &
Christensen, 2008). The purpose of sample selection is to identify potential participants from whom to request the information (Gay & Airasian, 2003). Minichiello et al. (2008) argued the purpose of sampling is to identify, choose and gain access to relevant data, which researchers want to carry out. Patton (2002) emphasised the importance of sampling skills in qualitative research: “The sample determines what the evaluator will have something to say about—thus the importance of sampling carefully and thoughtfully” (p. 240).

The sampling strategies were generally divided into two major groups: nonprobability sampling strategies and probability sampling strategies; or purposeful (non-random) sampling strategies and random sampling strategies (Cohen et al., 2007; Fraenkel & Wallen, 2006; Salkind, 2009; Wiersma, 2000). Purposeful sampling is where researchers intentionally select individuals and sites to understand or learn the central phenomenon (Cresswell, 2008).

Fraenkel and Wallen (2006) stated that purposive sampling, also known as judgmental sampling, is based on “previous knowledge of population and specific purpose of the research, investigators use personal judgment to select a sample. Researchers assume they can use their knowledge of the population to judge whether or not a particular sample will be representative” (p. 100). Purposive sampling was used in this research to select several specific music departments in different universities (those that had been the music education department of Teachers’ Colleges). These music departments continue play an important role in music teacher education after the new Teacher Education Act was launched in 1994. This research investigated IT related courses in the music departments for investigating their IT courses, as well as seeking the particular groups of
Another sampling skill, snowball sampling, is where the researcher asks participants to suggest other possible participants who can also be involved in the research (Cresswell, 2008). Snowball sampling is useful for studying communication patterns, decision-making or the diffusion of knowledge within a group (Kumar, 2005, p. 179). The researcher used snowball sampling as an approach to find the interviewees. Several interviewees were asked to introduce other possible candidates to be involved in this research.

The sample size in qualitative studies typically is small, and even might be a single sample. Researchers select the case to develop a deeper understanding of the phenomena and discover or test particular theories (Gall, Borg, & Gall, 2007). In addition to selecting nine universities in Taiwan, this research involved three groups of interviewees via purposive and snowball sampling processes.

The researcher chose music departments in nine different universities throughout Taiwan. These universities were all previous Teachers’ Colleges—the main providers for primary school teachers—and were distributed in the north, middle, south, and east parts of Taiwan. The music departments in these universities have a long tradition of music teacher training and a track record in curriculum development in music education; this is generally reflected in the research interests and professional endeavours of the professors. The researcher investigated IT courses and interviewed the professors in these music departments to understand the practice and feedback of the training.
Three groups of interviewees were selected, including two national educational policy developers; four university professors in music teacher education programs and specialist in IT and music education; and ten primary school music teachers whose Master’s study involved IT and music education. In choosing these particular respondents, the researcher believed that they would be the best equipped to provide insightful comments on practices pertaining to the application of IT music classroom in Taiwan based on their professional training and experiences. Following is the detail regarding the three groups of interviewees:

Policy developers

Two policy developers (also university professors) who deal with national IT education and Music curriculum were invited to participate in this research. Professor T. H. Wu is a former Vice Minister of Education and particularly responsible for the promotion of IT in education national wide. He was also the President of the Tainan Teacher’s College (which was also the southern IT centre of Taiwan). He has been involved in the development of IT education policies and national IT related project for several decades, and still advocates the integration of IT via teaching and research. Another policy developer, Professor M. L. Lai, has participated in the development of national curriculum (arts and music). She received funding from the National Science Council and started the research regarding computer assisted music education in the 1990s. She is a pioneer in this area.

University professors

Four university professors were involved from four different music departments of this study: two from the north and the other two from the south of Taiwan. The term “university professor” here is used in accordance with its normal usage in Taiwan,
that is, for those teaching at the Assistant Professor, Associate Professor, and Full Professor levels. (The term “lecturer” is used for those teaching at a lower level.) All of them have experience in teaching IT related courses in their departments and supervise Master’s students to conduct research in this area. One of the professors started IT and music educational research in her Master’s study in the 1980s, and is actively involved in the national projects for promoting the application of IT in music education.

Primary school teachers

Ten primary school teachers whose Master’s study focused on IT and music education were chosen. These teachers received their Master’s degree from different universities involved in this research. The researcher considered the distributions of interviewees and selected them from different parts of Taiwan. Additionally, several of them were the Master’s students of the university professors who were also interviewed in this study. In order to increase the reliability of the sample, the maximum of two students under the same university professor’s supervision was set.

During the interviews, all the dialogue was recorded to preserve the authenticity of the data and the recorded data was transcribed after the interviews. The researcher asked informants to check the transcription to ensure the accuracy and to refine the main point in the interview.

2.4.2 Content analysis

Budd, Thorp and Donohew (1967) determined that content analysis is a systematic technique to analyse context. Burns (2000) defined that content analysis is “the
systematic quantification of certain characteristics the investigator may be interested in, in terms of their frequency of occurrence within a selected context” (p. 347). Furthermore, Neuendorf (2002) identified of the systematic and objective characteristics of content analysis. Content analysis in this research study had been mainly used to analyses the historical data and other research materials. Fraenkel and Wallen (2006) considered that content analysis is often used in conjunction with other methods like historical research.

Cohen et al. (2007) pointed out that the process of summarising and reporting the main content and message of writing data can be defined as content analysis. Content analysis can be undertaken with many types of written materials, from media products to personal interviews, and documents to interview transcriptions. It is often used to analysis large quantities of text, facilitated by the systematic, rule-governed nature of content analysis. This research adopted content analysis to analyse three types of research sources: historical materials, teacher education programs, and the transcriptions of in-depth interviews.

In conducting this research, content analysis was used as well as grounded theory, historical research, survey and interview. In the first stage of content analysis in this study, a great deal of historical materials, such as official policies, laws, legislation, news, documents, internet resources, previous research results, and other supporting documents, had been collected in order to undertake the historical review. The analysis assisted the researcher to identify the emphasis of various IT education policies, as well as to discover the sequence and trends for the development of integration of IT.
In the second stage, the researcher sought through the music teacher education programs with respect to IT in music departments to understand their content and practice. The data covered from pre-service to postgraduate level. Moreover, documentation regarding primary school music education like policies, curriculum guidelines, and syllabuses also had been collected to understand the general situation of the integration of IT in music teacher education and primary schools music education.

In the third stage, the approach of content analysis was used to analyse and identify the significant meaning from the transcriptions of the in-depth interviews. Gillham (2003) stated that “content analysis is about organising the substantive content of the interview: the content that is of substance. So there are two essential strands to the analysis: identify those key, substance points, and putting them into categories” (p. 59). The transcriptions of the interviews were analysed to obtain answers to the research questions.

Several researchers suggested that some computer programs can be applied to assist the analysis of the interview transcriptions (Burns, 2000; Borg & Gall, 1989; Fraenkel & Wallen, 2006; Wiersma, 2000). However, Cohen et al. (2007) and Weber (1985) pointed out the limitations of using computer programs for content analysis. The researcher analysed research documents and interview transcriptions manually due to the needs and characteristics of this study.

2.4.3 Reliability and validity
This study employed three interview schedules with semi-structure questions. In designing the questions, due consideration was given to reliability and internal
consistency. Salkind (2009) addressed the importance of reliability and validity for research tools: they are the first lines of defense against spurious and incorrect conclusions. Cresswell (2008) insisted that reliability and validity are bond together in complex ways. These two terms sometimes overlap and at other times are mutually exclusive. The more reliable the research instrument, the more valid the study will be. Other factors like: personalities, social attitudes, and interactions between the interviewer and informants might also influence the reliability and validity. Although some researchers further use the terms “trustworthiness and authenticity” in place of “reliability and validity” (Guba & Lincoln, 1994), this study was mainly designed based on the theories of Cresswell (2008) and Salkind (2009) and used reliability and validity to measure the qualitative research.

Reliability

Cresswell (2008) and Salkind (2009) claimed that obtaining reliable measures or observations is an important condition of a good research. Reliability is not only a concept but also a practical measure of how consistent and stable a measurement instrument or a test might be. Although Kirk and Miller (1986) had divided reliability into three forms: quixotic reliability, diachronic reliability, and synchronic reliability, Cresswell (2008) and Salkind (2009) classified reliability as test-retest reliability, alternate forms reliability, alternate forms and test-retest reliability, inter-rater reliability, and internal consistency reliability.

The internal consistency reliability is a measure of how consistently each item measures the same underlying construct and examines how unified the items are in a test or assessment. However, Burns (2000) pointed out that this kind of reliability could be checked by building some redundancy into the instruments. In order to
reasonably assess reliability when doing the research, Minichiello et al., (2008) stated that it is necessary for the researcher to document the research procedure. This should be done in such a manner that any reader or prospective researcher can find the details of how and why the researcher made certain decisions in the research process, the perceived impact on researcher and informants, how the data was collected and analysed. This research used the internal consistency reliability to assess the reliability of interview questions and the information related to this research procedure.

Validity
In addition to reliability, validity is another consideration for establishing the research instruments. According to Salkind (2009) there are three aspects of validity:

1. Validity refers to the results of a test, not to the test itself. So if we have the ABC test of social skills, the results of the test may be valid for measuring social interaction in adolescents. We talk about the validity only in light of the outcome of a test.

2. Just as with reliability, validity is never a question of all or none. The results of a test are not just valid or invalid. This progression occurs in degrees from low validity to high validity.

3. The validity of the results of a test must be interpreted within the context in which the test occurs. If this were not the case, everything could be deemed to be valid just by changing its name. (p. 117)

There are different forms of validity: content validity, criterion-relate validity, and construct validity. The most obvious type of validity is content validity for the
interview questionnaires. Gall, Borg and Gall (1996) explained that content validity refers to “the degree to which the scores yielded by a test adequately represent the content, or conceptual domain, that these scores purport to measure” (p. 250).

Burns (2000) pointed out that content validity may be “assessed by having some competent colleagues who are familiar with the purpose of the survey examine the items to judge whether they are a representative sample of the behavior domain under investigation” (p. 585).

The expert content validity was used in this research to judge the research instruments and ensure the validity. Creswell (2008) identified the strategy to evaluate content validity: “typical researchers go to a panel of judges or experts and have them identify whether the questions are valid. This form of validity is useful, known and easily identifiable” (p. 172).

Three experts from academia were invited to consider the content and effectiveness of the interview schedules in this study. Because the interviews were conducted in Chinese, the Chinese translations of these questions were also checked. These experts gave some comments on the revision of the questions before the interviews were conducted.

2.5 Research instruments

This research adopted three different semi-structure interview schedules as research instruments to account for the research goals and to answer the research questions. Each group of interviewees in this study was interviewed via different interview schedules. (The first interviewee schedule is for the policy developers; the second is for the university professors, and the third is for the school teachers.) The questions
in three schedules overlapped. This is because the researcher expected to obtain the information on some particular issues from different perspectives.

**Interview Schedule I: for policy developers**

This interview schedule is mainly focused on the developments of the integration of IT in education in Taiwan, particularly in music education. The questions in this interview schedule were expected to obtain the historical data and evaluate the accuracy of existing historical research resources. The content includes personal background and opinions of the interviewees, important events and promotion approaches, influences of policies and the directions for future development with respect to the integration of IT. Before the interview, the researcher requested the interviewees to answer the question in relation to music education. The details are as follows:

1. What is your background and experience of the integration of IT?
2. What is your opinion on the integration of IT?
3. Please describe the developments of the integration of IT in education in Taiwan.
4. What are the important factors and their influences on the integration of IT in Taiwan?
5. What are the effects on the teacher education institution after the promotion of the integration of IT?
6. What are the effects on primary school education after the promotion of the integration of IT?
7. How should the institutions promote the integration of IT in pre-service teacher education and in-service teacher professional development programs?
8. How should the primary school promote the integration of IT?

9. What are the challenges to promote the integration of IT in pre-service teacher education and in-service teacher professional development programs?

10. What are the challenges to promote the integration of IT in primary school education?

11. What do you see as the future direction in the promotion of the integration of IT in both pre-service teacher education and in-service teacher professional development programs?

12. What do you see as the future direction to promote the integration of IT in primary school education?

**Interview Schedule II: for university professors**

This interview schedule is mainly focused on the investigation of the present situation and the feedback from the university professors regarding the integration of IT training in primary school music teacher education (including pre-service training and professional development). The content includes personal background and opinions of the interviewees, the practice of the integration of IT training for music teacher education, and the suggestions to the Ministry of Education and Primary school education for further promotion. The strategies and suggestions of the integration of IT in school music education are also explored. The details are as follows:

1. What is your background and experience in the integration of IT?

2. What is your opinion on the integration of IT?

3. What kind of knowledge and skills in the integration of IT do you think that music teacher should have?
4. What courses did your institution offer to teach undergraduate and postgraduate student related to the integration of IT?
5. What kind of knowledge and skills did the students learn from these courses?
6. As above, how about the feedback from students for these courses?
7. What are the challenges for music teacher education institutions in terms of training their students on the integration of IT?
8. What are your recommendations for music teacher education institutions to train students on the integration of IT?
9. What do you think is required in the training of in-service music teachers to integrate IT in their teaching?
10. What are the approaches or models of the integration of IT in primary school music teaching?
11. What are your recommendations for the Ministry of Education regarding the promotion of the integration of IT in music education in the future?
12. What are your recommendations for primary school to promote the integration of IT in music education in the future?

**Interview Schedule III: for school teachers**

This interview schedule is mainly focused on school music education and teacher’s feedback for IT integrated music teacher education. This interview schedule can help to understand the actual situation, needs, and strategies of the integration of IT in primary school music education. The content includes personal background and opinions of the interviewees, the practice of the integration of IT in primary school music education, and suggestions for Ministry of Education, music teacher education programs and other school staff. The details are as follows:
1. What is your background and experience in the integration of IT?
2. What is your opinion on the integration of IT?
3. What is the general situation of the integration of IT in primary school music teaching?
4. What are the challenges of the integration of IT in primary school music teaching?
5. How do you integrate IT into your music teaching?
6. How does IT solve your teaching problems or improve your teaching?
7. What are the advantages and disadvantages of integrating IT into your music teaching?
8. What further assistance do you need in integrating IT in your teaching?
9. What are your recommendations for the Ministry of Education to promote the integration of IT in music education in the future?
10. Did you undertake any course concerning the integration of IT when you studied in the teacher education institution? What did you learn from the courses? What are the effects on your teaching after taking those courses?
11. Did you participate in any training concerning the integration of IT during your teaching career? What did you learn from the courses? What are the effects on your teaching after taking those courses?
12. What are your recommendations for music teacher education institutions (either for pre-service or in-service teachers) about the integration of IT training?
13. What are your recommendations for primary school music education related to the integration of IT (such as policies, curriculum, facilities)?
14. What are your recommendations for other music teachers to integrate IT in their teaching?
15. Please recommend some integration approaches or models in primary school
music teaching.

2.6 Ethical issues

According to Christians (2005), codes of ethics for professional and academic associations are the conventional format for moral principles. The codes of ethics can be classified into four codes: informed consent, deception, privacy and confidentiality, and accuracy. This research study was granted approval from the Ethics Committee of RMIT University (see Appendix 9). Sixteen participants were selected for the in-depth interviews in this research. All these participants were required to sign the plain language statement as an indication of agreement to participate in this research study and agreed to have the interview recorded. The content and guidelines for interview were discussed with the interviewees before the interviews. After the interviews, the interview transcriptions were checked for accuracy by the interviewees.

2.7 Research processes

The processes of this research are divided into five stages. Although several of them have been discussed previously in this chapter, this section presents the sequence of the research processes. It is worth mentioning that the process of the literature review covered all the stages.

Stage One

The first stage of this research is to collect and review various historical materials in relation to the developments in the integration of IT in music education in Taiwan. After this process, an overview was initially established.
Stage Two

Three groups of interviewees were interviewed. After transcribing the content, the interviewees checked the accuracy of the transcription, and the interview data is analysed. The results between different groups are compared and contrasted.

Stage Three

Current IT courses in both undergraduate and postgraduate programs over nine music departments were investigated. The content of these courses were consequently analysed.

Stage Four

The interview data from the first group of interviewees (policy developers) is used to triangulate the overview of historical developments in stage one. The interview data of the second and third groups of interviewees (university professors and school teachers) is used to assist the understanding of the data observed in stage three (IT courses in music departments).

Stage Five

In the last stage of this research, all the results are combined together to help draw conclusions. A map is established to present the relationship among the implementation of policy, music teacher education and school music education with respect to the integration of IT. Several recommendations are also provided for future development and research.

2.8 Summary of chapter

This chapter presents the methodology of this study. The research is based on the
qualitative paradigm; and grounded theory, historical research, survey research and interview are employed. The purposive and snowball sampling are adopted to select research items; while content analysis is used to analyse the research data.

In addition to an overview of the historical documents and IT courses in music departments, the researcher conducted in-depth interviews with three groups of interviewees using semi-structured questions. In designing the questions, due consideration was given to internal consistency and reliability. The interviews were undertaken either face-to-face or by telephone. After each interview, the recording is transcribed and analysed. Ethical issues are also a concern of this research.
Chapter 3 Literature Review

3.1 Overview of chapter

The literature review is comprised of three sections in relation to the integration of IT: the integration of IT in education generally, the integration of IT in music education specifically, and the development of the integration of IT in education in three different Chinese cultural communities—Taiwan, Hong Kong and Mainland China. Over the duration of the research program, the references were collected on these three main fields and provided the foundation and ongoing development of the research.

The rapid development of IT impacts on its use and application. This chapter firstly overviews the integration of IT in general education including the definitions, development, philosophy and rationale, strategies and applications, considerations, standards, as well as IT and teacher education. Secondly, the literature has been narrowed down to IT and music education specifically. This section covers the rationale, development, resources, applications, considerations, and music teacher education. In addition, several research studies with respect to the integration of IT in music education in Taiwan were reviewed. In the third part of literature review, the characteristics, similarities and differences in the development of IT integrated music education in three Chinese cultural areas were discussed. The literature review forms the basis for the resolution of the research design and research questions of this study.

3.2 The integration of IT in education

In order to gather a general understanding of the integration of IT in education, the
researcher overviewed the definitions, development, philosophy and rationale, strategies and applications, considerations, standards. In addition, the issue of IT and teacher education was discussed.

3.2.1 Definitions

“IT” is generally acknowledged as the abbreviation for “information technology”. According to the Oxford English Reference Dictionary (Pearsall & Trumble, 1996), the term “information technology” refers to “the technology involved in the recording, storage, and dissemination of information, esp. using computers, telecommunications, etc.” (p. 723). Another two dictionaries, Cambridge Advanced Learner’s Dictionary (Woodford & Jackson, 2003) and The Collins Australia Dictionary (Anderson et al., 2005), offer the definitions directly under the term “IT”. The former defined IT as “science and activity using computers and other electronic equipment to store or send information” (Woodford & Jackson, 2003, p. 644); and the later states that IT is “the technology of the production, storage, and communication of information using computers and microelectronics” (Anderson et al., 2005, p. 833). Thus, IT defined as computers and other relevant devices for storing, transferring, and communicating data.

The complementary term to IT is “ICT”, which is the abbreviation for Information and Communications Technology. ICT has been described as any activity that utilises computers and hardware or software to generate, store, transfer, and retrieve information in an electronic format. Once ICT was regarded as equivalent to IT, but now, due to the rapid development of Internet access technology, digital information transfer between computers has become faster and applications such as email and videoconference are broadly utilised. Therefore, ICT is broader than IT
“Educational technology” is generally defined as teaching or learning with the aid of technology. The definition often varies depending on who uses it. Some educators have described educational technology as the specific use of computer-related equipment, while others have regarded it as any form of media used in the classroom. There is little agreement about the definition of educational technology (Lever-Duffy & McDonald, 2008).

Roblyer (2006) in his book Integrating Educational Technology into Teaching stated that “educational technology is a combination of the processes and tools in addressing educational needs and problems, with an emphasis on applying the most current tools: computers and their related technologies” (p. 9). Hence, “educational technology is viewed to have two components as processes that are simply the learning activities necessary to attain a learning objective and resources to enhance learning” (Isman, Yaratan, & Caner, 2007, ¶ 1). A few years later, in the fifth edition of Integrating Educational Technology into Teaching, Roblyer and Doering (2010) further defined educational technology from four perspectives: media and audiovisual communications; instructional systems and instructional design; vocational training; and computer systems. In addition to the definition, they also pointed out the development and even some future visions of the educational technology such as the issues of copyright and privacy/safety.

In this decade, the term “e-learning” is widely referred to as computer relevant instructional activities. E-learning is known as electronic learning. The American Society for Training & Development (ASTD), the world’s largest association dedicated
to workplace learning and performance professionals, argued that e-learning “covers a wide set of applications and processes, such as Web-based learning, computer-based learning, virtual classrooms, and digital collaboration. It includes the delivery of content via the Internet, intranet/extranet (LAN/WAN), audio- and videotape, satellite broadcast, interactive TV, CD-ROM” (Ellis, 2004, ¶ 1). A similar definition of e-learning by two IT education researchers Preston and Cuthell is that “the term ‘e-learning’ is used in further and higher education to describe the use if the web and other internet technologies to enhance the teaching and learning experience” (p. 171). Rossen and Hartley (2001) stated that e-learning comprises three aspects: computer-based training, Web-based learning, and online learning; and could be referred to anything enabled, delivered, or mediated by electronic technology for the explicit purpose of learning. Alwi and Fan (2010) further commented that “E-learning is the term used to describe the use of the web and other Internet technologies in terms of enhancing the teaching and learning experience” (p. 148). Similar to ICT, e-learning is more reliant on the Internet for the transforming and communicating information.

Another scholar, Allen (2003) provided a broader definition of e-learning. He argued that “a structure, purposeful use of electronic systems or computers in support of the learning process. ... All computer-delivered instructional applications are frequently grouped under the general heading of e-learning” (pp. 27-28). Nicholson (2007) clarified that the term e-learning has different meanings in different contexts and there is no single agreed definition. In the aspect of education, it could be widely referred to not only as online contexts but also the “full range of computer-based learning platforms and delivery methods, genres, format and media such as multimedia, educational programming, simulations, games and the use of new
media of fixed and mobile platforms across all discipline areas” (p. 2). In this sense, it does not necessarily proceed within the environment of the Internet connection; all computer relevant facilities associated in learning activities could be generally defined as e-learning.

In summary, terms such as IT, ICT, educational technology, and e-learning pervade modern educational research. The common component of these terms is the usage of computers and electronic devices for storing and transforming information; especially the latter two terms (educational technology and e-learning) are specific to the field of education. Yip (2005) clarified that even though different countries, regions, or specific curriculum documents have used different terminology in relation to the computer technology; it was similar. Although there is a variety in the choice of terms that could be used in place of the term IT, all of them are in substance referring to a comparable scope with a focus on the computer. In this research, the researcher widely reviewed the literature on IT, ICT, educational technology, e-learning and relevant fields in order to seek the theories and appropriate pedagogies for integrating computers in music instruction.

The term “the integration of IT” in education carries the meaning of applying IT to assist and enable the instructional activities in order to make the education more effective. The word “integrate” was defined as “to combine two or more things in order to become more effective” (Woodford & Jackson, 2003, p. 653). In the “Delimitation” section of Chapter One (1.6), “integration” was also defined based on other researchers’ definitions (Shelly et al., 2008; Tomei, 2007). In this study, the term integration is used to describe the incorporation of IT into curricula and classroom practices to enhance teaching and learning.
Moresch (1995) suggested, “Technology-based tools are integrated [into the curriculum] in a manner that provides a rich context for students’ understanding of the pertinent concepts, themes, and processes. Technology ... is perceived as a tool to identify and solve authentic problems” (p. 42). Other researchers including Boudrot, Hertzberg, and Leonard (1988) provided a definition of computer integration as “the process of totally integrating the use of computers into the existing curriculum through learning activities that address the subject-area objects” (p. 36). Additionally, it is worth mentioning that the term “IT integration (資訊融入)” has generally been used in the syllabuses, curriculum, and educational policies in Taiwan. There has been a significant amount of research undertaken related to the integration of IT in education and this will be discussed in the following sections.

3.2.2 Historical development

The researchers generally agreed that the start of the utilisation of technology in education took place in the 1950s (Bitter & Legacy, 2008; Cuban, 2002; Lockard & Abrams, 2004; Morrison & Lowther, 2005; Roblyer & Doering, 2010). Jonassen, Peck and Wilson (1999) made the comment that the educational technologies have been traced back to the 15th century and later involved to the development of the “true educational technology” in the 1950s—that is, the programmed instruction specifically to meet the needs of education. Different to Jonassen et al. (1999), Lever-Duffy and McDonald (2008) traced the application of educational technology back to the early 1900s and the advent of early movies. However, similar to other researchers, Lever-Duffy and McDonald commented that the first implementation of modern educational technology appeared in the 1950s—a programmed instruction system was established base on Skinner’s behaviourist view of learning theory.
Morrison, Ross and Lowther (2009) stated that technology has long been viewed as the means to deliver instruction in the late 19th century, since the lanternslide projector was introduced into classroom. This conception of technology has led the use of technology through the 20th century with the overhead projector, television, and other related devices in the classroom.

Lockard and Abrams (2004) identified that the integration of technology within the education sector has been slower than other fields—such as business—since the 1950s. With the increasing percentage of computer systems in schools and the accessibility of the Internet, teachers should be capable to integrate IT in the technology-rich educational environments.

Bitter and Legacy (2008) claimed that the acceleration of utilising technology in education became significant starting from the late 1950s. Morrison and Lowther (2005) also declared that the USA commenced introducing technology into schools in the late 1950s, when the National Defense Education Act was launched. In the book *Integrating educational technology into teaching*, Roblyer and Doering (2010) presented a timeline for the historical development of educational computing activities and resources from 1950 to 2010. The timeline indicated the first use of computers in school, the use of computer assisted instruction (CAI) and the Internet, as well as the first introduction of the *National Educational Technology Standards* in the USA. Australian researcher, Nicholson (2007), however, explained that even though there is no single evolutionary tree of computer assisted learning, it could be traced back to the 1960s when a number of educational applications of computers were introduced in universities.
The application of IT has developed in different countries around the world. Robinson (2007) stated that the application of technology was limited in scope in North American schools in the initial stage, and now, with the federal government injecting large amount of funding and support to the schools, the contemporary integration of technology needs to be an integral component of education. In Britain, the rapid enrichment of IT devices in schools during this decade created new possibilities for school education. This “e-maturity” environment of schools enables the teachers to consider the best use of technology and develop new pedagogic repertoires for the new effective teaching (Sutherland, Robertson & John, 2009). On the aspect of the development of IT facilities, the popularised mobile device and wireless internet connection, mobile learning (m-learning) and ubiquitous learning (u-learning) are seen in school education (Oliver, 2005).

A notable researcher in IT and education, Jonassen (2000), defined the historical development of using computers in learning into three stages–learning from computers, learning about computer, and learning with computers. In the age of learning from computers, a primary use of computers has been the delivery of computer assisted instruction (CAI). The CAI systems included the approaches such as the drill and practice, tutorials, and intelligent tutorials. In the 1980s, the age of learning about computers, learning computer skills was seen as mainstream in the application of computers in education. In the last stage, learning with computers, computers were defined as the technological learning partner to support the learning. A research study from Malaysia maintained a similar viewpoint that the role of computers themselves in the early days was seen as the objective of instruction. After learning theory has shifted from a behaviourist perspective to
cognitivism, and now to the constructivism in school education, the status of computers has been shifted to become a powerful tool for learning (Nalliah & Jamaludin, 2001). This viewpoint based on the development of learning theory, was obviously different from other research which insisted that the development of IT applications in education is influenced by the development of technology facilities. In addition, the relationship between learning theory and the application of technology will be discussed in the following section—learning theory and the integration of IT.

Even though a number of researchers offer various comments on the start of the application of technology in education, most of them agree that it could be traced back to the 1950s, when computers were adopted in the education system. In addition, the creation of the Internet is a significant issue for IT development and its application. Along with the increasing availability of IT devices and accessibility of the Internet, it becomes a general trend to enhance teaching and learning via IT in the 21th century.

**3.2.3 Philosophy and rationale of the integration of IT**

This section presents the rationale of the integration of IT and then discusses the learning theories and their relationship to the integration of IT. It is essential for the teachers to understand the role of IT in the process of teaching and learning. Lever-Duffy and McDonald (2008) suggested “It’s best to begin with a solid understanding of what teaching and learning really are. To be effectively used, educational technology should not be segregated from the teaching and learning that it supports” (p. 3).
Rationale of the integration of IT

In the 21st century, the computer plays an integral part in people’s daily life. Lockard and Abrams (2004) pointed out that not only in the USA but also worldwide, computers are an essential part of education in the 21st century. Shelly et al. (2008) illustrated that the computer and related technology have continued to influence the lives of most people. The teachers nowadays are educating students who will spend all their lives in a technology-rich society. It is necessary to use technology in teaching so that the students will be comfortable to use the new technology in their lives.

In the aspect of learning, IT has impacted on classroom pedagogy and enhanced students’ motivation and attitudes (Harrison, 2005). Somekh (2007) indicated that IT provides a number of new potentials to learners including the tools to support them in constructing knowledge, an extraordinary degree of control over accessing and handling information, and radically new ways of producing and publishing their own work.

In the early period of the integration of IT, Jonassen (1989) found that the computer-based systems have the potential to foster levels of cognitive processing, as well as engage the learner in a stage of analysis and depth of learning that is not elicited by other learning or instructional strategies. Recently, Lever-Duffy and McDonald (2008) commented that IT could be used to support and enhance the process of teaching and learning at any number of points in the process. Here, we can say that it offers both the teachers and learners the opportunity for optimum performance; IT has the ability to assist teaching and learning in many aspects.
Our life has been and will continue to be altered by the development of technology. Nowadays, teachers are teaching the citizens for the future, who need the ability to handle information and communication using new technology. The importance of involving technology into education system has been increased (Downes & Fatouros, 1995; Nettelbeck, 2005). Dawes and Robertson (1991) explained that the rationale for introducing IT into the classroom is to enhance teaching and learning for the short term, and to further help students’ future education for the long term. Especially when the availability and accessibility of IT is getting popular, the educators should seriously consider the application of IT in teaching in order to enhance teaching and learning in the modern age as well as to cultivate adequate abilities for the future citizens.

Learning theory and the integration of IT

Although many researchers identify the importance and rationale of the integration of IT, IT itself is not a guarantee of successful teaching. It only contributes when the integration meets students’ learning (Robinson, 2007). It is necessary to know how the students learn when new variables (such as IT) are introduced into teaching in order to maximize positive impact.

In this research study, the researcher believes that there are links between the integration of IT and various learning theories. This is also supported by Pachler (2005a). A number of researchers have focused on the relationship between learning theory and the integration of IT. On one hand, the researchers mentioned that the design of the computer instruction should be based on the consideration of learning theories and the development of cognition (Berry, 2000; Jonassen, 1991, 2004; Lakoie & Nakamura, 2005; Mayer, 2005; Miller & Miller, 2000; Rouet, 2001; Schnitz,
On the other hand, the research showed that the application of ICT in education has positive strengths in developing students’ cognitive skills (Allen, 2003; Boon, Burke, Fore, & Spencer, 2006; Chiazzese, Chifari, Merio, Ottaviano, & Seta, 2008; Guha, 2010; Kanuka & Anderson, 1999; Salomon, Perkins, & Globerson, 1991; Ridgway & McCusker, 2003; Somekh, 2007; Sweller, 2005). For example, Mayer (2001) and Sweller (2005) identified that multimedia has the potential to overcome the limitations of working memory and help the development of cognition. Further, Nalliah and Jamaludin (2001) explained that the evolution of learning theory also influences the use of technology in education: from learning the computing skills to the utilisation of computer as a powerful tool in delivering instruction.

Bitter and Legacy (2008) identified that the integration of IT in the classroom “must be informed by an understanding of current learning theories and practices that represent fundamental changes in the way teachers teach and learners learn” (p. 143). Duffy and Jonassen (1992) presented similar arguments that the teachers should understand the learning theories and the subject matter; hence they are able to seek appropriate strategies or approaches for integrating.

Roblyer and Doering (2010) indicated that, whether through objectivist (direct instruction) or constructivist instruction, technology could enhance the quality of education. The application of technology such as drill and practice and tutorials might be particularly helpful for direct instruction, while most other applications of technology might either be useful for direct instruction or constructivist learning—it all depends on how teachers use it. As a result, teachers should consider the content and possible problems of learning in order to integrate IT into an appropriate learning activity and, at the same time, match the individual learning needs.
Lever-Duffy and McDonald (2008) argued that to understand educational technology, teachers should understand the process of teaching and learning. Fundamentally speaking, teachers need to understand the learning theory. They mentioned several types of learning theories, yet no particular suggestion and specific theory or strategy for integration.

In contrast to Lever-Duffy and McDonald (2008), Heinich, Molenda, Russell, and Smaldino (1996) urged that the teachers’ viewpoint on IT in the classroom depends very much on their beliefs of how people learn. They listed different perspectives of learning theories (behaviourist, cognitive, constructivist, and social-psychological perspectives) and recommended various approaches for the integration of IT. For example, programmed instruction, such as the computer assisted instruction (CAI) system, is highly structured and particularly beneficial to the learning in a behaviourist perspective, which has been very successful in teaching basic knowledge and skills. Pachler (2005a) also provided his viewpoint on the application of IT in the learning of behaviourist perspective. He claimed, “a computer program or application models the role of tutor by offering some input or paradigm which the learner can ‘drill and practise’ followed by the provision or feedback” (p. 194).

Pachler (2005a) raised another example of the IT application in another learning theory—cognitive perspective. He believed that it is important for educators to understand the impact of applications and tools (on the learning process) which help learners to access the information, engage in abstract thinking, make the knowledge-construction process transparent and build the classificatory systems of knowledge in the cognitive perspective learning theory. Generic software such as
word processors, spreadsheets and databases belong to this category. In addition, the use of multimedia and hypermedia has tremendous potential for presenting learners’ near-to-life micro worlds modeling and creating various aspects of the targeted subjects. Thus, IT can be seen as a useful tool to empower the user to engage in cognitive and creative thinking.

In the *Handbook of Research on Educational Communications and Technology* (Jonassen, 2004), several researchers (Burton, Moore, & Magliaro, 2004; Henning, 2004; Kerr, 2004; Winn, 2004) discussed the theoretical functions for IT in education based on various learning theories including the behaviourist perspective, cognitive perspective and social-psychological perspective. Shelly et al. (2008) in the *Teachers Discovering Computers Integrating Technology and Digital Media in the Classroom*, stated that to understand the features of various learning theories would help teachers to better integrate technology into the classroom. They illustrated a range of learning theories and research as well as explained the relationship among learning theories, researchers, and the integration of IT:

Many forms of computer-based instruction and educational software are based on Skinner’s operant conditioning. They provide positive reinforcement when a desired behavior occurs ... For instance, when the correct answer is given, the software program provides positive verbal and visual feedback for the students’ correct response. (p. 370)

Digital media technology appeals to a variety of learning styles and learning intelligence (Gardner). Students are more activity engaged in their learning when teachers effectively integrate technology (Bruner). Technology is effective
with group project, working in teams (Vygotsky and Dewey), and problem-solving activities requiring higher-order thinking skills that allow students to build new ideas from their current knowledge (Bloom). Teachers even have used computer time effectively as part of a behavior management system (Pavlov and Skinner). (p. 390)

In addition, Shelly et al. (2008) mentioned the new technology in education such as games-based learning and social network, and emphasised that both of them should be integrated into learning activities based on educational practice or learning theories.

At the same time, it is worth mentioning that many researchers suggested that concept mapping is a significant mind tool for the development of cognition. The idea of concept mapping is closely allied to the constructivist theory of learning. The computer diagrammatic software, in particular, helps learners to organise, present, communicate their thoughts in an easier way and, thus, it constructs learners’ cognition more effectively (Beaver & Moore, 2004; Cook & Ralston, 2005; Jonassen, 2000; Nettelbeck, 2005; Somekh, 2007).

Heinich et al. (1996), further, mentioned that one particular theory would not suit all kinds of learning activities; the instructors need to develop the ability to select the most appropriate media in the classroom based on studying psychology. This argument was later supported by Preston and Cuthell (2005), who believed that the instructors should properly evaluate which IT resources could be deployed, and how various learning styles and the development of intelligences can be supported by IT.
According to the literature above, we can see that an effective integration of IT should be based on a fine connection among diverse learning theories. From the objectivist instruction to the constructivist instruction, the integration of IT would provide the possibility to enhance teaching and learning for all. It is essential for the instructors to consider the subject matter and the learning theories before they integrate IT into their teaching.

### 3.2.4 Strategies and applications

This section discusses the strategies and applications of the integration of IT. For practical IT applications, Dick (2005) offered a range of ideas in his technology integration template. To start the integration of IT, Shelly et al. (2008) suggested for teachers to use technology as a powerful tool in the classroom and extensively integrate technology throughout the curriculum. A great deal of discussion has taken place on the strategies to practice the integration of IT in education, yet there are no consistent agreements. In 2002, Twining intended to conceptualise the use of computers in education and developed the Computer Practice Framework (CPF) for primary school. He argued that the CPF was developed based on the confederation and development of the existing practice of computer use in school (Twining, 2002). However, numerous theories in relation to the strategies of IT interrogation have continued to be raised.

The integration of IT strategies for classroom practice has been widely discussed. Such diverse discussions of the integration of IT strategies and application could be classified into following categories: process based, software/hardware based, learning theory based, learning activity based, and the classroom size.
Process based

This category emphasises the process of the integration of IT. Shelly et al. (2008) claimed that the teachers would progress through different stages of familiarising with technology integration.

1. Familiarisation—Teachers become aware of technology and its potential uses.
2. Utilisation—Teachers use technology, but minor problems will cause teachers to discontinue its use.
3. Integration—Technology becomes essential for the educational process and teachers are constantly thinking of ways to use technology in their classrooms.
4. Reorientation—Teachers begin to rethink the educational goals of the classroom with the use of technology.
5. Revolution—The evolving classroom becomes completely integrated with technology in all subject areas. Technology becomes an invisible tool that is seamlessly woven into the teaching and learning process. (p. 332)

Sutherland et al. (2009) stated that IT itself will not lead to enhanced learning nor replacing the teachers’ teaching. Before integrating IT into teaching and learning, teachers should consider the potential of particular technologies for the content of learning and evaluate the available technologies. They suggested four processes for teachers to start with the integration of IT in the classroom as follows:

• deciding on a focused area of the curriculum. The student normally find difficult to learn and choosing ICTs that could potentially enhance learning in this area;
• *out-of-the-classroom design as a thought experiment*. This involves thinking about the area to be taught, considering relevant ICTs, while at the same time imagining how students would engage with these activities from the point of view of the intended learning. It also involves taking into account the background knowledge and experience of the students;

• *into-the-classroom contingent teaching* which draws on all the prepared activities while at the same time opportunistically using what the students bring to the lesson to extend their learning;

• *out-of-the-classroom reflection on and analysis of the design initiative using video data collected from the classroom experimentation*. (Sutherland et al., 2009, pp. 30-31)

Sutherland et al. put the emphasis on the role of the teacher. They commented that the teacher is the key for integrating IT to transform and enhance learning. The teachers should obtain maximum benefits and potential from IT. More importantly, when using the new digital tool, teachers are expected to weight the background experience of students and the content of what they are going to teach. These could be supported through teacher professional development (Sutherland et al., 2009).

With respect to students’ learning process, Jonassen, Howland, Marra, and Crismond (2008) introduced the implications of learning with technology based on various learning processes, such as investigating, exploring, writing, modeling, community building, communicating, designing, visualising, and assessing. They suggested that the teachers should consider different processes of learning to integrate IT.
Software/hardware based

Lever-Duffy and McDonald (2007) presented several applications of IT for effective instruction. They introduced different types of IT resources including administrative software, academic software, the Internet and audiovisual software. The authors exam and explain how such resources might be used to enhance teaching and learning.

Bitter and Legacy (2008) introduced several strategies for using technology in the classroom. Similar to Lever-Duffy and McDonald, they classified the IT resources in two categories: software and the Internet. Each category comprised several components along with their applications in teaching. With respect to software, word processing, spreadsheets, databases and concept-mapping tools are introduced, whilst the use of World Wide Web, email, Weblogs and blogs were described in the category of Internet sources.

Learning theory based

Other researchers presented different ways to categorise the levels of IT application (Moersch, 1995; Wan, C. S. & Li, C. C., 2000). For example, Moersch’s Seven levels for the integration of IT (1995) classified the levels of IT application from “Nonuse, Awareness, Exploration, Infusion, Integration, Expansion to Refinement” (p. 42), to be used to assist school districts in restructuring their curricula to include concept/process-based instruction, authentic uses of technology, and qualitative assessment. This taxonomy has been adopted as one of the teacher training materials for the integration of IT in Taiwan.
Beaver and Moore (2004) suggested that teachers consider students’ higher-order thinking skills and decide on adequate learning styles to design the IT integrated curriculum. Three steps were suggested:

- Consider goals/objectives or outcomes/standards for their lesson or unit
- List possible questions and activities for each level on Bloom’s taxonomy (Knowledge, Comprehension, Application, Analysis, Synthesis, Evaluation) and each learning style in Gardner’s theory of multiple intelligences (Visual/Spatial, Verbal/Linguistic, Logical/Mathematical, Bodily/Kinesthetic, Musical/Rhythmic, Interpersonal, Intrapersonal)
- Look for areas where technology might support the lesson or activity. (p. 44)

**Learning activity based**

Smaldino, Lowther and Russell (2008) believed that well-planned instructional strategies incorporating technology and media promote learning regardless of the learning environment, subject matter and the conditions of learners. This statement was broader than previous research studies, which claimed that the teachers must predominantly consider the subject feature for the integration of IT (Boudrot et al., 1988; Duffy & Jonassen, 1992). Smaldino et al. (2008) suggested a number of strategies for applying IT in the instruction, such as: presentation, demonstration, drill-and-practice, tutorial, discussion, cooperative learning, games, stimulation, discovery, and problem solving. These strategies comprise both teacher-centred and student-centred activities. Each strategy has its advantages and limitations. They could be used in various instructional settings and for learners of any age groups. The teachers should be comfortable with using an appropriate strategy in the diverse
instructional environment to ensure its effectiveness. For example, the “drill and practice” software might lead students to seek only the “right answers” rather than underlying reason or producing answers (Bonnet, 1997).

**Classroom size based**

There are diverse strategies for teachers to integrate IT in their teaching. From one perspective, Dawes and Robertson (1991) used the size of class to evaluate the use of computers in the classroom. They presented various approaches for whole grade and small group teaching. In addition, they commented that a small group, which comprises students with different capacities, is the most effective method for using computer in the classroom. However, they still suggested that the teachers should decide the most suitable approach to use IT in teaching.

In addition to these strategies for integrating IT in teaching, Younie and Moore (2005) developed the e-pedagogy which comprised six stages for teachers to integrate IT into their classroom:

- **Step one**—information giving: upgrading your written teaching materials into an electronic format
- **Step two**—providing on-line templates and writing frames for pupils to download and work with or edit
- **Step three**—developing pupil interactively with the on-line resources by inserting hyperlinks
- **Step four**—developing more interactively with on-line resources
- **Step five**—using multimedia, for example video experts
- **Step six**—development and using *Virtual Learning Environment* and *Managed*
Learning Environment

These steps offered a concise guide for teachers to follow and start to integrate IT in their teaching.

3.2.5 Considerations

Fox and Trinidad (2007) argued that successful integration of IT relies on the provision of co-ordinated, well-integrated and strategically considered programs, and projects supported by documents and policies. They identified the framework for improving technology enhanced learning in the aspects of developing frameworks, staff development (professional development), resourcing, recognising the impact of technology.

Jonassen et al. (1999) also encouraged teachers to construct their integration of IT activities. Oliver (2005) reminded the teachers that the nature of technology is to help the students to solve problems they encounter and teachers should not be too worried about the rapid development of technology and how to adapt it. Sutherland et al. (2009) identified the importance for teachers to consider about available technologies, as opposed to looking for the future development of new technology for integration. Similarly, Beaver and Moore (2004) suggested that teachers keep available software in mind and aware its capabilities so that they are able to apply the software to support the learning activities. In addition to the consideration of availability and capabilities of IT, Webb (2005) and Pachler (2005b) identified that teachers should have students’ learning objectives in view in using available IT resources to support teaching.
Several researchers offered further detail regarding teachers’ planning to think about the students’ learning before integrating IT into their classroom. Hsieh and Chen (2005) identified concerns regarding the integration of IT which include the “necessity of the teaching scene, available apparatus, the timing for incorporating technology, and promoting teaching effects” (p. 1). Preston and Cuthell (2005) suggested that teachers should think about the following issues before they integrate IT into their teaching such as students’ age, the content of curriculum, the effective use of IT, useful resources, and students’ outcome. Resnik (2002) believed that the best learning experiences involve designing and creating new things with the help of new technology, especially in project-based activities.

The role of the teachers would be modified after introducing IT in teaching. Beaver and Moore (2004) claimed that only using technology to deliver or present instruction can be useful for teaching, but it is not true integration. Selinger (2005) pointed out that rather than giving knowledge to the students, the role of teachers is more like expert learners to guide students to apply IT for problem solving. Teachers nowadays have a role more than ever in teaching student how to acquire the information handling skills essential for a knowledge society and making sensible use of IT in school education.

Jonassen et al. (1999) argued that students cannot learn from technology, but the technology could support the learning when they learn with the help of technology. As a result, IT is a tool for enhancing and sharing students’ thinking and making meaningful learning rather than just a medium to deliver instructional information. Technology should be used by learners to engage in active learning, constructive learning, intentional learning, authentic learning and cooperative learning.
With respect to the integration of IT in school curriculum, Leask and Williams (2005) indicated that the attitude of school staff may appear apparently unchangeable and do not want to involve new technology into school education. Teamwork (staff working together and supporting each other) to experience the change of involving technology into school curriculum is a useful approach to overcome this issue. It is particularly useful for school administrators to promote the integration of IT.

In addition, the accessibility and availability of IT facilities and support in school should be always be a concern. The shortage of time and money is the general problem when teachers integrating IT in teaching. The demand of IT facilities and maintaining various IT devices are always needed (Harrison, 2005). The teachers should consider these conditions before they start the integration.

3.2.6 Standards
There is a range of national and international organisations supporting education in the use of technology. The International Society for Technology Education (ISTE) in the USA is the leading organisation to promote the application of technology in teaching and learning (Shelly et al., 2008). The ISTE developed the National Educational Technology Standards (NETS) in order to provide the road map to teaching effectively and growing professionally in an increasingly digital world. In addition, the issue of the technology literacy is a crucial component in the standards. This standard was originally adopted by the USA and now adopted by schools in Norway, Costa Rica, Malaysia, Japan, Australia, Philippines, Micronesia, Korea and Turkey (International Society of Technology in Education (ISTE), 2011a).
The NETS would be the standards for learning, teaching, and leading in the digital age. It sets a standard of excellence and best practices of technology in education. The standards comprise five sub-categories: NETS for Students (NETS•S), NETS for Teachers (NETS•T), NETS for Administrators (NETS•A), NETS for Coaches (NETS•C), and NETS for Computer Science Teachers (NETS•CSE) (ISTE, 2011b). The following part will explain more detail in relation to the NETS•S, NETS•T and NETS•A.

In NETS for Students (NETS•S), the students are expected to apply the basic knowledge in authentic, integrated ways to solve problems, complete projects, and creatively extend their abilities. It helps students prepare for work, live, and contribute to the social and civic fabric of their communities. These standards identify several higher-order thinking skills as critical for students to learn effectively and live productively in our emerging global society. These areas include:

1. Creativity and Innovation: Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.

2. Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.

3. Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.

4. Critical Thinking, Problem Solving, and Decision Making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

5. Digital Citizenship: Students understand human, cultural, and societal issues
related to technology and practice legal and ethical behavior.


The NETS for Teachers were first released in 2000, following the NETS for Students in 1998. It provides a framework for educators to use as they transform their schools from the Industrial Age to Digital Age and sets the bar for the integration of technology in education, as well as defining the fundamental concepts, knowledge, skills, and attitudes for applying technology in educational settings. The standards comprise five categories:

1. **Facilitate and Inspire Student Learning and Creativity**: Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments.

2. **Design and Develop Digital-Age Learning Experiences and Assessments**: Teachers design, develop, and evaluate authentic learning experiences and assessment incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills, and attitudes identified in the NETS for students.

3. **Model Digital-Age Work and Learning**: Teachers exhibit knowledge, skills, and work processes representative of an innovative professional in a global and digital society.

4. **Promote and Model Digital Citizenship and Responsibility**: Teachers understand local and global societal issues and responsibilities in an evolving
digital culture and exhibit legal and ethical behavior in their professional practices.

5. **Engage in Professional Growth and Leadership:** Teachers continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community by promoting and demonstrating the effective use of digital tools and resources. (ISTE, 2008, pp. 1-2)

Administrators play a pivotal role in determining how well technology is used in the schools. The NETS for Administrators enable the educators to define what administrators need to know and be able to do in order to discharge their responsibility as leaders in the effective use of technology in our schools.

1. **Visionary Leadership:** Educational Administrators inspire and lead development and implementation of a shared vision for comprehensive integration of technology to promote excellence and support transformation throughout the organization.

2. **Digital Age Learning Culture:** Educational Administrators create, promote, and sustain a dynamic, digital-age learning culture that provides a rigorous, relevant, and engaging education for all students.

3. **Excellence in Professional Practice:** Educational Administrators promote an environment of professional learning and innovation that empowers educators to enhance student learning through the infusion of contemporary technologies and digital resources.
4. **Systemic Improvement**: Educational Administrators provide digital-age leadership and management to continuously improve the organization through the effective use of information and technology resources.


Another standard is the Sharable Content Object Reference Model (SCORM) for web-based e-learning which was initiated by the Advanced Distributed Learning (ADL) in the USA. It is a “collection and harmonisation of specifications and standards that defines the interrelationship of content objects, data models and protocols such that objects are sharable across systems that conform to the same model” (ADL, n.d., ¶1). It defines the technique of communications between client side content and a host system on the web-page and how the content may be packaged into a transferable particular format (ADL, n.d.). The web-pages of the *Taiwan e-learning and Digital Archives Program* are based on this international standard to enable reader interaction and to make the archives standardised.

In Taiwan, several standards of IT in education have been developed for teachers and students. For students, the *Grades 1-9 Curriculum Guidelines* classify IT as one of the six crucial issues to be integrated into all seven areas of learning. The guidelines identify several competence indicators of IT and expect students not only to obtain the IT knowledge and skills but also could adopt IT to assist all areas of learning and make learning more effective. For teachers, since the implementation of the *Short Term Primary and Middle School Teachers Basic IT Literacy Standards* (中小學教師資訊基本素養短期指標) (Taiwan Ministry of Education, 1998b), the Ministry of
Education has developed a number of standards for teachers’ IT literacy. The *Primary and Middle School Teachers IT Literacy Standards Development Plan* (中小學教師資訊基本素養基準制定計畫) and the *Primary and Middle School teachers IT Literacy Self Evaluate Form Development Plan* (中小學教師資訊科技素養自評表發展計畫) aim to develop the standards for teachers to follow, and further, improve their IT literacy (Taiwan Ministry of Education, 2005, 2007). These plans, however, have not been widely promoted and have limited impact in providing the standards for teachers’ IT literacy nationwide.

### 3.2.7 IT and teacher education

Two aspects, IT and teacher education, are discussed in this section. On one hand, IT could be used to assist teacher education and professional development (Bitter & Legacy, 2008; Waniganayake, Wilks, & Linser, 2007); the training for teachers to understand how to integrate IT in teaching is another (Christensen & Knezek, 2007; Duran, Fossum, & Luera, 2007; Lisowski, Lisowaki, & Nicolia, 2007; Shelly et al., 2008).

The importance of teacher education for promoting the integration of IT is generally discussed. Dawes and Robertson acknowledged that one of the greatest impediments to the effective use of the computers in education is the lack of knowledge on the teacher’s part (Dawes & Robertson, 1991). Teachers should be technologically competent and information-literate. Most importantly, they need to know how and when they should enhance teaching and learning (Smaldino et al., 2008). Harrison (2005) addressed that many teachers claim that their IT skills increased through in-service training, but they are still expected to develop their ability to explore the potential of IT in relation to their teaching. Similarly, a survey
conducted in Australia in 2007 shows that although the pre-service teachers have learned the fundamental IT skills, they still should have had the opportunities to learn about the tools and associated settings for preparing their future teaching (Russell & Romeo, 2007). Shelly et al. (2008) also suggested that teachers undertake professional development to acquire the knowledge and start the integration of IT.

Bitter and Legacy (2008) suggested that teachers could improve their professional skills (including the skill of the integration of IT) via the collegial communication, participate in the professional associations and professional development. Technology allows teachers to access different resources, approach experienced colleagues and experts by connecting to the Internet. There are several professional websites that offer forums for the teachers to discuss, communicate, share and get advice for challenging situations. The professional associations provide either face-to-face or on-line environment for teachers to explore and develop their professional skills. Many government/non-government organisations or teacher education institutions of different sectors operate their workshops and training (including web-based training) for teacher professional development. In general, teachers have a variety of options to improve their professional skills.

In order to prepare tomorrow’s teachers to infuse technology into teaching, several researchers draw attention to the pre-service teacher training (Christensen & Knezek, 2007; Duran et al., 2007; Lisowski et al., 2007). Christensen and Knezek (2007), based on the Preparing Tomorrow’s Teachers to Use Technology Program (PT3) (a program in the USA to support teacher education in IT), explain the goals, processes and content of pre-service teachers’ IT related training. Lisowski et al. (2007) not only designed a project for pre-service teachers’ training for integrating IT but also
addressed several processes they have encountered. Duran et al. (2007) argued that if future teachers are to effectively use technology, their pre-service training should adopt key components such as educational technology, faculty modeling and clinical experiences. Such researchers intended to develop the models for pre-service training in the integration of IT to enhance teaching and learning. Wentworth (2006) pointed out the importance of modeling the appropriate use of technology in teacher education courses. Thus, with these, pre-service teachers are able to experience, create and evaluate appropriate technology to enhance their future teaching career.

With respect to in-service teacher training, Meskill, Mossop and Bates (1999) found that there are significant differences between novice and experienced teachers in terms of using IT in teaching. Experienced teachers use technologies effectively and their students can be generally characterised as viewing technology as means rather than an end of learning, whilst the novice teachers are concerned more about mastering the routines and rituals regarding using IT. Three years later, Meskill and other, further addressed the difference between novice and experienced teachers in using IT. They suggested that teacher training should reconsider the processes involving technologies; the inclusion of experienced and expert teachers as models of discourse and practice; and the notion of technologies as sidestepping the human expertise required for powerful learning (Meskill, Mossop, DiAngelo, & Pasquale, 2002). That means pre-service teachers should have undertaken IT related training courses in teacher education institutions. In addition, a continuing professional development is needed to improve their skills and strategies in terms of the integration of IT.
For in-service teachers, they are able to undertake either IT related courses in teacher education institutions or participate in related workshops to improve their IT literacy in order to meet *NET for Teachers Standards* in the USA. As the researcher mentioned previously, several professional associations and professional development websites are accessible for teachers to obtain the information needed so as to improve their teaching (Lever-Duffy & McDonald, 2008). Amburgey (2007) developed a model for professional development in order to improve the use of IT in university teaching. This model adopted the NETS for Teachers and appeared to be successful. Teachers themselves also suggested establishing their e-portfolio for the professional purposes, that is, teachers use an electronic profile to collect their experience of professional development to present teachers’ best light (Younie & Moore, 2005).

### 3.3 The integration of IT in music education

This section presents the rationale and development of IT in music education. Following this, the resources and applications, considerations, and music teacher education are discussed with respect to the integration of IT. In addition, several research studies with respect to the integration of IT in music education in Taiwan are reviewed.

#### 3.3.1 Rationale and development of the integration of IT in music education

IT literacy has been seen as an important component of contemporary arts learning (O'Toole, 2009; Snyder & Bulfin, 2007). Harrison (2005) claimed that although only limited research results have been published in relation to the integration of IT in arts education, the enhancement of students’ arts learning via the application of IT is obvious. Leask, Litchfield and Younie (2005) identified various usages of IT in teaching
for particular subject such as Arts learning. They claimed that the application of on-line resources such as artist’s profile and multimedia – as well as video/audio media and programs - are particularly useful for the learning of the Arts.

Similar to the various forms of arts, the application of technology also brings new possibilities to music education. Rudolph (2004) claimed that new technology has the potential to engage students in making music in more and various ways. As a result, students’ music experience could be enhanced if teachers use technology appropriately. Dillon and Hirche (2010) defined that new technology has the potential to offer new experience of music learning. For example, the engagement with collaborative performance using music technology would provide students with opportunities to make sense of the influence of media in their lives.

In Martin Comte’s (1994) Music Education: International Viewpoints, researchers around the world were invited to explain the circumstances and trend of music education in their countries/regions. The researchers in Singapore/Western Australia, Canada and North America acknowledged that IT is a powerful tool to assist teaching; the integration of IT has become a general trend for music education in their countries (Leong, 2004; Roberts, 2004; Werner; 2004).

The application of IT in music education can be traced back to the mid-1950s. Webster (2002) mentioned that:

Several forces converged to make some of the very first computer to the development of the phonograph; tape recorder, sound reproduction devices, and computer hardware, high-level programming languages begin to be created
to help run the mainframe systems. Music educators began to experiment with principles of electronic music. (p. 4)

Another music educator, Brown (2007), however, defined that music educators have used computers in music instruction since 1960s, ten years later than Webster’s definition. Brown explained that several colleges and universities started to utilise computer in the teaching of music theory and aural training in the 1960s. Since then, computer assisted instruction (CAI) systems have been adapted to assist music teaching from tertiary to school levels.

The application of IT in music education had become more and more widely adopted because of the increasing populations of computer in schools and families. Later on, after 2000, Webster observed that the Internet has been used increasingly in music education due to the popularisation of Internet connection (Webster, 2007a). Brown (2007) identified that the impact of the Internet in music is more significant than any other development of new technology.

In recent years, second generation of Internet (often referred to as Web 2.0, a technology which allows users to communicate and interact with other users or webpage developers) is enhancing Internet communication and social collaboration. “This environment enables the students to engage collaboratively with music and each other, both inside and outside of class time” (Ruthmann, 2007, p. 131). By incorporating Web 2.0 into the classroom, teachers and students are able to connect learning with a familiar environment and, further, to create podcasts, interactive websites and blogs for music teaching and learning (Rudolph & Frankel, 2009). Of course, this revolution of the Internet technology offers more possibilities for music
education in the 21st century.

Over these two decades, numerous books have been published to guide music educators with respect to IT in music teaching (Berz & Bowman, 1994; Brown, 2007; Burns, 2008; Cain, 2004; Finney & Burnard, 2007; Foreman & Pace, 2008; Pontiff, 2003; Richmond, 2002; Rudolph, 2004; Rudolph & Frankel, 2009; Ruthmann, 2007; Savage, 2005; Stevens, 1994). Additionally, several books have particularly focused on strategies of the integration of IT in music education. These books provide brief lesson plans for students of different ages and music learning activities. These includes the *Strategies for Teaching Technology* (Reese, McCord, & Walls, 2001), the *Teaching Music with Technology* (Rudolph, 2004) and the *Technology Integration in the Elementary Music Classroom* (Burns, 2008). In addition to these books for the integration of IT strategies, a number of articles have focused on the application of IT in music education administration including scheduling solo or ensemble context (Jones, 2003), controlling attendance (Naydan, 2003) and keeping track of students’ records (Tanner, 2003). These references not only provide school teachers with various templates but also support this research to find out useful approaches in the integration of IT.

### 3.3.2 Resources and applications

Several researchers have addressed on the resources and applications for integrating IT in teaching and learning. Berz (1994) and Richmond (2002) offered many practical usages of IT in education; Cain (2004) and Stevens (1994) classified the integration of IT as software applications and hardware applications and provided significant examples. Rudolph (2004) raised 199 teaching strategies for integrating technology in music instruction. He presented several applications of IT based on the type of
hardware and software such as computer devices, electronic keyboard, notation, sequencing and instructional software (CAI). Williams and Webster (2006) also introduced various music technologies and listed their possible applications.

The researcher has reviewed various literature regarding the strategies and application of IT in music education. Several resources and their applications, including CAI, the Internet, YouTube, the notation and sequencing programs, presentation software and other resources are explained:

**CAI**

The Computer Assisted Instruction (CAI) systems have been applied for music education over several decades since the 1960s. It is the oldest of the IT applications in music education. Like other subject areas the researcher mentioned before (such as math and language), the CAI systems for music education could be divided into four categories: drill and practice, games, tutorial and simulations. There is a large amount of CAI systems for different music instructions such as music theory, music history, music experience and aural training. Especially after the Internet connection has become more popular, an increasing number of CAI systems were offered in the Internet environment.

Teachers need to evaluate these various CAI systems carefully before using them and consider the best way to integrate them into music teaching. Williams and Webster (2006) suggested teachers to consider the content and need of music curriculum and choose suitable CAI system to integrate. They argued that choosing a CAI is an extension of teachers’ philosophy of music teaching. Teachers should ask themselves: “What do I want technology to do?” for seeking a CAI before using it.
The Internet

After the Internet connection was popularised, the application of Internet in music education has become a significant trend. From e-mail to Webpages, the Internet provides and disseminates information such as music knowledge, video and audio resources. Burnard (2007) claimed that:

The Internet has shown itself to be a dynamic teaching tool for exploring, discovering, creating, communicating about playing virtual making context. It provides mechanism for connecting a network of places, spaces (both physical and symbolic), musical worlds, music makers, generators, performances and productions. ... It enables participation across places and fields through multiple form of expression. (p. 197)

The Internet resources for music education are very comprehensive. The on-line CAI systems offer students opportunities to practice in class and after class; music related websites contains diverse information for music teaching and learning (Chen, Y. H., 2007; Ke, 2008; Li, Y. J., 2003; Rudolph, 2004; Wang, T. H., 2009). The Internet provides a space for students to store, present and review the learning progress; it also enables teachers to demonstrate their teaching materials and the process of their professional development (Wang, M. L. & Chuang, M. J., 2008; Younie & Moore, 2005). In recent years, the second generation Internet allows users to communicate and interact, while the pace of information transforming on the Internet is far faster than in previous times. This provides more possibilities of applying the Internet in music instruction.
A significant project applying the Internet to music education is the *Vermont MIDI Project* since 1996 in the USA (http://www.vtmidi.org/index.htm). This project marks almost two decades of infusing music composition into school music education. A community of professional composers, teachers (including in-service and pre-service) and students engage in mentoring and on-line discussion of students’ composition work. It focuses on students from the elementary to middle school levels working in pairs or groups of three to create their original work and post their work on the Internet. These works have been shared and critiqued by professional composers and other teachers and students involved in the project.

Revision of student work is a recursive procedure where students get feedback on their work-in-progress and consider which of the suggestions will help them improve their work. Critique can also come from other teachers and students who participate in the project. ... Since April 2000, student compositions have been selected for live performance in the Opus series events where professional performers rehearse with each student. (Vermont MIDI Project, 2004, para. 4-5)

This project not only provides students with opportunities to learn and share their composition via the Internet, but also promotes the composition for music teachers. Music teachers are able to attend the annual summer institute courses for professional development which enables them to give their students appropriate advice in music composition. This on-going project is a positive and significance case for applying the Internet in music learning successfully.

**YouTube**

YouTube is a kind of Internet resource for the integration of IT in music learning. It
contains numerous audio and video files and offers music learners more possibilities to experience the music and get music understanding (Webb, 2009). These are particularly useful for music teachers to integrate it to assist their teaching. Thus, the researcher classified YouTube here as an IT resource for music teaching.

In the book *YouTube in Music Education* (Rudolph & Frankel, 2009), the authors claimed that YouTube enable music teachers to access an enormous pedagogical database, that is, an immense library of music and video that can be incorporated into music curriculum. Based on the Web 2.0 technology, YouTube allows users to communicate and interact on-line. This would be an additional benefit for students’ learning. The authors suggested a number of music educational applications of YouTube including the on-line instrumental music lessons, online music instructions and tutorials, great performance on-lines and extra spaces for teachers and students to post their work. There are also several YouTube music education channels (such as the National Association for Music Education [MENC], Children’s Music Workshop, Music For All and the Midwest Clinic) and other channels created by music educators particularly useful for integrating IT into music education. In addition, the authors raised *111 YouTube Teaching Strategies* for music teachers to practice in their class and expected them to make music education come alive via applying YouTube resources.

**Notation and sequencing programs**

The definitions of notation program are various. Rudolph (2004) reviewed different definitions and suggested that “All of the various names used for printing notation—notation, scoring, or printing-have one thing in common: their main objectives is to produce traditional music notation for musician to read and/or play”
One of the most popular applications of notation software is producing printed parts and arrangement of music. The advantage of using notation software is that the music works are easy to be delivered, revised and printed. The most important is that the notation software provides immediate aural feedback of the music works. The students can listen to and revise their music works on the computer easily. This is particularly useful for their music composition activities. Although this type of software takes time to be familiar with, it is still a powerful resource for music teachers in terms of the integration of IT in their teaching.

The notation software is mainly focused on creating and printing the score for music, whilst, the sequencing software is designed particularly for sound recording and editing. It not only could be used in students’ music arrangement and composition, but also applied by teachers for choral/ensemble rehearsals. Sequencing software can be created from scratch or purchased in the digital format and output as a new production after editing or arrangement. This type of software provides so many features, and, of course, it might be more difficult to learn. In many ways, it could be seen as an ultimate tool for both the teachers and students.

Despite the fact that the notation and sequencing program are two significant tools for the integration of IT in music teaching, there are several considerations for teachers to use them. Teachers need to check their teaching goals and available support in schools. The availability and accessibility of the software program and computer lab could be a big issue in integrating notation and sequencing program into music teaching.
Presentation software

This type of software is specifically focused on presenting ideas and knowledge. It is particularly useful for both teachers and students as a presentation tool. The presentation software such as PowerPoint enables users to use the text, images, sound, video and hyperlinks to demonstrate and explain the ideas. It is almost the simplest way to present multiple media in the class.

Other resources

Other resources such as electronic keyboards, digital pianos, CDs, DVDs, and word processing are generally integrated into music instruction. The integrated materials could be combined and used in the music learning activities.

Several writers have considered the use of IT in the teaching of music knowledge, music composition (Chen, C. Y. J., 2007; Cheung & Liu, 2005; Field, 2007; Hubmayer, 2009; Jennings, 2003, 2007; Reese & Hickey, 1999; Seddon, 2007; Wiggins, 2001, 2009), music accompaniment (Brittin, 2002), music improvisation (Brown & Dillon, 2007), music appreciations (Webb, 2009); choral rehearsal (Barrett, 2007) and other music instruction (Bauer, Reese, & McAllister, 2003). As can be seen, IT has been widely used in the teaching of music composition.

Except for the use of IT in separate music learning activities, in recent years, IT also has been used widely in music learning projects. These projects might comprise various music learning activities such as the learning of music theory, music knowledge, and music composition. Jeanneret and Swainston (2009) conducted a project in relation to Australian aboriginal arts (art, drama and music). In this project, IT was used for students to learn the knowledge and produce a digital multimedia
presentation. Dillon and Hirche (2010) used a computer program, jam2jam, to assist students’ collaborative music learning and making (including music knowledge, music making and performing). The integration of IT in music education looks more comprehensive and well rounded nowadays.

3.3.3 Considerations

The considerations for integrating IT in music teaching are similar to the other subjects. Brown (2007) raised several considerations in this area; these include logistical issues of finding, location, connectivity and security, and educational issues such as modifications to pedagogy supported by professional development. The integration of IT into the music program is not merely a tool or about the transference of ideas. He reminded music teachers that the impact of IT on learning depends on teachers’ careful consideration, positive approach, and attitude. It is also important to make sure that the integration of IT is comprehensible and the students are motivated to utilise them.

The design of teaching programs that focus on maximizing a meaningful engagement with music for students can make the use of technology effectively. “Meaningful music learning” is the central idea for integrating technology in music teaching. Brown (2007) further encouraged music teachers on guiding students and “sharing the learning journey about the opportunities of computer music systems” (p. 308) rather than try to master all areas of computer technology. With the integration of IT, teachers are encouraged to act as a helper for students, assisting and guiding their learning behaviour in the music class.
In addition, music teachers are suggested to review the content of their teaching before integrating IT (Rudolph, 2004; Webster, 2007b). Webster (2007b) commented that teachers should consider the core of knowledge, skills, attitudes and values in the teaching context in order to make a good teaching. Similarly, a few years earlier, Rudolph (2004) suggested teachers to consider the curriculum goals (skills and knowledge) and desired educational outcomes to integrate IT in their music teaching. He further explained, “Skills refers to the ability to play musical instruments, sing, create, and perform music. Knowledge refers to understanding and comprehending information about music such as composer’s biographical information, music theory concepts and so forth” (p. 7).

Dillon and Hirche (2010) conducted a series of research studies pertaining to the use of computer technology in students’ collaborative music making and learning. They advocated a need “to be critical of music technologies, and proposes an approach that considers the affordances of technologies in relation to context and a meaningful and engaging experience for students” (p. 190).

In Rudolph’s book—Teaching Music with Technology, he suggested teachers refer to the NETs and the National Standards for Arts Education (in US) to consider the utilisation of IT in music class (Rudolph, 2004). Similarly, a number of books published in US in relation to integrating IT in music teaching are also based on the National Standards for the Music. These books include the Strategies for Teaching Technology by the National Association for Music Education (MENC) (Reese et al., 2001), the Technology Integration in the Elementary Music Classroom by Hal-Leonardo Cooperation (Burns, 2008) and the Integrating Technology with Music Instruction (Foreman & Pace, 2008) by Alfred Publisher. These suggested that the
curriculum standards or curriculum guidelines might be used as a reference when music teachers intent to integrate IT in their teaching.

Another set of standards established particularly for using technology in music education is the *Opportunity to Learn Standards for Music Technology* published by MENC (1999) in the USA. These standards suggest what schools should provide to help students achieve the National Standards for Music Education standards. The *Opportunity to Learn Standards for Music Technology* have provided more specific guidance to all music teachers, administrators, and other decision makers who must determine how best to take advantage of new technologies in the ongoing effort to give the students a full, balanced curriculum. These standards cover the prekindergarten to high school levels and comprise four distinct areas: curriculum and scheduling; staffing and equipment; materials/software; facilities. Based on these standards, with imaginative and creative use of technology to support a strong music program, the teachers are expected to find that the music program is greatly enhanced by innovative applications of technology. As well, they will find that music offers an exciting way for students and teachers alike to make technology come alive.

### 3.3.4 IT and music teacher education

Music teacher education is an integral part of music education. There are ample amounts of literature concerning music teacher education. These have been divided into four categories: investigation, teacher education program building, evaluation and analysis, and reports. The investigation research surveyed the need of music teacher education, discussed curriculum limitations, considered/evaluated the pedagogies, or the differences among different music teacher education programs
(Gruenhagen, 2008; Hammel, 1999; Hancock, 2002; Meltzer, 2001; Royse, Akosua Addo, Klinger, Dunbar-Hall & Campbell, 1999; Siebert, 2008; Sinclair, 2004). The studies on music teacher education program building were focused on new plan creation and evaluation (Dumisa, 1996; Nord, 1998; Ohlenbusch, 2001; Patrick, 2007; Smith, 1994). Interestingly, IT also can be integrated into this field to complement teacher education programs (Nord, 1998). Researchers (such as, Bauer & Daugherty, 2001; Cutietta, 2007; Liske, 1999) investigated the evaluation and analysis of music teacher education programs. The reports were intended to describe the characteristics of different music teacher education systems (Colwell, 2006; Hammel, 2003; Karakelle, 2006; Manford, 1983; Masafumi, 2004; Wiggins, 2007). Particularly, several Taiwanese researchers conducted their PhD research in the field of music teacher education in Taiwan (Chang, H. H., 1991; Chen, Y. Y., 2000; Chiang, M., 1998; Yu, H. Y., 2007).

In the 21st century, arts teacher are expected to teach technology literacy to the digital native without considerable help (O'Toole, 2009). Especially the rapid development of new technology in the modern age, teachers should be trained appropriately for using new technology (Brown, 2007). It is obvious that teachers’ IT related training should be properly considered in music teacher education programs (including pre-service and in-service teachers). On one hand, IT could be adopted to assist music teacher training; on the other hand, teachers’ IT ability should be improved via adequate teacher training.

After 2000, the research in relation to in-service teachers’ music technology training has become a common topic (Webster, 2007a). For example, Bryne and MacDonald’s (2002) research regarded in-service music teachers using technology in the music
curriculum in Scotland; Reese, Repp, Meltzer and Burrack (2002) conducted a research using a multimedia Web site for online music teacher professional development; Bauer et al. (2003) studied the effectiveness of music technology summer workshops for in-service music teachers. These research studies in IT and music teacher education are mainly focused on the utilisation of IT in music teacher education.

Interestingly, an Australian researcher used IT to teach generalist pre-service teachers to teach music and received a positive result (Heyworth, 2011). He integrated IT into the training program for generalist pre-service teachers with different backgrounds of music knowledge, experiences and skills with the view to encourage creativity, innovative and collaborative learning. He has successfully helped enable pre-service teachers to facilitate their future career.

Another aspect of research is that music teachers develop their ability to integrate IT in their teaching via the teacher education program or professional development. Smith (1996) concerned that not many music teachers use technology in teaching and provided suggestions for music teachers in this area. Reese and Hickey (1999) conducted a study about the Internet-based music composition activities for pre-service teachers to teach music composition.

Brown (2007) suggested that it might be possible for staff from outside music department to offer their experience in pedagogical approaches or to facilitate a workshop for music teacher. There is a number of institutions that run short courses, in particular software applications or music teaching ideas with computing technology, for music teachers to improve their IT and teaching abilities. He also
identified several organisations in the USA, UK and Australia which operate these short term IT relate trainings.

Several researchers developed music teacher education program in relation to IT. Merrick (1997) designed a model of music technology course particularly for in-service music teacher professional development in Sydney, Australia. Yip (2005) designed the content and model for IT related instruction in a music teacher education program in her PhD research.

The research with respect to reviewing the existed IT and music courses in music teacher education institutions can help researcher identify the trend and insufficiency of these training. This type of research, however, appears relatively less in quantity than the research in other fields. Yip (2005) reviewed IT music courses and the content of selected teacher education programs (or music programs) in different regions of the world including Hong Kong, Taiwan, China, Canada, USA and Australia. She found that the curriculum change always lags behind the pace of technological changes so that curriculum planners need to address the issue. Her research also provided the explanations of the new IT knowledge and skills, and the new musical language that has been included in the music teacher curriculum around the world. In my research, the IT related courses in music teacher education programs in Taiwan universities are also surveyed to understand current implementations and their content.

3.3.5 Relevant research in Taiwan

There is a significant number of research studies regarding the integration of IT in music education in Taiwan. Based on a previous study (Chiu, H. C., 2008), the
Master’s research in relation to the integration of IT in music during this period could be divided into four categories:

1. IT multimedia teaching material design: IT was used to assist ear training (Lien, W. W., 2004), music creation (Chen, Y. M., 2002), music theory learning (Chan, C. P., 2005), and the instrumental teaching (Hsu, F. J., 2004; Hsu, K. C., 2005; Yang, L. H., 2003; Yang, S. J., 2002).


It is worth mentioning that a study, conducted by a Taiwanese researcher J. T. Sun in the USA, investigated how four expert teachers from Australia, Japan, Taiwan and the USA integrated computers into their music classrooms. The research results suggested that “music teachers in Taiwan should use computers within the context of more creative activities in music education, and that computer technologies have more educational value as a music-making instrument, instead of an auxiliary tool.”
(Sun, J. T., 2008, p. iii). Interestingly, another research study in Hong Kong presented similar results that the integration of IT in music education has been focused on teacher-centred learning activities in Hong Kong (Lee, B. K-Y., 2007).

3.4 The development of the integration of IT in education in Taiwan, Hong Kong and Mainland China

In contrast to the previous sections (3.2 and 3.3), which focused on the philosophy, strategy and consideration of the integration of IT, this section emphasises its development in three different Chinese cultural communities: Taiwan, Hong Kong and Mainland China. Through reviewing and comparing the developments, this section not only identifies the characteristics of each community but also indicates the directions for implementing the integration of IT in education within Chinese social and cultural contexts.

Singapore is a region influenced by Chinese culture, however, it appears relatively more culturally diversified than Taiwan, Hong Kong and Mainland China. The IT 2000 project in 1991 scheduled the initiative development of Singapore in IT application (Choo, 1997). After that, Singapore One (1996), IT Master Plan in Education (1997), Second IT Master Plan in Education (2002), ICT in Education Priorities (2006), and the current Third IT Master Plan in Education (2008) projects also state various strategies for national IT education development (Ang, Zhou, & Jiang, 2003; Ho, R. K., 2001; Lai, C. Y., Wu, C. C., & Ho, R. K., 2001; Singapore Ministry of Education, 1997, 2002, 2008). In recent years, the communication among Taiwan, Hong Kong and Mainland China have become more frequently. As a result, this section discusses the integration of IT of these three areas and excludes Singapore.
Taiwan, Hong Kong, and Mainland China have quite different political systems and education contexts. This section of the literature review is primarily focused on the official policy documents, legislations and relevant research studies to identify the development and progress in each area. It aims to: (1) investigate the development of IT integrated music education in Taiwan, Hong Kong, and Mainland China; (2) map the characteristics of each community to conduct a comparison of IT integrated music education; and (3) discuss the implications of IT integrated music education from findings.

3.4.1 Background information

Taiwan and Hong Kong were China’s territories before mid-19th century. At that time, China was in a fatally difficult situation and faced desperate challenges: on one hand, the dynasty was weakened by a great number of social problems and domestic turmoil; on the other hand, a number of countries coveted great resources and markets in China, and demanded large benefits which led to a series of wars.

Between 1840 and 1900, China lost a number of wars and was forced to cede or lease territories to other countries. Taiwan was ceded to the Japanese Empire in 1894. When World War II ended in 1945, Taiwan was returned to China, while Hong Kong was still under the governing of the British Empire on a treaty of 99 years (from 1899 to 1997) lease.

In 1911, China became the first republic in Asia. Unfortunately, a civil war between the two major political parties: Communist Party of China (CPC) and Kuomintang (KMT) divided China into two parts in 1949: the People’s Republic of China (PRC) and the Republic of China (ROC). The People’s Republic of China occupied the Mainland
and Republic of China occupied Taiwan with totally different social systems. As a result, Taiwan refers to the Republic of China and Mainland China the People’s Republic of China in this study.

With the passing of time, the confrontational relationship between Taiwan and Mainland China has started to soften. There have been more and more communications and interactions in politics, business, and education over the last two decades.

In 1997, Hong Kong reverted to Chinese sovereignty and became Hong Kong Special Administrative Region (HKSAR) of China. The rights and freedoms of people in Hong Kong are based on the impartial rule of law and an independent judiciary (Hong Kong Special Administrative Government, n.d., para. 2).

The special relationship between Taiwan, Hong Kong and Mainland China has undergone different changes over the century. The specialty and characteristics of IT education and music education of the three Chinese culture communities are quite different. Therefore, this paper presents the context of IT integrated music education in each of the three communities in the next section.

**3.4.2 IT in education in Taiwan**

Taiwan is very receptive to the development and application of IT. The information technology has influenced many aspects of social development, including education. The government’s awareness of the contribution that IT can make to education has resulted in launching a series of policies advocating the integration of IT in teaching and learning. The government expected that with the implementations of these
policies, the quality of education could be upgraded.

According to the review of the government policies, three periods of development of IT education have been identified:

1. The Computer Assisted Instruction (CAI) Period (1986-1997). In 1986, the first IT assisted music teaching system was created in the university sector for the teaching of music theory. In this initial stage, a number of computer software programs were employed in the universities, middle schools, primary schools, and kindergartens to assist music teaching. In this period IT provided some differing sporadic approaches to music education (Chen, H. P., 2008). The main IT education policy documents of this period were the *Program to Develop and Promote Computer-aided Teaching* (電腦輔助教學發展及推廣計畫) (Taiwan Ministry of Education, 1993a) and the *Program to Improve Information Education at Schools of All Levels* (改善各級學校資訊教學計畫) (Taiwan Ministry of Education, 1993b). A focus of both of these was the development of computer-aided teaching materials.

2. The Internet Development Period (1997-2001). After 1997, the *Infrastructure of Information Education Program* (資訊教育基礎建設計畫) (Taiwan Ministry of Education, 1997a), the *Expand Domestic Demand Plan* (擴大內需計畫) (Taiwan Ministry of Education, 1998c), and other IT education policies focused on the promotion of the internet connection in education systems. As a result, music educators started to apply internet techniques such as e-mail and homepage in their teaching.

3. The Digital Content Period (2001 to the present). After 2001, education in Taiwan has undergone great changes. Two important national policies: the
Information Technology Education for Primary and Middle Schools: Blueprint (國民中小學資訊教育總藍圖) (Taiwan Ministry of Education, 2001a), and the Provisional Grades 1-9 Curriculum Guidelines (九年一貫課程暫行綱要) (Taiwan Ministry of Education, 1998a) were implemented in 2001. The curriculum guidelines emphasise that IT education as a crucial issue in all areas of teaching and indicate IT as a learning tool in Arts and Humanities Learning Area (music, visual arts, and performing arts). In addition, the government offered extensive funding for teacher education, hardware and software improvement, and the collection of digital teaching resources. Furthermore, a series of education policies involving IT promoted digital content databases for learning after 2001. Various learning resources such as digital archives, digital learning centres, and learning websites were comprehensively constructed over these years.

After 2004, the Taiwan government promoted the Creating Digital Opportunity for Rural Areas Project (創造偏鄉數位機會推動計畫) (Taiwan Ministry of Education, 2004) to bridge the gap of the digital divide. Generally speaking, the IT education policies lead the development of the integration of IT in music education in Taiwan. In addition, the use of e-learning in music education was considered a significant future trend in the integration of IT, while teacher education programs in relation to IT education and the integration of IT in music education were mentioned in all periods.

3.4.3 IT in education in Hong Kong

Hong Kong was a British colony until 1997, when it reverted to Chinese sovereignty. With the rapid development of IT and the commitment of Hong Kong government, the impact of government policy of IT on Hong Kong education has been tremendous
The Hong Kong government played the leading role by offering significant funding to support IT education. In 1998, the *Five-Year IT Strategies Project* (Hong Kong Education and Manpower Bureau, 1998) offered a large amount of funding to support IT infrastructure and education training in IT (Tang, 2005; Wing, 2001; Yip, 2005). Looi and Hung (2004) commented that the *Five-Year IT Strategies Project* not only encouraged students to utilise the Internet resources but also teachers were expected to adopt learner-centred paradigm in their teaching.

In 2004, the *Empowering Learning and Teaching with IT* project was published and continued to lead IT education in Hong Kong (Hong Kong Education Bureau, 2004a). Although both IT education policies had not immediately indicated the integration of IT in music education, the IT education promotion did influenced music education in teacher education, teaching resources, and IT facilities improvement. The Hong Kong Education City Net (http://www.hkedcity.net) offered a large amount of cyber resources including music teaching materials.

According to the Five-Year IT Strategies review document, *Overall Study on Reviewing the Progress and Evaluating the Information Technology in Education (ITEd) Projects 1998/2003* (Hong Kong Education and Manpower Bureau, 2004b), the IT education promotion policies created a positive impact in Hong Kong. The review also shows the demands of IT facilities upgraded and teachers’ working-loads reduced.

With respect to music education, a number of promotional documents of the integration of IT were implemented. The Hong Kong Creative Arts and Home Economics Section (Music) Advisory Inspectorate Division Education Department
(1999) published a handbook for music teachers to apply IT in music teaching. The *Music Curriculum Guide (Primary 1 –Secondary 3)* in 2003 also identified IT as an approach to music teaching and learning (Hong Kong Education and Manpower Bureau, 2003).

Although the Hong Kong government advocates the application of IT in music teaching with economic support and curriculum development, a current research study showed that the implementation of IT in primary music education in Hong Kong should still be improved. The integration of IT in music education has only been realised in less than half of the schools in Hong Kong and mostly has been focused on teacher-centred learning activities (Lee, B. K-Y., 2007).

### 3.4.4 IT in education in Mainland China

According to Zhou (2002), IT education in China started in 1978, with the computer clubs established in middle schools in Shanghai and Beijing. He divided the IT education development in China into three periods:

1. **Experiment and Beginning Period:** During the end of 1970s to the middle 1980s, the IT education was focused on IT technical learning.

2. **Gradual Development Period:** After the middle 1980s, the trend of IT education changed and turned to assist education. In addition, IT was introduced into the Conservatories during this period (Huang, W., 2004).

3. **Rapid Development Period:** In 2000, the *National Primary and Secondary School IT Education Conference* was a milestone for IT education in China (Li, J., 2003). The official legislation *Primary and Secondary School IT Curriculum Guidelines*
(China Ministry of Education, 2000a) was published and released at the conference to indicate the direction in IT education.

Even though there were a number of problems such as the digital divide between urban and rural areas in China (Wang, C. H., 2007) and the lack of teacher manpower (Zhou, D., 2007), IT education in China is continuing to develop rapidly. Although the Ministry of Education of China did not specifically mention IT in music education in the IT curriculum guidelines or 9-years Primary School Music Curriculum Guidelines (China Ministry of Education, 2000b), music educators (Liu, J. X., 2007; Lu, H., 2001; Tan, W., 2006) still put an emphasis on the importance related to the integration of IT in music education. A great amount of official and private music educational websites have been built for music teachers to seek teaching materials and to communicate in China.

3.4.5 Discussion

According to the aforementioned information, IT plays an important role in education in Taiwan, Hong Kong, and Mainland China. The findings also refer to the characteristics of development for IT integrated music education in the three regions, as well as a number of similarities and differences.

Firstly, governments in all three regions made efforts on IT education and implemented a series of IT education policies. Especially in Taiwan, new IT education policies were introduced every few years. However, IT education policies were not immediately linked to music education in Taiwan, Hong Kong or Mainland China. In terms of music education policies, the Grades 1-9 Curriculum Guidelines in Taiwan and Music Curriculum Guide (Primary 1 –Secondary 3) in Hong Kong directly
mentioned the IT application in music teaching and learning.

Secondly, IT capabilities education for teachers displayed a significant role in IT education policies in Taiwan and Hong Kong. Both areas offered not only school IT education but also teacher IT capabilities education.

Thirdly, the on-line music learning cyber resources were built in all three communities. The on-line databases for music teaching in Hong Kong and Taiwan were mainly supported by government. In contrast, plentiful music teaching databases in Mainland China were offered not only by the government, but also by civil communities and private sectors.

Fourthly, the gap of the digital divide between urban and rural appears in both Mainland China and Taiwan (Taiwan Network Information Center, 2009), and Mainland China demonstrates a more serious situation because of its large territory. Hong Kong is a small area and the digital divide does not seem to become a problem. However, Taiwan presented a similar percentage (69%) to Hong Kong (66%) on the Internet access (Taiwan Central News Agency, 2009).

In addition to the similarities and differences, there is a number of remarkable implications, which could enhance teachers’ educational experience and assist students in developing their musical understanding. Further, referring to the developments of IT integrated music education in the three areas, IT education promotions are suggested to start with the announcement of national policies which are focused on school IT education and teacher IT education.
To conclude, Taiwan, Hong Kong, and Mainland China are three very different Chinese culture communities. Taiwan and Hong Kong have similar developments in IT education and IT integrated music education. China has its own unique developments with great resources. This chapter also suggests that government implement the IT integrated music education promotions based on regional specialties.

3.5 Summary of chapter

This chapter has reviewed a wide range of literature regarding the integration of IT in education. Such literature provided the basis and theories for this research. The definition of the integration of IT and other relative terms had clarified different aspects of the use of technology in education in this research, while several considerations and standards offered significant thoughts on using IT in teaching, and, furthermore, the importance of teacher education in integrating IT in education was addressed in a number of research studies.

With respect to the integration of IT in music education, as well as to the general education, several issues were addressed. The rationale and historical development were firstly discussed. Consequently, a range of resources and applications such as the CAI, the Internet, the YouTube, notation and sequencing programs, presentation software and other resources was raised, accompanied with examples. In addition, meaningful music learning and curriculum standards/guidelines are two basic considerations for music teachers to integrate IT in their teaching. The music teacher education pertaining to IT was discussed. However, it showed the limited number of researches in developing music teachers’ training for the integration of IT. Other relevant researches regarding the integration of IT in music education in Taiwan was
The last section of this chapter discussed the development of the integration of IT in the three Chinese culture communities—Taiwan, Hong Kong and Mainland China. IT plays an important role in education in all three areas. With the similarities and differences of the development of IT in education among the three areas, the government is suggested to promote the integration of IT with the announcement of national policies which are particularly focused on IT in school education and in teacher education.

The following chapter will explore the development of IT in education in Taiwan. Several important educational policies will be reviewed and the policy developers will also be interviewed to obtain related information.
Chapter 4 Developments in the Integration of IT in Music Education in Taiwan

4.1 Overview of chapter

This chapter deals with the developments in the integration of IT in music education in Taiwan. The three important government sectors in Taiwan responsible for the development of IT in education—the Executive Yuan, the Ministry of Education, and the National Science Council—are introduced. Through reviewing the government policies and a range of important events, the researcher has identified the developments in the integration of IT in music education in Taiwan as three periods: the Computer Assisted Instruction (CAI) period, the internet development period, and the digital content period. The important events, government policies, and the features of development in each period are discussed.

4.2 Important government sectors involved in IT education

The Executive Yuan in Taiwan is one of five divisions of government that reports directly to the President and has a significant role to play in the development and implementation of national policy. A subordinate sector of the Executive Yuan, the Ministry of Education, is predominately responsible for education, including IT education. Another subordinate sector of the Executive Yuan, the National Science Council, provides an additional source of funding to support science and IT related projects. These government sectors are immediately involved in the development of IT education in Taiwan. They plan the directions of development, launch policies, and provide the financial support. Following is a brief overview of the Executive Yuan, the Ministry of Education, and the National Science Council.
4.2.1 Executive Yuan

The Executive Yuan is the executive branch of government in Taiwan. The Constitution of Taiwan and its Additional Articles state that the Executive Yuan is the highest administrative organ of the State. According to the Constitution, the Executive Yuan has authority to decide the administrative direction of the country and to initiate and implement appropriate policies (Taiwan Executive Yuan, 2009a).

There are currently 34 subordinate sectors under the Executive Yuan (Taiwan Executive Yuan, 2008, January), including eight ministries (Interior, Foreign Affairs, National Defense, Finance, Education, Foreign Affairs, Economic Affairs, Transportation and Communications, Mongolian and Tibetan Affairs) and other special commissions and agencies such as the National Science Council (Taiwan Executive Yuan, 2009b).

The policies implemented by the Executive Yuan mainly focus on future development and involve input across several of its subordinate sectors. For example, Challenge 2008: National Development Plan (挑戰 2008：國家發展重點計畫) is based on current problems facing Taiwan, and the conduct of political, financial and fiscal reform. This plan has involved several subordinate sectors (the Ministry of Education, the National Science Council, the Ministry of Economic Affairs, and some others) and expected to increase national competitiveness to face future challenges. The plan also has had a remarkable influence on IT education in Taiwan (Taiwan Executive Yuan, 2002).

4.2.2 Ministry of Education

The administration of education in Taiwan is the concern of the Ministry of
Education which has major responsibility for initiating and implementing educational policies. The mission of the Ministry of Education is to enhance the overall quality of the citizens’ lives in Taiwan, and provide a solid cornerstone for societal transition, democratic development, cultural attainment, and economic achievement. In the 21st century, the Ministry of Education plays a leadership role in promoting education and enabling the young generation to face the challenges in the new era (Taiwan Ministry of Education, 2006a).

In order to cope with rapid social change, the Ministry of Education has conducted a series of educational reforms, with IT education as one of eight key components. The Ministry of Education is committed to the development of information technology within strict ethical parameters. To better tackle the challenges in the information age, the Ministry has focused on the construction of an internationalised environment, promoting English learning on a national scale and cultivating citizens to have international perspectives. In addition, it has set up the Six Major Learning Nets Project (六大學習網), one of which is the Humanities and Arts Learning Website (人文藝術網). The aims of these websites are to provide quality digital content, shared resources, guidance for schools in remote areas, and bridges for the digital divide between cities and rural areas (Taiwan Ministry of Education, 2006a).

The Ministry of Education launched a series of policies to lead the direction and mission of the educational development. These policies contain the core values and education mission in society. In 2008, the Ministry mapped out a four year plan, Blueprint for Education (教育施政藍圖) (2009-2012) to advise the educational direction for levels of education for enhancing national competitiveness (Taiwan Ministry of Education, 2009a).
There are four organisational divisions within the Ministry of Education: internal units, committees, affiliated agencies, and affiliated schools (which includes the tertiary institutions). One of the internal units is the Computer Centre, which is primarily concerned with IT education. This Centre comprises six areas of operation—information education, digital infrastructure, information system, digital learning, digital resources, and information management. The Computer Centre is responsible for digitalising the educational administrative affairs, promoting information education and web learning, ongoing support for the digitalised educational environment (which entails the provision of computer assisted teaching and learning and administration), and inter-school and international networks. This Centre established an integrated information service system within an academic research and development (R&D) environment (Taiwan Ministry of Education, 2006b). At present, there are over 8,000 schools across all levels in Taiwan, including universities, high schools, primary schools, and other types of educational providers (Taiwan Ministry of Education, 2006a).

4.2.3 National Science Council
The National Science Council of the Executive Yuan was established in 1959. This is the government sector responsible for promoting the development of science and technology. One of its fundamental functions is as a funding organisation to support science and technology development. The three goals of the National Science Council are: the promotion of science and technology development, support for academic research, and development of science parks. The “support for academic research” goal includes Funding Research Projects (國科會專題研究計畫) where grants are given to educational and research institutions to conduct research in
science and technology. Proposed research projects must pass through two stringent rounds of review; and if approved, funding is provided from the Council for research personnel, equipment, books, data collection, consumable materials and overseas travel expenses (National Science Council, 2005). The first research project funded by the National Science Council in IT and music education was conducted in 1986 in the National Normal University. Following this, the National Science Council has continued to support a number of research projects in IT and music education.

The National Science Council created a number of programs to promote science and technology development and influence IT education. Three important programs directly linked to e-learning such as the National Digital Archives Program (數位典藏國家型科技計畫), the National Science and Technology Program for e-learning (數位學習國家型科技計畫), and the Taiwan e-learning and Digital Archives Program (數位典藏與數位學習國家型科技計畫).

The National Digital Archives Program was officially implemented in 2002. The aims of this project are: to showcase Taiwan’s biological, cultural, and social diversity; to promote the cultural, academic, socio-economic and educational values engendered by the National Digital Archives Program; and to develop an international cooperation and exchange network, and promote awareness about Taiwan’s cultural heritage (National Science Council, 2002a).

In the same year, the National Science and Technology Program for e-learning was implemented. The aims of this program are: to upgrade competitiveness in the era of knowledge-based economy in Taiwan; to stimulate the development of e-learning related industries; to bring forth new waves of academic research in science and
technology learning; and to increase societal welfare through e-learning (National Science Council, 2002b).

Subsequently, the above two programs were brought together into the *Taiwan e-learning and Digital Archives Program* in 2008. The aim of this program is:

> To creatively promote national digital archives and e-learning applications and facilitate the development of Taiwan's culture, society, industry and economy, followed by disseminating Taiwan's experience in the international community to expand Taiwan's international space and sustainably maintaining important cultural assets of our nation and the development of e-learning’s application in industry, academic research and education. (National Science Council, 2008, ¶. 5)

These programs of the National Science Council are aimed to digitalise archival materials and promote e-learning. It is based on the international standard for e-learning: the *Sharable Content Object Reference Model* (known as SCORM which was mentioned in Chapter Three) from the Advanced Distributed Learning (ALD) project in the USA. To enable reader interaction, the program uses Web 2.0 technology. This ongoing program not only considers the learner-centred approach but also establishes an evaluation system for the digital content (National Science Council, 2008).

Professor T. H. Wu, a former Vice Minister of Education and President of the Tainan Teacher’s College (now National University of Tainan), said:
The Digital Archives Program is to digitalise our important national cultural heritage, and includes the materials of the “Council of Culture Affairs” and the “National Palace Museum”. ... These data can be used for the content of digital learning. The Digital Archives Program can enhance our digital learning content. The Ministry of Education also encouraged the industries to get involved in this program. .... Another key point is the digital platform. Sometimes you use your skills and I use mine to create the digital content. The format of my data may be different to yours. That may cause you to be not able to use mine while I am not able to use yours. .... As a result, our country introduced a “SCORM” system imported from America to help standardise these digital learning contents. .... Another important issue is the certification. .... The standard of certification has already been established for evaluation. (Wu, T. H., personal communication, December 16, 2008)

The National Science Council conducted various activities in order to promote these programs including demonstrations, speeches, and competitions. However, there were only a few archives related to music learning. To date, this appears to be weak support for music learning in these programs. Since these archives have been established based on international standards, there is potential for the National Science Council to consider the possibility of international collaborations to share the successful experiences of establishing these archives, and, further, to enrich the resources in concerned fields such as music.

4.3 Three development periods of the integration of IT in music education in Taiwan

This section is concerned with the developments in the integration of IT in education,
particularly in music education in Taiwan. The researcher reviewed a series of IT education policies and important events for developing an understanding of the development of IT integrated music education. The focus of the section is on the evolution of IT education policies and their relationship to music education in the primary school levels. Three periods of development are identified.

4.3.1 The Computer Assisted Instruction (CAI) period (1986-1997)

4.3.1.1 Developments

In 1975, Tan-Kan University, a private university situated in Taipei, introduced the first computer system from overseas in order to design software to assist teaching in general. A decade later, in early 1986, a teacher J. M. Chen introduced the country’s first computer assisted instruction in music in relation to ear training at Taichung Teacher’s College (now National Taichung University) in central Taiwan (Chen, J. M., 1986a, 1986b). The system offered learners repeatable practice and enabled them to save their results on a 4.2 inch softdisk that the teacher could review. J. M. Chen (personal communication, March 26, 2009) said:

Teaching music in Teacher’s College became tough, because many students did not have enough musical background knowledge. As a result, I designed a CAI system to assist my teaching. This CAI system also offered the opportunity for students to practice after the music class. The content of the CAI system included the practices and examinations of fundamental ear training. The system was executed on an “Apple II” compliant computer and used computer programs to control the pitch of sound.
In the same year, 1986, the National Science Council funded Professor L. K. Chen in the Music Department of the National Normal University in Taipei to conduct a project: *Computer Assisted Music Instruction Software Design and Development* (電腦輔助音樂教學軟體之設計與發展), which was the first system for the teaching of music theory. During the development process the researchers experimented successfully with this system at the middle school level (Chen, L. K., 1986).

These two systems—developed by Taichung Teacher’s College and the Music Department of the National Normal University—were of great significance because they were computer assisted music instruction systems developed in Taiwan. As such, they represented a milestone in teaching music using computer assisted instruction.

In 1987, a research project, the *Computer Assisted Music Instruction Software Design and Development* of the National Normal University continued to be supported by the National Science Council. The researchers added a database that could store students’ results which could be accessed by their teachers. In the same year, the first Master’s thesis based on this work was awarded by the same university to Y. M. Hsieh (1987) under Professor L. K. Chen’s supervision. It was, further, the first such thesis undertaken in the area of computer assisted music instruction in Taiwan. Subsequently, a number of others undertook higher degree research in this area (see for example, Chen, J. M., 1987; Chen, L. K., 1987, 1988; Chen, M. S., 1991, 1993; Chen, M. S., & Hong, R. J., 1987; Li, Y. W., 1997).

In 1990, a teacher Bin Yin Fu who was studying for a post-graduate degree in the Music Department at the National Normal University, introduced computer assisted instruction into her school to teach music notation reading. She designed a system
based on the “show partner” software (Fu, B. Y., 1990). The results of her research formed the basis of her Master’s thesis. This study reported on the first primary school that had introduced computer assisted instruction in relation to music teaching.

Between 1991 and 1993, the National Science Council funded Professor M. L. Lai in the Music Education Department of the National Taipei Teacher’s College (now National Taipei University of Education) to conduct the Design and Development of a Computer-Assisted Instruction projects (I and II) for primary students’ ear training (Lai, M. L., 1993). This was the first computer assisted music instruction program to be based on the school curriculum and designed to assist music teaching. In this project, Lai adopted the “Drill and Practice” theory in Computer Assisted Instruction. As a result, students had more opportunity to do ear training individually. Professor Lai said (personal communication, December 23, 2008):

On one hand, there were only a few ear training courses in primary schools due to the great individual differences among students. That caused teachers difficulties in handling their teaching. On the other hand, the ear training CAI system was more popular than other kinds of CAI systems. These were my reasons to conduct this research. .... I think this system might be a solution for teachers to teach ear training courses in the primary schools.

I used one of five CAI design models of “Drill and Practice” to design my system. When students used this system, they could proceed to next higher level if their accuracy rate is high enough. In contrast, if a student’s accuracy rate is low, he needs to practice repeatedly at the same level until he could do it right. Then he
could move to the next higher level.

In the second project, which was a continuation of the first, she added sound feedback into the interface. In addition, due to the popularisation of the colour screen, the second project is in colour. According to the interview with Professor M. L. Lai (personal communication, December 23, 2008):

The development of computer technology at that time was very fast. The first system could just identify the student’s answer that is “correct” or “incorrect”, and then calculate a score. In the second phase I added different sound feedbacks for the “correct” or “incorrect” answers. From memory, I took a lot of time to seek appropriate sounds. I also tried to find some icons such as “smile” and others to match the sound feedbacks.

Two years later, in 1995, computer assisted music instruction was first used in the kindergarten (ages 4-6) in Taiwan. These children had not yet commenced primary school. The research was conducted by Professor Der Jen Sun in the Hsinchu Teacher’s College (now National Hsinchu University of Education) located in north Taiwan. The purpose of this study was to develop a computer learning environment that put the child in control of his learning, and to investigate the feasibility of teaching young children musical creativity through the implementation of computer technology. This study developed a program for young children to explore music under four types of activities: improvisation, composition, sight reading, and ear training (Sun, D. J., 1995).
Another issue is that radical and ongoing developments occurred in relation to computer hardware during this period. Understandably, researchers faced many challenges not only in developing a computer assisted instruction system, but also having to constantly modify the systems as a result of new generations of computers being introduced. This was not only time-consuming but also financially draining. Not surprisingly, this led to a considerable degree of frustration. Professor T. H. Wu said:

I felt quite frustrated in the early years of the integration of IT, especially in the CAI period. One of the reasons was the fast development of the personal computer during the period of 1986 to the early 1990s. At that time, the computer advanced from 8-bit to 16-bit, and then 16-bit to 32-bit. Amazingly, this happened in just one year. Because of the rapid development of computer technology, the CAI system, which we developed last year, is out of date and not able to be used this year. So we always had to revise the CAI system so that it could be operated on newer generation computers.

Unfortunately, because the computer technology would again be upgraded, the CAI system we had revised this year would be out of date next year, and we would have to revise it again. There were non-stop revisions, and it seemed as if we'd done a lot of work but eventually it would all become useless. (personal communication, December 16, 2008)

During this period, a number of research projects were conducted in relation to computer assisted music teaching of instruments, such as the violin and string ensemble (Ho, K. L., 1991, 1995, 1996, 1997). However, computer assisted instruction systems in this period were mainly focused on ear training and the
learning of music theory at various levels of study. The opportunity afforded for repeated practice in CAI learning provided the main rationale for the development of such research programs (Chen, J. M., 1986a, 1986b; Lai, M. L., 1993).

4.3.1.2 Policies

In this period (1986 - 1997), a number of policies and programs was introduced by the Ministry of Education. Two important initiatives implemented in 1993 were the Program to Develop and Promote Computer-aided Teaching (電腦輔助教學發展及推廣計畫) and the Program to Improve Information Education in Schools of all Levels (改善各級學校資訊教學計畫) (including post-secondary). A focus of both of these was the development of computer-aided teaching materials.

Program to Develop and Promote Computer-aided Teaching (電腦輔助教學發展及推廣計畫) (1993)

There were four main goals of the program (Taiwan Ministry of Education, 1993b):

1. To apply computer-aided teaching software in school education.
2. To integrate Taiwan’s CAI systems and promote them to schools in order to encourage more effective learning.
3. To establish a national educational information service system in order to share a range of educational resources.
4. To train more people to design and develop computer-aided teaching systems.
Program to Improve Information Education in Schools of all Levels (改善各級學校資訊教學計畫) (1993)

This program, implemented from 1993 to 1997, covered all levels of schooling, including post-secondary. Its aims were four-fold: funding support, teacher education, curriculum design, and Computer Assisted Instruction system development (Taiwan Ministry of Education, 1993c).

1. Funding support

   The funding was provided by both the central government and local governments. Financial support was given to purchase IT devices over a period of four years.

2. Teacher education

   In order to increase teachers’ basic computer capabilities, a number of teacher computer education courses were held, targeting 25% of primary school teachers and 30% of secondary school teachers over the four years. The Ministry of Education’s Computer Centre also authorised the non-government Institute for Information Industry and some universities to assist in this training.

3. Curriculum design

   IT curriculum guidelines were developed for all levels of schooling, including Teacher’s Colleges.


   In combination with the Program to Develop and Promote Computer-aided Teaching, four national IT education “centres” were established to integrate CAI resources for school education.

In summary, the period 1986-1997 was notable for funding support and the development of CAI systems. In 1990, the Ministry of Education began establishing the Taiwan Academic Network (TANet), providing colleges and universities with
dedicated teaching and research networks that could connect with the world. The influence of this Network in all levels of schooling was particularly seen in the discussion on the next period, 1997-2001.

4.3.2 The Internet Development Period (1997-2001)
The education system in this period underwent a rapid change. Two important policies— *Infrastructure of Information Education Program* (*資訊教育基礎建設計畫*) and the *Medium-Term Program to Train Personnel for National Information Infrastructure (NII)* (*國家資訊通信基礎建設人才培育中程發展計畫*)—were launched in 1997 and ushered in a new era of IT education. In addition, the new curriculum guidelines were announced in preparation for the coming educational reform.

4.3.2.1 Developments
In 1990, the *Taiwan Academic Network (TANet)* was established in a wide range of colleges and universities for the exchange of information and sharing of resources. This network not only connected colleges and universities but also linked overseas institutions. Based on this network infrastructure, a number of IT education policies were implemented. These enhanced the Internet infrastructure, and the Internet system in Taiwan started to develop.

In 1999, the first website specifically for music instruction was established for all levels of student music learning (Lin, Y. H., 1999). This work integrated e-mail and a discussion forum into the webpage to provide an opportunity for learners’ interaction. A research study on primary school undertaken in 1999 developed a webpage for music teaching (Ho, K. L., 1999). In addition, a Master’s research thesis
focused on the relationship of IT and music education was conducted by L. J. Chen in 1998.

In this period, the National Science Council continued to support the research project in relation to IT and Music education (Li, Y. W., 1997), and computer assisted instruction systems continued to develop. The Internet offered new possibilities for music education, and as a result, the Internet applications in music education became more dominant and this trend has continued to the present day.

4.3.2.2 Policies

Infrastructures of Information Education Program (資訊教育基礎建設計畫) (1997)

In 1995, the Ministry of Education published the Republic of China Educational Report: A Prospective Plan towards the 21st Century (中華民國教育報告書：邁向二十一世紀的教育遠景). The expectation was that IT would raise the quality of education. The ultimate goal of the program was to ensure that students were taught according to their aptitude and potential to engage in life-long learning (Taiwan Ministry of Education, 1995a).

The Program to Improve Information Education in Schools of all Levels and the Program to Develop and Promote Computer-aided Teaching are both four year projects (1993-1997). A new program was required to show the direction of IT education in Taiwan. This led the Ministry of Education to implement a ten-year plan: Infrastructure of Information Education Program (Taiwan Ministry of Education, 1997a). This program was also the result of the Executive Yuan publishing in 1996, a vision to build Taiwan as a Technology Island to increase its competitiveness
nationally and internationally. The program played a fundamental role in developing the vision of Taiwan as a *Technology Island*. It fostered the development of facilities in schools and aimed to implement an IT environment with more accessible Internet connections.

The content of this program not only contained the key points of the previous two programs—the *Program to Improve Information Education in Schools of all Levels* and the *Program to Develop and Promote Computer-aided Teaching*, but also combined with a new plan, *TANet in Primary and Middle Schools (TANet 到中小學計劃)* (1997b, Taiwan Ministry of Education), into a ten year program. The *TANet toward Primary and Secondary Schools Plan* was previously named the *Email in Middle Schools (Email 到中學)* which aimed to connect the *Taiwan Academic Network (TANet)* and secondary school, so that all the schools could access the Internet (Taiwan Ministry of Education, 1995b). This plan was launched in 1997 and then subsequently merged into the *Infrastructure of Information Education Program* in the same year. The Internet connection was also expected to extend to all levels of schooling.
This program was divided into short term and long term plans which were 1997 to 2001, and 2001 to 2007. The target of the long-term plan of this program was to construct a well-rounded IT education environment and promote IT education to all citizens (Taiwan Ministry of Education, 1997a). The content was divided into six parts:

1. Teaching materials development

To promote the integration of teaching software in whole teaching areas was emphasised. The development of CAI system was the important work in this program. The government also holds a number of teaching materials design competitions for the schools, universities, and private sectors. Thus, all the sectors were encouraged to develop the CAI systems as the teaching materials. Moreover, the Ministry of Education built a virtual centre by collecting educational software and teaching materials. The official website of the educational software and teaching materials centre (now the “Learning Gas Station Website” http://content.edu.tw/) was launched in 1998 to collect, share, and disseminate various teaching resources.
2. Teacher education

Teacher education focus on the capabilities of IT application and computer assisted teaching skills. The Ministry of Education continued to authorise the Institute for Information Industry and other universities to train teachers. There were a number of teacher education course particularly for special education teachers and teachers who teach in the rural area. In addition, the relevant program: the Medium-Term Program to Train Personnel for National Information Infrastructure (NII) was implemented later in the same year to train the manpower for IT education (Taiwan Ministry of Education, 1997c).

3. Funding support

The Ministry of Education established the national standards of IT environment in schools and expected all schools can have at least one computer lab. This program supported a large amount of funding to purchase various IT devices in order to meet the national standards of information education, and also offered further hardware maintenance and maintainer training. In addition, the universities were encouraged to organise volunteers to assist in the development of informational environments in primary and secondary schools.

4. The TANet toward primary and secondary schools

A significant emphasis of this program was to build the internet connection between the TANet and every primary and secondary school, so that all the schools could access the Internet. In addition, another important emphasis of this program was to increase the speed of the Internet connection. These strategies were put in place to help the dissemination of teaching resources across all levels of schooling and education. Professor T. H. Wu Said:
The TANet was completed and extended. The Computer Centre of the Ministry of Education divided Taiwan into a number of areas, and each area has its “area centre”. For example, the “area centre” in Taipei is the Computer Centre of the Ministry of Education itself, and the area centres in Taoyuan, Shinchu, and Taichung are located at Chong-Yuan Christian University, Tsing-Hua and Chiao-Tong Universities, and Chung-Shing University respectively. ... Every local city or county government also established its local Internet centre to link these area centres in the universities. Those Internet centres of the local government were located in the schools or set as an independent sector under the local government’s control. The network of each school firstly connected to the local Internet centre, and then the local Internet centres connected to the Universities, and finally the Universities were connected to the computer centre of the Ministry of Education. (personal communication, December 16, 2008)

5. IT integrated teaching

In order to promote IT integrated teaching, teacher training, teaching demonstrations, and related conferences were held.

6. The government and private enterprise cooperation

Government and private enterprises worked together to promote the IT education and IT literacy to all citizens. The sub-programs: Medium-Term Program for Remote Teaching (遠距教學中程發展計畫) and the Information Network for Social Education Program (社會教育資訊網計畫) were introduced to develop multimedia and distance learning materials. In addition, two auxiliary plans were implemented to assist the development of informational
environment in school—the Program by Non-Government Organisations to Donate Computer Facilities to Schools of all Levels (民間捐贈各級學校電腦硬體實施要點) and the Plan for Sharing the Primary School Computer Lab with the Community (開放國小教室資源與社區共享方案). As Professor Wu identified the Sharing the Primary School Computer Lab with the Community plan was to open the computer lab in schools at night time for the community. “Because the IT facilities in school were used for instruction at day time only. As a result, the Ministry of Education expected that the people in community also could use the computer and the Internet in school” (Wu, T. H., personal communication, December 16, 2008).

This program offered over 4,684,530,000 TWD (approximately 220,000,000 AUD) for program promotion in the initial stage. After the first term of this finished, the second term program was revised according to the effects of the first one. In 1998, the Ministry of Education launched the Expanding Domestic Demand Plan (擴大內需計畫) to supplement the funding support (Taiwan Ministry of Education, 1998c). Therefore, the targets of the short term plan were achieved within just two years.

Medium-Term Program to Train Personnel for National Information Infrastructure (NII) (國家資訊通信基本建設(NII)人才培育中程發展計畫) (1997)

The development of the National Information Infrastructure (NII) is for enhancing the national competitive superiority for the coming century in the Global Village (National Information Infrastructure Enterprise Promotion Association, n.d.). The Executive Yuan established the NII Steering Committee (now the National Information and Communications Initiative Committee) in 1996 and it would work with others Ministries (under the Executive Yuan) to promote the national
information infrastructure (Sung, C. Y., 2001). That resulted in the Ministry of Education launching the \textit{National Information Infrastructure (NII) Promotion Project} (國家資訊通訊基本建設推動方案) and its sub-program, the \textit{Medium-Term Program to Train Personnel for National Information Infrastructure}, to establish the manpower for developing the national information infrastructure (Taiwan Ministry of Education, 1997c). With respect to school education, the vision of this program was:

1. To improve primary and secondary school teachers’ IT literacy and the application of the Internet resources for enhancing the teaching quality.
2. To introduce advanced IT training into universities and enable universities to train computer specialist teachers for further development of the national information infrastructure.
3. To encourage teachers to adopt technology to expand teaching resources and enhance students’ learning.

Subsequently, another project implemented by the NII Steering Committee—the \textit{National Information Infrastructure (NII) Promotion Project} (國家資訊通訊基本建設推動方案) was launched at the end of the year. The importance of teacher education and the promotion of information/Internet education was addressed (Taiwan Executive Yuan, 1997).

\textit{Expanding Domestic Demand Plan (擴大內需計畫)(1998)}

The \textit{Expanding Domestic Demand Plan} is a budget supplement plan designed particularly for the \textit{Program for the Infrastructure of Information Education} (Taiwan Ministry of Education, 1998c). The \textit{Expanding Domestic Demand Plan} was
accompanied with 6,472,300,000 TWD funding to accelerate the information education infrastructure and push ahead with the development of IT and communication industries. The goals of this plan were crystallised based on the previous *Infrastructure of Information Education Program* (which emphasised the development of teaching material, teacher education, funding support, the TANet in primary and middle schools, and IT integrated teaching); and provided more detail for improving IT education infrastructure in schools. Three aspects were specifically indicated including the teacher education, funding support and the development of internet connection.

1. Teacher education

   The *Short Term Plan to Address Fundamental Information Technology Literacy of Primary and Middle School Teachers* (國民中小學教師資訊基本素養短期指標) (Taiwan Ministry of Education, 1998b) was published to determine teachers’ technological literacy. These included the literacy of IT skills, software application, and applying the use of the Internet in their teaching.

2. Funding support

   This plan offered financial subsides for the purchase of IT facilities in all Teachers’ Colleges to enable better training for pre-service teachers. The funding also supported primary and secondary schools with the objective of one computer for one pupil in computer labs.

3. The development of internet connection

   This plan indicated that every school should build an official Homepage and encouraged schools to participate in the competitions of Webpages design such as the “Cyberfair (網界博覽會)” (now *Taiwan School Cyberfair* [台灣學校網界博覽會], http://cyberfair.taiwanschoolnet.org/). Professor T. H.
Wu identified that:

Because of the limitation of funding, we access the Internet with ADSL connections in the initial stage. ... The ADSL connection was faster for downloading but slower for uploading data. The schools basically provide sufficient download bandwidth for teachers to obtain the teaching materials from the Internet. However, when teachers and students want to have international communication and interaction with other students in other schools, the upload bandwidth for the ADSL is insufficient. As a result, the Ministry of Education has to greatly increase the bandwidth of the Internet. (Wu, T. H., personal communication, December 16, 2008)

With this supplementary plan and extra funding, the Infrastructure of Information Education Program got additional funding support and achieved the short term goals in 1999, which is two years in advance. As can be seem, the three policies mentioned above have set a great foundation for information education and, further, would considerably influence the future development.

*Provisional Grades 1-9 Curriculum Guidelines (九年一貫課程暫行綱要) (1998)*

The implementation of Grades 1-9 Curriculum is an important milestone of education in Taiwan. In order to meet the national development needs and public expectations, the Ministry of Education engaged in a large scale education reform starting from 1998 by announcing the *Provisional Grades 1-9 Curriculum Guidelines*. This education reform was expected to foster national competitiveness and to promote the overall quality of its citizens in keeping up with the 21st century global trends (Taiwan Ministry of Education, 1998a, 2005a).
In 1998, the *Provisional Grades 1-9 Curriculum Guidelines* were announced by the Ministry of Education. In the meantime, a decision was made to implement this new curriculum from the 2001 school year. The curriculum guidelines were emphasised on three dimensions: – individual development, community and culture, and natural environment – to establish the framework of curriculum structure and seven major branches of learning areas: Language Arts, Health and Physical Education, Social Studies, Arts and Humanities, Mathematics, Science and Technology, and Integrative Activities (Taiwan Ministry of Education, 2005a).

The new curriculum integrated music, visual arts and performing arts into a new learning area: *Arts and Humanities*. The aim of this learning area was to help students “to cultivate an interest for the arts and encourages them to enthusiastically participate in related activities, thus promoting abilities such as imagination, creativity, appreciation for the arts, and other abilities” (Taiwan Ministry of Education, 2005a, ¶. 7). Music study in the new curriculum guideline now became an element in the *Arts and Humanities Learning Area* rather than a stand-alone subject. The structure of the various Learning Areas in Grades 1-9 Curriculum is shown below as Figure 4.1 (Taiwan Ministry of Education, 2005b).
### Table 4.1 The Structure of Learning Areas in Grades 1-9 Curriculum

<table>
<thead>
<tr>
<th>Grade/Learning Area</th>
<th>Language Arts</th>
<th>Health and Physical Education</th>
<th>Social Studies</th>
<th>Arts and Humanities</th>
<th>Science and Technology</th>
<th>Mathematics</th>
<th>Integrative Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>Mandarin</td>
<td>Health and Physical Education</td>
<td>Life Curriculum</td>
<td></td>
<td></td>
<td>Mathematics</td>
<td>Integrative Activities</td>
</tr>
<tr>
<td>Two</td>
<td>Mandarin</td>
<td>Health and Physical Education</td>
<td>Social Studies</td>
<td>Arts and Humanities</td>
<td>Science and Technology</td>
<td>Mathematics</td>
<td>Integrative Activities</td>
</tr>
<tr>
<td>Three</td>
<td>Mandarin</td>
<td>Health and Physical Education</td>
<td>Social Studies</td>
<td>Arts and Humanities</td>
<td>Science and Technology</td>
<td>Mathematics</td>
<td>Integrative Activities</td>
</tr>
<tr>
<td>Four</td>
<td>Mandarin</td>
<td>Health and Physical Education</td>
<td>Social Studies</td>
<td>Arts and Humanities</td>
<td>Science and Technology</td>
<td>Mathematics</td>
<td>Integrative Activities</td>
</tr>
<tr>
<td>Five</td>
<td>Mandarin</td>
<td>English</td>
<td>Social Studies</td>
<td>Arts and Humanities</td>
<td>Science and Technology</td>
<td>Mathematics</td>
<td>Integrative Activities</td>
</tr>
<tr>
<td>Six</td>
<td>Mandarin</td>
<td>English</td>
<td>Social Studies</td>
<td>Arts and Humanities</td>
<td>Science and Technology</td>
<td>Mathematics</td>
<td>Integrative Activities</td>
</tr>
<tr>
<td>Seven</td>
<td>Mandarin</td>
<td>English</td>
<td>Social Studies</td>
<td>Arts and Humanities</td>
<td>Science and Technology</td>
<td>Mathematics</td>
<td>Integrative Activities</td>
</tr>
<tr>
<td>Eight</td>
<td>Mandarin</td>
<td>English</td>
<td>Social Studies</td>
<td>Arts and Humanities</td>
<td>Science and Technology</td>
<td>Mathematics</td>
<td>Integrative Activities</td>
</tr>
<tr>
<td>Nine</td>
<td>Mandarin</td>
<td>English</td>
<td>Social Studies</td>
<td>Arts and Humanities</td>
<td>Science and Technology</td>
<td>Mathematics</td>
<td>Integrative Activities</td>
</tr>
</tbody>
</table>


These guidelines also provided the detail regarding the learning period (class time) of each learning area. The time for the Arts and Humanities Learning Area accounted for 10%-15% of all learning periods. Generally, the learning period for the Arts and Humanities Learning Area was three classes of 40 minutes per week in the primary school. In addition, there were 4-6 classes for the Alternative Learning Periods per week for other or extra-curricular subjects of learning. The Ministry of Education empowered schools to “organise and conduct activities for the Alternative Learning Periods, carried out curriculum or activities designed to correspond to goals and objectives of the school, provide optional courses for learning areas, implement remedial teaching programs, conduct group counseling or self-learning activities” (Taiwan Ministry of Education, 2005a, ¶. 10). The table below shows the detail of the length of learning periods in different grades of school learning.
Table 4.2 The Length of Learning Periods in Different Grades of School Learning

<table>
<thead>
<tr>
<th></th>
<th>Total Learning Periods</th>
<th>Area Learning periods</th>
<th>Alternative Learning Periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>22-24</td>
<td>20</td>
<td>2-4</td>
</tr>
<tr>
<td>Two</td>
<td>22-24</td>
<td>20</td>
<td>2-4</td>
</tr>
<tr>
<td>Three</td>
<td>28-31</td>
<td>25</td>
<td>3-6</td>
</tr>
<tr>
<td>Four</td>
<td>28-31</td>
<td>25</td>
<td>3-6</td>
</tr>
<tr>
<td>Five</td>
<td>30-33</td>
<td>27</td>
<td>3-6</td>
</tr>
<tr>
<td>Six</td>
<td>30-33</td>
<td>27</td>
<td>3-6</td>
</tr>
<tr>
<td>Seven</td>
<td>32-34</td>
<td>28</td>
<td>4-6</td>
</tr>
<tr>
<td>Eight</td>
<td>32-34</td>
<td>28</td>
<td>4-6</td>
</tr>
<tr>
<td>Nine</td>
<td>33-35</td>
<td>30</td>
<td>3-5</td>
</tr>
</tbody>
</table>


With respect to the importance of technology in education, the goal “to acquire the ability to utilise technology and information” was set as one of the ten core competences in the new curriculum. The guideline indicated that students should be encouraged to utilise new technologies (including Internet resources) for learning, which:

involves the utilisation of technology in a correct, safe and effective way so as to collect data, make judgments after thorough analyses of the data, integrate and sort out useful information, and make use of such information for the purpose of enhancing learning efficiency and living quality. (Taiwan Ministry of Education, 2005a, ¶. 6)
Based on the guidelines, schools were empowered to arrange time for the learning of information technology, as well as to integrate technology into various learning areas.

During 1998 to 2000, a series of sub-guidelines of this new curriculum was published. In 1999, the provisional teaching goals and the competence indicators for each learning area (including the *Art and Humanities Learning Area*) and six other crucial issues of learning were defined. Within the *Arts and Humanities Learning Area*—where music learning is located—there are several competency indicators identified with the application of IT. These competency indicators included: integrating technology, engaging in new experiences and exploring new directions; adopting technology and other approaches to collect and classify information on the arts. After the announcement of this new curriculum, the application of IT has been officially identified in all subsequent guidelines. In 2003, these provisional teaching goals and competence indicators were revised as the *Grades 1-9 Curriculum Guidelines* (九年一貫課程綱要).

In order to advocate and disseminate the information of the new curriculum, the Ministry of Education started to build websites to support its implementation and provide relevant information. Since 2000, the Ministry has established the website of *Grades 1-9 Curriculum Teaching* (九年一貫課程與教學網站) (http://teach.eje.edu.tw) (now *Taiwan Elementary and Secondary Educator Community* (國教社群網)) and the *Small Class Program Experimental Website* (小班教學網) (http://class.eje.isst.edu.tw). These Internet resources provided the information regarding the new curriculum including guidelines, educational news,
teaching materials and on-line teacher education courses, and gave teachers the access to a forum for communication. Most importantly, these websites have been linked to a great number of other websites of similar interest and became the most important portal of the new curriculum (Taiwan Ministry of Education, 1999). The National Sun Yet Sen University also built the Smart Creative Teacher Net (SCTNet) (思摩特網) (http://sctnet.edu.tw/) and offered the opportunities for teachers to share their knowledge and experience in this teacher professional network. As well as the development of an internet resources framework, a large number of teacher education courses were held to enable teachers to adapt the new curriculum.

In this large-scale education reform, the new learning areas were introduced with the idea of integration. For example, music, visual arts and performing arts are integrated to the Arts and Humanities Learning Area. That also led to the reduction of teaching time for music because music was forced to share the time quota with the other two subjects. The impacts of this change are discussed in the following chapter.

In this period, the development of the IT infrastructure for education systems was rapid because of the significant funding support by the implementation of government policies. The government promoted IT education in various aspects including funding support, teacher education, internet connection, teaching resources development, and the advocacy of cooperation between government and private sectors. These approaches provided a positive condition for future development of IT education. The education in Taiwan entered a new era because of the implementation of new curriculum.
In this Internet Development Period (1997-2001), the CAI systems continued to develop; plus the improvement of internet infrastructure, these systems were able to work on the Internet. Teaching materials and educational information started to be disseminated through the internet connection. In addition, the characteristics of the Internet technology—including the easy accessibility of communication and the new learning environment—created new possibilities for teaching and learning. Thus, the development of the Internet connection framework has become a notable trend in this period.

4.3.3 The Digital Content Period (2001 to the present)

4.3.3.1 Developments

The education systems in Taiwan have undergone a big change over this period. With the implementation of three important policies: the Provisional Grades 1-9 Curriculum Guidelines, the Information Technology Education for Primary and Middle Schools: Blueprint (國民中小學資訊教育總藍圖), and the Information Technology Seed School Project (資訊種子學校計畫), the new age of education in Taiwan started from 2001. In this section, the events discussed in the time line at times overlap.

Prior to 2001, primary and secondary school education were based on the national uniform curriculum standards, which had been revised several times over the years. However, the new curriculum guideline in 2001 took the place of the curriculum standards, while the Learning Area also replaced the single subject in the previous curriculum standards. The Learning Area refers to the content of learning (not the names of subjects) and follows the principle of Integration. According to the curriculum guideline, different schools could integrate different Learning Areas into
the particular topics or issues for teaching. In another words, new curriculum guidelines offered schools more opportunities to develop the particular curricula based on their unique conditions. The schools were able to arrange the learning and teaching time based on the structure of the learning period in the curriculum guidelines. These guidelines identified that the school administrators can consolidate the efforts of all school staff as well as resources provided by the community, to develop a school-based curriculum, and formulate a comprehensive School Curriculum Plan based on thorough consideration of relevant factors, such as school conditions, features of the community, parental expectations, students’ needs (Taiwan Ministry of Education, 2005a, ¶. 11).

In 2001, the *Information Technology Education for Primary and Secondary Schools: Blueprint* was announced. This blueprint switched the focus of information education towards IT integrated education. In the same year, the *Information Technology Seed School Project* was implemented for a large scale teacher training for the integration of IT. There were in total 37 *Arts and Humanities Information Technology Seminal Schools* developed in this project (Taiwan Ministry of Education, 2001a).

In 2002, the *National Digital Archives Program* was officially implemented by the National Science Council to preserve and demonstrate significant resources nationwide on the Internet as well as to provide comprehensive materials for e-learning. The *Treasure Island of Digital Archives* (數位典藏金銀島) (http://dlm.ntu.edu.tw/land/) was the portal website for the *National Digital Archives Program*. In 2002, the *National Digital Archives Program* and the *National Science and Technology Program for e-learning* were initiated. In 2008 these
programs merged and were renamed the Taiwan e-learning and Digital Archives Program. Based on the achievements of the previous two programs (National Digital Archives Program and National Science and Technology Program for e-learning), Taiwan e-learning and Digital Archives Program puts further emphasis on the subject of indigenous cultures, and showcases Taiwan’s diversity and identity. An expectation for the program is that it will preserve and pass on Taiwan’s cultural legacy to future generations through e-learning. There are now (in 2012) more than 600 archives (Chen, H. P., 2012b).

As a means of promoting the program, the National Science Council has been engaged in activities such as demonstrations, speeches, forums and competitions. School teachers have been strongly encouraged to use the digital archives to assist their teaching. They can also download a range of lesson plans. In the field of music, the Taiwan e-learning and Digital Archives Program predominately focuses on the lives of famous Taiwanese musicians, indigenous Taiwanese music, and the place of music in the lives of various races and cultures. There are now some archives that focus on learning in select discipline areas; unfortunately, music is not one of them. That is, the program offers relatively weak support in the field of contemporary music education or school music learning.

With respect to the National Science Council funded research projects, the studies pertaining to internet resources and music learning were undertaken in this period. Y. M. Hsieh (2003) conducted research in relation to Web Project-Based Music Learning. The webpages in this research provided “the functions to foster Internet communication, showcase examples of student collaborative work and rate[d]
students’ on-line discussions or assignments completed)” (p. 2). K. L. Ho, a researcher in music education, developed and published a group of Internet game modules based on the 20th century Arts and Humanities curricula, hoping that this would inspire commercial game developers to design a new kind of learning game (Ho, K. L., 2004, 2007, 2008). These studies were undertaken in conjunction with the Humanities and Arts Learning Website in the Six Major Learning Nets Project of the Ministry of Education.

In terms of teacher education, the first in-service music teacher Master degree program (Master of Music Education) was established in 1998. More and more music teachers returned to universities for further study (Lai, M. L., 2005). As mentioned in Chapter Three, these in-service teachers’ studies predominately related to part of their teaching work, and the application of IT in music education is one field of their research. Such studies provide insightful arguments for further research and application, and several of these Taiwanese researchers were involved in this current study as interviewees contributing their experience and expertise in the integration of IT in music education. Moreover, a number of relevant research studies focused on the whole Arts and Humanities learning Area rather than music, which reflected the change of the new curriculum.

During this period, the government promoted IT education in many ways, especially in the learning and application of the Internet. From 2005 to 2008, the Conceptual Framework of Education Administration of the Ministry of Education (教育施政主軸架構) addressed the establishment of a digitalised learning environment in schools. The conceptual framework put the emphasis on the development of “excellent” digital learning content for primary and secondary schools (Taiwan Ministry of
Additionally, the Ministry of Education 2007 Administration Guidelines (教育部96年度施政計畫) addressed the aims of bridging the digital gap between urban and rural areas (in the middle and elementary school levels); creating high quality learning materials to improve information infrastructure and the skills for using the Internet in schools (Taiwan Ministry of Education, 2007). One year after, in 2008, the Blueprint for Education (教育施政藍圖) (2009-2012) stressed the importance of improving the digital education environment (Taiwan Ministry of Education, 2008a). Meanwhile, the Ministry of Education 2008 Administration Guidelines (教育部97年度施政計畫) (Taiwan Ministry of Education, 2008b) advocated equal digital opportunities between urban and rural areas through teacher education and special funding support for the schools in rural area. The importance of developing on-line learning resource, promoting IT integrated teaching and learning, as well as advocating the international cooperation learning via the Internet was mentioned in this plan.

Over these years, the government promoted IT education and its application in education via a number of approaches including the implementation of a series of policies, appropriating ample funds for constructing digital learning content and facilities. Due to the maturity of internet technology and IT development, increasing number of educational websites (including those in the Taiwan e-learning and Digital Archives Program) were established after 2001, with digital content being significantly enriched, the resources of the integration of IT in education were greatly improved. Various learning resources and an upgraded digital learning environment are offered on-line nowadays in Taiwan. With respect to music education, however, the on-line resources have been relatively less than other areas and need further support and promotion.
4.3.3.2 Policies

A series of policies during this period has led to a great change of IT education in Taiwan. From 2001, with the implementation of the Information Education for Primary and Secondary Schools: Blueprint and the Information Seed Schools Project, IT education in Taiwan began to emphasise integration. In 2002, the Executive Yuan announced the Challenge 2008: National Development Plans (挑戰2008：國家重點發展計畫 (2002-2007)). In this plan, the goals of establishing a web learning system for all citizens (including those in schools) and narrowing the digital gap between urban and rural schools were addressed. More recently, in 2008, the Taiwan Ministry of Education Whitepaper on ICT in K-12 Education (2008-2011) (教育部中小學資訊教育白皮書) indicated the current situation and future directions for the development of IT education. With respect to the school curriculum, the Grades 1-9 Curriculum Guidelines have been slightly revised over the time while still guiding the development of school education in Taiwan in this period.

Information Education for Primary and Middle Schools: Blueprint (國民中小學資訊教育總藍圖) (2001)

In the 21st century, the education system is expected to cultivate the citizens with basic IT literacy in keeping up with social development, and further, to enhance national competitiveness. The capacity of such literacy includes the competence of applying IT into learning and innovative thinking. This, as a result of the effort of the Ministry of Education in Taiwan to promote the integration of IT in education systems so as to cultivate its citizens, could match the demand of the new age. The Information Technology Education for Primary and Middle Schools: Blueprint in 2001 was based on these statements and expected to enhance the island’s IT education to
another level. This blueprint comprised of six aspects including: the Internet and hardware infrastructure; teaching materials and software; students, teachers and schools; bridging the digital divide between rural and urban areas; the participation of communities and private sectors, and educational administrations (Taiwan Ministry of Education, 2001a):

1. The Internet and hardware infrastructure.
   Schools are encouraged to establish an internet connection throughout every classroom in the school and a wireless connection on campus, as well as offering the accessibility of computer resources in school particularly for disabled students.

2. Teaching materials and software
   Educators, research and educational organisations, and private sectors are encouraged to upload and share teaching materials on the Internet, so that the comprehensive on-line teaching materials could be downloaded, revised, and applied for educational purpose.

   Students are encouraged to learn through active, innovative, and cooperative approaches. In addition, the importance of developing students’ IT literacy (such as the understanding of IT application, copyright issues, and positive learning attitude) are mentioned. For pre-service teachers, the learning of the integration of IT should be included in pedagogy courses of teacher training; teacher education institutions are also encouraged to integrate IT into the syllabus. As for in-service teachers, they are expected to integrate IT into one-fifth of their teaching hours after undertaking the professional development program. As for schools, according to the Information Seed School Project, a number of schools
(specifically focusing on various learning areas) are selected and supported for extra funding for teacher education so as to enhance IT education environment. These seed schools are expected to be a paragon and would then promote their experience of success in the integration of IT to other schools. The number of these schools is anticipated to achieve one-fifth of all schools nationwide (which would be over 600 schools) within four years.

4. Bridging the digital divide between rural and urban areas.

Through the approaches of establishing on-line teaching resources centre and operating on-line educational workshops and conferences, both rural and urban areas are expected to have equal digital opportunities—that is, the opportunities for obtaining and using digital resources. The schools in both areas were encouraged to forge an alliance to share the educational resources with each other.

5. The participation of communities and private sectors.

Schools are encouraged to be involved in the social communities, thus, the parents, teachers and students will become a learning community and apply IT for life-long learning. In the meantime, private sectors are encouraged to cooperate with schools to assist the development of the excellent teaching materials and maintain IT facilities in schools.


To digitalise the educational administration systems as well as increase the IT literacy for school administrators are set as two main goals in this aspect.

With these six aspects, this blueprint was anticipated to achieve the vision of easy access to information, active and happy learning, innovation through cooperation, and life-long learning. The contents of this blueprint continued the important issues
of the *Infrastructure of Information Education Program* in 1997 and linked to the Grades 1-9 *Curriculum* to increase the education quality via information technology.


The *Challenge 2008: National Development Plan* was implemented by the Executive Yuan and its sub-sectors from 2002 to 2007. The *E-Generation Manpower Cultivation Plan* was one of its ten key sub-plans announced by the Ministry of Education. This plan aimed to cultivate the new generation as competitive citizens with international foresights. This could be achieved through creating international environments, developing enthusiastic youths, and establishing life-long social learning. In addition, to minimise the digital divide in remote areas is another important mission.

In order to educate enthusiastic young people, the *Building the Digitalised Environment Project* *(建構數位化學習內容)* was one of the ten important sub-projects in this *E-Generation Manpower Cultivation Plan*. The relationship among the *Challenge 2008: National development Plan*, the *E-Generation Manpower Cultivation Plan* and the *Building the Digitalised Environment Project* is shown as Figure. 4.2.
The *Building the Digitalised Environment Project* provided more detail in building the digital education environment. The two main strategies were:

1. Building the digital learning content

   This project aims to combine the resources from academic professionals, elementary and middle school teachers, business corporations, social education institutions and community groups to enhance the digital learning environment (Taiwan Ministry of Education, 2005d). Supplementary learning materials for the Grade 1-9 Curriculum, such as the *Six Major Learning Nets* were contained in this project. Additionally, a range of Web-based competitions was held to enrich on-line learning materials and increase students’ internet literacy. The integration of various digital learning materials from the digital archives, on-line teaching resource centres and social education organisations offered comprehensive digital learning resources for teachers and students.
2. Reducing the digital divide between urban and rural areas.

In order to enhance the IT education conditions in rural area, the improvement of hardware facilities and the internet connection, as well as teachers’ abilities in using IT were concerned. Thus, the distance teacher education courses and comprehensive on-line teaching resources were offered for improving the quality of IT education in rural area.

The performance index of this project was targeted on increasing the number of teachers to participate in on-line education communities and the percentage of teachers integrating IT in teaching and learning. Based on this plan, the quality of on-line learning content was expected to be improved, and, consequently, would enhance internet literacy nationwide.


The Provisional Grade 1-9 Curriculum Guidelines were implemented since 2001. By November 2003, the revised curriculum that outlines various areas of learning was announced as the formal Grades 1-9 Curriculum Guidelines. Since then, the revised guidelines had replaced the previous provisional curriculum guidelines and standards and immensely changed the form and essence of the curriculum nationwide. Several important aspects of these guidelines were based on the old provisional guidelines, which were presented in a previous section of this chapter.

As mentioned previously, the learning of music, visual arts, and performing arts in the curriculum guidelines were integrated into the Arts and Humanities Learning Area; the Information Education was classified as one of the six crucial issues to be integrated into all seven areas of learning. Each learning area and crucial issue was
“divided into several learning stages according to the structure of knowledge concerned as well as the continuity principles of the psychological development of learning” (Taiwan Ministry of Education, 2005a, ¶ 8). With respect to the Arts and Humanities Learning Area and the Information Education Crucial Issue, the learning process was divided into four stages (grades 1 to 2; grades 3 to 4; grades 5 to 6; and grades 7 to 9).

For the Arts and Humanities Learning Area, the new teaching goals and the competence indicators were set for each learning stage and implemented in 2003. The three teaching goals were: 1. exploration and expression; 2. appreciation and understanding; 3. practice and application. Each of these three teaching goals includes a number of competency indicators, some of which are reproduced below (Taiwan Ministry of Education, 2003). In the following outline, the first number indicates which of the three teaching goals is being referred to. The second number refers to the learning stage (1. stage one: grades 1 to 2; 2. stage two: grades 3 to 4; 3. stage three: grades 5 to 6; 4. stage four: grades 7 to 9). The third number is a serial number indicates the individual competency indicator in various learning goals and stages. The Arts and Humanities Learning Area includes several competency indicators that encapsulate the application of IT; it is these which are produced here:

1-2-1 exploring all kinds of Media, techniques, and forms; and understanding the effects of various creative elements and their differences, with reference to artistic creation

2-2-9 collecting information related to local, traditional and living arts, researching their background and characteristics
1-3-5 integrating technology, engaging in new experiences and exploring new directions

3-3-12 adopting technology and other approaches to collect and classify information on the arts, with the expectation that this will become a habit

1-4-2 identifying communities’ concerns as a basis for designing topics that foster stronger consideration of societal issues and the natural environment; this will entail using appropriate media and techniques to convey personal or group concern and values and, at the same time, develop unique ways of expression

1-4-3 engaging in a wide range of arts media and investigating differences between traditional and non-traditional styles

1-4-4 linking arts and technology media to design works that have application to life and disseminate information

2-4-8 using IT to collect arts information worldwide in order to understand contemporary trends in the arts as they reflect life, and enhance understanding of arts and culture

The competence indicators 1-3-5, 3-3-12, 1-4-4, and 2-4-8 directly mention IT and have been referred to one of the ten core competences “to acquire the ability to utilise technology and information” in the new curriculum. Even though there was no competence indicator in the first learning stage mentioning IT, the arts curriculum and teaching were encouraged to integrate IT in teaching.

The Information Education Crucial Issue (Taiwan Ministry of Education, 2001b) has its competence indicators that were emphasised on the learning of IT skills. Nevertheless, after the learning of computer skills, the students were expected to have a positive attitude and get use to apply IT to solve problems. In other words,
students not only got the IT knowledge and skills but also could adopt IT to assist all areas of learning and make learning more effective.

The competence indicators of the Information Education Crucial Issue were based on the same four learning stages to the Arts and Humanities Learning Area. Although these competence indicators were concerned from the second learning stage (grades 3 to 4) to the fourth learning stage (grades 7 to 9), teachers were encouraged to integrate information technology in teaching in order to improve their teaching in the first learning stage (grades 1 to 2). Generally speaking, teachers were advised to integrate all six crucial issues into the teaching of seven learning areas. It is worth mentioning that this curriculum guideline suggested in totally 16 computer classes per school year for the second and the third learning stages. In the current revision of Grades 1-9 Curriculum Guidelines in 2008, the time for computer learning were increased to 32-36 classes per school year (Taiwan Ministry of Education, 2008c).

The Grades 1-9 Curriculum Guidelines was officially announced in 2003 and practiced from 2004 to present. In 2008, these guidelines were revised and had several minor changes in order to match the partial needs in education systems. The newest version of this curriculum will be implemented in 2012 (Taiwan Ministry of Education, 2008d).

Taiwan Ministry of Education Whitepaper on ICT in K-12 Education (教育部資訊教育白皮書) (2008)

After the Infrastructure of Information Education Program (1997-2001), the

Information Technology Education for Primary and Middle Schools: Blueprint
(2001-2005) and the Challenge 2008: National Development Plans (2002-2007), the Taiwan Ministry of Education Whitepaper on ICT in K-12 Education was implemented in 2008 to guide further development of IT education. This Whitepaper was planned from 2006 and announced in middle of 2008. It was expected to conduct the development of information education in Taiwan from 2008 to 2011. The main themes of this Whitepaper continued several important visions in previous policies, such as bridging the digital divide, enhancing the IT literacy and increasing the educational quality (Taiwan Ministry of Education, 2008e).

This policy articulated eight goals:
1. Increasing students’ capabilities to apply IT to solve problems.
2. Developing students’ positive understanding, attitude, and behavior to IT.
3. Promoting equality in digital opportunities between teachers and students.
4. Educating teachers with the capabilities of IT application.
5. Developing various digital teaching resources.
6. Improving the hardware and software facilities and internet connection in the campus and classroom.
7. Developing and promoting the successful experiences and paragon of IT application among different schools.
8. Establishing a well-rounded IT education administrative mechanism.

The main issues of the Whitepaper were the application of IT, arousing innovative thinking, sharing digital resources, and promoting equality in digital opportunity. Additionally, twenty implemented strategies and thirty-nine action plans were explained in this Whitepaper for clearer indication.
In 2008, the global financial crisis impacted on Taiwan and caused high unemployed rate and social problems. Owing to enhance the competitiveness of the national manpower and improved education conditions, the Ministry of Education launched the Program of Excellence and Equality in ICT Education for Primary and Middle Schools in early 2009. This program was targeted at all levels of schooling to construct the excellent digital learning environment and e-classroom. There were five goals of this program (Taiwan Ministry of Education, 2009b):

1. Students can utilise IT to improve their learning and live.
2. Teachers can utilise IT to enhance the quality of their teaching.
3. Offering equality in digital environment for teachers and students in classroom.
4. Improving the application of IT in senior high school education.
5. Improving the accessibility of digital learning via enhancing internet connection in schools and advocating the importance of information safety.

As can be seen, the enrichment of on-line learning resources was mentioned in the majority of policies in this period. The “integration” has become a significant trend in using IT in education during this period. Other important issues such as bridging digital divide, equality in using IT, and teacher education were also mention.

4.4 Discussion
Commencing in the mid-1980s, the Taiwanese government launched a range of education policies to improve teaching and learning, to develop IT literacy, and to promote life-long learning. The government undertook this to enhance its global
competitiveness. As a result, a great deal of funding was offered to establish the
technology infrastructure, to promote IT education, and to support teacher
education.

The computer was first introduced in universities. The application of the Internet
presented a similar situation. The Internet was also first connected between
universities, and then extended to be used in all levels of schooling as a result of
government policy initiatives.

The development of IT in music education was initially introduced from CAI systems.
The use of the Internet then followed. Moreover, the development of the application
of the Internet in education initially focused on the Internet infrastructure, and then
turned to the enrichment of on-line digital learning content. The government has
constantly initiated the educational policies and modified the educational
environment in response to rapid development of technology. However, reference
to music education has been limited, as has the provision of funding and relevant
resources. After the 2001 educational reforms, music was merged into the Arts and
Humanities Learning Area, and the situation got worse.

These educational policies aimed to guide future education in general and not
specifically focused on each subject. In practice this has resulted in music gaining less
support. The researcher argues that a specialised policy with proper funding is
needed to support the development of Internet resources and IT equipment for
music education. Music educators, further, should be supported to readily avail
themselves of the new developments in the integration of IT.
4.5 Summary of chapter

This chapter discussed the developments in the integration of IT in Taiwan with respect to policy implementation. Three important government sectors immediately involved in the development of IT education (the Executive Yuan, the Ministry of Education, and the National Science Council) are introduced, as well as three periods of development and important events of the integration of IT were identified.

The discussion section identified the impacts of government policy implementation and the general trend on the development with respect to the integration of IT.
Chapter 5 The Integration of IT in Music Teacher Education in Taiwan

5.1 Overview of chapter

This chapter discusses the training regarding the integration of IT for both pre-service and practising teachers in Taiwan. The first section is concerned with IT related training at the pre-service and post-graduate levels in music departments in universities. The second section discusses professional development (in-service training) for practising teachers provided by various organisations and institutions, including universities.

5.2 Pre-service training in the integration of IT for primary school music teachers

Teacher education plays an integral role in promoting IT education. Since the early 1990s, IT related education policies have stressed the importance of teacher education. In 1993, the Ministry of Education’s policy, the Program to Improve Information Education at Schools of all Levels, supported teacher education institutions through funding to enhance computer education facilities, and encouraged the institutions to provide IT related courses. Since then, Taiwan’s teacher education institutions have continued to promote IT education. Professor T. H. Wu, who was President of the Tainan Teacher’s College at that period, said:

Although the Ministry of Education did not compel teacher education institutions to promote IT education, they undertook the task willingly. On one hand, the promotion of IT education was a general trend and, on the other, the institutions were given funding and resources by the Ministry of Education to support this. Clearly, it was to the benefit of the teacher education institutions
to develop IT education. (Wu, T. H., personal communication, December 16, 2008)

In 1993, the Ministry of Education set up three information service centres in Taiwan to deal with IT education. The centre in northern Taiwan was the Ministry of Education’s Computer Centre; the National Changhua Normal University (one of the middle school teacher education institutions), became the centre in the middle of Taiwan; and in southern Taiwan the centre was the Tainan Teacher’s College (one of the primary school teacher education institutions). The Tainan Teacher’s College—now renamed as the National University of Tainan—was also commissioned to plan and integrate IT related courses in all Teachers’ Colleges to cultivate IT literacy for pre-service primary school teachers. Professor T. H. Wu further identified:

Following the Ministry of Education’s recognition of the importance of teacher education, the teacher education institutions played a significant role in promoting IT education nation-wide. As a result, IT facilities in these institutions were enriched and the development of IT related courses was encouraged, particularly in the area of computer assisted instruction. ... The Ministry of Education established three information service centres in different areas of Taiwan. The main responsibility of the Tainan Teacher’s College, which was the southern centre, was to plan and integrate all aspects of IT among all Teachers’ Colleges. (Wu, T. H., personal communication, December 16, 2008)

What follows is a discussion of IT related training for music teachers in primary school teacher institutions in Taiwan. This will begin by explaining the present
situation relating to primary school music teacher education. Following this there will be a discussion of IT related courses in the music departments of the teacher education institutions. Finally, the content of these courses will be analysed and discussed.

5.2.1 Primary school music teacher education in Taiwan

Before 1994, there were nine Teachers’ Colleges in Taiwan that trained primary school teachers. The students graduating from the department of music education in these Teachers’ Colleges were the main sources of primary school music teachers. After the new Teacher Education Act (師資培育法) (Ministry of Education, 1994) was launched, the teacher education system underwent large scale reform. This section describes, firstly, the changes after the new Teacher Education Act was launched and, secondly, briefly introduces the curriculum structure in the new music departments of the new universities following the change.

5.2.1.1 Changes in the new Teacher Education Act

The new Teacher Education Act of 1994 decreed that “teacher education shall be done by teacher training colleges and normal universities, and universities with teacher education-related departments or teacher education centres” (Ministry of Education, 1994, p. 2). It diversified the channels of teacher education; no longer was primary teacher training the sole province of the Teachers’ Colleges. As a consequence, for the first time, many universities began to offer the pre-service teacher education courses for teacher education. The pre-service education courses for those training to become primary school teachers generally involved at least 40 credit points, with each credit point equating to at least 18 hours of instruction. The number of institutions offering primary school pre-service teacher education
courses increased exponentially after 1994, but by 2009 had fallen back to 26 universities; this included the nine former Teachers’ Colleges that existed at the time of the Teacher Education Act of 1994.

In accordance with the new Teacher Education Act and the accompanying Teacher Education Act Enforcement Rules, students entering pre-service primary teacher training in 1994 were required to undertake, after graduating from the four-year course, one year of teaching practice in order to complete their teacher education training. (Prior to this, teaching practice was not a requirement for trainee teachers; that is, they were appointed to a school without having had any teaching experience.) The teaching practice requirement was subsequently reduced to half-a-year from 2005. Following the introduction of this new regulation in 1994 teachers were given a teacher licence after they had completed the mandatory teaching practice. From 2005 this was changed again and teachers were required, additionally, to pass the Ministry of Education’s “qualification certification examination” after completing their teaching practice in order to obtain a teacher licence. One further hurdle was introduced as a result of the 1994 Act: anyone wishing to be recruited into a primary school had to pass an examination conducted by the school or the local government.

From 1994 the Teachers’ Colleges no longer had a monopoly on teacher education. This, along with the diminishing demand for primary school teachers (owing to a decline in Taiwan’s birth rate), led to the Teachers’ Colleges evolving into a University of Education, or changing their status to a general university, or amalgamating with another university in order to enhance the breadth of its offerings. This also saw a change in name and status of the former music education departments, which became music departments providing a broader training in
music that extended beyond the training of school music teachers to the training of professional musicians.

As is the situation in Australia, primary school teachers are expected to teach all subjects in the curriculum—regardless of what their major was in their course of training. Allowing a teacher to teach in a specialist area such as music is the prerogative of the school administration. For example, if a school has sufficient teacher resources in a particular year, the administration might consider designating one teacher as the music specialist for that year. This however does not necessarily apply the following year, and the teacher may be expected to return to teaching in the general classroom. Even in situations where a teacher is designated as a Music Education Specialist by the local government, this can be overridden by the school administration. It is not uncommon for teachers who have a speciality in music (or some other subject) to be working as a generalist teacher. For example five of the ten teachers interviewed for this study, despite having a Master’s degree in the field of music education were working as general classroom teachers—not music specialists.

5.2.1.2 The curriculum for music teacher education in music departments

After the new Teacher Education Act was launched in 1994, students were not guaranteed a teaching position in a primary school. This applied to students graduating from what had been the former Teachers’ Colleges as well as those who graduated from other universities that had no affiliation with the former Teachers’ Colleges. For four main reasons, the present research focuses on the music (education) departments in former Teachers’ Colleges which, even today, account for a large number of graduates who enter primary teaching. Firstly, unlike some of
the other universities, they have a long tradition of teacher training and a track record in curriculum development in this field; this is generally reflected in the research interests and professional endeavours of the professors. Secondly, teacher education departments in other—non-Teachers’ Colleges—universities have not consistently offered teacher training over the full period since 1994. Thirdly, the music curriculum content in what were the Teachers’ Colleges—in contrast to that in the universities—has tended to be more inclined to music education than to the training of musicians; thus, there is a primary school music orientation in the training that they offer students. Finally, current research showed that the students in these universities have higher professional identity as school music teachers than the music major students in other universities (Tai, T. C., 2012).

Most of the new universities, including those that were Teachers’ Colleges, have been offering Master’s degrees over the last decade. As identified previously, this study will concentrate on those offered by the former Teachers’ Colleges. Two types are particularly relevant to this study: the Master of Music, and the Master of Music Education; whilst both can be undertaken through the “in-service” mode, this is more common with the second of these. The first, the Master of Music, is generally offered in the following fields: music education, performance, vocal, composition, traditional music, and so on. Students with a Bachelor’s degree, including primary trained teachers, can enrol in it. If students who are not qualified primary school teachers wish, they can enrol in pre-service courses as part of their study program, thus opening-up the possibility of them entering the teaching service upon graduation - subject, of course, to them satisfying the other requirements discussed above, including practice teaching. In contrast, the Master of Music Education program is predominately for the in-servicing of school teachers and other music
educators. This program requires a teacher to have had relevant work experience prior to entry. It is conducted in an evening or during the summer vacation so that students can continue with their career without interruption. In the courses they study and in their research the teachers focus mainly on practical teaching.

Figure 5.1 The Curriculum for Music Teacher Education in Music Departments

This research focuses on the programs offered by Music Departments at the undergraduate level in each of the nine universities, and two types of postgraduate programs that they offer in relation to music education. The study surveyed these undergraduate and postgraduate programs to ascertain the status and content of IT related courses. Of the six professors interviewed, two had a responsibility for policy development, and four were principally teachers. In addition, 10 former students—representing a range of universities—who were either graduates or undergraduates but all of whom were primary school teachers, provided feedback on university IT related courses that they had studied.

5.2.2 IT Related Courses

The curriculum structure of tertiary education in Taiwan is based on the University Act (大學法) and the University Act Enforcement Rules (大學法施行細則). A
Bachelor program requires at least 128 credit points over a four-year period, with each credit point equating to at least 18 hours of instruction per semester. The study period for undergraduate students is four years (eight semesters) in general, with students being able to extend their study period up to a maximum of six years.

Students studying in the former Teachers’ Colleges generally include some teaching/education units as part of their 128 credit points; this is much less common in other universities. This generally means that graduates from the former Teachers’ Colleges who wish to become primary teachers have to do fewer credit points in order to accrue the required 40 credit points needed for teaching.

The Master’s program requires students to both undertake courses and to write a thesis. The study period ranges from one to four years, but it generally takes two to three years. The universities are authorised to build their own curriculum structure, but this has to be approved by the Ministry of Education. Generally speaking, a Master’s program requires 32 to 40 credit points.

There are two types of courses in the university curriculum: “required courses” and “elective courses”. Universities vary in their regulations for the ratio of required to elective course. Some universities have more required courses than elective courses, and others are the opposite. The range of required courses for undergraduate programs is from 40 to 90 credit points (approximately 35% to 65% of total credit points); similarly with the elective courses. A similar ratio between required and elective courses also exists for postgraduate programs, with each ranging from 10 to 20 credit points.
The data used here are taken from university music departments that relate to the 2009 school year (mid-2009 to mid-2010). The year designated when the courses were firstly offered.

5.2.2.1 Undergraduate programs

Nine university music departments were involved in this study. All of these departments offered IT related courses. Some music departments however have different regulations for students depending on their major. This research however focuses on the curriculum for music education majors.

The content of courses is shown in Table 5.1. This table includes the name of the university, IT related course names, the type of course (required/elective), the semester of the program, as well as the relationship between class hours and credit points (e.g., 2/1 signifying two class hours for one credit point). The symbol “★” in the table identifies the courses that encapsulate IT and music teaching or instruction (as distinct from more “general” IT courses in music).

<table>
<thead>
<tr>
<th>Uni.</th>
<th>Courses</th>
<th>Req’d/Elect.</th>
<th>Sem.</th>
<th>Hours/Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Taipei University of Education (NTUE) 國立台北教育大學 2008</td>
<td>The Music Applications of Computer Technology I 電腦科技在音樂上的應用(一)</td>
<td>R</td>
<td>3</td>
<td>2/2</td>
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<tr>
<td></td>
<td>The Music Applications of Computer Technology II 電腦科技在音樂上的應用(二)</td>
<td>R</td>
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<td></td>
<td>Computer Application in Music Education I 電腦在音樂教學上的應用(一)★</td>
<td>E</td>
<td>7</td>
<td>2/2</td>
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<tr>
<td></td>
<td>Computer Application in Music Education II 電腦在音樂教學上的應用(二)★</td>
<td>E</td>
<td>8</td>
<td>2/2</td>
</tr>
<tr>
<td>Uni.</td>
<td>Courses</td>
<td>Req’d/Elect.</td>
<td>Sem.</td>
<td>Hours/Credit Points</td>
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</tr>
</tbody>
</table>
| **Taipei Municipal University of Education (TMUE)**
台北市立教育大學 2007 | Computer Technology in Music Education 數位化音樂教學 ★ | R | 7 | 2/2 |
| | Introduction to Music Technology 音樂科技導論 | E | 3 | 2/2 |
| | Multimedia Music Production 多媒體音樂創作 | E | 4 | 2/2 |
| | Sound Effect Production 音效製作 | E | 4 | 2/2 |
| | Applied Music (I) 應用音樂(一) | E | 5 | 2/2 |
| | Applied Music (II) 應用音樂(二) | E | 6 | 2/2 |
| **National Hsinchu University of Education (NHCUE)**
國立新竹教育大學 2009 | Computer Music 電腦音樂 | E | 7 | 2/2 |
| | Application of Digital Music in Industry 數位音樂在產業上的應用 | E | 8 | 2/2 |
| **National Taichung University (NTCU)**
國立台中教育大學 2008 | Introduction to Musical Technology 音樂科技導論 | R | 1 | 1/2 |
| | Introduction to Musical Technology 音樂科技導論 | R | 2 | 1/2 |
| | Computer Technology in Music Education 音樂數位化教學★ | E | 3 | 2/2 |
| | Computer Teaching Materials in Music Education Design 音樂數位化教材製作★ | E | 4 | 2/2 |
| **National Chaiyi University (NCYU)**
國立嘉義大學 2008 | Application of Music Software 電腦音樂軟體應用 | E | 1/2 | 2/2 |
| | Computer-Assisted Music Instruction 電腦輔助音樂教學★ | E | 3/4 | 2/2 |
| **National University of Tainan (NUTN)**
國立台南大學 2009 | Computer Music 電腦音樂 | E | 3 | 2/2 |
| **National PingTung University of Education(NPUE)**
國立屏東教育大學 2007 | Computer-Assisted Music Instruction 音樂軟體應用 | E | 1 | 2/2 |
| | Computer-Assisted Music Instruction 音樂軟體應用 | E | 2 | 2/2 |
| | Design of Digital Media 數位媒體製作 | E | 7 | 2/2 |
| | Digital Sound Effects 數位音效設計 | E | 8 | 2/2 |
## Table 5.1 Related Courses in Undergraduate Programs in Music Departments

(continued)

<table>
<thead>
<tr>
<th>Uni.</th>
<th>Courses</th>
<th>Req’d/Elect.</th>
<th>Sem.</th>
<th>Hours/Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Taitung University (NTTU) 國立台東大學 2007</td>
<td>Computer Music (1) 應用音樂：樂團演奏(一)</td>
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<td>1</td>
<td>1/2</td>
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<tr>
<td></td>
<td>Computer Music (2) 應用音樂：樂團演奏(二)</td>
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<td>Computer Music(1) 電腦音樂理論與實作</td>
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<td>2/2</td>
</tr>
<tr>
<td></td>
<td>Computer Music 電腦音樂</td>
<td>E</td>
<td>3</td>
<td>2/2</td>
</tr>
<tr>
<td></td>
<td>Computer Assisted Music Instruction 電腦輔助音樂教學 ★</td>
<td>E</td>
<td>4</td>
<td>2/2</td>
</tr>
<tr>
<td>National Dong Hwa University (NDHU) 國立東華大學 2008</td>
<td>Introduction to Computer Music 電腦音樂概論</td>
<td>E</td>
<td>3</td>
<td>2/2</td>
</tr>
<tr>
<td></td>
<td>Notation software &amp; MIDI 製譜軟體與 MIDI</td>
<td>E</td>
<td>5</td>
<td>3/3</td>
</tr>
<tr>
<td></td>
<td>Introduction to Synthesizer 合成樂器概論</td>
<td>E</td>
<td>5</td>
<td>3/3</td>
</tr>
<tr>
<td></td>
<td>Audio-Visual Production 電腦影音整合</td>
<td>E</td>
<td>5</td>
<td>2/2</td>
</tr>
<tr>
<td></td>
<td>Creating Music Software 音樂軟體製作</td>
<td>E</td>
<td>6</td>
<td>2/2</td>
</tr>
<tr>
<td></td>
<td>Acoustics 音響學</td>
<td>E</td>
<td>7</td>
<td>2/2</td>
</tr>
<tr>
<td></td>
<td>Edited of Computer Music3 電腦音樂編輯</td>
<td>E</td>
<td>7</td>
<td>3/3</td>
</tr>
<tr>
<td></td>
<td>Recording Engineering (I) 錄音工程(一)</td>
<td>E</td>
<td>7</td>
<td>2/2</td>
</tr>
<tr>
<td></td>
<td>Recording Engineering (II) 錄音工程(二)</td>
<td>E</td>
<td>8</td>
<td>2/2</td>
</tr>
<tr>
<td></td>
<td>Multimedia Application in Music 音樂多媒體製作</td>
<td>E</td>
<td>8</td>
<td>3/3</td>
</tr>
</tbody>
</table>

Before discussing the above table which shows the IT courses offered by the music departments across the nine universities, it must be noted that some of them are of a more “general” nature whilst others are specifically concerned with music teaching or instruction.
From the table the following observations can be made:

1. The number of IT courses in the different universities is quite different: five universities offer four to six courses and three universities offer just one to two courses. The National Dong Hwa University is a special case. It offers 10 courses over eight semesters. This means that students in this university are able to undertake IT related courses almost every semester. Moreover, some of these are two-semester (as distinct from one-semester) courses.

2. These IT related courses generally take two hours per week, giving students two credit points. With the exception of three universities, IT music courses offered by the music departments are part of the elective program. In other words, apart from these three universities, students enrolled in the other universities are not compelled to take any IT course in music. Students thus can graduate not having studied any aspect of IT over the four-year degree program; looking at the universities as a whole, of the 128 total credit points required for the completion of a Bachelor degree, it is possible for this to represent anything from zero credit points to 24 in some aspect of IT and music.

3. There is no uniformity across the universities as to when these IT related courses are offered. In four universities they are concentrated in the first two years of study, in the other five the years in which IT courses are offered varies considerably.

4. An analysis of the title of the various IT courses shows that only seven of the 38 courses identified in the above table (representing five universities) relate specifically to music teaching or instruction; one of these is a required course and the other six are elective courses. This further shows that four of the nine universities do not offer any IT course in music teaching or instruction. With
reference to the present study, it is important to note that four of the music departments across the nine universities did not offer any IT courses related to music teaching or instruction. This is an important consideration when investigating the use of IT in school music programs and, indeed, helps account for the relatively weak place of IT in school music education.

5. An analysis of the “sequence” of IT courses shows that those related to teaching or instruction are all offered later in the degree program, following on from the more ‘general’ IT music courses. This is not surprising as it might be expected that the specifics of teaching would build on some general knowledge of IT.

As can be seen, different universities place different emphases on these IT courses, with one university offering only one course, another two universities offering two courses, and the remaining six offering between three and ten courses. The majority of IT courses in music are elective courses. The ramifications for teacher practice in schools are obvious, explaining why this is an aspect of school music teaching that needs special attention—and, indeed, forms part of the rationale of this study. In other words, the relative paucity of music teaching courses as well as IT courses has implications for graduates who will enter the teaching profession. Not surprisingly, many of them are insufficiently trained in both areas: music teaching and IT.

A likely explanation for the relatively low status of courses in music teaching and IT is that university music departments in general are more concerned with the training of professional musicians—with an emphasis on practical performance—in line with the traditional conservatory (or conservatorium) model and this is reflected in curricular offerings.
5.2.2.2 Postgraduate programs

Eight of the nine universities (the exception being the National Taitung University) offer the Master of Music degree. It is possible to major in music education in all eight of these Master’s degrees. In addition to offering this “generic” Master’s degree in music, four universities—the National Taipei University of Education, the Taipei Municipal University of Education, the National Hsinchu University of Education and the National University of Tainan—offer a degree specifically called Master of Music Education. The Master of Music Education is only offered to graduates who have teaching experience and this generally functions as in-service training.

Master of Music

As noted, the Master of Music degree is offered by eight of the universities in this study. Students elect to major in a particular field or stream: such as performance, composition, and music education. What follows relates to the IT courses in the field of music education offered to students studying for the Master of Music degree. The distribution of IT related courses is shown in Table 5.2. The elements of this table are the same as seen in the undergraduate section above. If the programs do not contain any IT related course, “None” is shown.

Table 5.2 IT Related Courses in Master of Music Programs in Music Departments

<table>
<thead>
<tr>
<th>Uni.</th>
<th>courses</th>
<th>Req’d/Elect.</th>
<th>Sem.</th>
<th>Hours/Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Taipei University of</td>
<td>None</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Education (NTUE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>國立台北教育大學</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 5.2 IT Related Courses in Master of Music Programs in Music Departments

(continue)

<table>
<thead>
<tr>
<th>Uni.</th>
<th>courses</th>
<th>Req’d/Elect.</th>
<th>Sem.</th>
<th>Hours/Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taipei Municipal University of Education (TMUE) 台北市立教育大學 2007</td>
<td>Design of Teaching Materials and Methods in Multimedia Music 多媒體音樂教材設計 ★</td>
<td>E</td>
<td>N/A</td>
<td>2/2</td>
</tr>
<tr>
<td>National Hsinchu University of Education (NHCUE) 國立新竹教育大學 2009</td>
<td>Research on Computer Music 電腦音樂研究</td>
<td>E</td>
<td>2</td>
<td>2/2</td>
</tr>
<tr>
<td></td>
<td>Multimedia Music Course Design 多媒體音樂教材設計 ★</td>
<td>E</td>
<td>2</td>
<td>2/2</td>
</tr>
<tr>
<td>National Taichung University (NTCU) 國立台中教育大學 2008</td>
<td>Technology of Music 音樂科技</td>
<td>E</td>
<td>1</td>
<td>2/2</td>
</tr>
<tr>
<td></td>
<td>Media Music 媒體音樂</td>
<td>E</td>
<td>2</td>
<td>2/2</td>
</tr>
<tr>
<td></td>
<td>Computer Music Theory &amp; Application 電腦音樂理論與實際</td>
<td>E</td>
<td>4</td>
<td>2/2</td>
</tr>
<tr>
<td>National Chaiyi University (NCYU) 國立嘉義大學 2008</td>
<td>Computer Music 電腦音樂</td>
<td>E</td>
<td>2</td>
<td>2/2</td>
</tr>
<tr>
<td>National University of Tainan (NUTN) 國立台南大學 2009</td>
<td>Multimedia for music instruction 音樂教學媒體 ★</td>
<td>E</td>
<td>1</td>
<td>2/2</td>
</tr>
<tr>
<td></td>
<td>Computer Assisted Music Instruction 電腦輔助音樂教學研究 ★</td>
<td>E</td>
<td>2</td>
<td>2/2</td>
</tr>
<tr>
<td>National PingTung University of Education (NPUE) 國立屏東教育大學 2007</td>
<td>Applications of Music Technology 音樂科技應用</td>
<td>R</td>
<td>N/A</td>
<td>2/2</td>
</tr>
<tr>
<td>National Dong Hwa University (NDHU) 國立東華大學 2008</td>
<td>None</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

There are some significant messages that we can gain from this table:

1. Two of the university music departments offer no IT courses in their curriculum.

   Surprisingly, although the National Dong Hwa University offers the largest number of IT courses in the undergraduate curriculum, it does not offer any courses in the Master’s degree. The remaining universities offer one to three courses.
2. Most IT courses are elective courses. The only institution to have a compulsory IT course is The National PingTung University of Education; and this IT course is the only one that it offers. By contrast, in the undergraduate degree, this university only offers elective courses in IT.

3. These IT courses all take two hours per week for two credit points. Compared to the undergraduate degree programs, IT courses account for a higher percentage of courses offered to students.

4. In most of the programs, IT courses are offered in the 1st year (the exception being “Computer Music Theory & Application” in the National Taichung University). Two universities do not designate a particular semester in which IT is offered.

5. Across the universities, IT courses in music teaching account for a higher percentage of the overall program at the postgraduate level than at the undergraduate level. A likely explanation is that in the Master of Music degree students are required to study the application of IT as distinct from simply acquiring basic IT skills. Although most music departments offer IT courses in music instruction in both postgraduate and undergraduate programs, a few only provide it in one or the other level.

**Master of Music Education**

The following section presents the IT related courses in three of the four universities that offer a Master of Music Education program. (In one of these universities, the National Taipei University of Education, this degree program is only offered every second year and details are not available on the official website; for this reason the university is not represented in the table below.)
The following is of particular interest:

1. All of the three Master of Music Education programs offer IT courses, and most of them are concerned with music teaching or instruction. Presumably this is because this degree is particularly relevant to music teaching.

2. All courses are two hours per week and represent two credit points. Similar to the Master of Music programs, IT courses in music teaching account for a higher percentage of the overall program at the postgraduate level than at the undergraduate level in these institutions.

3. With the exception of “Research in Multi-media Music Pedagogy” in the Taipei Municipal University of Education, the other courses are all electives.

In summary, the IT courses offered by universities for both Master of Music and Master of Music Education are mostly electives. The ratio of IT courses compared to others is higher at the postgraduate level than at the undergraduate level. The IT
courses in the Master of Music Education programs have a stronger correlation with music teaching and instruction; this is not surprising, given the more pedagogical biases of this degree. Finally, it must be stressed that the above analysis of courses and degree programs has been based simply on course titles—and these are not necessarily a good indicator of their content. More detail relating to content was obtained through in-depth interviews with university teachers and graduate students, and this is presented in the following section.

5.2.3 Interview results

In this study, three groups of interviewees of different status discussed their perceptions and experiences with respect to teacher education training at undergraduate or postgraduate level. Of most relevance in obtaining a deeper understanding of the content of IT courses were the interviews conducted with university professors who taught such courses, representing four universities; two taught at universities in Taipei, and two taught in the south of Taiwan. This section places more emphasis on the Group 2 interviewees (the professors who teach IT courses in the different music departments in this research). Although this group (Group 2) provided most detailed information, information was also obtained from those representing the other two groups: policy developers (Group 1) and primary school teachers who had graduated with a Master’s degree (Group 3). This enabled a triangulation of the information.

5.2.3.1 Courses

The four Group 2 professors, who represent different music teacher education institutions, were asked what kind of knowledge and skills music teachers should have to integrating IT in teaching. They provided several viewpoints, suggesting that
teachers should: (1) be familiar with a range of music related software; (2) be able to use MIDI, notation software, and image and audio editing software; (3) be experienced with online resources such as Internet applications and YouTube; (4) have well-developed skills in making e-teaching materials; and, finally, (5) be familiar with Office software. Overall, their opinions were quite consistent. However, one of the interviewees argued that although university students already have some IT skills in this information age, what many still lack is an understanding of the application of IT to teaching:

Teachers nowadays generally have a different degree of IT literacy. If teachers can use any of the IT systems or software, even if it is just word processing software, they are already in a position where they can integrate IT into teaching. It is not necessary to say that “music teachers should ...”. If music teachers can use music software, that is great. But if they don’t, they can still integrate IT in their teaching—the only difference is the degree to which they can integrate IT into their teaching. (Interviewee B3)

The next question asked of the four professors related to the IT related courses their institutions offered for undergraduate and postgraduate students. The purpose of this was to ascertain in detail the content of each course as distinct from its title only which is all that is indicated on official websites. Their responses indicated that at the undergraduate level IT courses were focused on the introduction of fundamental knowledge and skills. A wide range of software programs was introduced in these courses. Even though there was some variation in the teaching content, a broad pattern emerged, with content focusing principally on: (1) notation software—such as Finale and Encore; (2) audio mixing and editing software; (3) multimedia; (4)
recording software; (5) accompaniment software; and (6) dubbing background music.

As might be expected, specific content and emphases reflected the particular interests of each professor.

At the postgraduate level, IT courses are not only focused on the introduction of software but on furthering understanding and knowledge. All four interviewees mentioned the introduction of multimedia in courses. Course content was informed by a range of theories and relevant research relating to IT. Only one of the interviewees referred to the importance of the sequencing of IT courses between the undergraduate and postgraduate programs. The problem here, unfortunately, is that at the postgraduate level students come from different universities and can vary considerably in their degree of experience with IT; part of the reason for this is that IT courses at the undergraduate level have been electives. This, of course, makes the “sequencing” of content difficult between undergraduate and postgraduate study.

In the curriculum design, the emphasis of either the undergraduate or postgraduate programs should be consistent among universities. Undergraduate study should focus on practical applications of IT, such as software handling, while postgraduate study should emphasise theoretical underpinnings or related research. That, for me, is the ideal situation. The problem is not only that most Master’s students have graduated from different institutions, but it is possible that they have not undertaken any courses in IT in their undergraduate programs; this can present problems for them—and me—when I want to focus on more advanced applications of IT. (Interviewee B4)
She noted that the idea of sequencing IT courses from the undergraduate to the postgraduate level presents difficulties because such courses are predominantly electives and not compulsory. If this problem can be overcome, an analysis of the various courses in IT suggests that the sequence design itself is not difficult given, as noted above, that the undergraduate programs offer “general” courses whilst those at the postgraduate level focus on teaching or instruction. How such practice might be applied was highlighted by two of the professors:

When I teach the software, *Finale*, the students are not only asked to notate a tune but also to think about the application of this software; I use ‘Project-oriented’ teaching. Having introduced this software, I require students to design a project showing how they might apply it in their future career, whether they will be a school teacher or a studio teacher. (Interviewee B2)

When I introduce a software program I also teach its application; I guide students to think about possibilities for applying it. I pose questions such as, “What kind of content can you teach when using this software?” Such an approach offers greater potential for the application of the software.

(Interviewee B3)

This same professor indicated that she goes even further by incorporating IT into other—non-IT courses:

When I teach "Music and Humanities" and “World Musics”, I give students a task that requires them to apply IT in their presentations. Although these
courses are not particularly focused on the integration of IT, I do nonetheless integrate it into my teaching. (Interviewee B3)

The Group 3 interviewees (primary school teachers who had graduated with a Master’s degree) were asked to recollect the IT courses they undertook in their undergraduate and postgraduate programs. Their recollections did not strongly support what the Group 2 professors saw themselves as doing. This however is not a contradiction because it is possible that the Group 3 interviewees were taught by professors other than these—or that these professors had changed their teaching focus over time. Further, it is not uncommon for students and their teachers to have different perceptions of the same teaching-learning experience.

Only eight of the ten teachers comprising Group 3 discussed the IT courses that were offered in their undergraduate programs. The other two teachers had completed their initial degree prior to IT becoming widely used. Indeed, of the eight who did discuss IT offerings at the undergraduate level, only seven actually enrolled in such a course because it was an elective. They recalled that the description of IT courses focused on a general introduction to IT knowledge and software. Most of the eight teachers who did discuss IT mentioned particularly the use and operation of “notation software” in such courses. Three of them stressed that these IT courses focused on learning of general IT skills and operating the software. This concurs with the opinions of the four university professors (Group 2) who were interviewed.

Even in the postgraduate programs, not all the interviewees enrolled in IT courses because, again, these were electives. There was a prevailing opinion that the content of the courses at the postgraduate level differed little, if at all, from what was
offered at the undergraduate level. Four of them made specific reference to the introduction of “notation software” in these courses. Interestingly, no-one mentioned that the courses were concerned with “theories and relevant research” (as was described by two of the professors). Further, none of them commented on any attempt at “sequencing” between the IT offerings in the undergraduate and postgraduate programs.

Overall, in looking at the undergraduate and postgraduate courses as a whole, the primary school teachers’ perceptions of IT courses did not match those of the professors. When asked about student feedback on IT courses, the professors indicated it was positive, believing that most university students regarded the courses as very interesting and useful. They added that the students were actively involved into these courses and studied hard. Two professors mentioned that there was a high demand for these courses, to the extent that not all students could be accommodated due to limited facilities for teaching IT.

This collective viewpoint contrasts to some extent with that of the primary school teachers, all of whom had enrolled in at least one IT course at either the undergraduate or postgraduate level. (Again, it needs to be stressed that this is not necessarily a contradiction, given that the professors were commenting on the present, whereas the teachers were reflecting back; further they may have been taught by professors other than those interviewed.) At the same time, the teachers confirmed that the courses they had studied did give them fundamental knowledge of IT and introduced them to various music software programs. For example, seven of the ten interviewees mentioned that the notation and audio editing software they had learned – either at the undergraduate or postgraduate level—was helpful in
their teaching career; this was especially so for teachers involved in training student ensembles. However, whilst useful for the teachers themselves, they did not introduce these skills and software packages to their students; they suggested that the software was too hard for pupils to operate and difficult to integrate easily into the music classroom. Moreover, the limited availability of IT equipment and software in primary schools also prevented teachers from applying what they learned in the universities into their practical teaching. Two teachers considered that the IT courses they had enrolled in had not been really useful for their career. One teacher said that he already understood the content of the course before he undertook it. The other said that the content of the course she did was not linked to music teaching and learning; it needs to be re-stated that she enrolled in this subject within the music department.

As can be seen, all of the professors interviewed thought that the feedback they received from students had been very positive. On the other hand, the students’ “reflective evaluation” on the courses they had done (which, as has been stated, was not necessarily with the professors interviewed) was not altogether positive. A few reasons might be proffered for this seeming contradiction or discrepancy. The first has already been mentioned: the primary school teachers who were interviewed had already graduated from university and were thus responding to past experiences, not necessarily the courses currently being conducted and which were the subject of commentary by the professors. It is conceivable that the content of the IT courses had changed. The second reason might be that, after graduating, the primary school teachers were assessing the teaching they received through a different “lens”: that of a teacher who needs to apply what they had learnt? In other words, although the content might seem satisfactory to students, they could not be expected to realise
that it had not prepared them to use IT in their subsequent, practical teaching. Over the years, the missing element, it would seem, has been that the *practical application* of IT in the classroom has not figured highly in IT courses, which have concentrated on knowledge and skills of IT.

Another issue identified by many of the interviewees across three groups is that the content of these courses has not been standardised. Different professors might teach different content within the same university and across universities—despite the name of the course being the same. As one of the policy developers, who was also a professor, commented:

> I used to teach the course “The application of computers in music teaching”. Unlike me, the next instructor responsible for this course taught *Finale* in the course. The teacher might teach different content despite the fact that the course name is the same. I know that many of the IT courses were taught by teachers who had a composition major. They teach students to use software programs to arrange music. Although it could be argued that this was more or less related to music education, the actual application of computers to general use in the music classroom was not strong. (Interview A2)

In a similar vein, two other professors—representing a further two universities—discussed their experience with this issue. Interviewee B2 stated:

> Our department offers a course entitled ‘Multimedia Production’. Those who teach this course could be from an IT-related department who do not have any music background, let alone one in music education. Even if they focused on
teaching and provided students with some relevant knowledge in this field, it would be unrealistic to expect them to be able to provide students with specific information related to music education.

The other university professor, B4, addressed that there was no clearly stated, common agreement, regarding the content of IT courses. She further explained that:

In the main, they were taught by teachers who had compositional specialities who, understandably, tended to emphasise the skills of computer music. I do not think that many of these teachers have considered their teaching content and its link to music in education, and so on. Anyway, the content and the title of these courses are two different things. (Interview B4)

Another interviewee, a school teacher, commented:

If you simply go by the titles, you will see we had a number of IT related courses. Despite this, I do not think that the course I undertook was IT related. From my point of view, the content did not match the course title. (Interview C6)

A further perspective was provided by five of the ten school teachers who volunteered additional information that was not the result of a specific question. Although not a commentary on IT courses as such, they acknowledged the useful advice and assistance that had been given to them by their supervisors with respect to IT in relation to both their Master’s degree research and the use of IT in teaching.
5.2.3.2 Challenges

Since the interviewees in Groups 1 and 2 (the policy developers and the university professors) have their experience in training pre-service teachers, they were asked about the challenges in operating these IT course in university music departments. Understandably, the Group 1 interviewees focussed on education policy, while those in Group 2 addressed practical issues relating to the implementation of the courses.

One policy developer, a former president of Tainan Teacher’s College, raised the negative impact of changes occurring in teacher education policy. Since the new Teacher Education Act was launched in 1994, pre-service teacher education channels have become diverse. As a result, many universities have had the opportunity to train pre-service teachers: this was no longer the sole domain of the former Teachers’ Colleges. The increased number of institutions offering teacher education, however, has made the promotion of IT education in pre-service teacher training by the Ministry of Education even more difficult.

Of course, to promote IT education in the teacher education institutions is harder than in the past, especially after multiple teacher education channels were introduced. Previously, the Ministry of Education was only responsible for twelve institutions offering teacher education (Teachers’ Colleges and normal universities); it was relatively simple to develop a relationship between these institutions and schools. But with the diversification of teacher training, which meant that it could be offered for the first time in all universities, the link between training and school practice was weakened; government promotion and support became more difficult. (Interview A1)
In the response from the interviewees in Group 2, university professors, a range of challenges for teaching these IT related courses are identified. Their point of view was relatively consistent across music departments.

Prior to the interviews being conducted, the researcher supposed that insufficient IT equipment might be a major challenge in these music departments. But, surprisingly, this was mentioned by one of the four professors only. Two others pointed out that their departments were receiving significant funding support to enhance IT equipment and computer laboratories. The remaining professor in this category made no mention of equipment. Clearly, the challenge of limited IT equipment was not as serious as the researcher had expected.

A major challenge was not one of insufficient IT equipment—but, rather, the maintenance of such equipment. All four of the professors in Group 2 addressed the difficulty of maintaining the computer lab within their department. This is exacerbated by the need to continually upgrade computer hardware and software because of the rapid development of IT. Unfortunately, this was not taken into consideration by the central government when providing grants to purchase IT equipment: no consideration was given to the need for ongoing maintenance and upgrading.

The Ministry of Education merely “sprinkle” the money for initial IT support. They gave our music department a one-off appropriation; after that, the department received no additional support, however, all of the software programs needed to be upgraded after two years. But how can you do this without any financial support? I know that this situation is similar in many
universities: and it’s getting worse. (Interviewee B1)

Funding support is limited, particularly in this period of economic depression. We are not able to get funding on a yearly basis. This is the disadvantage of promoting the integration of IT. (Interviewee B2)

Hardware maintenance is another problem for operating a computer lab. Ensuring that there are responsible technicians able to maintain IT labs is not easy. Many departments have commissioned computer companies to repair and maintain IT equipment for problems such as a computer virus, a computer hardware problem, or the Internet being disconnected. When this occurs frequently, it places an added burden on the professor teaching the IT course; they have little choice but to “maintain” the IT lab in working order. This can easily lead to frustration and exhaustion. All four professors said that this results in a reduced sense of motivation to teach IT courses. Some universities employ part time teachers to deliver these courses, but this can make the situation even worse.

Many professors would rather teach other subjects than computer music related courses. When teaching these IT courses there are so many issues you need to be concerned with, such as computer viruses, and the maintenance of computer hardware and software. Sometimes you even need to repair the computer. There is just too much extra work that you need to deal with. ... I am so happy that I do not have to teach these courses this year. (Interviewee B1)

I used to teach an IT course, but I gave up teaching it. We did not have any technicians in the computer lab. In addition to teaching the course I needed to
attend to a number of other things by myself: I had to check that every station
was working before each class; I also had to solve students’ technical problems
in the class. My God—the time I spent on teaching this subject was so much
more than what I spent on any other subject! ... If teachers have to take on the
responsibility of maintenance, repairing, and organising the equipment and
facilities before they begin teaching, it detracts from the pleasure of teaching.
When you talk with those who teach these courses, you can perceive their
frustration. (Interviewee B2)

I do not teach an IT course now. I felt so tired.... We expected that we would
have a professional technician in the computer lab. However, we didn’t. ... And
that greatly diminished our interest in using the computer lab and teaching the
course. (Interviewee B3)

Another problem relates to the specialty of those who teach IT related courses.
Whilst some of them come from the field of music composition within the music
department, others have come from other, non-music, IT areas. Those in this latter
group are severely restricted in being able to offer students content that focuses
specifically on music education.

We see if there is someone in our faculty who can teach the course, but if this is
not possible we employ a part-time or adjunct teacher. This however will
influence the effectiveness of the course. (Interviewee B2)

The interviewees also mentioned other challenges, including: (1) limited number of
the software programs with a Chinese interface; (2) too many students in a class; and
(3) whether the IT courses were electives or compulsory, with most of them being elective and this not only presents issues of “sequence” of study, but also departments tend not to put as much weight on electives compared to compulsory courses. Each of these challenges has added to the difficulty of delivering IT courses. The interviewees provided a range of recommendations to improve the situation and these are included in a subsequent section.

5.3 IT related professional development for primary school music teachers

Teachers in Taiwan are encouraged to undertake professional development training to improve their teaching, and the implementation of educational policies is aligned with teacher professional development. From the Computer Assisted Instruction (CAI) period (1990s) to the present, in-service teachers’ professional development was emphasised whenever the central government implemented new IT related policies. Following the introduction of CAI into schools, two strands of training were introduced and conducted by government and non-government agencies as well as universities to enhance teachers’ IT literacy. There were computer-aided teaching systems design and development training (to assist teachers to design teaching materials) and computer education courses (to assist teachers to improve their general IT skills). Some years later, in 2001, the Information Seed School Project was introduced and this also was significant for professional development. A number of schools were selected and given funding for teacher training and the improvement of IT facilities. Some of the interviewees argued the importance of this Ministry of Education initiative for the promotion of IT integrated education in primary schools.

5.3.1 The practise of IT related professional development for primary school music teachers

The central government in Taiwan encourages teachers to continue their
professional development and provides diverse pathways that they can pursue. These include workshops, lectures, exhibitions and demonstrations—all of which have been offered regularly by various organisations and not necessarily under the auspices of the Ministry of Education. Teachers participate in these training courses in the summer and winter vacations, on public holidays, or on weekdays during the school term. In general, Wednesday afternoon is normally set aside for primary school teacher professional development since students do not attend classes. Although more and more teachers are now returning to university for postgraduate study, it is the short-term in-service training that is most commonly accessed by the majority of teachers in Taiwan and which is the focus of this section.

Teacher professional development in Taiwan is offered by a range of organisations such as the Ministry of Education, universities, local (both city and country), Education Departments, school themselves, social education organisations (such as Cultural Centres, Adult Education Centres, and Art Centres), as well as the private sector. With the exception of universities, these organisations generally offer short-term courses; universities also offer long-term courses during the summer and winter vacations.

The content of these professional development courses include the promotion of new policies, introduction to various pedagogies, general educational information, and so on. Unfortunately, despite the diversity of offerings across the educational spectrum, the courses that focus specifically on music education are relatively few in number. Of course, music teachers are also expected to participate in other in-service programs that are outside the domain of music.
Certainly, there has been an increase in the number of IT related teacher professional development programs that have been offered over the past two decades; in part this has been because of an ongoing need for teachers to keep abreast of Ministry of Education policies in the field. Such courses are expected to introduce new technology to assist teaching. Most of them however put the emphasis on the skills of using hardware, the introduction of software programs, or the application of IT in general teaching. There has been little of direct relevance to music teachers with respect to the teaching of their discipline or art form. The following section indicates the feedback from the music teachers and experts on this issue.

5.3.2 Primary school teacher interviewees’ feedback: Professional development

The primary school teachers were asked to comment on professional development opportunities. Although many professional development courses—offered by a range of organisations—focus on various fields, the teachers were not strongly satisfied with them. Nine of the ten teachers stated that the IT related teacher professional development courses they had undertaken did not adequately meet their needs. In addition, the same nine teachers complained that they were expected to participate in too many professional training programs that were unrelated to the teaching of music. Only one of the ten teachers spoke positively with respect to both of these issues. Of those who were dissatisfied, one teacher said:

There are too many things [outside the realm of music teaching] that teachers need to learn, such as ‘Environmental Education’, ‘Gender Education’, and ‘Home Economics Education’. ... Primary school teachers need to learn about all the issues that the government identifies as being important. (Interviewee C7)
Given the relative paucity of in-service training provided for music teachers, as well as the fact that teachers can only reasonably attend a certain number of such courses, teachers felt that they were not being adequately in-serviced in IT that focuses specifically on music teaching. Even though there were some generalist IT related training courses, most of them focused on the introduction of software programs that were not music-specific. A number of other courses focused on integrating IT into other learning areas such as language or mathematics. Relatively, IT related training for music teaching was very limited. As some of the interviewees commented:

The courses were only focused on the production of multimedia. There was nothing about integrating IT into education. ... They taught us to use “Photoshop”, but that was not immediately related to integrating IT in my music teaching. (Interviewee C1)

I attended the workshop. They taught us software programs to edit video and audio files such as “Photoimpact”. With regard to music teaching, I cannot recall any courses. (Interviewee C4)

As I recall, I rarely took these courses after I started teaching. I felt that the IT integrating courses for teachers were of not much use for my music class. (Interviewee C5)

We did have the courses related to the integration of IT, but not particularly the application of this to the music class. (Interviewee C9)
I think there were a few professional courses for integrating IT into music education. I have seen IT-integrated courses on language learning but never heard of any on music learning. (Interviewee C10)

Three teachers mentioned the professional development courses that were offered as part of the Information Seed School Project that was launched in 2001. This project selected a number of schools and focused on a particular learning area in each one, for example, Language, Science, Arts and Humanities. Schools were given additional funding for teacher professional development and the purchase of IT equipment. One of the three teachers regarded this project and the training courses offered as being helpful; she not only gained an understanding of the integration of IT from participating in the training, but also had opportunities to co-operate with other teachers to practise them in the school curriculum. By contrast, the other two teachers found the training courses they undertook as part of the Information Seed School Project limited because their school chose an area other than the Arts and Humanities Learning Area.

Several interviewees mentioned that they participated in extra IT related training outside of the government system in order to enhance their IT literacy and improve their teaching. Whilst a few were directly related to music, most of them were not.

In general, the lack of available and relevant courses that focused on music teaching, coupled with inappropriate or irrelevant content, were identified as two major issues. In other words, it was overwhelmingly obvious that music teachers’ needs were not being in IT training courses.
5.4 Implications for future development

The survey and interview results highlighted a dearth of opportunities for IT related training at both the pre-service and in-service levels in primary school music teacher education. The limited availability and irrelevant content were two major issues identified by teachers in relation to the training in the integration of IT. What follows are recommendations based on feedback from all three groups of respondents: the policy developers, university professors, and primary school teachers.

One of the two policy developers, Professor T. H. Wu—a former Vice Minister of Education and President of the Tainan Teacher’s College—insisted that pre-service teacher education is more important than teacher professional development in developing teachers’ IT capabilities. Even if one accepts his point, the problem is that since 1994 pre-service teacher education in Taiwan has been provided by a range of different universities and there has been little consistency between them with respect to content and delivery of courses; this diversity has made it extremely difficult for the Ministry of Education to implement new educational directions at the pre-service training level. The situation was exacerbated because of the limited number of professors who specialised in IT in music education in the Music Departments of the universities. The upshot has been that the majority of students who graduated from these departments have been insufficiently trained in IT and thus inadequately equipped for their future careers as music teachers. Yet another issue identified by Professor Wu is the importance of teachers having a proficient knowledge of English in order to adequately access international teaching databases and communicate with colleagues in countries overseas.
The other policy developer, Professor M. L. Lai, identified the importance of IT related courses at both the pre-service and in-service teacher education levels being focused on “strategies” of the integration of IT. That is, she argued for teachers to be given strategies for the integration of IT in their day-to-day teaching. This can be approached in a number of ways, including the sharing of successful approaches and teaching demonstrations.

The four professors working in teacher education institutions and the ten primary school teachers also provided important suggestions for the use of IT related courses in teacher education. The professors were concerned with both pre-service and in-service teacher education, whilst the primary school teachers were more focused on in-service courses. The following discusses each area separately.

5.4.1 Recommendations for pre-service teacher education

Two main issues were identified: the importance of adequately maintaining IT labs in the universities, and the content of the IT courses. Although not endorsed as strongly, there was some discussion of the importance of student teachers encountering good IT practice in schools during their training.

Adequate maintenance of IT labs

All four professors from Group 2 pointed out that the maintenance of IT labs is a serious issue for the universities. Where these are not adequately maintained teachers are less motivated to teach the courses and, not surprisingly, student learning is affected. Three of the four professors commented on the efficiency of lab maintenance in universities in the USA. They added that this requires adequate financial support in a department’s or university budget for maintenance and
upgrading of equipment.

Five of six the interviewees across Groups 1 and 2 recalled the function of the respective university IT labs in the USA when they themselves had studied there. In all instances the employment of the IT lab technicians who dealt with maintenance and technical assistance was seen as integral and essential for the smooth operation of IT courses. They added that the IT labs not only serviced the courses themselves, but also offered a range of software programs to assist students’ music learning in general. This established good practices for them after graduation with respect to accessing IT labs.

At the same time different viewpoints were expressed relating to the management of university IT labs. On the one hand was the belief that the music department should have its specific IT lab that focused specifically on music because this required specialist software as well as hardware facilities such as electronic piano keyboards and synthesisers. On the other hand, some professors advocated the IT lab servicing departments across the university because this would result in financial savings to an individual department such as music.

**IT courses in the university**

Training in the integration of IT in pre-service teacher education is essential. One of the above professors stressed this by saying:

> These courses give students an opportunity to become involved with this field.

> The best approach is to make sure that these are prerequisite—and not simply elective—courses. In this way, all the students will be able to get at least an
introduction for further understanding in this area. (Interviewee B2)

As has been seen, this was reinforced by the music teachers (Group 3) when commenting on the IT courses that they had undertaken in their undergraduate studies. In other words, the suggestion was supported by those in all three groups.

Across all three groups it was generally agreed that IT courses for music students should develop IT skills as well as assist students in integrating IT in their own teaching. This should involve both theory and practice. Of course this can be done in different ways. For example, students could be introduced to a software program and then encouraged to think about its application to music teaching, or students could be given “first hand” acquaintance with real classroom situations. Another emphasis might entail introducing students to a wide range of teaching materials and resources such as websites, teaching databases, and software programs that they can apply to their teaching. All of this entails making the link between technology and pedagogy. If, in their undergraduate training, teachers are acquainted with relevant IT resources relating to all aspects of music—including singing, composition, and appreciation—their students will ultimately benefit from this.

One of the music teachers interviewed stressed the importance of developing in pre-service teachers an enquiring and open mind such that they would be receptive to new developments in IT technology in the future. This, she argued, would give them a strong base for embracing IT in all aspects of their teaching—a point that was discussed above with respect to those from Groups 1 and 2 who commented on their own IT training in the USA with respect to music labs. In other words, all three
groups again were in support of a strong introduction to IT at the undergraduate level. The researcher contends that for those undertaking pre-service teaching courses it should be supplemented by practical application in the classroom.

5.4.2 Recommendations for teacher professional development (in-service)

The interviewees from all three groups made recommendations for IT courses for professional development or in-service. All ten of the interviewees in Group 3, the primary school teachers, put more emphasis on this issue than others. Arguably, this might be because of their direct involvement in in-service training and perhaps their more acute awareness of its importance for them as teachers.

At the same time two policy developers (Group 1) were in support of encouraging teachers to undertake, on their own volition, IT professional development. One of them, Professor T. H. Wu, argued against the earlier policy under which teachers’ IT literacy skills were assessed by the Ministry of Education because a number of senior teachers experienced difficulty in embracing computer technology. He strongly supported the new approach of encouragement rather than coercion or formal assessment. The other policy developer, Professor M. L. Lai, drew attention to the need to introduce teachers a range of useful and available teaching materials and to demonstrate the use of these, in the processes sharing with teachers exemplars of good IT practice.

The recommendations provided by the four university professors in Group 2 working in the music teacher education institutions were also quite consistent. They argued that professional development should be focused on the music teacher and music teaching, as distinct from general teaching or cross-disciplinary teaching. Suggested
modes for professional development included conferences, lectures, demonstrations, workshops, and on-line social networks. Workshops were particularly recommended because they were considered not only to provide “hands-on” experience, but also a more supportive environment for teachers to develop their own plans for the integration of IT. Such a product-oriented training program was considered to be especially useful. It was noted earlier that one of the school teachers spoke strongly in support of the Information Seed School Project that was in place for a few years up to 2004. Similarly, one of the university professors also spoke positively of the benefits of this government-funded Ministry of Education program and regretted that it was no longer available. Another professor drew attention to the need to offer professional development in IT on a regular basis and to allow sufficient time for teachers to become literate and fluent in their use of it. Further, she stressed, such professional development should be provided on an ongoing basis such that teachers can easily avail themselves of opportunities to keep up-to-date with current developments and classroom applications of IT. Yet another professor questioned the effectiveness of some IT training courses offered as professional development by the private sector or commercial organisations. These courses, he suggested, tended to have a commercial, business focus (advertising, computer software/hardware, or training for business purposes) and thus were not necessarily appropriate for school teaching. He suggested the Ministry of Education establish a database that recommends people or organisations that are most appropriate to deliver IT training for teachers. Interestingly, his criticism of courses conducted by the private sector was not supported by the primary school teachers themselves, some of whom spoke quite positively of such training.
In addition, the university professors recommended the sharing of successful strategies for classroom use as well as teachers having access to demonstrations in an authentic classroom situation. Concomitant with this, it was argued, they should be strongly encouraged—as distinct from being required—to apply IT in their music teaching, that is, to put their new knowledge and skills into practice without unnecessary delay; this, it was noted above, was stressed as well by the two policy makers. Ideally, it was suggested, teachers should also have access to feedback and sharing at subsequent professional development sessions in relation to what worked well and where they need additional assistance. Involvement in on-line virtual social networks for music teacher professional development was strongly recommended as a means of enabling music teachers to share their knowledge and experience.

The university professors—as with the school teachers—discussed the implications of the “new” Grades 1-9 curriculum, introduced in 2001, with respect to the role and responsibility of music teachers. Prior to this music had been a “stand-alone” subject. With the new curriculum music became just one of three Arts subjects under the general heading of the Arts and Humanities. As a consequence the amount of time devoted to the teaching of music in the curriculum was generally reduced, depending on the decision of the school administration. This has since been reflected in teacher development programs that focus across the art forms and not necessarily on music alone. Both the university professors and the primary school teachers expressed a strong degree of frustration with this situation.

The university professors strongly argued that IT related professional development music teacher education should be more strongly promoted or facilitated by the Ministry of Education as distinct from it being the responsibility of local governments,
schools, or universities. The university professors recommended that the Ministry of Education develop a long-term plan for music teacher professional development in IT—that is, training that is music specific. This, of course, will require appropriate funding and the development of a range of programs to meet the IT needs of all music teachers. It was considered essential that all of this must be strongly supported by the central government.

The primary school music teachers (Group 3) provided similar recommendations for professional development. They demanded more IT related training to enhance their teaching, arguing that it should be music-specific. Essentially it was thought that the three hours per week that teachers have each term—across all curriculum areas—is insufficient. For this reason they suggested that the universities could provide longer music-specific IT courses over the summer and winter vacations to supplement what teachers can access during the school term.

As with the university professors, most of the primary school music teachers argued that the content of such courses should focus not merely on IT literacy, but also on its application in the classroom. Similarly also, eight of the ten teachers advocated being given strategies for integration along with appropriate examples, as well as an opportunity to share their own classroom successes within the context of teaching IT literacy—arguing against the mere learning of basic skills without reference to their application in the classroom. That is, they stressed the importance of basic IT skills being taught in parallel with their application in the classroom, even if at a simple level. It was pointed out that, unfortunately, many of the available courses focus principally on the introduction of new technology or software programs—a number of which cannot be accessed because of financial constraints in schools.
In addition to criticising the content of music teacher professional development courses, four of the school teachers pointed out the problem of them being assigned to teach in general classrooms as distinct from being given appointments as music specialists in schools—despite the fact that not only had they trained as music specialists in their pre-service courses, but had continued to avail themselves of professional development in music. As in Australia, certification as a primary school teacher signifies that the teacher can teach all subjects in the curriculum. In Taiwan it is not uncommon for teachers who have undertaken a speciality in music in their pre-service course to be teaching in the general classroom only, and for some teachers who did not undertake a music speciality to be employed as the music specialist. And the same ‘contradiction’ applies to teachers who have undertaken professional development in music compared to those who have not. Not surprisingly this causes a considerable degree of frustration. What some would like to see introduced is a specific music teacher licence that “guarantees” that a teacher will be employed as a music specialist—as distinct from it being left up to the decision of the school administration. (Specific subject teacher licences currently exist for teachers at the high school level, that is, Years 7 to 12.)

5.5 Summary of chapter

This chapter discusses the current situation relating to the training of the integration of at both the pre-service and in-service (professional development) levels. The researcher sought feedback from interviewees from all three groups (policy developers, university professors, and primary school teachers) on their own experiences as well as their recommendations for future improvement in pre-service training and professional development courses.
The survey shows that the nine universities represented in the study put different emphases on IT courses and offer them at different year levels across their four-year degree programs. The majority of these courses are electives. An analysis of the “sequence” of the IT courses has shown that those relating to teaching or instruction are all offered later in the degree program, following on from the more ‘general’ IT music courses. At the same time it must be stressed that only five of the nine universities offer courses in IT music teaching at the undergraduate level.

The university professors argued, variously, that primary school music teachers should be skilled in the integration of IT, including having an understanding of a range of music related software, an ability to use MIDI notation software as well as image and audio edition software, and be able to apply relevant Internet resources and office software in developing e-teaching materials. However, a number of interviewees from all three groups pointed out that the content of such courses has not been standardised.

Different professors/lectures might teach different content within the same university and across universities, despite the name of the course being the same. A further issue, which acts as an impediment to the success of such courses, relates to the often poor maintenance of IT equipment for teaching in university music departments. This is exacerbated by the need to continually upgrade computer hardware and software because of the rapid developments in IT. Ensuring that there are responsible technicians able to maintain IT labs is not easy.
The research also showed that the ten school music teachers who participated in this study were not satisfied with the current offerings in IT related music teacher professional development; principally this was because of the limited availability and inadequacy of the courses offered. The relative paucity of courses offered to music teachers in IT, and their inadequacy, supports the need not only for more appropriate music teacher education in this area, but also the necessity of giving more weight to the importance of music as a subject offered for teacher professional development.

Further, the school teachers and those working in teacher education in the universities suggested a number of possible modes for providing in-service training: conferences, lectures, demonstrations, workshops, and on-line social networks. They also were in agreement on the nature and content of training programs. Unfortunately, the professional development IT training has been of a generalised nature—not music education specific. Such an approach has tended to ignore the specific needs of music teachers and the range of IT resources that are available.
Chapter 6 The Integration of IT in School Music Education in Taiwan

6.1 Overview of chapter
This chapter deals with the integration of IT in school music education. It discusses attitudes, perceptions and experiences of a select group of ten primary school teachers, all of whom had completed a Master’s degree with a focus on music and IT. These teachers offered several salient suggestions relating to IT for the benefit of music teachers, school administrators, and the Ministry of Education. This was supplemented by equally useful insights and advice from policy developers and university professors.

6.2 School teacher interviewees’ perspectives and experience
This section presents the opinions and views of ten school teachers regarding integrating IT into the primary school music classroom. These ten teachers did their Master’s study specialising in IT in music education. In selecting these particular respondents, the researcher believed that they would be the appropriately equipped to provide insightful comment on practices pertaining to the integration of IT.

6.2.1 Background and attitudes
In addition to being questioned on their background and current teaching situation, they were asked why they chose to use IT in their teaching. Three teachers mentioned that they were very interested in computer technology and set about learning IT skills on their own volition. They did this through self-learning and also by participating in various training courses. One of them (C7) even took an official test and obtained a certificate of certification in computer skills from the government.
Respondent C6 said: “After I went back to my home town to teach, I could not wait to learn about computers and bought a lot of IT equipment. Consequently, I applied my skills in my class teaching”. Another three teachers said that they attended the Information Seed Schools Project (資訊種子學校計畫) of the Ministry of Education (under the Information Technology Education for Primary and Secondary Schools: Blueprint [國民中小學資訊教育總藍圖], 2001) and then started to integrate IT into their teaching. Four of the teachers applied IT in their teaching after completing their university studies: two teachers were influenced by the courses taken at the Bachelor's level and the other two were influenced by their respective supervisors when they undertook their Master’s study. Collectively, we can say that personal interest, professional development, and university education were the three main pathways that provided the impetus for these teachers to integrate IT in the classroom. Regardless of what led them to this, all ten demonstrated a positive attitude towards the application of IT in music education. They all believed that it would assist them in their music teaching. This is consistent with research by Cuban (2001) showing that teachers across disciplines believed that using computers was worthwhile for children.

One of the ten respondents in the present study said: “Some music learning needs to be practised repeatedly. It is essential for students to do this on the computer. Students find this is interesting and sometimes practice it voluntarily” (Interviewee C1). Another suggested: “It is helpful to integrate IT into music teaching. There are various software programs to assist music teaching covering many aspects of music learning” (Interviewee C4). Educationally, IT has the potential to increase students’ learning and motivation. Respondent C3 said: “IT is a wonderful tool, no matter if it is for the teacher or the learner. Students are so excited when I use the computer to
teach them notation”. Similarly, another respondent said: “Using information
technology in teaching is not only my interest but also a general trend. It enhances
students’ learning, motivation and effectiveness” (Interviewee C6). As well as the
enhancement of students’ motivation, nine of the ten teachers went on to identify
specific positive effects in their teaching as the result of their use of IT. This of course
is supported by educational research which has identified the potential of IT to
increase students’ learning and motivation (Hsu, K. C., 2005; Lien, W. W., 2004; Lin, C.
Y., 2009).

The respondents in the present study presented a range of viewpoints relating to IT.
Two teachers said it has the potential to reduce teaching time in certain areas of
music learning—an important consideration, given that after the Grades 1-9
Curriculum was launched in 2001, the teaching time for music was reduced and
music teachers needed to use their time more efficiently. Three teachers said that
setting-up computer facilities in a classroom in preparation for a lesson was
time-consuming. But, certainly, a number of them believed that students can learn
faster when IT is integrated into teaching. At the same time, it was pointed out by
three teachers that IT was only a tool to assist in teaching and should not be seen as
a replacement for good teaching, that is, there should not be an undue emphasis on
it throughout a whole lesson. Or, as Interviewee C8 put it: “IT can be of assistance in
music teaching: it can increase students’ motivation. But teachers must remember
that their main task is to focus on the content of music learning.” Four teachers
advocated the benefits of sharing digital teaching materials with other teachers.
Another suggestion related to the benefits of music teachers working with IT and
other specialists within a school wherever possible as a means of opening-up new
possibilities for using IT in music.
6.2.2 Applications and materials

The interviewees shared their experience of applying IT in their music classroom. Amongst them, IT has been applied to the teaching of music knowledge, music theory, aural training, music composition, music appreciation, and instrumental learning. Resources accessed comprised Computer Assisted Instruction (CAI) systems, the Internet, notation and sequencing programs, audio editing programs, MIDI, digital pianos, CDs and DVDs, and PowerPoint, as follows.

*Computer Assisted Instruction (CAI)*

Amongst the ten teachers, CAI systems were the most widely used means of applying IT in music teaching. Seven of the ten teachers said that they either used traditional or on-line CAI systems to assist in their music teaching. As well as a range of ready-made CAI systems, sometimes the teachers also designed the CAI systems themselves for their special (and particular) needs in class. They referred to a number of CAI programs that allowed teachers to revise and customise the system in order to adapt their teaching. The characteristic drill-and-practice associated with CAI systems was particularly useful for music theory learning and aural training. Interviewee C9 explained: “In aural training, the students’ performances were quite different within the same class. …. If the students could use the software program to practice at home repeatedly their ability would be improved.” Students acquired musical knowledge and skills themselves through repetitive practice using CAI systems. The CAI program *A-Mao’s DoReMi Paradise* was mentioned by two teachers. This CAI system was developed as a result of the Ministry of Education encouraging schools, universities, and the private sector to design CAI systems in the *Program for the Infrastructure of Information Education* in 1997.
The Internet

The Internet is the second most popular resource among the ten primary school teachers, with six of them sharing their experience of using it in their teaching. A diverse range of resources is available on the Internet, including learning websites, audio/video media, interactive learning games, software programs, and much information on music itself. These six teachers highlighted ways in which they and their students used the Internet to search relevant websites for music teaching and learning. All these six teachers noted that audio/video media has provided students with new methods of gaining music understanding. For example, they pointed out that students can listen to the sounds of different instruments, and see concerts and musicals on-line even though they might not have the opportunity to experience them live. “There are a number of music instruction websites that present the music instruments. The students can click the items and explore the sound of the various instruments” (Interviewee C5). Additionally, on-line interactive music learning games provide opportunities for students to practise repeatedly in or after a music class. The software programs on the Internet were considered useful because they enabled teachers to explore new resources. Two teachers suggested that students can build a personal music learning blog by searching diverse information on the Internet and recording the progress of their music learning.

Notation and sequencing programs

Six teachers used notation and sequencing programs in their teaching. The software program Finale was the one most commonly used by teachers, probably because this was the program that was widely introduced in the IT related courses in universities. With regard to notation and sequencing programs, only one teacher
used such a program herself, but the other five teachers did introduce such programs to their students for notating, composing, and editing music. A particular Chinese composition software program *Happy Musician* was employed by two teachers to support students’ music composition activities. An issue relating to the use of these programs is that of copyright; unfortunately not all the schools had purchased them and so students were unable to access them. Further, even where schools had purchased such programs the problem of accessibility often arose because of the inadequate number of school computers available; and copyright prevented students from using their own personal computer to access the programs in class.

*Audio editing programs*

Audio editing programs are generally used by teachers in preparing their teaching material. Only one of the interviewees encouraged students to edit sound and music themes via these programs; perhaps this was because they are complicated to use and most of the software is written in English. But having said this, the students of this teacher who did use the software presented better results than the teacher expected. This teacher, C7, shared his experience:

> Computers are very popular now and many students can use them to do fundamental music editing. With advanced editing some students might have experienced difficulty, but I know that they liked it at the basic level at which they were operating.” Three teachers made specific reference to the software program *Hyperscore* produced by the Massachusetts Institute of Technology (MIT) Media Laboratory in the USA. Two of them had applied this software program for the teaching of music composition in their Master’s degree study.
**MIDI**

Three of the teachers produced MIDI files through notation, sequencing, and audio editing programs and then used them as a supplementary resource in the class. Their students also used MIDI to arrange, accompany, and create music; they found this an excellent resource as MIDI offers an immediate audio response. Three of the teachers pointed out that MIDI files were particularly useful for the rehearsal of music ensembles. As Interviewee C4 said:

MIDI has several sound tracks. Each part of a music ensemble can be assigned to different music tracks as the accompaniment to practice with. In addition to the function of accompaniment, the variability in MIDI’s playing speed is also useful for students when practising.

**Digital pianos**

Digital pianos provide diverse tone colours and functionalities to record and play music. Two teachers mentioned the convenience of digital pianos for recording and accompanying music in class. The various tone colours of digital pianos also provide students with a new sound experience—and an important source of motivation. “I use electronic keyboard in class and change the tone colours to accompany students’ singing. ... They like the various tone colours” said by Interviewee C3.

**CDs and DVDs**

These were mostly used in the teaching of music appreciation. Interviewee C3 said: “The most general integration activity, used by myself and other music teachers, is to play CDs and other multimedia. For example, when I introduce The Sound of Music, I
play the film.” It is now common for publishers to attach related teaching materials, including CDs and DVDs, in music textbooks as a kit for teachers arranged in semesters. As a consequence, teachers can simply play CDs and DVDs to assist the teaching of singing, listening, and appreciation. One of the teachers indicated that she had recorded previous students’ performances on a DVD in order to demonstrate to future students. However, not many respondents mentioned that they used the CDs or DVDs in their teaching—perhaps because they did not consider this as the integration of IT. This issue will be discussed later in Section 6.3, “Practice in schools”.

**PowerPoint**

PowerPoint was mentioned by three teachers. They indicated using it to present information principally in relation to music history, knowledge and ideas, and notation. They suggested that it is useful in demonstrating information and providing sound links in the teaching of music appreciation. Teacher C10 said: “I use hyperlink to connect my PowerPoint and on-line resources and integrate these resources to make a PowerPoint file. Then, in class, I link to the webpages via PowerPoint.”

According to research by H. P. Chen (2006), PowerPoint was widely used when IT was integrated in the teaching of the Arts and Humanities Learning Area. Interestingly for the present study however is that only three of the teachers mentioned that they used PowerPoint in class. There are at least two possible reasons: one is that PowerPoint might not be used as commonly in music teaching as it is in other arts and humanities areas; the other is that these music teachers tended to equate the use of PowerPoint simply to the playing of CDs or DVDs, which they did not regard as the integration of IT and hence did not indicate using PowerPoint.
6.2.3 Improving teaching quality

In this discussion of their use of IT in music classrooms, the ten teachers indicated how it addressed various teaching issues and improved the quality of their teaching. They all agreed that the use of IT enriched students’ experiences as well as the quality of teaching. The following issues were identified:

Broadening student’s music experience

Six teachers indicated that integrating IT in the music class offered students a richer opportunity to listen to and experience music. In the absence of becoming directly acquainted with actual instruments, IT enabled students to see them visually and to listen to their various tone colours via CAI, digital pianos, or other software programs. One teacher said:

The schools are not able to provide many different sorts of instruments for music teaching. However, the students can listen to the sound of various instruments via software programs. IT also enables them to search relevant information on these instruments, including photos and descriptions of them. Further, with the aid of computer programs, they can choose different instrumental sounds to create their own music. (Interviewee C5)

Another teacher pointed out that:

Music teaching in schools is mostly focused on singing and recorder playing. Students do not have a chance to experience other instruments. But MIDI files comprise at least 128 tone colours that students can listen to. This can be very useful in music teaching. (Interviewee C7)
In addition, it was pointed out that a large number of students had never participated in a live concert, musical, drama, or other performances. However, because of the possibilities of the integration of IT in the music class, these students could see and experience performances via video recordings, CDs and DVDs or on-line Internet video such as YouTube. It was also noted that IT offers music teachers many possibilities for integrating drama and other performing arts into music teaching—thus enabling teachers to broaden their approach to the teaching of music itself.

_Intensive/extensive learning_

Six of the interviewees mentioned that the integration of IT both deepened and broadened students’ learning. The content of music learning was not limited to textbooks and the learning time was not restricted to the music class. It was pointed out that there was plenty of information on the Internet for students’ to engage in further music learning beyond the classroom. Textbooks and music teachers are not the only providers of music knowledge. Interviewee C2 said: “The students who own computers at home are happy to explore and learn music via webpages or music learning games” Similarly, Interviewee C10 offered: “The information on the Internet is abundant. Websites provide words, images, or animations to accompany music. Students are very impressed when they see these and appreciate the music simultaneously”. Moreover, such resources often extend students interest and learning time beyond the classroom. Interviewee C1 identified that:

I introduce my students to a number of CAI programs and software on my website. These students are asked to practise by themselves after class. …
because, since the launch of the new curriculum, teaching time has been reduced. It is a very satisfactory and beneficial situation if students can practise music voluntarily after class.

Another teacher pointed out that:

The music teachers build their music teaching blogs and post relevant information on the Internet. The students can browse these blogs and continue their music study at home. ... And some students go to the computer lab to search music information at the lunch break in school. They make use of their time very well. (Interviewee C3)

**Music composition teaching**

IT has changed the teaching of music composition. In the past, students could only create music with pencil and paper in the traditional way. They were not able to listen to their work after completing a composition unless someone played it for them. This traditional method of composing, where students generally cannot hear internally what they are writing, is more of a technical exercise rather than a musical one that encourages imagination, creativity, and aural development. Following the introduction of IT into the music class, composition has the potential to be a more musical activity with students being able to explore sounds that they can, simultaneously, hear. And this is one of the greatest benefits of IT in the classroom, albeit not the only one. Additionally, students can choose which instrument or instruments they wish to compose for and hear the same melodic or harmonic progression played by different instruments. Changes and revisions are relatively effortless compared to having to re-write something with a pencil. Once completed,
compositions can be saved as electronic files and shared or disseminated easily; further, they offer obvious advantages for obtaining feedback. Notation itself—be it traditional staff notation or “graphic” notation—is no longer the laborious task it once was. As Interviewee C7 said:

> In traditional music composition activities students are asked to compose on paper. However, these notes on paper are often meaningless for students in that they are unable to relate the symbol to a sound. In effect, they do not hear what they have written. But with a computer, students can hear the music immediately and be touched by it.

**Repeat practice**

Research has shown that CAI and other music learning software programs give students the opportunity to practice repeatedly (Heinich et al., 1996; Williams & Webster, 2006). This characteristic has been used widely for music theory learning and aural training, as well as singing and instrumental practice. Using these computer programs, student practice is based on individual progress in music learning either in school or at home. Interviewee C8 said:

> Students themselves can select the lesson they are interested in or need to practise. This is done on an individual basis and students can engage in repeated practice. As a result, leaning improves. Sometimes teachers are not able to teach every student individually and this approach solves the problem.

**Increase in learning and motivation**

Teachers suggested that IT has increased students’ learning and motivation. This
concurs with a number of previous research studies (Harrison, 2005; Hsu, K. C., 2005; Somekh, 2007). As well as having a positive effect on motivation, IT can also encourage students to engage more readily in repeated practice. Interviewee C1 said:

Some students did not pass the exam and were asked to do more practice after class. They did not see this as a punishment but, rather, were very willing to practise more. In a few extreme cases, some students even failed the exam intentionally because they wanted access to the computer to play music learning games after class.

6.2.4 Disadvantages

All ten of the primary school teacher interviewees had a positive attitude to the integration of IT. They indicated that it provides a solution to some of their teaching problems and can assist in improving the quality of teaching. At the same time, they raised a number of issues, including the preparation time involved in using IT, the limited support and resources often associated with IT in schools, the problem of adding something else to an already over-crowded music curriculum, and the fact that excessive use of IT to the detriment of other elements can results in an imbalance within a music program.

Four respondents noted that integrating IT into teaching was time consuming, with teachers needing to spend more time seeking or building appropriate IT related teaching materials. It was pointed out that although extensive music teaching materials are provided by schools, textbook publishers, and are available on the Internet, they do not fully match all of the requirements of school music teaching. It was also noted that where teachers lacked sufficient computer skills to enable them
to readily build their own teaching materials, the task became all the more
time-consuming. To compound the problem, it was not always easy to find a
colleague whom they could consult or work with on a particular task. Not
surprisingly, it was suggested, this can lead to a degree of frustration. But having said
all of this, they were nonetheless willing to find the time to take on the task of
incorporating IT into their music teaching because of a strong belief in its benefits.
Teacher C1 said: “Writing programs is time-consuming, and then ‘de-bugging’ them
also takes time.” Teacher C10 opined: “The trouble is that you need to take time to
integrate various resources before the class—and this is time consuming. However, I
find IT greatly benefits my teaching.”

Another inconvenience, raised by four teachers, is the limited support and resources
associated with the integration of IT in schools. This includes insufficient IT facilities,
limited accessibility of computer labs, the inability of many schools to afford a range
of programs, coupled with a general lack of suitable programs being available. These
all decline their enthusiasm to integrate IT into their music teaching. To compound
the problem, even where free music education software programs, CAI, and
websites exist on the Internet, most of them use a non-Chinese interface such as
English and this essentially prevents students—and often teachers
themselves—from using them. All of this has affected students’ learning because
generally they are not able to have individual access to a computer and a particular
program within class; instead, they normally have to share computers and programs
with other students. This can result in students being less motivated and engaged
that they otherwise might be. Teacher C5 said:

I feel less than enthusiastic when taking students to the computer lab for a
music class. ... Because of the limited number of software programs available two or more students must share a computer and it all becomes too crowded. Because of this I don’t do it very often, just occasionally.

Three teachers indicated that, because of their position as co-ordinator of IT within their school, they were able to purchase a number of music related software programs and CAI. At the other extreme however, two teachers revealed that because of the lack of software programs in their schools they had bought some themselves out of their own pocket; not surprisingly, this situation reduced somewhat their enthusiasm to apply IT in their teaching. Three interviewees mentioned that it was not common for music teachers to be asked about their needs in relation to software programs or IT facilities when schools purchase teaching materials; again, this situation is not conducive to the encouragement and development of IT integrated music teaching.

The limited time available in schools for music teaching was seen to be another constraint. With the launch of the Grades 1-9 Curriculum, schools were required to re-arrange the teaching time for each learning area. Unfortunately, this allowed schools to reduce the teaching time available for music from two classes (eighty minutes) to one class (forty minutes) per week. As a consequence, in some schools, music was relegated to a smaller percentage of the overall teaching time. Understandably, where this occurred, music teachers complained that one class per week was inadequate, and the task of incorporating IT into the music curriculum was made even more difficult.
Another disadvantage associated with the incorporation of IT into music teaching has been that with some teachers it has been emphasised excessively to the detriment of other elements; this, of course, results in an imbalance. Two of the interviewees expressed concern that an over-emphasis on multimedia would detract from the core content of music learning. Further, they wished to guard against the use of IT being seen as a goal, as distinct from being a tool to assist and motivate teaching and learning. Interviewee C4 commented: “I think that stressing multimedia too much will lead to teachers neglecting certain aspects of content in music learning.” Teacher C8 argued: “IT is only a tool for enhancing students’ motivation. It is not a substitute for introducing proper content.”

Another observation was that a number of students did not observe appropriate etiquette when using the Internet. They wrote unnecessary and unproductive posts or used impolite and vulgar language. This results in the need for teachers to use valuable teaching time instructing them in appropriate IT usage. Teacher C3 commented: “Sometimes students post strange content or something useless on the Internet. It’s not always easy to teach them to reflect on the appropriateness of what they do.” She added that this unnecessarily increased a teacher’s load and was a contributing factor in some teachers being disinclined to integrate IT in class.

Teacher C1 suggested that using IT in class often had a motivating effect on students’ engagement with music. Where students also had access to a computer at home they were more inclined to engage with CAI in relation to music than students who did not have such access; as a consequence, they displayed greater improvement in music learning. Additionally, this widened the interest and skill level gap between those who had home access to IT and those who didn’t. This, of course, presents its
own challenge for teachers: namely, how to cope with widely disparate levels of music learning brought about by this phenomenon.

6.2.5 Teachers’ requests

The ten teachers also argued the need for more support from schools, teacher education institutions, and the Ministry of Education. They stressed that if IT was to be used to enhance the quality of music teaching and learning, there must be adequate support from these agencies. Accordingly, they identified a number of issues, in particular: the importance of adequate IT facilities and technical support, access to a database of systematic music teaching materials, adequate teaching time, quality professional development, improving music’s status in the curriculum, and opportunities for team teaching as a means of collegial support.

IT facilities and technical support

Eight of the teachers advocated the need for more and improved IT facilities and technical support, with four of them mentioning the limited accessibility of computer labs. This was felt especially with respect to the teaching of music composition and the use of CAI programs. Generally, because of an insufficient number of computers, labs were principally used for designated computer classes, leaving little if any time available for teachers of other subjects to access these labs. The overall problem was compounded by the relative dearth of music teaching related hardware facilities (such as earphones, keyboards, and speakers) as well as software programs. Ideally, teachers wanted to have a fully fitted music classroom, one that met all of their needs, including the availability of an adequate number of computers. At the time they were interviewed, this was not common. It must be acknowledged however that having sufficient IT facilities, equipment and software does not of itself
guarantee a successful integration of IT in music program. In addition to the requisite teacher skills, it is important that technical support be readily available to assist them both within and outside the music class. Unfortunately, the specialist computer teachers in schools rarely have time to offer such support.

In this regard, it is worth mentioning that Teacher C2, who teaches in a municipal primary school in Taipei City, was happy with the situation regarding IT in her school. But hers is an exceptional case in that Taipei City is the only place that has a ‘system management technician’ position in each school. The principal role of the person in this teacher position is to deal with IT equipment maintenance and technical support rather than classroom teaching itself. Of course, schools in Taipei City are unique in this respect, highlighting a very apparent digital divide between them and schools in the rest of the country.

*Systematic teaching materials database*

Five teachers talked about their desire for a systematic teaching materials database. As has been indicated already, there was a range of music teaching materials provided by the schools and textbook publishers, as well as that which was available on the Internet. The central government also conducted a number of projects to enrich on-line digital learning content, such as the *Six Major Learning Nets Project* (Ministry of Education), and the *Taiwan e-learning and Digital Archives Program* (National Science Council). Although the on-line teaching materials seemed diverse, a problem for teachers has been that the Internet stores a great deal of information for music teachers, and sifting through it to discern what is relevant and what is not can be extremely time-consuming. Teacher C3 said: “The *Six Major Learning Nets Project* comprised the Arts and Humanities Learning Area, but music related
resources are limited. And the National Digital Archives Program also does not comprise much relevant music teaching materials.” This has already been referred to in Chapter Four where it was indicated that, in their interviews, five of the ten primary school teachers believed that these national projects had little direct benefit on the integration of IT in music education. Part of the reason, perhaps, is that the teaching materials included in these government projects were not sufficient of themselves to provide an adequate IT based music program. The need to seek appropriate materials from a range of other resources involved teachers in an inordinate amount of time which they could ill afford; consequently, some chose not to give as much attention to IT as might otherwise have been desired. It was for this reason that five teachers requested an easily accessible, systematic teaching materials database that stored a rich range of appropriate on-line music teaching materials. This database, they argued, should relate fundamentally to the school music curriculum. To this end, the interviewees suggested that the government should engage diverse groups—including music educators, curriculum developers, technicians, and designers—in building such a database.

_Adequate teaching time_

Coincidently, half (five) of the interviewees discussed the stresses associated with insufficient teaching time for music. After the *Grades 1-9 Curriculum* was implemented in 2001, music was merged into the *Arts and Humanities Learning Area* along with performing and visual arts. The *Arts and Humanities Learning Area* accounted for 10%-15% (depending on the school administration) of weekly teaching time in the curriculum. Generally speaking, Arts and Humanities was assigned three classes per week at the primary school level. In practice, this has meant that music is only taught in one forty-minute period a week, compared to the two periods per
week that was the norm previously. Not surprisingly, two teachers explained that they did not have enough time to teach all of the prescribed content in one class—let alone deal with the integration of IT. Teacher C10 said:

I only see my students once a week. In general, I can’t get through all of the content in the textbooks. I always feel that I’m rushing in an effort to teach as much as possible—but I never complete it.

When the added task of the integration of IT is put into this mix, teachers are even further burdened with the demands of setting-up IT equipment, operating the computers, and solving technical problems. It is little wonder that this component is seen as a very heavy imposition on what is already limited available teaching time.

**Teacher professional development**

Even though all ten teachers interviewed for this study specialised in IT and music education, five of them mentioned that they still needed more training in these fields. Teacher C3 said: “I believe I still need to undertake more professional development. That was the reason also for me undertaking my Master’s study.” Four of them suggested that teacher professional development in IT should be music specific, as distinct from focusing on teaching in general or the much broader Arts and Humanities Learning Area that encompasses performing and visual arts as well as music. This would enable music teachers not only to become familiar with appropriate software programs and their application in the classroom, but also theories of music and teaching and learning that underlie them.
Music’s status in the curriculum

Half (five) of the teachers mentioned that music was relegated as a peripheral subject in most schools. This reflected a perceived attitude towards music held by government officers, school principals, teachers, parents and students that music learning is not as important as other subjects such as language, science, and mathematics. It fails to acknowledge the new possibilities that the integration of IT offers for music education. The result has been that the “high status” subjects receive by far the most attention and support. Music for some students is no more than entertainment. Respondent C10 said:

Music teachers are very conscientious in their approach to the teaching of the subject, but they generally do not have strong support from the administration. Students, in turn, reflect this attitude and do not treat the subject seriously. ... Music for them is merely a form of relaxation and entertainment.

As has been discussed, following the 2001 educational reform, music was merged into the Arts and Humanities Learning Area and the situation got worse. Music education today, consequently, remains a low status subject.

Team teaching

Team teaching was suggested by four teachers as an extremely useful strategy to engage in the integration of IT in music education. This reflected to the previous research indicated that teamwork (staff work together and support each other) is a useful approach to involve technology into school curriculum (Leask & Williams, 2005). This was because the integration of IT required more diverse specialties than traditional teaching. It was suggested that not many teachers were inclined to
engage in the integration of IT activities because of the limited collegial support and team teaching opportunities available in most schools. Lacking in the requisite skills, they felt isolated and insecure when trying to introduce the integration of IT. “I felt so isolated. Sometimes when I had [technical] questions there was no one to help me and I had to try to solve them by myself. I felt so helpless” (Interviewee C8). The problem could be addressed if teachers with different specialties (such as computing and curriculum design) worked together to pool their areas of expertise. This would not only save time and a great deal of frustration, but also facilitate more effective teaching. Potentially, music teachers would benefit not only from working with their colleagues in the visual and performing arts, but also in other curriculum areas as well. Interestingly, but somewhat disconcerting, only one of the ten teachers indicated working with colleagues herself when integrating IT.

It should be emphasised that these insights were provided by teachers who had specialised in music as well as IT. If some of them still experienced some difficulty, it stands to reason that music teachers without such expertise would tend to have even more problems. The next section discusses their understanding of practices relating to the integration of IT in music education.

6.3 Practice in schools

6.3.1 General situation

One of the three aims of this study was to investigate actual practice regarding the integration of IT in school music education. Accordingly, these teachers were asked to comment on their understanding of current practices in schools. Whilst it cannot be claimed that their insights or perceptions represented those of all teachers or schools, at the very least they provided an expert’s opinion based on their
experience and broader acquaintance with other music teachers and schools. Their experience covered all regions of Taiwan.

All of them argued that the integration of IT was not popular in primary school music teaching. They suggested that music teaching in primary schools focused mainly on singing and recorder playing. Not surprisingly, given what has already been presented, they indicated that relatively few music teachers integrated IT in their classroom. As Interviewee C6 stated: “I feel that school music teaching is much more focused on singing and recorder playing. Integrating IT into the music classroom is not common.” Interestingly, one interviewee identified that the situation was more serious in the southern part of Taiwan. This, again, appears the phenomenon of digital divide in some degree. The interviewee C7 said:

As far as I know, there is almost no the integration of IT in any area of the curriculum in the southern part of Taiwan, not to mention the integration of IT in music education. Music teachers even do not have computers in classroom. How can they integrate IT in their classes?

Further, eight teachers claimed that even when music teachers use IT in their teaching, it is mainly focused on low-level integration activities such as playing CDs and DVDs or searching the Internet for information. One teacher said:

The ratio of music teachers who use IT in their teaching is very low. Even if they use it, it is just to search for teaching materials on the Internet or play CDs and DVDs when they teach music appreciation. That is not really ‘integration’.

(Interviewee C1).
In fact, seven of the ten interviewees mentioned that music teachers only use IT to play CDs and DVDs. Only one respondent said that they had seen teachers using notation and sequencing programs to teach music composition. There can be little doubt that the integration of IT in music teaching was not common in primary schools.

Two teachers questioned whether using IT to play CDs and DVDs, or searching on the Internet for information, can be defined as the “integration of IT”. Their point being that the integration of IT was more encompassing and a “deeper” concept than this: for them, in the words of Moersch in his *Seven levels for the integration of IT*, it should be concerned with “infusion, integration, expansion, or refinement” (Moersch, 1995). These two interviewees expected that not only should teachers be skilled in handling IT facilities themselves, but should also provide students with the opportunity to work on computers. This, they argued, would assist student learning in music. They suggested that, unfortunately, where IT is used in music teaching it is predominantly as a tool for music appreciation and is teacher-centred. This result is consistent with the previous research that the integration of IT in music education was focused on teacher-centred activities (Chen, H. P., 2006). Of course, this may be attributable in part at least to the limited availability of IT equipment in schools.

6.3.2 Challenges

The next question asked of the ten teachers related to the challenges entailed with respect to the integration of IT in the music classroom. Two main challenges were identified: insufficient IT facilities and the limitations of teachers’ IT literacy.
The problem of insufficient IT facilities relates to both hardware equipment and software programs. Seven interviewees addressed issues relating to accessibility and availability of computer labs for music teaching. Ideally, it was argued, professional music stations should be installed in music classrooms themselves. The challenge is compounded in those schools that do not have a designated classroom for music teaching. Software programs and copyright also present issues. Within schools there appeared to be a hierarchy of subject areas that were most strongly supported with respect to this expenditure, with music being low on the priority list. It is not surprising therefore that schools tended to have limited software programs for music instruction. As well as insufficient IT facilities, the teachers also identified the problem of obtaining adequate IT support.

Five of the teachers addressed the challenge of ensuring that teachers were sufficiently IT literate. The teachers’ IT literacy, together with their confidence and skill in the integration of IT in the classroom, is of paramount importance. It was argued that despite having access to relevant professional development training programs some teachers still lack the necessary confidence in the integration of IT and what is sometimes a psychological barrier can act as an impediment in them using this technology. The core of the issue was highlighted quite graphically by Interviewee C7:

We cannot say that teachers do not want to do this [the integration of IT]. They are fearful of the things that might go wrong and, as a result, feel that playing the piano or presenting music using CDs and videos are the safest—and therefore best—activities in a music class.
One interviewee claimed that the issue of IT literacy was more seriously evident in the older generation of teachers; the younger generation of teachers had, to some extent at least, grown-up with computers. Whilst there is undoubtedly some truth in this, to some extent it is an oversimplification of the issue; even some young teachers lacked appropriate IT literacy skills.

With respect to both challenges—insufficient IT facilities and the limitations of teachers’ IT literacy—two teachers drew attention to the vexed issue of limited time for music in the curriculum. This, they suggested, also affected their decision to the integration of IT into their teaching.

In discussing these challenges the researcher became acutely aware of a significant phenomenon: there is a relatively high proportion of teachers who specialised in music at university but who do not teach the subject in their school; instead they work as “generalist” primary teachers. Unfortunately, their specialised music skills are not utilised; this decision is made by the school administration. On the other hand, some schools have a tendency to employ part-time teachers to teach music, not all of whom necessarily have the expertise or experience of those specialist music teachers who have been assigned as generalists to teach in classrooms. Essentially it has occurred because of the dramatically declining birth rate in Taiwan over the past decade that has impacted on the education system. Schools have contracted teachers who have generally been assigned to teach the “minor” subjects in the Arts and Humanities Learning Area, including, of course, music; it is quite common for these contracted teachers to remain for a short period of a year in any one school because of the ongoing flux in student numbers. The full-time teachers,
on the other hand, who tend to remain in the same school for some years, have been required to be generalist classroom teachers. This explains why only five of the ten teachers interviewed taught music in schools despite all of them having a Master’s degree in music education. Such a policy has not only affected morale but, it might be argued, denied children access to the some of the best trained music teachers.

6.4 Interview teachers’ suggestions for school music teachers, school administrators, and the Ministry of Education

Given their specialist qualifications in music education at the Master’s degree level, as well as their varying degrees of experience, the researcher sought the advice the ten teacher interviewees would give to school music teachers, school administrators, and the Ministry of Education with respect to the integration of IT in music.

6.4.1 Interviewee suggestions for school music teachers

The major suggestions proffered by the interviewees were to commence the integration of IT activities in music with relatively simple resources; undertaking further teacher professional development; participating in team teaching or teachers’ professional networks; and considering carefully the availability of resources and their appropriateness for teaching.

Commence with relatively simple resources

Five interviewees recommended that music teachers should start the integration of IT with easy or simple resources, many of which are readily accessible on the Internet or on blogs. Interviewee C5 stated: “I would suggest that the teachers start with materials from the Internet. There are a number of significant websites that
they could have a look at and try.” Such resources will not only assist teachers in the integration of IT, but also help to develop their self-confidence. Three interviewees drew attention to the usefulness of self-made PowerPoint teaching materials that are easy to create and use. Interviewee C1 suggested: “You could begin with the easy ways for integration. If you have an existing PowerPoint file, you could start with that because it is quite easy for teachers.” The essential point stressed was to begin with ‘low level’ tasks that are simple and manageable, and this will lead to increased confidence in using the relevant technology.

**Undertake further teacher professional development**

Four respondents stressed the importance of teachers being appropriately skilled in technology in order to fully engage in the integration of IT; this, of course, entails professional development. Interviewee C7 responded: “Firstly they need to learn computer skills and develop a confident attitude in using them.” Another respondent, C8, said:

> The fastest way to embrace technology is to undertake teacher professional development; that will take you to the next level. You could also enroll in commercial classes offered by some private companies—this, too, can be very helpful.

There was strong consensus that when teachers overcome any psychological barrier they might have in using new technology, they then tend to embrace it enthusiastically. Here too, the importance of them beginning with basic skills that they could readily master and apply in the classroom was stressed. Two teachers, further, advocated that teachers read relevant research articles or papers as a means
of keeping abreast of new developments in the field.

**Participate in team teaching or teachers’ professional networks**

Five respondents highlighted the importance of communication and collegiality—including team teaching—among teachers. Interviewee C1 said: “If there is a team approach in a school, the teachers can encourage and support each other in skills and morale.” Similarly, interviewee C3 said: “Teachers could come together to form a support group or professional network to share their ideas and experience, or they could access services offered by a professional education group, such as the *Taiwan Elementary and Secondary Educator Community*.” Activities such as these could support teachers in both theory and practice. At the coal-face level, of course, it is teachers’ colleagues within their school who can most readily provide support. As Bitter and Legacy (2008) have put it:

> Professional education websites offer virtual communication areas wherein teachers discuss education trends, share innovations, and get advice for challenging situation at any time of the day or night. ... Professional associations bring together diverse educators who share common interests and most now have a web presence. (pp. 294-395)

**Consider the availability of resources and their appropriateness for teaching**

Four respondents suggested that in addition to music teachers having some knowledge of appropriate activities, they should also aware of available resources and support before integrating IT into their teaching. The available resources and support would include equipment, software, facilities, and access to personnel who can provide assistance. Not being aware of what resources and support are available
can make the task of the integration of IT formidable, and result in frustration and a lack of motivation and confidence in exploring the possibilities of the integration of IT. It is only when they are familiar with the resources that are available that they can effectively consider teaching content. Encouragingly, one teacher reflected:

If you really like to integrate IT, you can do it even if you only have the most basic of resources—and getting these is not necessarily easy. I did not have adequate equipment in the beginning but I think that if school administrators can see what teachers are achieving they will be more inclined to offer support. (Interviewee C6).

Having looked at the advice proffered by the primary teacher interviewees for what teachers in general should do in embracing the integration of IT, the next section will examine their advice for administrators.

6.4.2 Interviewee suggestions for school administrators

Recommendations for school administrators focused on issues such as providing appropriate facilities, equipment and resources, ensuring that there is sufficient music teaching time, emphasising music education more strongly in the school curriculum, providing opportunities for team teaching, and assigning music teachers appropriately (that is, giving appropriate recognition to the specialist music qualifications of teachers who might be in their school).

All of the interviewees argued for improvement in the facilities, equipment and resources available for music education in schools. At the same time, they recognised that the adequacy of this differs from school to school. Attention was
drawn to the fact that some schools did not have a permanently designated and specialist music classroom and, as a consequence, the music teacher needed to take all teaching materials, including a keyboard, to whichever room the music class was scheduled in. Six of the interviewees argued the importance of schools providing professional music stations—including computers, keyboards and projector—in music classrooms. Further, eight teachers stressed the need for music classes to be able to access general computer labs. Interviewee C6 opined:

I hope that the schools can provide fundamental equipment for music teaching. Unfortunately, at this stage, there is no agreement on what is ‘fundamental’. Some schools have nothing in the music classroom; the students sit on stools and the music teacher plays an old harmonium [an instrument common earlier in the 20th century which requires teachers to pump ‘bellows’ with their feet to produce sound]. Where this situation exists, it is highly likely that the school gives little or no attention to music education.

A second suggestion was that sufficient time for music teaching be made available. It has already been noted that these interviewees expressed general concern about there being only one class—of forty minutes duration—per week. But this need not be so for the Grades 1-9 Curriculum allows for four to six classes per week of what is designated “Alternative Learning Periods” where schools can “organise and conduct activities ... carry out curriculum or activities designed to correspond to goals and objectives of the school, provide optional courses for learning areas, implement remedial teaching programs, conduct group counseling or self-learning activities” (Taiwan Ministry of Education, 2005a, ¶. 10). In other words, schools do have the freedom to designate at least one of these periods as an additional music class,
resulting in two music classes a week, as was the norm under the previous curriculum document. Attention was drawn to this possibility by some of the interviewees; unfortunately, it was not uniformly used as an option. Interviewee C5 claimed: “Many schools have only one music class per week. And within this class teachers might take half of the time starting up and shutting down computers.”

A third suggestion, offered by five of the interviewees, was that a stronger emphasis be given to music education in the curriculum and in schools. In comparison with other subjects, such as language, mathematics and science, music was relegated as a “minor” subject in schools and received less support. For example, it was noted that when purchasing IT equipment music was given a lower priority. And, in relation to the previous point, music generally did not fare well when arguing for an extra period in the timetable. Teacher C6 said:

The support of the principal and the school administrators is very important. The principal who is sensitive to the needs of music education will provide extra support. In contrast, the principal who is committed to physical education will ensure that that receives more support.

A fourth suggestion, by four of the interviewees, focused on the importance of ensuring that music specialist teachers be assigned to teach music as distinct from teaching a generalist, grade level class. They drew attention to the fact that employing contracted teachers to teach music when there was already a specialist music teacher teaching a generalist class, contributed to low morale. Interviewee C5 said:
The school administrators say that this is based on the needs of the school. A part time, contracted teacher teaches almost all of the music classes in our school. ... [Despite my specialist qualifications] I’m not employed as the music teacher. I’m employed as a generalist classroom teacher and only teach music to my own grade.

Interviewee C7 said:

I can tell you the truth: not only do I not integrated IT, I don’t teach music at all—not even to my own class because that is done by another teacher. ... In schools, the administration is not really concerned if a teacher has an area of specialisation.

All of the four interviewees who discussed this issue further suggested that the part time or contracted teachers tended to be less familiar with teaching and the school environment. In addition, because they were not part of the staff establishment, they generally received minimal support in relation to the integration of IT in music. The interviewees acknowledged that, with a dramatically declining birthrate in Taiwan, it makes no sense to employ additional permanent teachers whose employment would not be ongoing because of declining school numbers. At the same time, they expressed regret that their specialist skills were not being used in music: instead the subject was taught by contracted teachers employed on a short-term basis.

Finally, three teachers stressed the importance of team teaching. They argued that this had the potential to improve the integration of IT in music teaching. Two of
these teachers acknowledged the benefit of the Information Seed School Project (2001-04) for team teaching. They expressed regret that, at the end of this project, the teams were disbanded.

6.4.3 Interviewee suggestions for the Ministry of Education

The respondents provided significant recommendations for the Ministry of Education. These included criticism of the new curriculum, the need for greater recognition of the importance of music in the curriculum and in schools themselves, establishment of a systematic teaching materials database, effective teacher professional development, and a subject-based primary school teachers’ license. These suggestions are particularly for the Ministry of Education, although several issues have been mentioned previously when discussing teachers’ requests on integrating IT (6.2.5).

Six of the teachers were very critical of the Grades 1-9 Curriculum. The lack of provision for sufficient teaching time was one issue, and the fact that music was “integrated” along with other arts learning was another. Interviewee C1 said: “I don’t know what they [the Ministry of Education] are doing. The time recommended for music is less and the whole Arts and Humanities Learning Area is assigned only three classes. This is ridiculous.” In some schools, music teachers also need to teach the visual arts and performing arts despite the fact that they have not been given sufficient training to enable them to do this; this has only compounded the problem and been an additional source of pressure.

Not surprisingly, and in line with the recommendations proffered for school administrators, five interviewees argued for more attention to be given to music in
the curriculum and in schools themselves. Although the Ministry of Education had, over three decades, launched a series of policies and injected significant funds to promote the integration of IT in general, specific support for music itself was lacking. The government had tended to focus on the integration of IT in general teaching but had not done enough to support specialist subject areas like music. It was for this reason that the interviewees argued the need for the Ministry of Education to provide support specifically in music education.

Half (five) of the interviewees suggested that the Ministry of Education should establish and manage a systematic teaching materials database specifically for music education. For many years the Ministry of Education has been advocating the benefits of on-line learning. At the time the interviews were conducted in 2009-10, on-line learning content in music was limited in comparison with other subjects; even today, this remains the case. Many of the existing music learning websites that were supported by government funding were not popular because much of it did not relate directly to the music curriculum. Interviewee C1 suggested: “Even though the Ministry of Education has built some webpages, this is somewhat limited in the information provided. I think that the content could be improved and comprise more interactive components.” In making recommendations for a database, the interviewees recommended not only collecting a range of music teaching materials, but also identifying and integrating existing related websites. This would enable school teachers to search and use the data with relative ease. A further suggestion was that the government invite various experts in music education to work together to build this website. This should be designed to be of use to music teachers regardless of their experience.
Four interviewees also advocated effective teacher professional development in relation to IT and music education. This issue was also discussed in Chapter Five. Certainly, attention has been drawn to the limited teacher professional development opportunities pertaining to the integration of IT for music education. Teacher C4 commented: “The present IT related teacher professional development is not particularly relevant for music instruction. Every subject has its unique characteristics, including music. For it to be relevant, professional development should focus on the particular needs of specialist music teachers.”

Finally, interviewee C3 suggested that the Ministry of Education should implement a subject-based primary school teacher’s license. Currently in Taiwan, the primary school teacher’s license is given for general classroom teaching, while the secondary school teacher’s license signifies a teacher’s discipline (teaching) areas. Interviewee C3 argued that, as with secondary school teachers, the license of all primary school teachers should indicate their area or areas of teaching specialty. Not only might this have benefit in relation to the provision of professional development, but it would better serve to indicate to the school administration the particular specialist areas of general classroom teachers. Of course, in making this suggestion she hoped that it would, to some extent, address the problem of specialist music teachers being employed to teach in the generalist classroom when most, if not all, would prefer to teach music.

In proffering suggestions for the Ministry of Education, two interviewees made suggestions relating to textbooks. One, C7, recommended that the Ministry of Education should stipulate that approved music textbooks must deal with the teaching of the integration of IT. This recommendation has much merit; certainly, it
would greatly assist teachers who needed particular help and guidance in this area. Teacher C1 went even further in recommending that textbook publishers should provide supplementary material including, perhaps, CDs or CAI materials, to provide additional assistance to teachers (and students) above that contained in the body of the textbook itself.

When invited to make any additional suggestions, two of the interviewees, C6 and C10, referred to the role of parents. Both of them said that parents should view music as a ‘normal’ and ‘essential’ subject rather than a minor one in the curriculum. They argued that if parents showed strongly that they valued music it would have a profound influence on school administrators, and children themselves, and music, potentially, would be raised in value and status within schools.

The researcher anticipated that this group of interviewees would provide teachers with some particular teaching strategies in IT music integration that could be used with beginners. But, as the discussion under 6.4.1 above shows, their responses tended to be “general” suggestions as distinct from providing a “how to” set of precise activities that students could undertake. That is, they suggested beginning with relatively simple resources; undertaking further teacher professional development; participating in team teaching or teachers’ professional networks; and considering carefully the availability of resources and their appropriateness for teaching. In explaining their reluctance to suggest specific activities, teachers pointed out the extremely diverse situation in schools where there was no degree of uniformity across the country with respect to IT infrastructure. Providing such strategies remains a challenge today to the Ministry of Education, lecturers in universities, textbook publishers, and those who provide professional development.
6.5 The perspective of policy developers

This section details the perspective of the two policy developers on the integration of IT in school music education. They discussed the impact of the integration of IT and the challenges it presented in relation to primary school education. In addition, they offered strategies and directions for further promotion of the integration of IT. Given their different backgrounds it was not surprising that they emphasises different issues. One, who does not have a music background, spoke somewhat generally about the integration of IT whilst the other, a music specialist, focused on music education. Both interviewees nonetheless spoke positively on the importance of the integration of IT.

With the integration of IT having become a “buzzword” in education, it was inevitable that this would have an impact on music education in schools. Professor M. L. Lai, the policy developer with a strong music education background who played a pivotal role in the establishment of the music content of the Grades 1-9 Curriculum, noted that the integration of IT was a significant issue in this process. In her comments she referred to it being one of the ten core competencies in the new curriculum: “to acquire the ability to utilise technology and information” (Taiwan Ministry of Education, 2005a). She also stressed that the application of IT was regarded as being a basic capability for students in every areas of learning. Further, in the curriculum guidelines for the Arts and Humanities Learning Area, there are several competency indicators that encapsulate the application of IT. In practice, Professor Lai claimed that whilst Taipei City advocated the importance of the integration of IT, some other cities/counties were not so strongly supportive. Despite the place of the integration of IT in the new curriculum, Professor Lai expressed a
belief (as had the primary school teacher interviewees) that, across the curriculum, it had not been strongly embedded into subject teaching and learning; adding, that this was certainly the case with music. Of course this is not to deny the excellent work being undertaken by a minority of teachers.

The other interviewee in the category of policy developers, Professor T. H. Wu, commented that the Information Seed Schools Project under the Information Technology Education for Primary and Secondary Schools: Blueprint (2001) had been a meaningful project and had a significant impact on the integration of IT in schools. He stressed that a number of schools had been involved and, as a result, had established a strong foundation in the integration of IT.

Professor Wu also discussed the issue of teachers’ attitudes towards the integration of IT, its relatively low level of importance in the minds of parents, teacher resources in rural schools, and the importance of ensuring that experienced music specialists teach the subject in school. He went on to say:

> In my opinion, funding is not a problem in Taiwan. The key issue in promoting the integration of IT is teachers’ attitudes. ... and the need to encourage teachers to try to incorporate it in their teaching. This is not only an important issue, but also a major challenge.

This view is consistent with that with that expressed by the Group 3 interviewees—the primary school teachers. With respect to parents, Professor Wu suggested that some place limited value on computer technology because it, *per se*, is not examined in the entrance examinations for high schools and universities. He
added that this is not so much an issue in primary schools and, as a consequence, the integration of IT tends to be given more recognition at this level—but still not enough. This, he suggested, is especially the case in rural areas. In elaborating on this he argued that, after undertaking professional development in the integration of IT, many teachers used this as a stepping stone to leave the rural area to go to a school in a larger area, thus denying students the benefits of a teacher’s newly acquired skills. Sensitive to the particular needs of schools in rural areas, he suggested that, where there was not enough teaching in music for a full-time specialist, one solution might be that a teacher be employed to work across two or three schools in the area. As with many of the primary school interviewees, Professor Wu expressed disappointment that a large number of music specialists were assigned to general classroom teaching and not specialist music teaching, which was being done by contracted part-time teachers. He suggested that the low status of music was both reinforced and continued with the implementation of the Arts and Humanities Learning Area; employing part-time, contracted teachers only added to this diminution in the status of music education.

When these two interviewees were asked to suggest strategies for the promotion of the integration of IT in primary schools, they responded from different perspectives. Professor Lai identified searching the Internet for information as one possibility, and accessing music composition activities via software programs as another. At the same time, she commended those teachers who taught music successfully without resorting to the use of IT. Professor Wu suggested that teachers and students having a good facility in English was the key for future development of the integration of IT. He claimed that although the government has advocated the enrichment of on-line digital learning content (through the Chinese language), those who are not fluent in
English are severely limited in the information they can access. That is, the number of resources that are only available through English are considerably higher than those available in Chinese. As discussed earlier, this point was also made by the school music teachers who complained that free Internet resources, CAI, and music software programs were mostly in English and thus presented problems for the majority of students in music classes.

In discussing future directions, Professor Lai identified computer assisted music composition as one possibility for the integration of IT in school music education. Professor Wu identified several possible—indeed desirable—directions. Firstly, given that the overwhelming number of IT programs are in English, he argued the need for teachers to become much more fluent in that language. Secondly, because much of the integration of IT requires input from various specialists, he believed that team teaching would become more common in schools. He also suggested that prior to undertaking government sponsored professional development, teachers should be required to sign a contract guaranteeing that they would use their newly acquired knowledge and skills in their own school for a defined period—and not simply use the professional development as a means of transferring to another school. Finally, he stressed the importance of students becoming familiar with appropriate Internet etiquette or, as it is referred to, “netiquette”; this, of course, would be an additional responsibility for teachers.

Additionally, the researcher asked Professor Wu, who had promoted the integration of IT nationwide for many years, about the issue of the digital divide in Taiwan, that is, the tendency for some areas or regions to be better served by technology than others. He argued that whilst the digital divide did exist in Taiwan, it was more
evident in teacher resources and manpower than with respect to IT equipment. He suggested that in some remote areas schools had received special funding and had modern computers and IT equipment. Indeed, there were even instances where the number of computers was higher than the number of students. The problem as he discussed it, was that these schools are frequently characterised by a shortage of experienced and permanent teachers because most teachers preferred not to live in remote areas, such as the high mountains. This, he suggested, was the nature of the digital divide in Taiwan. His perspective on this issue was unlike that of school music teachers who tended to see the digital divide in relation to cities and counties, or the north and south parts of Taiwan.

The researcher found that both the school teachers interviewed and the policy developers identified similar issues in relation to the integration of IT. In essence, these issues were concerned with teachers’ attitudes, availability of IT equipment, importance of teacher professional development, sensible use of qualified music specialists in a school, availability of adequate teaching time for music, as well as the issue of the overwhelming majority of IT music programs being in English. To this should be added the issue of the digital divide, keeping in mind that two distinct interpretations of it were offered. These, certainly, provide the government and other decision makers with valuable advice for future planning.

**6.6 The perspective of university professors**

The four university professors interviewed—who comprised Group 2—provided their own individual perspectives on IT integrated music education in primary schools. One of them insisted that in order to obtain the most useful responses in relation to this topic it was essential to get feedback from the teachers themselves (as, indeed,
was done in this study). For this reason she declined to offer any insights in relation to this particular issue; fortunately, the other three university respondents did.

6.6.1 The promotion of the integration of IT

On the issue of how to promote the integration of IT in school music education, respondent B1 emphasised once again the importance of IT related teacher professional development, arguing strongly that this would enable them to take new technologies (such as “wii” from Nintendo) back into the school. He also advocated more use of IT in class not only as a means of making music teaching more effective but, especially, to address the problem of insufficient teaching time for the subject in the new curriculum. Further, he felt that many music teachers did not have adequate IT support in terms of facilities, equipment and software programs. (Interestingly, he noted that some of his own graduate students had, in addition to being music teachers, been assigned as Chair of the IT departments in their respective schools and thus were in an extremely favourable position in this regard; a similar observation was made by some of the primary teacher interviewees.) B1 also stressed the importance of school administrators understanding the role and needs of specialist music teachers, and providing adequate IT support.

Another respondent, B2, also commented on the importance of school administrators’ attitudes towards the promotion of the integration of IT. She said that their attitudes impacted on teacher practice with respect to the integration of IT; where it was positive, teachers were much more inclined to take their first steps in this field. She added that a positive attitude alone was enough—it needed to be accompanied by appropriate support. Speaking in reference to her previous students, she recalled that some of them had been isolated by their colleagues because they
advocated the integration of IT; in such a situation, support from the administration is vital, a point that was made also by some of the primary school teacher interviewees. As B2 expressed it:

> I have some students who work very hard to integrate IT into their teaching. Sometimes they might be seen to be putting pressure on their colleagues who are not interested in integration. As a consequence, their colleagues exclude them. In such a situation, if the school [administrators] do not show their support, these teachers will be very frustrated.

Where this occurred, she suggested, it was important that the school administration offer these teachers a pathway to share their ideas and experience with their colleagues; ideally, this might have a positive outcome.

Respondent B3, who was involved with the Ministry of Education’s Information Seed Schools Project, expressed a feeling of frustration regarding the state of the integration of IT in school music education. As has been discussed, this project had provided significant funding to schools for the purchase of IT equipment and for teacher professional development in the integration of IT. Her frustration was even greater given that, with the implementation of the Grades 1-9 Curriculum, the position of music had been weakened. However, she was adamant that music teachers should not be put off but should do everything they can to ensure that their subject is adequately resourced with respect to the integration of IT. As will be seen in the following section, she made a number of suggestions for the Ministry of Education.
6.6.2 Suggestions for the Ministry of Education

As requested by the researcher, the same three interviewees offered suggestions for the Ministry of Education for promoting the integration of IT in primary school music education. Even though each of them made different suggestions, the suggestions impacted on one particular issue—teacher professional development.

Respondent B1 insisted that the Ministry of Education should provide more opportunities for music teacher professional development in relation to the integration of IT. In this regard, he argued that experts in the field should come together to work out strategies for further development and promotion in this area. Ideally, he suggested, these experts could take a leading role in the provision of professional development with respect to both the theory and practical strategies for the integration of IT.

In similar vein, respondent B2 suggested that the Ministry of Education form a special professional group, comprising experienced music teachers and music professors from the universities, to engage in strong and ongoing advocacy for the integration of IT. The mission of this group would be to develop a number of models of the integration of IT suitable for primary school music teaching. Teachers could apply or modify these models as appropriate in their teaching. She emphasised particularly “sustainable promotion” of the integration of IT. This, she argued, must be accompanied by sustainable professional development, given the importance of music teachers keeping up with the rapidly expanding new technologies—and their implication for the integration of IT—that were being released worldwide.
The last respondent, B3, commented that the *Information Seed Schools Project* of the Ministry of Education was a significant project in the development of the integration of IT in Taiwan. Through this project, a number of schools were given funding and other support by the Ministry of Education to introduce the integration of IT in one particular learning area; some schools chose the Arts and Humanities. As part of this project the Ministry of Education injected a large amount of funding into teacher professional development and the construction of an IT environment in those schools that participated. This project, under the management of the Ministry’s Computer Centre, involved professors from universities, school administrators, and teachers who worked together as a team within a school. Unfortunately, this project only operated from 2001 until 2004 and the excellent infrastructure that had been established dissipated. Subsequent support for the integration of IT has not been as strong and well-considered. She said:

To promote the integration of IT, long-term and sustainable plans are needed. ... The Ministry of Education must do more than simply play around at the edges. The departure of the manager of the Ministry of Education’s Computer Centre resulted in a change in strategy and direction for the promotion of IT. Funding, further, was no longer as readily obtainable and schools were faced with the problem of not being able to adequately maintain and upgrade their equipment. And for new teachers, especially, provision for professional development fell far short of what had previously been available.

There can be no doubt that the *Information Seed Schools Project* had a pivotal role in the development of the integration of IT in Taiwan. In addition to this being reinforced here by interviewee B3, it has been seen in earlier discussions that
members of all three groups attested to its significance. Indeed, it was because of
this project that three of the primary school teachers who contributed to this study
became involved in the integration of IT. It is to be greatly regretted that the
Ministry of Education was not able to satisfactorily fill the void that resulted from the
demise of the *Information Seed Schools Project*.

6.7 Summary of the chapter
The research results in this chapter indicate that the primary school teacher
interviewees (Group 3) had a positive attitude towards the integration of IT in music
teaching. This should not be surprising, given their specialist training and
qualifications in this area at the Master’s degree level. They applied IT to the
teaching of music knowledge, music theory, aural training, music composition, music
appreciation, and instrumental learning. Resources that they accessed included
Computer Assisted Instruction (CAI) systems, the Internet, notation and sequencing
programs, audio editing programs, MIDI, digital pianos, CDs and DVDs, and
PowerPoint. These teachers discussed a range of issues, including the advantages of
applying IT in their music teaching.

These same teachers generally agreed that the application of IT in school music
education was not common across primary schools in Taiwan. Two reasons for this,
they suggested, were: insufficient IT facilities and the limitations of teachers’ IT
literacy. In recommending where teachers unfamiliar with IT should begin, they
advocated using relatively simple and available resources. They also offered sage
advice for school administrators and the Ministry of Education.
The other two groups of interviewees, the policy developers and the university professors, also provided valuable insights, and suggested strategies and directions for the promotion of the integration of IT in the future. Both groups strongly endorsed the salient importance of music teacher professional development and the importance of employing teachers who were especially qualified and experienced to teach music.
Chapter 7 Conclusions and Recommendations

In this last chapter, the conclusions of the study are presented and several recommendations are provided from different perspectives. Particular focus is on the link between the research results and research questions; each of the three major research questions is discussed in relation to the results of the study. Similarly, the conclusions are presented with reference to the research questions. The three major research questions related to the development of the integration of IT in education in Taiwan, music teacher education, and primary school music education. The study has enabled the researcher to map developments in IT integrate music education in Taiwan from the 1980s up to the present day. This chapter concludes with four sets of recommendations for the respective interviewees delineated in the study: the Ministry of Education, teacher education institutions, primary school administrators, and music teachers in primary schools. Finally suggested areas for future research into the development and status of IT in music education in Taiwan are offered.

7.1 The research questions

This study was an investigation into the integration of information technology in music teacher education and primary school music education in Taiwan. The literature review indicated that Taiwan has excellent IT infrastructures and resources in general, including those relevant to education at all levels. In the field of education, since the early 1990s the Taiwanese government has been implementing a series of IT education policies aimed at improving teaching and learning, enhancing IT literacy, and promoting life-long learning projects. In conjunction with this the government has provided significant funding support, along with the necessary teacher training, as part of the process of advocating and implementing its policies. All of this has been taking place as IT itself has seen rapid developments globally and the government has ensured that it has kept abreast of them.

With respect to music education, the literature review showed that although IT resources in education were strong, not all subjects in the curriculum have embraced
to the same extent the possibilities afforded by the new technology; this has been the case with music where many teachers were reluctant to try to become proficient in the field of IT. Eventually, the application of IT in music education has been relatively weak compared to most other subject or discipline areas.

An aim of this research was to identify problems or issues in this regard with a view to bridging the gap between teachers’ limited use of IT in music education and what might be seen as the “ideal” situation. The study began with an overview of the development of IT integrated education in Taiwan and the effects this has had on music education. Next, it reviewed the extent to the integration of IT in music is supported in teacher education and through professional development. Finally, the third dimension to the study examined the current situation in music teaching in schools in the context of possible practical approaches as suggested by three groups of interviewees: policy developers, university professors, and primary school teachers with expertise in music. The resultant insights, ideas and suggestions for the integration of IT in primary school music education have been at the core of this research undertaking and offer scope and guidelines for future directions. All of this was enshrined in the study’s three research questions:

1. What developments in the integration of information technology in music education have taken place in Taiwan?
2. How is the integration of information technology in music supported by teacher education and professional development in Taiwan?
3. How is information technology integrated into primary school music education in Taiwan?

In addressing the first of these research questions, the development of the integration of IT in music education in Taiwan is discussed with reference to policies enacted by the government. This historical perspective was undertaken in relation to three periods delineated by the researcher: the Computer Assisted Instruction period (1986 to 1997), the Internet Development period (1997 to 2001), and the Digital Content period (2001 to the present). The discussion of each period focuses
on the implementation of important policies and their impact on the integration of IT into education.

The second research question involved an examination of the integration of IT in music teacher education at both the pre-service and in-service (or professional development) levels. This included a survey of recent IT courses offered at the undergraduate and post-graduate levels by music teacher education institutions; and in-depth interviews with the three select groups of interviewees: ten primary school teachers (all of whom had a Master’s degree in music or music education in the field of IT), two policy developers, and four university professors familiar with IT courses in music. The survey of IT courses and the interviews provided the researcher with significant strategies and possible directions for improving music teachers’ training in the integration of IT within the Taiwanese context.

The third research question was addressed principally to the ten primary school teachers in order to elicit how, in their experience, IT is integrated into primary school music education. (To a lesser extent, input on this issue was also provided by the other two groups of interviewees.) This not only elicited details of the interviewees’ own experiences, viewpoints and ideas for incorporating the integration of IT into the curriculum, but also threw light on attitudes in general amongst primary school music teachers. Following this, each person interviewed was asked to proffer recommendations for music teachers, school administrators, and the Ministry of Education that might result in an improvement in this area.

7.2 Conclusions
This study’s conclusions are discussed in relation to the three research questions.

7.2.1 Development of the integration of IT in music education in Taiwan
As a result of the review of government policies, three periods of development of the integration of IT (each of which has had implications for music education) have been identified:
Although in 1975 the first computer system from overseas was introduced to design software to assist teaching in general in Taiwan, it was not until 1986 that an IT assisted music teaching system was created in the university sector for the teaching of music theory. Subsequent to this, a range of computer software programs was employed not only in the universities, but also in middle schools, primary schools, and kindergartens to assist music teaching. However, these programs resulted in sporadic approaches to IT in music education across these sectors. Specific government policies in relation to IT were not introduced until 1993—and focused principally on computer-aided systems. The period 1986-1997 was notable for the development of CAI systems as well as government funding support.

The Internet Development Period (1997-2001)
Government policies during this period emphasised the development and promotion of the Internet in education. Music educators began using internet techniques such as e-mail and homepages in their teaching. At the same time, computer assisted instruction systems continued to develop and, because of the improved infrastructure, were able to be demonstrated on the Internet, which also disseminated teaching materials and educational information. In addition, the many features of the Internet—including ease of communication and the new teaching and learning environment—created diverse and exciting possibilities for all educational sectors.

The Digital Content Period (2001 to the present)
Since 2001, the education system in Taiwan has been undergoing rapid change. This began with the implementation that year of three important policies: the provisional Grades 1-9 Curriculum Guidelines, the Information Technology Education for Primary and Secondary Schools: Blueprint, and the Information Technology Seed School Project. The new, provisional Grades 1-9 curriculum guidelines emphasised the place of IT in education as a crucial issue in all areas of teaching. In addition, the guidelines identified IT as a learning tool in the Arts and Humanities Learning Area (music, visual, and performing arts). To support this, the government offered extensive
funding for teacher education, hardware and software improvement, and the collection of digital teaching resources. Furthermore, a series of education policies involving IT, promoted a great deal of digital content databases for learning. Various learning resources such as digital archives, digital learning centres, and learning websites have been constructed since 2001. During this period many more music teachers returned to university to study for a Master of Music Education degree; because of the growing interest in IT, some of them chose to focus on it within their studies. As a consequence, they were able to provide expert advice on the use of IT in music education within their schools, and more broadly.

The research into these three periods has shown that the policies implemented during them impacted significantly on the development of the integration of IT in education systems. The aims of these educational policies were to enhance the international competitiveness of the Taiwanese, and to improve the quality of education. In implementing these policies the government was mindful of the social needs of its people and the importance of ensuring that the education system played a crucial role in addressing them. Appropriate support and funding were provided. The government believed strongly that the introduction of such changes required substantial funding accompanied by intensive teacher training in IT; this was evident in each of the three periods delineated above.

A major aim of the policies pertaining to the three periods delineated in this study was to guide future education and give strong direction to the development of the integration of IT. The policies themselves did not focus on specific subject areas. In practice this has resulted in subjects such as language, science, and mathematics gaining most attention; in relation to them, music has not been strongly supported. This, it is contended here, must be addressed without further delay. Ideally, the place of music—and all subjects—in relation to IT should be enshrined in government policies themselves and not be left to “interpretation” by education authorities and schools themselves.
### 7.2.2 The integration of IT in primary school music teacher education in Taiwan

This section has two components: pre-service training and professional development (pre-service and in-service). The conclusions presented here derive from the results of the survey of IT courses offered by music teacher education institutions as well as interviews with three stakeholders in education: policy developers, university professors, and primary school teachers.

**Pre-service teacher education**

Although all of the nine universities involved in this research have addressed the notion of the integration of IT in their own way, it is clear that there is a need for more uniformity across universities and, even more importantly, for this to be given increased weight in undergraduate degrees relating to music and music education. Certainly, the fact that IT courses are mostly offered as electives, is something that needs addressing urgently, given the argument that has been postulated here for the integration of IT. For those who enter the teaching profession it is imperative that they study the uses of IT in relation to teaching and learning at this level. Regrettably, even at the postgraduate level IT courses continue to be offered as electives in most instances. The problem is compounded by the fact that there is no common agreement by professors within and across universities regarding the content of IT courses in music: the resolution of this issue would go a long way towards addressing some of the problems that have been identified. Of course, the issue was exacerbated after the *Teacher Education Act* of 1994 which led to much greater diversification with respect to the universities and former Teachers’ Colleges.

Finally, in universities (and, as will be seen in the following section, in schools) issues surrounding computer hardware and software upgrades and maintenance not only affected the quality and content of teaching but even discouraged some professors from wishing to be involved in this area; again, this is a serious situation that must be addressed.

**Teacher professional development**

The research showed that the primary school teachers who participated in the study were not satisfied with the current offerings in IT related music teacher professional
development; principally this was because of the limited availability and inadequacy of the courses offered. The relative paucity of existing courses—as well as the inadequacy of them—supports the need for more appropriate music teacher education in this area; it also draws attention to the necessity of giving more weight to music as a subject in teacher professional development.

To assist in addressing the situation, both the teacher interviewees and the university professors provided a number of suggestions for possible modes of professional development, including conferences, lectures, demonstrations, workshops, and on-line social networks. They were in agreement on the nature and content of training programs: they should be music education specific. Given that the school teachers and those working in teacher education were in general agreement on these issues, the question must be asked: “Why has this not happened?” In large part the answer lies in the fact that the status of music has not been high and much of the in-service IT training has been of a generalised nature—not music education specific. Such an approach has tended to ignore the particular needs of music teachers and the range of IT resources that are available for music. As has been seen, the criticisms noted here apply as much to pre-service training as they do to professional development.

If further argument to support this is needed, it is—as has been noted earlier in this study—that there is evidence of a strong relationship between the nature and quality of IT training or professional development given to music teachers, and their level of motivation and application of it in the classroom; again, this underscores the need for both broad provision and quality courses as a one of the most effective strategies for improving the integration of IT in school music education.

7.2.3. The integration of IT in primary school music education in Taiwan

The research findings have suggested that the practice of the integration of IT has not been strongly endorsed by the majority of primary school music teachers; indeed, it would appear that relatively few teachers have integrated IT into their music teaching. This, it has been seen, is consistent with previous research results in
Taiwan. Even when music teachers have used IT, it has tended to focus on low-level integration activities such as playing CDs/DVDs and searching the Internet for information which has totally been teacher-centred. This study has argued that this unsatisfactory situation has not been helped by present employment policies in primary schools where experienced and well qualified music teachers can be expected to teach general classes whilst less experienced or qualified teachers are employed to teach music.

As would be expected, all ten of the primary school teachers who contributed to this study had a strong commitment to the application of IT in music education; this is not surprising of course, given that they had all graduated with a Master’s degree in Music education specialising in IT. They all believed that judicious use of IT can assist the teaching-learning process. It is a belief founded on personal experience and supported by educational research, some of which has identified the potential of IT to increase students’ learning and motivation. At the same time, no one involved in this study saw IT *per se* as a panacea for all of the challenges confronting school music teachers; equally, it was stressed that IT should not be seen simply as an ‘add-on’ to the music curriculum but, rather, integrated fully into the teaching-learning process. The school teachers and the university professors offered suggestions for strategies to maximize the benefits of IT in the music classroom. And all three groups, including the policy developers, acknowledged that overcoming a psychological barrier that “resisted” new technologies was one of the biggest impediments for many music teachers—particularly those who had been teaching for some years.

Of course, underscoring discussions relating to improving the current situation in schools and in universities is the importance of the government providing adequate funding for training, facilities, and equipment such that music is as strongly supported with respect to IT as other subject areas. But this alone is not the solution which must, in some way, bring together experts representing all three groups to advocate and design appropriate curricula and explore ways of ensuring that those teaching in universities and schools are sufficiently motivated and skilled to integrate
IT effectively. And all of this must be undertaken with respect to the country as a whole and not, as at present, principally in urban areas.

7.2.4 Research map

The following map (Figure 7.1) of this research undertaking is presented to provide a visual overview as a means of “bringing together” the various components of the study. It is, in a sense, a quasi-summary of the study’s design. The map delineates the three major components that were at the core of the research. The study has looked at issues and practices relating to the integration of information technology in music teacher education and primary school music education in Taiwan from the standpoint of the government, music teacher education, and music education in primary schools.

The research has shown that, over the past twenty years, the government has developed a series of policies aimed at improving the education system at all levels; particular emphasis has been placed on the integration of information technology into school and teacher education curricula. The implementation of these policies has been supported by substantial funding to establish appropriate technology infrastructure, to provide support for teacher education and schools, and to advocate the importance of IT in education generally. Although not all of the government’s policies relating to information technology have been an unqualified success, most of them have nonetheless had a strong impact in education, including school music education and teacher education.

With respect to music teacher education, government policies and support have impacted on pre-service training, postgraduate training, and professional (or in-service) development. Although there have been significant changes to curricula in all of these forms of training, there is still a need to continue implementing teacher education curricula and practices that adequately prepare all music teachers to integrate technology into their teaching. Particular attention needs to bridging the nexus between the training given to teachers at any level and their actual practices in the classroom. Of course, all of this must be undertaken with due consideration of
predominant philosophies and practices for integrating technology into music programs.

Although what happens at the school level is, to a large extent, a result of government policy and teacher education, there are particular issues that reflect the nature of schools themselves that must be addressed. Even where music teachers are adequately prepared and motivated to integrate information technology into their curricula, and where IT facilities and resources are of a high standard, there remains the issue in some schools of sensible employment of these teachers. It has been seen that, for administrative reasons, some are relegated to general classroom teaching whilst “part-time” teachers are employed to teach music; it is an issue that must be addressed. Further, there is the issue of some schools not having any access to a qualified music teacher or adequate IT facilities.
Figure 7.1 Research Map

Integration of Information Technology in Music Teacher Education and School Music Education in Taiwan

Government
- Policy Initiation
- Policy Development
- Policy Implementation

Music Teacher Education
- Pre-service Training
- Professional Development (In-service)
- Postgraduate Training

School Music Education
- Integrating IT
- Music Education
- IT Infrastructure

IT Education Policy
Curriculum Guidelines
Funding
7.3 Recommendations
The following recommendations emerge from the study. They relate to the government and the Ministry of Education, music teacher education institutions, primary school administrators, primary school music teachers, and future research. In offering these recommendations it must be stressed that the integration of information technology into school music programs is not being suggested as a panacea per se for all of the challenges confronting school music teachers; nor is it seen simply as an “add-on” to the music curriculum but, rather, as being fully integrated into the music teaching-learning process.

7.3.1 Government and the Ministry of Education
• Unfortunately, policies relating to information technology have tended to focus on education in general and not been subject specific. In practice this has often meant that subjects such as language, mathematics and science have been more strongly supported than subjects like music. It is something the government should address in the formulation of future policies to ensure parity in funding for information technology and not inequality based on a supposed hierarchy of subjects. This should also be reflected in curriculum documents themselves. The place of music in relation to information technology should be enshrined alongside all other subjects in government policies and curriculum documents and not be left to “interpretation” by education authorities and schools.

• There is a need to develop a general information technology literacy standard for teachers. It should be the responsibility of teacher education institutions to ensure that, upon graduation, all pre-service students meet this standard. Further, students who are studying to become music teachers should also be obliged to meet a standard that relates specifically to the use of information technology in music teaching and learning. Practising teachers should also be required to meet this standard; this may involve them undertaking special professional development in order to achieve it. This is a responsibility of the Ministry of Education.
• The previous recommendation implies that there should be greater consistency and parity between universities in the nature and content of the information technology courses they offer. There is a need for the Ministry of Education to ensure that this is addressed. Relatedly, the relative paucity of existing professional development courses in music—as well as a perceived inadequacy—supports the need for more quality, music-specific courses. At the core of this issue is the need for both broad provision and quality courses at the pre-service and in-service or professional development levels as a one of the most effective strategies for improving the integration of information technology into school music education.

• The very nature of information technology requires ongoing maintenance and upgrading of facilities and resources. It is therefore incumbent on the government and the Ministry of Education to ensure that all teacher education institutions and schools are appropriately funded and resourced with respect to their IT needs.

• It is recommended that the Ministry of Education establish and maintain a systematic teaching materials’ database for music education. In addition to providing easily accessible material for music teachers, it should support them in their endeavours to integrate information technology into their teaching.

7.3.2 Music teacher education institutions

• The study has shown that information technology courses are generally offered as electives and not as compulsory subjects. It is imperative, if standards are to be met, that all students studying music are compulsorily obliged to enrol in appropriate and “accredited” information technology subjects that themselves satisfy Ministry of Education directives.

• University personnel who teach in information technology areas need to be strongly supported by professional technicians who can maintain IT laboratories, equipment, and resources. This saves teachers from having to solve technical problems and allows them to concentrate on teaching per se. Of course the issue is not confined to those teaching music and is a university-wide responsibility. Ideally,
such support will enhance teachers’ enthusiasm and contribute to greater
effectiveness in their teaching. (A similar recommendation applies to schools which
also need to ensure that classroom teachers are appropriately supported when using
IT.)

7.3.3 Primary school administrators
• The school administration has responsibility for the whole curriculum.
Unfortunately, despite music being a component of the curriculum, the support it is
given depends to a large extent on the principal and other members of the
administration team; whilst in some schools this is strong, in others it is weak. Not
only should administrators accord music its rightful place in the curriculum, but they
should also make certain it is taught by those most qualified to teach it. This includes
ensuring that music teachers are appropriately trained, resourced and supported to
use information technology. The study has drawn attention to a not uncommon
situation whereby teachers less qualified in music and information technology are
employed to teach music over others who are better trained and more experienced,
but relegated to general classroom teaching. Indeed, only half of school teachers
interviewed for this research had been assigned the role of music teacher: the others
were general classroom teachers despite the fact that all of them had a Master’s
degree in Music Education specialising in information technology.

7.3.4 Primary school music teachers
• The interviews with the three groups of stakeholders, as well as the literature
reviewed, have suggested that many primary school teachers face a psychological
barrier in using technology. This presents the most serious challenge to the
promotion of information technology in music teaching. It is recommended
therefore that all stakeholders explore ways of assisting teachers to overcome this
reluctance to use technology. At least part of the solution might entail beginning
with easy to use and appropriate resources that readily lead to a feeling of comfort
and success for teachers and students; this in turn can function as a source of
motivation to explore further the uses and benefits of information technology in the
classroom. Rather than recommending a particular theoretical framework, the
researcher recommends this directive (beginning with easy to use and appropriate resources) for teachers in integrating IT in their teaching because it is more applicable in various educational circumstances. To assist this, relevant and easily accessible professional development must be offered, and teachers should be encouraged to seek the support of their colleagues and participate in professional networks.

7.3.5 Future research

• This research undertaking has focused on the integration of information technology into music education programs in primary schools in Taiwan. The study could be extended to investigate the corresponding situation in secondary schools. Comparative studies could also be undertaken with school systems in other countries. Further, to go beyond music, there might be some benefit in exploring the ways in which information technology is incorporated into other subjects and discipline areas in schools and universities in Taiwan and beyond.

• Whilst it can be claimed that this research used a representative sample of interviewees, there might be some benefit in extending it more broadly—and, in particular, to primary and secondary school teachers in general in Taiwan. Such a study, which might involve a questionnaire sent to schools and music teachers, could assist in gathering an overall picture of attitudes and practices towards music and the use of information technology held by teachers and school administrators.

• A useful project would be one that investigated best practice for integrating information technology into music programs in schools and universities. Such a study would be conducted globally and seek out resources and strategies for assisting teachers to develop and teach programs that best support music teaching and learning at all levels of the education spectrum.
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ISME World Conference in Bologna, Italy.


Educators Journal, 93(3), 36.


Teachers College, Columbia University, New York, NY


Dear Participant,

My name is Hung Pai Chen. I am undertaking a PhD in Education in the School of Education at RMIT University, Australia.

The title of my research is: The integration of information technology in music teacher education and school music education in Taiwan: a conceptual framework. The aim of this research is to investigate the development and integration of IT in music teacher education and school music education in Taiwan, and to construct a conceptual framework in this field.

I would like to invite you to be involved in this research. This research includes three different questionnaires to three groups of interviewees: official document builders, experts in music teacher education and IT integration, and primary school music teachers. The questions for the interviews will be sent to interviewees in advance to guide the interview. Names are kept confidential (unless you agree to disclose your identity) and the recordings of the interviews will be securely stored in the researcher’s study in line with the procedure of RMIT University. I will be asking for your opinions about IT integration in music teacher education and primary school music education in Taiwan. The interview will take approximately 45 minutes.

This project would be completed by 2010 and the outcome will be the development of a conceptual framework of IT integration in primary school music education in Taiwan. It is anticipated that it will benefit government policy building, music teacher education program development and primary school music education in Taiwan. The results of this study may appear in publications.

Privacy and Disclosure of Information will be kept confidential and in accordance to the regulations and procedures set by the University. Participation is voluntary and you are free to withdraw from the project at any time and to withdraw any unprocessed data previously supplied. Further information including contact names and numbers for any questions/problems can be withdrawn if necessary in the case of interviews.

This research is not funded by any particular organization. My supervisor’s name is Dr. David Forrest and he can be contacted on (+61 3) 9925 4920 or david.forrest@rmit.edu.au. I thank you in advance for your participation in this interview. Without your assistance I will not able to conduct this research. Thank you for your willingness to help.

Yours sincerely,

Hung Pai Chen

Any complaints about your participation in this project may be directed to the Executive Officer, RMIT Human Research Ethics Committee, Research & Innovation, RMIT, GPO Box 2476V, Melbourne, 3001. Details of the complaints procedure are available at: http://www.rmit.edu.au/rd/hrec_complaints
敬愛的老師您好：

我是澳洲皇家墨爾本理工大學 RMIT University 博士候選人陳虹百 (Hung-Pai Chen)，在 Dr. David Forrest 的指導下目前正在進行博士論文，研究題目為「台灣資訊融入音樂教學的師資訓練及學校教育概況」(The integration of information technology in music teacher education and school music education in Taiwan: a conceptual framework)。希望藉由此論文，瞭解台灣資訊融入音樂教學的發展情形、教師訓練以及學校中實際應用狀況，並且提供可行的資訊融入音樂教學模式以供教師訓練及學校音樂教學之用，冀能為後續對此議題有興趣的相關人員，提供參考的資料，對國內音樂教育略盡心力。

您的專業經驗能為本研究提供相當有價值的資料，因此個人很希望能有機會向您請教並進行訪談，以豐富研究的內涵與結果。訪談內容僅供研究論文使用，絕不移作他用。因此，請您以輕鬆自然的心情來聊聊您的經驗與看法。本研究的訪談部分，約需 45 分鐘。同時，為了資料的整理與分析，希望您同意於訪談過程中錄音。錄音內容僅作為研究者分析資料、編碼及因素歸類之用。基於保護受訪者的緣故，除非徵得您的同意，您的姓名及服務單位於論文中一律隱匿。希望您能提供真實的意見，以增加研究資料的正確性。在研究過程中，您可以隨時收回您所提供的任何資料。若您對本研究有任何建議，歡迎隨時提供給研究者，並誠摯邀請您參與本研究。

本研究擬在 2010 年底前完成，在研究完成審核後，必定致贈研究結果給閣下，以表達最深的謝意。隨函檢附「訪談大綱」乙份，懇請惠予協助。再次感謝您的熱忱協助！

敬頌 大安

陳虹百 Hung-Pai Chen
敬筆

TEL : 06-3112522 ; 0931096961 ; +61402723995
E-mail: hungpai.chen@student.rmit.edu.au

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Bundoora Campus
PO Box 71 Bundoora 3083
Victoria Australia
Tel: +61 3 9925 7480
Fax: + 61 3 9925 7586
Appendix 3 Consent Form (English)

RMIT HUMAN RESEARCH ETHICS COMMITTEE

Prescribed Consent Form For Persons Participating In Research Projects Involving Interviews, Questionnaires, Focus Groups or Disclosure of Personal Information

PORTFOLIO OF SCHOOL/CENTRE OF
Design and Social Context

Name of participant: [Name]
Project Title: [Project Title]

Name(s) of investigators:
(1) Hung Pai Chen Phone: 0402723995
(2)

1. I have received a statement explaining the interview involved in this project.
2. I consent to participate in the above project, the particulars of which - including details of the interviews or questionnaires - have been explained to me.
3. I authorise the investigator or his or her assistant to interview me or administer a questionnaire.
4. I give my permission to be audio taped/photographed [Yes] [No]
5. I give my permission for my name or identity to be used [Yes] [No]
6. I acknowledge that:
   a. Having read the Plain Language Statement, I agree to the general purpose, methods and demands of the study.
   b. I have been informed that I am free to withdraw from the project at any time and to withdraw any unprocessed data previously supplied.
   c. The project is for the purpose of research and/or teaching. It may not be of direct benefit to me. The privacy of the information I provide will be safeguarded. The privacy of the personal information I provide will be safeguarded and only disclosed where I have consented to the disclosure or as required by law. If I participate in a focus group I understand that whilst all participants will be asked to keep the conversation confidential, the researcher cannot guarantee that other participants will do this.
   d. The security of the research data is assured during and after completion of the study. The data collected during the study may be published, and a written report of the project outcomes will be provided to participants by the researcher at the end of the project. Any information which may be used to identify me will not be used unless I have given my permission (see point 5).

Participant’s Consent

Name: [Name] Date: [Date]

(Participant)

Name: [Name] Date: [Date]

(Witness to signature)
Where participant is under 18 years of age:

I consent to the participation of __________________________ in the above project.

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(Signatures of parents or guardians)

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(Witness to signature)

Participants should be given a photocopy of this consent form after it has been signed.

Any complaints about your participation in this project may be directed to the Executive Officer, RMIT Human Research Ethics Committee, Research & Innovation, RMIT, GPO Box 2476V, Melbourne, 3001. Details of the complaints procedure are available at: [http://www.rmit.edu.au/rd/hrec_complaints](http://www.rmit.edu.au/rd/hrec_complaints)
### Appendix 4 Consent Form (Chinese)

RMIT 人文研究倫理委員會 參與研究受訪者訪談同意書

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<td>研究題目</td>
<td>台灣資訊融入音樂教學的師資訓練及學校教育概況</td>
</tr>
<tr>
<td>研究者:</td>
<td>陳虹百 Hung Pai Chen Phone: +61-402723995</td>
</tr>
<tr>
<td>Dr. David Forrest Phone:</td>
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1. 我已瞭解這個訪談在本研究中的定位。
2. 我同意參與本研究，並同意研究者使用對我訪談所得的資料。
3. 我同意研究者對我進行訪談。
4. 我同意訪談過程錄音。 □ 是 □ 否
5. 我同意在本研究中公開我的姓名及辨識資料。 □ 是 □ 否
6. 我已瞭解：
   a. 我已經閱讀了訪談說明，且同意本研究的目的、方法及用途。
   b. 我已經被通知我可以在研究中隨時收回我所提供的資料。
   c. 本研究只供學術用途，對我而言可能沒有直接的利益。我的個人隱私與提供的研究資料將會受到保護。除非法律上的需要，或徵得我的同意，我的個人資料將受到隱匿的保護。
   d. 從研究開始直到研究完成後，研究資料的安全都將得到保障。在研究完成或發表後，研究者將提供我研究的結果。我的個人資訊除非徵得我的同意否則將被隱匿 (見第 5 點)。

受訪者姓名 ____________________________ 日期 ____________

受訪者簽名 ____________________________ 日期 ____________

受訪者將保有本同意書影本

若您參與過程中有任何意見需反映，請洽詢以下地址或網址：
Executive Officer, RMIT Human Research Ethics Committee, Research & Innovation, RMIT, GPO Box 2476V, Melbourne, 3001.
http://www.rmit.edu.au/rd/hrec_complaint
Appendix 5 Interview Schedule I (Chinese)

訪談大綱Ⅰ

本訪談旨在了解台灣資訊融入教學的發展，並探求專家們對推廣資訊融入的意見，包括個人經驗、推廣方法與未來的發展建議等。專家們可以依據自己的相關經驗與看法陳述回答，如果可能的話也請在回答提及資訊融入音樂教學的範圍。

1. 請敘述您在資訊融入教學方面的相關背景與經驗。
2. 您對資訊融入教學的看法為何？
3. 請您敘述資訊融入教學在台灣的發展過程。
4. 在台灣的資訊融入教學發展過程中有哪些重要的記事（如政策、法案、會議……等）？他們的影響為何？
5. 資訊融入教學推廣後，對師資培育機構產生哪些影響？
6. 資訊融入教學的推廣後，對小學學校教育產生哪些影響？
7. 如何在「職前教師培訓」及「在職教師訓練」中推廣資訊融入教學？
8. 如何在小學學校教育中推廣資訊融入教學？
9. 對於「職前教師培訓」及「在職教師訓練」而言，推廣資訊融入教學的挑戰為什麼？
10. 對於小學學校教育而言，推廣資訊融入教學的挑戰為什麼？
11. 對於「職前教師培訓」及「在職教師訓練」而言，未來推展資訊融入教學的方向為什麼？
12. 對於小學學校教育而言，未來推展資訊融入教學的方向為什麼？
訪談大綱 Ⅱ

本訪談旨在瞭解台灣師資培育機構資訊融入教學課程的提供情形，並冀能瞭解專家們以師資培育的立場，在推廣資訊融入教學訓練上的意見，包括個人經驗、推廣方法與未來的發展建議等，專家們可以依據自己的相關經驗與看法陳述回答。

1. 請敘述您在資訊融入教學方面的相關背景與經驗。
2. 您對資訊融入教學的看法為何？
3. 您覺得音樂教師必須具備哪些資訊融入的知識與技能？
4. 貴系目前大學部及研究所開設哪些資訊融入相關的課程？
5. 從這些課程當中，學生學習到哪些知識與技能？
6. 承上題，學生對這些課程的反應如何？
7. 貴系在進行這些資訊融入相關課程時，面臨哪些挑戰？
8. 您對音樂師資培育機構提供資訊融入教學課程有哪些建議？
9. 您認為應該如何培訓在職音樂教師實施資訊融入教學？
10. 請您建議幾個資訊融入音樂教學實施的策略或模式。
11. 您對未來教育部推廣資訊融入音樂教學有哪些建議？
12. 您對未來小學學校教育推廣資訊融入音樂教學有哪些建議？
訪談大綱 III

本訪談旨在瞭解台灣小學音樂教學中資訊融入的情形，並探求專家教師們對推廣資訊融入的意見，包括師資訓練課程的回顧、個人資訊融入的經驗、資訊融入音樂教學的推廣方法與未來發展的建議等。專家教師們可以依據自己的經驗與看法陳述回答。

1. 請敘述您在資訊融入教學方面的相關背景與經驗。
2. 您對資訊融入教學的看法為何？
3. 現今在小學資訊融入音樂教學的一般狀況為何？
4. 現今在小學實施資訊融入音樂教學的挑戰為何？
5. 您平常都是如何實施資訊融入在您的音樂教學中？
6. 資訊科技如何改善您的教學、解決您教學上的問題？
7. 您覺得實施資訊融入教學對您而言有哪些優缺點？
8. 您在進行資訊融入音樂教學時，希望能得到哪些方面的協助？
9. 您對未來教育部推廣資訊融入教學，尤其在音樂教學方面有哪些建議？
10. 您在師資培育的階段有修過資訊融入教學相關的課程嗎？內容為何？對您現今的教學有何影響？
11. 您在工作的期間有參與任何資訊融入教學的訓練嗎？內容為何？對您現今的教學有何影響？
12. 您對師資培育機構的「職前教師」及「在職教師」資訊融入教學訓練有哪些建議？
13. 您對國小資訊融入音樂教學有哪些建議（如政策、行政管理、課程、設備......等）
14. 您對其他音樂教師在實施資訊融入教學上有哪些建議？
15. 請您建議幾個資訊融入音樂教學實施的策略或模式。
敬愛的老師您好：

感謝您接受我的訪談，叨擾您了！不好意思！附上訪談逐字稿懇請您過目。核閱完畢後，還望您確認是否有不妥之處，謝謝您！再次謝謝您的協助與支持！

敬頌 大安

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E-mail: hungpai.chen@student.rmit.edu.au
Appendix 9 Letter of Approval and Ethics Clearance

RMIT University

Human Research Ethics Sub-Committee
Phone: 9925 3774
Email: cheryl.deleon@rmit.edu.au

5 September 2008

Ms Hung Pai Chen
205/58 La Trobe Street
MELBOURNE. 3000

Dear Ms Chen,

Re: Human Research Ethics Application – Register Number HREC B-079-06/08

The Design and Social Context Human Research Ethics Sub-Committee, at its meeting on 4 September 2008 considered your amended ethics application entitled “The integration of information technology in music teacher education and school music education in Taiwan: a conceptual framework”.

I am pleased to advise that your application has been approved as Risk Level 2 classification by the committee. This approval will now be reported to the University Human Research Ethics Committee for noting.

This now completes the Ethics procedures. Your ethics approval expires in December 2010.

Please note that all research data should be stored on University Network systems. These systems provide high levels of manageable security and data integrity, can provide secure remote access, are backed on a regular basis and can provide Disaster Recover processes should a large scale incident occur. The use of portable devices such as CDs and memory sticks is valid for archiving, data transport where necessary and some works in progress. The authoritative copy of all current data should reside on appropriate network systems; and the Principal Investigator is responsible for the retention and storage of the original data pertaining to the project for a minimum period of five years.

You are reminded that an Annual/Final report is mandatory and should be forwarded to the Portfolio Ethics Subcommittee Secretary by mid-December 2008. This report is available from: URL: http://www.rmit.edu.au/dh/hrec_apply

Should you have any queries regarding your application please seek advice from the Chair of the sub-committee Associate Professor Heather Fehring on (03) 9925 7840, heather.fehring@rmit.edu.au or contact Cheryl de Leon on (03) 9925 2974 or email cheryl.deleon@rmit.edu.au

I wish you well in your research.

Yours sincerely

CHERYL C DE LEON
Secretary
DSC Human Research Ethics Sub-Committee

cc:
A/Prof David Forrest, School of Education
Louise Prentice, School of Education