CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

The purpose of reviewing the literature is to find out and learn more about the related research efforts done on the subject. This was particularly important as it helped the researcher to analyze the extent of the availability of research and documents on the topic. Furthermore, the review exercise assisted the researcher in that it was relatively easier to define clearly and delineate the research problem. The review process also yielded new concepts and search terms which were related to the topic of study.

From another perspective, the literature review’s main functions are to unveil substantial reasons as to why the topic was of sufficient importance to be researched. Secondly, it would provide the reader with a brief up-to-date account and discussion on the issues relevant to the topic. Furthermore, it provided a conceptual and theoretical context in which the topic of research was to be situated. Lastly, the review process was a precursor to a discussion of the relevant researches carried out on related or similar topics (Stevens et al., 1993; Blaxter et al., 2001).

The literature review is also useful in that it helped to answer some important questions. For instance, it provided some insight into the key sources, the major issues and debates about the topic, and some origins and definitions of the topic. In addition, the review process made it possible to uncover some concepts and ideas; the main questions and problems that have been addressed to date, as well as the structure and organization of the knowledge on the topic of research (Hart, 1998). In addition to all the above, certain specific facts and conclusions related to the topic of inquiry were also unveiled.
All the above are important as they helped the researcher in establishing some of the important facts and themes related to the topic, as well as designing the research problem and formulating research questions that were appropriate in relation to the topic of study.

The researcher’s approach to reviewing the related literature was based on the following:

a) Searching databases and library catalogues. The main databases that were searched during the literature review were ERIC (Education Resources Information Center), LISA (Library and Information Science Abstracts), Lisa Plus, Proquest (Dissertation Abstracts by University Microfilms International), PsyLIT (Journal Articles, chapters and Books), Wilson Disc (Education Full Text) and Ebsco host. These were the main databases that were found to contain relevant items on the topic of research.

b) Online public access catalogues and digital library of University Malaya, International Islamic University, University Putra Malaysia, and Open University Malaysia's Digital Library at: http://www.oum.edu.my/portal/ and National Library of Malaysia were also thoroughly searched for relevant documents on the topic of study.

c) The World Wide Web and related Internet information resources and services available by electronic mail, for example Google Scholar, question answering services, electronic discussion groups, Usenet newsgroups, online professional journals related to education and instructional technology were also searched during the study.

The keywords and search terms employed while searching the databases and catalogues were: instructional needs, information seeking, information searching, information technology, special education, education curriculum, computer technology, multimedia networks, computer-assisted instruction, Technology integration., Barriers to
Information technology, Information Technology-related Competencies, Information technology-based resources, online searching, software program, electronic service, school, teach, learn, etc. and combinations of these. Other terms employed to search the databases and catalogues on a narrower basis included: disabled children, learning disability, handicapped children, special children, special school, Down syndrome, autism, attention deficiency hyperactivity disorder (ADHD), emotional instability / behavior problems, mental retardation and slow learners.

The basis for selection of the items was relevancy to the topic of research. The relevancy of the items was determined through subject search terms, key words, main concepts and ideas in documents as they related to the title or subject of research. The time period covered was also considered. The documents selected were those that were found relevant and falling within the time period between 1992 and the time of the study until 2005. This time period was selected because Malaysia, like other Asian countries, came up with policies regarding special education that have been fulfilled during the decade 1983 -1992 (Lynch, 1994). However, in certain cases this time period was used flexibly, depending on the importance of the document. This means that any latest documents relevant to this study are also included.

In order to understand the research problem from a precise but detailed perspective, the first part of the literature review covers areas related to benefits of IT to instruction, followed by IT and special education in general plus IT and domain instructional benefits. In an attempt to cast the research problem within the larger literature about issues related to IT and instructional needs in special education, certain subject areas were covered. They include; computer assisted instruction and special education; multimedia technology and the teaching-learning process; current use of IT-based
resources for instructional needs; barriers to information technology integration in special schools; IT-related competencies and teachers; Lastly, in an effort to localize the research study, an attempt was made to find some documentary evidence regarding IT and special education curriculum instructional needs in Asia. The literature also examined IT and education in Malaysia in general.

2.2 Benefits of Information Technology to Instruction

Several research studies have investigated and explored the benefits of integrating computer-based applications and instruction. In general, they indicated that computers could provide students with vibrant and new ways to learn (Lee and Vail, 2005), provided students with accurate and valid learning experiences (Office of Technology Assessment, 1995) and boosted academic progress and achievement by sustaining learning in a wide array of skill areas (Wehmeyer et al., 2004).

Computer-based strategies offered step-by-step instructions in task performance to boost user confidence (Lancioni, O'Reilly and Campodonico, 2002) and increased students’ inquiry and analytical skills (Honey and Henriquez, 1993). Also, computer-based instruction, with prompting devices, improved focus on the learning process, accuracy and independence in accomplishing tasks (Davies, Stock and Wehmeyer, 2002a). It also promoted better time management in vocational instructional settings (Davies, Stock and Wehmeyer, 2002b).

Information technology enhances learning by providing students with extra help in the skill areas in which they are deficient (Coughenour, 2002). Furthermore, computer-based applications offer individualized support to meet the diverse needs of students, guide them towards higher development of competencies by controlling frustration and
promoting interests in their tasks (Cheng-Fang, 2004). At the same time, IT achieved this endeavor by availing support in the learning process through specialized computer training programs (Stock, Davies and Wehmeyer, 2004).

The concept of utilizing virtual technologies in the classroom can boost students’ morale, by making abstract learning concepts more concrete, enabling students to progress through an experience at their own pace, and encouraging active participation rather than passive observation (Pantelidis, 1995). At the same time, IT provides support facilities to benefit students in the classroom in order to remain on task, remind them of pending assignments, and provide access to information on the computer or the Internet (Braddock et al., 2004).

Computer-based applications have also influenced students’ understanding and respect for cultural differences (Gersh, 1994), improved students’ attitudes and communication skills (Chiu, 1996; Follansbee et al., 1996), and increased the quality of student writing (Wright, 1991; Lewis, 2000). Other facilities, for instance the Internet can help students to extend their thinking as well as reasoning skills and achieve multiple objectives within a single lesson (Harris, 2000).

As for the teachers, the benefits included increased collaboration and communication with their peers (Donlan, 1998; Honey and Henriquez, 1993) and `fingertip’ access to research, online experts, and many curriculum resources (Barron and Ivers, 1998). At the same time, computer programs can be valuable tools to teach and provide practice of new vocabularies or concepts in general education classrooms. They can also save teachers’ instructional and preparation time (Lee and Vail, 2005). In addition, computer-based applications help teachers to realize job satisfaction by allowing them to devote
sufficient attention to all students and offering them alternatives to individualize lessons (Coughenour, 2002).

Furthermore, computer based facilities can help teachers in introducing and implementing more sophisticated applications in the process of integrating technology into the learning environment (Pearson and Swain, 2001). Also, computer programs can assist teachers in promoting higher-level critical thinking abilities among students (Gorski, 2005). At the same time, by promoting digital and multimedia inclusion in their instructional strategies, teachers can also expose their students to a variety of electronic resources and engage them in activities that use technology for communication, research, problem solving and decision-making (Swain and Pearson, 2002).

Other IT-based facilities like a Web-based book marking service for instance at (www.iKeepBookmarks.com) can help teachers to enhance the curriculum and save time during the instructional process. This implies that such a service can also add value, interest, excitement and above all improve students’ attention and focus during the learning process. In addition, such a service would enable students to access the very best of the web material for classroom instruction and learning purposes (Forbes, 2004).

On the other hand, the World Wide Web and its myriad of sites provide resources and activities that support student learning. As a result, an increasing number of special education teachers have acquired sufficient skills in browsing and searching the World Wide Web for instructional materials (Gardener and Wissick, 2002).
2.3 Information Technology (IT) and Special Education

The focus on the application of information technology for individuals with intellectual disabilities is a fairly recent phenomenon (Wehmeyer and Smith, 2004). This partly explains why in the decade starting from the year 2000 onwards, the use and interest in computer programs is greater than ever before in both general and special education classrooms (Lee and Vail, 2005).

Clearly, the inclusion of students with learning disabilities in general education has led to a creation of new software and hardware programs designed to provide the necessary accommodations and modifications that these students might need. Yet access and usage continues to be limited for many students with disabilities (Jackson, 2003). The application of IT in special education was said to have emerged with the use of a computer station to provide an ideal environment for individual learning activities, provided that the software programs were suitable enough to allow the student to work on the desired skills (Ray, 1995).

Initially, children with special needs (physical, sensory, cognitive, emotional.) were made to utilize technology-based software and tools originally developed for normal students. This was quite difficult as the two were sometimes not compatible. The special children needed the skills and support of effective and experienced teachers who understood their learning characteristics. This also required that teachers be able to match the content and features of software to the needs and characteristics of their special education students. However, special teachers found the whole process extremely difficult and frustrating most of the time (MacCArthur and Malouf, 1991). As a result, a series of studies were conducted to explore the effectiveness of technology and the role it could play in promoting task performance. It was found that computer-
based strategies improved performance across tasks for individuals with moderate to severe intellectual disabilities (Lancioni et al., 2000).

Some two decades ago, Taylor (1981) explained that special education software programs were mainly designed to present simple skills and basic knowledge. They provided drill and practice activities, tutorials, games, simulations, problem solving and exploratory learning activities. By using the computer to record student performance in these activities, teachers were able to make informed decisions regarding instructional strategies as well as individual education program objectives and content (Merrill et al., 1996). Therefore, since the early eighties, special education teachers have used instructional software programs to encourage learning-by-doing.

However, based on the notion of individual student abilities and developmental stages, teachers use software programs to provide challenging but accomplishable tasks which motivate children with learning difficulties. Therefore, computer assisted instruction (CAI) or computer managed instruction (CMI) connotes direct one-to-one computer to student activity (Castellani, 1999)

The end of the nineties and the beginning of the new century has witnessed some striking technological changes in IT development. Due to advanced research and improved software product development, tutorial and drill programs have become less popular (Kurzweil, 2002). Instead, software tools, particularly word processors and desktop publishing programs are more popular. The design of educational software programs has shifted from a linear model to a hypermedia model. Whereas the traditional linear software was highly structured, hypermedia applications present
choices to the user to exercise control over the flow of interactions with the programs (Lewis and Doorlag, 1999; Lewis, 2000).

2.3.1 IT and Domain Instructional Benefits

There are many benefits of how information technology can assist students with learning disabilities in their domain instructional process. First, IT provides the opportunity to deploy assistive technologies in the process of helping students with cognitive disabilities. It enhances their functional skills in reading, learning and studying activities (Technology and Media Division, 2003). At the same time, IT lends a critical support needed by intellectually challenged students for example, with mental retardation to improve their performance across multiple environments, including school (Wehmeyer and Smith, 2004).

Computer-assisted learning and communication tools provide the needed support for students with cognitive disabilities through the use of specialized training programs. For instance, voice interfaces (Barker, 2002), picture-based e-mail programs, and modified web browsers such as Web Trek (Davies, Stock and Wehmeyer, 2001) assist in the learning process. Other facilities include wearable computers (for example, in the form of a data glove) which assists students with intellectual disabilities by translating American sign language and also transmitting information wirelessly to an electronic display device for the learner (Patterson, 2002).

Other studies have also documented the advantages of providing instruction to students with intellectual disabilities using virtual technologies and computer based simulations (Akhutina et al., 2003; Lannen, Brown and Powell, 2002). For instance, the “full bodied three-dimensional animated characters” with such capabilities as required to engage in
natural “face-to-face” conversational interactions with users, can enormously assist special children with speech and reading difficulties by interacting with them to improve their speech quality and language skills (Ma et al., 2004).

On the other hand, some researchers have also reported employing virtual technologies to provide instruction to students with intellectual disabilities in such community-based activities like shopping, social interactions and safety (Langone, Clees, Rieber and Matzko, 2003). Furthermore, it was observed that skills learned in virtual environments were transferred to real world challenging contextual experiences and situations with significant success (Standen, Brown and Cromby, 2001).

This section of the literature review highlighted some major technological advancements and software product engineering improvements for special education purposes. Hence the highly structured traditional linear software formats like tutorials and drill programs were slowly being replaced by more popular hypermedia applications. This enabled the users to exercise control and freedom of choice over the flow of interactions during the learning process. On the other hand, such freedom for the intellectually challenged meant closer and stricter teacher supervision. Otherwise, if left to themselves, they would be carried away from the target goals. Nevertheless, with all the necessary accommodations and modifications in place such as voice interfaces and hearing facilities, special children could improve their performance across multiple environments.

2.4 Information Technology and Domain Instructional Needs

This section of the literature review covers some of the relevant documents on IT and its support for domain instructional needs. As noted through the various studies, IT plays a
dual purpose role. It provides the needed support for students with learning disabilities, while at the same time enabling teachers to give challenging but accomplishable learning activities and tasks to the students. As an interface, IT provides the finest medium capable of handling text, sounds, pictures or multimedia instructional materials. The use of IT support in the teaching-learning process for students with intellectual disabilities is what has been generally referred to as computer assisted instruction (CAI).

2.4.1 Computer Assisted Instruction and Special Education

Computer-assisted instruction (CAI), i.e. the use of the computer in the process of delivering instruction including presenting new information and providing practice (Newby, Stepich, Lehman, and Russell, 1996), has the potential to play a significant role in the education process of students with disabilities (Jerome and Barbeta, 2005). Although there is a growing body of literature that documents the benefits of using CAI with intellectually challenged students (Irish, 2002 and Smith, 2000), some suggest that CAI is effective when used as a supplement to traditional instruction (Hall, Hughes and Filbert, 2000). For instance, computer-assisted instruction was shown to improve academic achievement in mathematical skills especially among children with attention-deficit hyperactivity disorder (Ota and DuPaul, 2002). CAI was also noted for its general contribution in increasing fluency of skills learned (Mechling and Cast, 2003).

Computer assisted instruction has been employed in special education since the early eighties. From that time until today, the application and use of computers has dramatically continued to improve. With continued research and innovations in information technology, more efficient applications and software programs have been created and put to use in special education for various instructional purposes (Bernard-
Opitz et al., 1990). For instance, the emergence of hypermedia-based children’s talking story books in the language domain (Lewis, 2000) is one such development. At the same time, software product engineering for special needs has continuously progressed and advanced from stand-alone devices and applications to connected, integrated and multi-technology systems (Kurzweil, 1999, 2002). Moreover, electronic products and computer software systems have evolved to become smart, adaptive as well as personalized (Braddock et al., 2004)

In two related studies, professionals and researchers described how computers and virtual reality tools played an important role in the learning process of students with autism and those with cognitive disabilities. For instance, it was observed that children with autism had monotropic interest inclinations and their attention tended to be fixed on isolated objects. They viewed objects as though through a tunnel and quite separate from the surrounding environment. Computers were found to be an ideal resource to break into each student’s world. This is because computers were used to ‘start where the child was’, by joining the individual’s attention tunnel. Therefore, autistic students ignored all external events when focusing on a computer screen. They tolerated higher sensory input via a computer than they could apparently tolerate elsewhere. Due to a context free environment offered by computers in which autistic students felt comfortable, teachers were increasingly using virtual reality tools to teach life skills such as crossing a road, and social skills such as recognizing emotions in other people (Murray and Lesser, 1999; Murray, 1997).

In a related study, it was demonstrated that virtual reality tools can help to overcome barriers to real-world training situations like costs, safety and accessibility (Cromby et al., 1996). In the recent past, special education researchers have used virtual
technologies to provide instruction to students with cognitive disabilities in community-based activities such as shopping, social interaction and safety (Langone et al., 2003). Moreover, it was observed and reported that skills learned in virtual environments were transferred to real world situations with considerable success (Standen et al., 2001).

In a related development, researchers at the University of Colorado created “full-bodied three-dimensional animated characters” with a capability to engage in “natural face-to-face conversational interaction with intellectually challenged students (Ma, Yan and Cole, 2004). Children with speech and reading difficulties showed improvement in general language skills after interacting with the virtual reality program. The animated characters helped students with intellectual disabilities to build confidence while being entertained. These characters both motivated and engaged intellectually challenged students with sustained interest. As a result the program was made available in English, Spanish and other languages (Ma et al., 2004).

Hitchcock and Noonan (2000) explained how computer-assisted instruction could be used to generate information necessary for early academic skills. They explained an experimental study of five preschool students with disabilities. The students received direct instruction on three primary skills including matching shapes, colors and numbers or letters. By following up the instruction process with computer-assisted instruction (CAI) plus an interactive software and teacher-assisted instruction (TAI) with manipulations, some observations and conclusions were made. The application of guided practice using constant time delay under the above conditions provided relevant information on students’ attending skills including attention span, focus and eye-contact as well as cognition and retention potentials. This information was useful for the planning of future instructional activities for students.
Chen and Bernard-Opitz (1993) compared personal and computer-assisted instruction with four children who had autism (age 4 – 7 years). Although they found no increase in their learning rate, they reported higher motivation and fewer behavior problems. Whenever CAI was applied during the instructional process, the children exhibited an improved eye contact, longer attention spans and less echolalia. They were more positive, relaxed and showed spontaneous communication behaviors after the introduction of computer-assisted instruction in their learning process.

The decade of the 1990s has witnessed a growth in software programs developed to improve the literacy of both the normal children and children with disabilities (Huttinger et al, 1996; Judge, 2001; Meyer and Rose, 1998). A number of models, for instance, Speaking for Myself, Flashcard2, and the Edmark Reading Program, used a sight word method of teaching reading. The Edmark program was noted as one of the stronger sight word instruction methods for children with moderate mental retardation (Conners, 1992). Programs developers considered the fact that children with disabilities had short term memory deficits and were easily distracted. Hence these programs used consistent repetition and presented each word in a variety of contexts in an effort to help the children transfer their understanding of vocabulary (Oelwein, 1995).

A study was conducted on the use of CAI as an intervention program in the teaching of sight word recognition to four children with developmental disabilities. The computer program features included a constant-time-delay procedure as well as sounds, video, text and animations. Generally, the results of the study indicated that the program was effective. The percentage of correct responses for all the four children increased. All the four participants acquired the target words and were able to generalize them in various other contexts of their daily environment. (Lee and Vail, 2005)
Lewis (2000) explained the main procedures and outcomes from investigations in Project LITT (Literacy Instruction Through Technology), of technology-based reading interventions for students with learning disabilities. The focus of the project was to study the effectiveness of hypermedia-based children’s literature, for students with learning disabilities. A hypermedia reading program offered choices in which a student could select and listen to stories read aloud in realistic digitized speech or see colorful graphics illustrating the meaning of a word. One could also choose to engage in non-reading activities such as drawing, matching, or memory games. The overall analysis revealed that when left on their own, most students spent much of their time engaged in non-reading activities. When Project LITT introduced an instructional support feature in the program, students had to read “each” screen of the story aloud. They used the program’s digitized speech feature for feedback about their reading accuracy. As a result, time on reading task increased dramatically, comprehension of the stories improved and their rate of acquisition of word recognition skills was remarkable.

Furthermore, it was revealed that computers empowered students with special needs in several ways. For instance, Davies, Stock and Wehmeyer (2002a) conducted a study where computer-based prompting devices with specialized interfaces were applied to support the learning of vocational tasks. In the study, the system was intended to provide self-directed audio and picture prompts on improving task accuracy and independence in accomplishing the tasks. Ten adolescents and young adults with intellectual disabilities were involved in folding pizza boxes and packaging a commercial software product with and without the use of the technology system. The results indicated that the computerized prompting system significantly improved task performance with greater individual independence. This was measured by the amount of assistance required from a job coach or supervisor, to complete each task. Also subjects
expressed strong positive desires as well as preference for using the specialized prompting system.

As for language programs, computers provided a new dimension of technological applications for students with literacy problems. Moreover, Lerner (2000) noted that approximately 80 percent of students identified with learning disabilities had primary difficulties in reading. MacArthur et al (2001) pointed out that a review of fifteen years of research on the use of technology to teach or support literacy among students with mild disabilities indicated cautious optimism. Computer assisted instruction was found to improve phonological awareness and word identification. On the other hand, whole-word feedback was found to be helpful for students with poor phonological awareness. Language programs which combined intensive training in phonological awareness and practiced reading with speech feedback were most effective for developing phonological awareness and decoding skills (Wise et al., 1998).

Schetz and Dettmar (2000) discussed the Technology option for At-Risk Readers (TOARR) program. This program was designed to address the concerns of classroom teachers for individualized reading instruction, particularly for students who were at risk for reading failure. By using specialized reading software, the program enabled classroom teachers to collect relevant information regarding students reading ability, vocabulary knowledge, pronunciation, phonology etc. Hence teachers were able to use suitable and relevant-motivating activities included in the software to encourage students to read. This enabled special teachers to determine student levels of performance and possible placement options.
Trifiletti, Firth and Armstrong (1984) compared a mastery learning technique and CAI with students with mild disabilities. The students learned twice as much through CAI programs than through conventional methods such as textbooks and worksheets. One explanation for this finding was that computer instruction was more attractive and provided a motivating medium for students to learn academic skills than the use of manipulatives in traditional instruction. Meanwhile, a study on features of computer software that promote engagement, affect and choice suggested that young children with disabilities prefer programs with higher interaction options, such as those using animation, sound, and voice features (Lahm, 1996).

Coyle (2001) described the latest developments in the use of computer technology for student assessment. He highlighted South Madison community school district in Pandleton, Indiana, where introducing computer-testing devices enhanced the student assessment system. Due to the inability to obtain very useful information from the traditionally state-mandated tests, the district implemented new assessment tools that were custom-designed to align with the curriculum and to show individual student results. The new computerized tests enabled the district to adjust questions on the basis of a student’s answer so that relevant information could be gathered. The new system improved their efficiency particularly when assessing special needs education students. The system helped to provide information on student category, ability, character traits, suitable program objectives, as well as creating and tracking important information regarding student performance.

Basically, the studies in this section established the role of IT and its support for domain instructional activities. However, one important observation was noted. There seemed to be more IT support for the language domain as compared to the cognitive and other
domains. The studies were also focused on how computers and IT affected the student learning characteristics and perhaps their influence on educational outcomes. None of the above studies however attempted to assess the relationship between special education teachers’ use of IT and how it helped them to meet instructional needs for special education activities.

2.4.2 Multimedia Technology and the Teaching-Learning Process

Multimedia has been defined as the “nonlinear or non sequential presentation of text, graphics, animation, voice, music, slides, movies, or motion video in a single system that involves the user as an active participant” (Wissick, 1996). However, in a rather precise form, Wissick and Gardner (2000) described the functional features of multimedia learning. They explained that this technology models the sources of human learning, increases learner control, encourages exploration and active involvement, provides numerous choices for navigation, uses icons and metaphors to aid navigation and allows for levels of different prior knowledge. They also added that, this technology enabled users to see a subtask as part of the whole, and allowed users to adapt materials to their own learning style.

Computer-based video instruction (CBVI) is one way through which multimedia technology has been used in the teaching-learning process. For instance, Mechling and Langone (2000) reported positive results when they used video captions paired with still photographs to teach photograph recognition, and also for augmentative communication devices to two students with severe intellectual disabilities. Every correct selection of the target photograph on the touch screen was followed by a 15-second video segment corresponding to the photograph (e.g. monkeys eating bananas). There was a demonstrated increase in the number of photographs correctly selected by each student.
using the computer-based program and generalization of the effects to the selection of photographs on their respective augmentative communication devices.

In a related study aimed at teaching grocery shopping skills to students with disabilities, Mechling, et al. (2002) applied a computer-based video instruction approach to teach four students with moderate intellectual disabilities to read aisle marker signs and locate items in generalized grocery stores. All instructional sessions were conducted through the use of a computer-based program. Results showed that, students increased their performance across three stores for entering correct aisles, locating items in the community stores, and generalization to novel stores which were not videotaped for the instructional programs.

In a follow up study to teach (a) reading of words on aisle signs, (b) reading of words not directly listed on aisle signs, but associated with words on the signs and (c) location of items on grocery stores, a computer-based video instruction approach (CBVI) was employed. Mechling and Cast (2003) used a computer-based program through text, photographs and video recordings to depict target grocery items and associated words on aisle signs. As text was used to match target words with associated words, a correct selection of the matching word prompted the program to advance to a photograph of the aisle sign. This was followed by a video footage of the two items together and functional use of the grocery item (eg. spreading butter on a slice of bread) from a subjective point of view. Results indicated that following simulated instruction with the computer based program, all three students involved in the study were able to match associated words on a grocery list with words on the aisle signs.
Furthermore, one other study evaluated the use of computer based video instruction to teach purchasing skills. In this particular study, Mechling Gast and Barthold (2003) used both video prompting and video modeling through a computer based program and constant time delay strategy to teach three students with intellectual disabilities the generalized use of a debit card to make purchases in a grocery and drug store. During the instructional process, students watched a video model of the steps of the task analysis for using a debit card with an automated payment machine made from the subjective point of view. Unlike previous studies, the computer program delivered prompts through video recordings. Results of the study indicated that a generalized use of skills with a debit card to make purchases across different stores was observed in all three students.

In a related study, twenty-two high school students with cognitive disabilities participated in a study to evaluate the effects of an interactive hypermedia (IH) facility. In this case, the development of effective communication strategies used during IEP conferences to promote self determination was monitored. In the study, Lancaster, Schumaker and Deshler (2002) used a CD-ROM program containing 6 interactive lessons using audio, text, and video clips of peer instructors describing and modeling the strategies. Also, teacher lecture with paper-based handouts and no treatment control group were used in a multiple probe and a pre-post comparison design replicated 3 times across experimental groups. Results showed that students increased their responses to questions following both IH and teacher lecture compared to no instruction. The response rate at actual IEP meetings was slightly higher for the IH program. Also, there was an indication that IH combined with short amounts of teacher interaction were effective in teaching self advocacy strategies.
Ashton (2000) described the current developments in multimedia software technology for special children. He explained that multimedia software technology had a potential mechanism to provide extra practice or another mode of instruction for students with learning disabilities, particularly those with primary difficulties in reading. He mentioned that the extensive body of multimedia software available in the area of reading included such categories as phonemic awareness, phonological decoding, talking story books and comprehension. His illustrations implied that such multimedia resources could be used to provide some relevant information in designing or creating related listening, comprehension and thinking skill activities. The study highlighted some websites that provided useful information and described the features of hypermedia-based children’s literature software and hypermedia based phonics programs.

Banks (1998) studied how interactive multimedia technology could help teachers generate useful information for their professional development and classroom application. His dissertation was focused on how to develop an effective method that could help teachers to use multimedia composition in their classrooms. This interactive multimedia application entitled virtual classroom visits (vcv) generated new concerns and new information resources for teachers. The most valuable information teachers received from (vcv) was practical and detailed information on handling classroom activities and lesson planning strategies.

Pillai (1998) carried out a study to determine baseline information pertaining to the instructional use of computer technology by educators of deaf and hard of hearing children in the rural state of Alaska. They were generally older, more experienced and half of them held a special education certification. Data analysis indicated that educators
who used computer technology to support their curriculum were among other conditions connected to the Internet. However, the inventory of technology available at their school showed gains in the acquisition and utilization of computer and multimedia technology but limited progress in the acquisition or utilization of deaf related technologies.

Educators working with students with intellectual disabilities have continuously chosen to employ alternative assessment methods including task analysis assessment, curriculum–based assessment and portfolio assessment (Browder, 2001). Due to inherent problems of relying on common testing formats, most educators are keen on developments in a new alternative approach ushered in by developments in IT. Hence Stock, Davies and Wehmeyer (2004) undertook a pilot test of an Internet-based multimedia testing and assessment system. The system comprised of audio, video, and picture supports to enable individuals with intellectual disabilities to provide accurate information by completing online tests and assessments independently. Twenty-two adolescents and adults in the study required 2.2 prompts to complete the online version of the test instead of an average of 7.5 prompts for the traditional written version. The results suggested the feasibility of generating accurate information for educators by utilizing a self-directed, multimedia software approach. The system demonstrated capabilities of creating an independent and potentially integrated test-taking format for individuals with intellectual disabilities or literacy challenges.

The main findings resulting from the literature review in this section were that, multimedia software technologies had great potentials and capabilities in assisting intellectually challenged students to develop and acquire grocery shopping skills and purchasing skills with a debit card. Also, the same technologies helped special children to improve their skills in reading, listening, comprehension and thinking activities in the
classroom. On the other hand, multimedia resources also enabled special teachers to generate useful instructional resources for their professional development purposes.

2.4.3 Current Use of IT-based Resources for Instructional Needs

Research has indicated that children with learning disabilities contribute one of the largest populations of students that require special education services. However, as this population continues to grow, so does its need to utilize the Internet for educational resources (Marie, 2002). The World Wide Web has emerged as one of the most important resources capable of providing multitudes of teaching and learning opportunities. Today, Web sites have evolved to include hyperlinks, text, digital pictures, graphics, audio, animations, and video clip applications. By providing a variety of tools, it makes it easy to design, customize, develop and implement creatively tailored materials and learning opportunities to cater for the needs of specific individuals with learning disabilities. Therefore, a clear advantage of the World Wide Web is its capability to function as a tool in advancing what teachers can do to provide all students with access to the general education requirements (Smith and Meyen, 2003). It was noted that, both general and special educators have increasingly reported using the World Wide Web as a resource to supplement their lesson preparations and to access relevant resources to be used during the instruction process (Tinker, 2001).

Castellani (1999) carried out a qualitative study on the teaching and learning with the Internet in the special education classroom environment. The study found that the Internet enhanced instruction by providing useful information on individualized learning experiences. It also helped in increasing student motivation to complete classroom activities, and expanding the resources available for instructional purposes.
In another study, the use of Web-based bookmarks was described as one of the most effective ways of using Internet content to support reading and other literacy activities for kindergarten and learners with special needs. It was noted that even children who could not read were able to recognize pictures and comprehended what they saw (Scott, 2003). By using Web-based bookmarking as a component of instruction, teachers were able to provide visual cues for students and presented high-interest, meaningful reading material from the Internet. The study showed that, since all links were previewed before being made available to students, safety on the Internet was improved. This facility allowed teachers to have quick access to sites used for instruction and helped them to design lessons which addressed multiple student needs with one activity. As for students, the use of Web-based bookmarking increased their time on task and decreased frustration among those who could not read. Students were allowed to encounter letters, words, graphical images and grammatical structures in an authentic context (Forbes, 2004).

Houx (1997) investigated how teachers used technology in planning and developing programs for students in special education. The study revealed that many teachers used computer technology for communication. Electronic mail was used to acquire or seek information from colleagues, or discussion groups on various subjects in special education. Teachers also used technology to keep and monitor information on students’ grades. This was vital as teachers could use this information to assess student performance and progress in a more accurate manner. Some teachers also used technology to help students to gather information so as to develop and prepare classroom presentations. Some tutorial programs were also found to contain useful information that helped teachers to acquire specific ways of generating more information for instructional use.
In an attempt to improve special education services, EDmin.com (2002) released a web-based resource to help K-12 educators in improving special needs services. This online resource provided support for managing vital but time consuming daily routine tasks. For instance, the software application was used to monitor individual student education plans. Through this application feature, educators accessed individual student plans from anywhere and at anytime. Therefore, teachers were able to track performance results and document as well as identify the most effective interventions for a particular student. Also, the same tool allowed teachers, case workers and school administrators to identify which student had special emotion, intellectual or physical needs in order to qualify for exceptional services.

Barron and Ivers (1998) explained that educators were not just consumers of online resources. They had begun to design their own school Web pages. Many of them also realized that they could use the Internet for such services as providing information about their school programs, sharing resources with their colleagues as well as displaying student work. Certain specific information in the form of newsletters, extra-curricular activities and PTA information were also provided. They concluded that as more schools acquired Internet connection, it became extremely easy to exchange ideas and share information among schools.

There were some documented efforts on researchers and professionals whose desire was to help teachers and speech language pathologists of students with autistic spectrum disorders. For instance, Polirstok and Lesser (2003) conducted a study and compiled some useful online information, resources and interventions useful for those professionals and caregivers working with students with such traits. They provided addresses or URLs which could be used to access relevant websites on autism and
autistic spectrum disorders, relevant resources for instructional strategies, behavior management and therapeutic interventions. Other information also included websites for parent support organizations and treatment centers operating within the United States.

Driskell (1999) used a constructivist approach to instructional design to develop an electronic resource. The resource was a website better known as the Houston Educator Lesson Plan Exchange and Resource (HELPER). This hypermedia website for lessons proved to be a very important reference source particularly for classroom teachers. Teachers accessed the website to get all kinds of information to help in improving the way they planned the size and content of their lesson plans. This facility also provided information that could be used by teachers to create, customize and modify their learning environments in away that suited their local conditions.

Although the World Wide Web was a huge instructional resource for special education teachers, it presented its own challenges to many of them. They faced difficulties in finding resources in an efficient manner, found it hard to review and identify instructionally appropriate resources to enhance current curriculum. Hence, they were unable to construct an effective delivery format to ensure appropriate integration and teaching (Higgins et al, 2000).

However, one of the alternatives to overcome this challenge, was for teachers and parents of students with disabilities to use The High Plains Regional Technology Education Consortium’s (HPR*TEC) TrackStar(http://trackstar.hprtec.org/). This was an online resource which helped teachers to organize and annotate websites into lessons, assignments or instructional resources. TrackStar allowed users to organize favorite web sites into tracks under a specific topic and made them accessible to any one with
Internet access. Since tracks were organized and catalogued by grade level and key word (e.g primary, special education), they provided teachers with just-in-time and content specific resources for use in their classroom instruction (Smith and Meyen, 2003).

Molindo (1997) studied the perceptions of school principals regarding the use of the Internet for administrative purposes. The findings suggested that principals considered the Internet as a valuable instructional tool in their schools. Whereas 89% of the principals did encourage their staffs (teachers to attend Internet in-service in order to remain current on its instructional use, 99.9% of the 292 principals who returned completed surveys had Internet services available to teachers and students in their schools. Principals encouraged their teachers to gather information from the Internet while preparing their teaching objectives and lesson plans. On the other hand, students used the Internet to gather information to complete their assignments, to plan for discussions and prepare class presentations. Teachers guided the students by indicating valuable sites and home pages for relevant information.

Some researchers and leaders in the area of special education technology, for instance Edyburn (2001) argued that technology has re-engineered the tools available for teachers and principally altered how they can teach. He explained that the Internet provides a new dimension in the instructional process and helps teachers in a variety of ways. For instance, electronic databases and journals allow them to access research-based instructional methods, behavior management techniques, and other classroom interventions from almost anywhere at any time. E-mails, chats, bulletin board and other Internet based communication tools, enabled teachers to have constant access to professionals and experts in special education. They helped to answer their questions
and provided needed information. Also, instructional websites allowed both general and special education teachers to facilitate student instruction without the need to acquire specialist knowledge or expertise in a particular content-based curriculum.

Hemenway (1999) investigated the various ways through which the classroom had changed as a result of the introduction of the Internet. He examined students’ response to assignments given in classrooms that use the Internet as an educational tool. The study was conducted through the use of a survey and a follow up telephone interview of the teachers whose students used the Internet with a frequency of at least once a week. The results of the study indicated that, based on the theory of cognitive science, students used the Internet as a resource to acquire information necessary for developing knowledge structures and filling in specific data points in the structure. As for the teachers, the Internet provided significant real life data sources. It provided information on subject material, lesson planning, extension activities and teaching methodology.

Yook (2000) compared the effects of software program instruction versus textbook instruction. The study was focused on students with emotional and behavior disorders. Titles from a series of contemporary children’s books were selected for the study, two for the software program and two for the text-based reading. Their reading performance and on-task behaviors were analyzed. The results revealed the existence of higher and faster improvements in reading fluency and accuracy of the participants when they used the reading software program. The study provided some useful information on how to handle activities related to pronunciations, spellings, intonation and phonetics. The study also suggested some text-to-speech features which made the stories seem more real to the students than when they simply read them.
In a related study, which expounded the teaching and learning potentials provided by the World Wide Web, certain benefits offered by online instructional resources were highlighted. Wissick and Gardner (2002) explained that Internet based applications combined IT features in a cost effective and accessible format designed with considerations for group and individual learners. Therefore, for students with special needs such resources provided them with extra practice to promote mastery of skills. Also they helped students in the development of writing abilities to convey understanding in content-based curriculum. In addition, through online instructional resources feedback could be individualized to each student, meeting his or her specific instructional needs. At the same time, tracking student progress could be designed as an integral element of online instruction easily accessible to both teacher and parent.

Thompson (1998) examined and described the current state of availability and use of the Internet among high school vocational education teachers in Idaho. During the study, the researcher evaluated the concerns the teachers had about using the Internet in teaching. The results of the survey indicated that electronic mail was by far the most used application. He also found that, as many as 40 % of the teachers used the Internet to acquire information resources for lesson planning, classroom instruction and personal development. On the other hand, as their level of access increased teachers concerns shifted from learning about the Internet, to sharing and using it with others, to obtaining new ideas and improving their use of the Internet in the classroom.

Stover (2001) studied the potential of hand held computers in education. He explained that these computers were an important development in educational technology. Due to their portability, user friendliness and accessibility, principals could use these computers to monitor administrative aspects of the school all the time. Teachers could use them to
take notes and grades during the day. Special education teachers could use these computers to easily access information pertaining to student progress, student’s individualized education plan, classroom activities and relevant teaching materials. They could store and access information regarding the student’s evaluation, progress and medical alert where applicable.

Falicki (2000) highlighted a comprehensive courseware program for special student populations. She explained the usefulness and effectiveness of the web-based program and how it helped students to achieve their goals and advance in their study programs. The web-based courseware covered such areas including; language arts, social studies, foreign languages, Mathematics and science. This web-based courseware helped special education teachers to get relevant information pertaining to lesson planning, classroom exercises, extension activities, games and quizzes and how to create a student evaluation and tracking system.

Due to the rise in the demand for competent reading performance in the past two decades, many have turned to the computer and Internet-based resources for answers. It was explained that some IT-based programs were particularly designed to offer technical support in reading especially in the development of word recognition skills. Such resources provided a large amount of extended practice and speech synthesizers to provide feedback. Thus computer-based reading software programs had the potential to develop word recognition skills of students with learning disabilities. This is due to the large number of repetitions of specific words and letter combinations which can be carried out in a short period of time (Earlyne, 2001; Gravois, 2001).
A study published in a symposium (1999) presented a special issue on the use of the World Wide Web (WWW) in special education. It highlighted the various special education services provided on the World Wide Web. However, the major highlights of the study were quite varied. They included among other things some useful information sources and services for special education teachers on various issues of concern. For instance, the study reported and analyzed aspects covered on the World Wide Web which contained information on different aspects for children disabilities such as; IEP samples, lesson plans, teaching materials etc ... Other potential sources of information highlighted on the World Wide Web (WWW) were discussion groups, chart rooms with special education professionals on curriculum design, behavior management and teaching materials etc.

Kurhila and Laine (2000) assessed the contribution of adaptive and assistive hypermedia resources in education. They demonstrated that such resources were very crucial in this respect as they were used in establishing a learning environment suitable for children with disabilities. They also indicated that hypermedia resources were useful for locating information for individualizing programs for special children. On the other hand, such resources were used in conducting individual sessions and for instance, using hypermedia reading programs as well as supporting the evaluation of their cognitive skills.

The demand for current and up to date instructional materials by general and special educators led to various research efforts aimed at providing the required information resources. Some of the examples of such efforts included the following.
Smith and Meyen (2003) analyzed the various web-based facilities for retrieving resources to supplement lesson preparation and to access relevant information for instruction purposes. For instance, the power of 2 at (http://powerof2.org) is a website which contains modules and teaching materials on effective collaboration among teachers, professionals and parents. The power of two also provides a list of lessons categorized by content and grade levels at (http://www.powerof2.org/resources/). Moreover, for teachers who intended to integrate both local and state curricula while also meeting the needs of students with disabilities could use other tools like MCREL at (http://www.mcrel.org) and other reference sites which catered for downloadable instructional resources. On the other hand, teachers were also free to improve their efficiency by identifying relevant resources for students with disabilities by using the High Plains Regional Technology Education Consortium’s (HPR*TEC) TrackStar at (http://trackstar.hprtec.org/). This online resource assisted teachers to organize and categorize websites into lessons, assignments presentations, or just instructional materials.

Carr and Jitendra (2000) highlighted a project-based learning program undertaken with the help of information acquired from the Internet. The writers explained how tenth grade special education students used hypermedia and multimedia facilities to self-direct their learning process. Participants in the program were nine tenth grade students from a special education class. They volunteered and were mentored at a homeless shelter for pre-school age children and their mothers. Students used the Internet to identify resources related to homelessness. They then organized the information from the Internet into a meaningful multimedia presentation. This project helped the students in meeting their information needs for their individualized education plans for reading, writing and speaking. At the same time, the program benefited students by giving them
a sense of accomplishment and pride and promoted their self-growth and empathy for others.

Most Internet–based curricula activities have been promoted by Internet-based software programs and technologies. Unlike a software program that stands alone, these resources offer flexibility and unlimited instructional choices for teachers. For instance, teachers were able to customize programs and activities to correspond to a specific reading series or word recognition activity needs of a particular child (Englert et al., 2005). An example here is by Englert, Manalo and Zhao, (2004) who evaluated the potential of the Technology-Enhanced Learning Environments on the Web (TELE-Web). This was a software program which could be entirely customized by the teacher allowing the input of words and selecting reading activities suitable for a particular child or a group of students. The TELE-Web software took advantage of digitized speech dictation and feedback, provision of word models or prompts and provision of context-dependent and in-context word identification. The results indicated that TELE-Web was an effective facility in improving sight-word recognition, and that these improvements translated into a standard measure of reading achievement levels among students with learning disabilities.

The desire to simplify an already complicated reading instructional process for the intellectually challenged students through the use of IT-based resources led to some new creative phenomena. Forbes (2004) described the use of web-based “bookmarking” as a process of creating favorites or bookmarks and storing them on the web to support reading activities. This approach provided suitable structure and content for students with disabilities. She explained that web-based activities could be made the backbone of instruction as they provided content and experiences that textbooks did not have. That
web-based bookmarking as a component of instruction allowed teachers to provide visual cues for special needs students and presented previewed, high interest, meaningful reading materials from the Internet. By using web-based bookmarking services like iKeepBookmarks.com, special teachers were able to store customized instructional materials, annotations and visual guidance through the use of colors and icons. Hence, during the reading lessons, students encountered letters, words and grammatical structures in an authentic learning context.

The desire to meet professional development challenges associated with literacy programs for all children and especially those with disabilities resulted into a unique and creative partnership. Bannan-Ritland (2002) described a project known as The Literacy Access Online (LAO) which was a partnership between the Helen A. Kellar Institute at George Mason University (GMU) and the Parent Educational Advocacy Training Center (PEATC). Their collaborative effort resulted into a web-based resource designed and developed as a new means of support for literacy facilitators in addressing literacy issues for all children, with particular reference to those with disabilities. The main purpose of the project was to employ web-based technologies to provide literacy support and information resources for teachers and parents who worked with children from 4th grade through 8th grade with a variety of disabilities.

The overall results showed that the LAO website provided an accessible and convenient format for both teachers and parents. It provided support in the key areas of reading strategies and accessibility to resources. Teachers and facilitators saved a lot of time as they could instantly access reading strategy techniques while reading with any individual student.
Generally, it was the evolvement of the World Wide Web and Internet technologies that brought about a significant impact and contributions to education. As illustrated by Smith and Meyen (2003), one of the educational benefits of IT was the process of assessment and evaluation of students with intellectual disabilities. Unlike paper and folder-based portfolios which comprised of standardized test scores filed away in the office, electronic portfolios often encouraged students to engage in periodic self reflection as their work was made available via the WWW. In addition, electronic portfolios provided an opportunity for ongoing modifications and interactive evaluation of learning goals. Also, these portfolios allowed for continued assessment of the effectiveness of learning strategies and the clarity of knowledge presentation. Altogether, this led to a system of feedback which could simultaneously evaluate several processes in the educational cycle. Being available online, feedback could also be exchanged between teacher and student, teacher and parent or other related professionals or experts involved in a student’s learning program.

The findings from the literature review in the section above indicate that IT and Internet in particular provide exceptional means of exploiting data resources to supplement lesson plans, individual education programs and other instructional materials for students with cognitive disabilities. At the same time, the World Wide Web presents opportunities and tools to design, develop and implement differentiated materials with the necessary accommodations and modifications for the intellectually challenged students. Also, computers and Internet resources support language and literacy activities, behavior management programs, and mathematical skills. Lastly, IT-based resources were used to improve writing abilities and to provide opportunities for extra practice to promote mastery of skills among students with cognitive disabilities.
2.4.4 Barriers to Information Technology Integration in Schools

Rogers (2007) undertook a study to assess the impact of increased good quality technology tools in elementary schools. By employing a Delphi research methodology, two studies were accomplished. Whereas the first one was focused on five experts in the field of information technology, the second one involved twenty-two elementary technology facilitators. Based on the results of the study, three barriers to information technology were identified. They include; lack of time, teachers’ attitudes and too much emphasis on standardized test preparations in schools.

Pavey (2005) carried out a study to evaluate the state of technology integration in a city school system. The school system was in the midst of completing a self-initiated five-year technology plan. Data was collected from individual and focus interviews, observations of technology-based activities, existing survey reports as well as other documents relevant to the school district’s technology initiative and staff development programs. As the study was about a city school system, the participants representing the schools were either former or current technology lead teachers. The barriers identified in the study reflected the broad picture of the study. They were; conflicts in the school community concerning instructional focus, lack of support personnel and adequate time to deal with the detailed technological needs of the school community.

Klamik (2005) conducted a study where an attempt was made to use proposed design principles. The aim was to use the approach to create a professional development product which would improve attitudes of technology non-users. By addressing the common barriers, and presenting step-by-step suggestions to address specific curricular areas through technology, progress was achieved. The professional development product had some positive impact on technology non-users and also produced some
major changes. However, the research indicated that attitude was not the main barrier to technology integration. As revealed in the study results, teachers were faced with barriers beyond their own control. For instance, such barriers existed in the form of malfunctioning computers, lack of funds for technology acquisition and time limitations.

There emerged an urgent need to integrate technology in two high schools in northern Illinois. This was particularly important considering how quickly technology was affecting peoples’ lives and their work environments in the community. In response to these developments, laboratory environments were created and other buildings were wired up to provide Internet access to school communities. However, educators were doubtful of the teachers’ preparedness to enhance their curriculum with the new technology. A survey was carried out to determine what teachers identified as the main barriers to technology use in their schools. The results of the study found that teachers had enough training and support to integrate technology into their curriculum. However, they lacked crucial release time to collaborate with colleagues, and also did not have time in their syllabus to teach students how to use computers without compromising curricular goals (Veltman, 2005).

Al-Alwani (2005) conducted a study to examine level of information technology integration in science education. This was specifically done in the Yanbu school district in Saudi Arabia. The sub-domains investigated during the study were; infrastructure and resources, policy and support, teachers’ personal beliefs and staff development. The same survey was also used to establish and ascertain demographic data, personal computer use, level of technology implementation and current instructional practice. The results found that all the four sub-domains were significant barriers to IT
integration. Hence it was necessary to have more computers in schools, more teacher training, more time for teachers to learn to use technology and readily-available technical support staff.

Simmons (2005) examined teacher’s perspectives of technology integration with educational practices on one hand, and their opinion of the association with student success. One hundred and ninety-two elementary school teachers participated in the study. Both quantitative and qualitative methods were employed. Data was collected about computer usage in the classrooms, general access to computers in schools, and nature of instructional uses of computers in schools. The main barriers to information technology integration by elementary school teachers were identified as time and lack of upgraded computers in their schools.

Eteokleous (2004) examined the current situation in Cyprus elementary classrooms concerning computer technology integration. He employed both structured questionnaires and semi-structured as well as open ended interviews. Although Cypriot teachers employed computers quite often for their own purposes, the study revealed that they used them less regularly for classroom activities. Some of the barriers in using computers for classroom activities were summarized as follows: lack of resources; incomplete and inadequate professional development and training; lack of guidance, support, incentives and technical problems.

Wabuyele (2003) examined and evaluated the teachers’ and administrators’ opinions and experiences towards computer usage in Kenyan classrooms. It was assumed that understanding teachers’ opinions and experiences would be helpful in designing teacher preparation and staff development programs. Data was collected from twenty seven
teachers comprising both computer users and non-users. The findings from in-depth interviews, participant observation and document analysis revealed the main barriers which hampered the use of computers in schools. They were; shortage of hardware and software, limited time, shortage of power, and lack of adequate training for teachers and administrators.

Derfler (2002) carried out a study to determine whether teachers who participated in the Technology Literacy Challenge (TLC) training program were better at integrating technology for their classroom instruction. The TLC program offered a thorough technology training program including equipment and technical support for the teacher participants. The sample population comprised of teachers from five middle schools in the Desert Sands Unified School District in the Coachella Valley. Among them, 103 middle school teachers made up the experimental group. On the other hand, 78 middle school teachers who did not receive the training were the control group. Among other findings, the study identified class size, classroom management, lack of technical support and lack of computers as the main barriers to technology integration.

Bronson (2002) conducted a study to assess the implementation of a Technology Literacy Challenge Grant, Project TREK. It was carried out in a small but urban Kindergarten through eighth grade school district. The use of portable keyboards and word processing software was aimed at helping fifth and sixth grade students to acquire digital literacy skills. At the same time, teachers were trained to integrate technology into their classroom instruction. Data was collected from twenty five teachers in four elementary sites. Two trainers and four administrators also participated in the study which employed surveys, online questionnaires and in-depth interviews in the data gathering process. The findings from the study indicated that teachers reported the main
barriers in the form of lack of time for planning, collaboration and familiarizing themselves with technology tools. Moreover, the absence of Internet access in individual classrooms was also identified as a main barrier to effective use of information technology.

Dias (2000) cited several studies which identified and also seemed to summarize a variety of barriers related to low IT or computer usage by teachers. Based on some of the studies, he reported such barriers including; lack of time to learn new software (Chiero, 1997); lack of time and adequate hardware and software (Sheingold and Hardley, 1990); lack of access to technology which limited teachers’ ability to share or implement what they had learned during training (Ringstaff, et al. (1996); and absence of on-site computer technology specialists or technicians (Winnans and Brown, 1992) as a hindrance to teachers’ use of information technology in schools.

2.4.5 IT-related Competencies and Teachers

Judith and Cynthia (2007) described the computer as a flexible educational tool that could be employed to individualize instruction especially for students with learning disabilities. They argued that in designing accessible learning environments, computers were very crucial. Therefore, it was important that whoever participated in the teaching process in such environments should possess certain competencies. For instance, they outlined certain competencies required by occupational therapy practitioners working in schools. By making reference to Hammel and Niehues (1998), they described competencies needed by school-based practitioners. They include abilities to; operate computing systems, trouble shoot system problems, establish networks, operate general application programs (e.g. word processing), teacher utility tools and computer-based instruction.
Saud (2004) conducted a study with the purpose of exploring and describing the perceived IT competencies and educational needs in computer technology. The research was specifically aimed at learning about such competencies among the vocational and technical teachers in Malaysia. The results of the study indicated that more than 50% of the respondents had not received formal computer technology training. Therefore, for this group of teachers, computer operating skills were the basic competency required. Meanwhile, the study highlighted media communication and telecommunications as the two main areas of educational needs among the eight domains of computer technology.

Lee (2004) conducted a study to assess the levels of IT and computer competency amongst the Institut Perguruan Bahasa-bahasa Antarabangsa (IPBA) staffs. This study was a follow up to determine the effectiveness of the ICT-in-house courses conducted over a period of 2 – 3 years by the education technology department of the same institute. This was due to the fact that such courses had been conducted on an assumed-to-be-needed manner basis and as part of the staff development program. Data was collected by using a set of rubrics previously adapted from CODE 77 Self-Evaluation Rubrics for Basic Teacher Computer Use created by Johnson (2000). Hence computer competencies in this study were evaluated based on the following components; basic computer operation, file management, word processing, electronic spread sheet, database, electronic presentation and network use.

Meanwhile Hawsawi (2002) highlighted the teachers’ IT competencies as perceived during the research study. Unlike other studies, this was particularly related to working with students with mild cognitive delay. By employing a case study format, the researcher was able to comprehend through interviews and observations how special education teachers used computers and IT facilities for classroom purposes. The results
of the study indicated the importance of possessing; basic skills in using technology for classroom activities, knowledge pertaining to a variety of software programs, and the capability to develop new skills from a self-learning process.

On the other hand, Randall (2001) conducted a study using a Delphi method. He employed electronic mail as the basic means of communication. The findings of the study indicated that 95 statements were used to summarize computer competencies that needed to be included in business teacher education curriculum. The panel of experts employed in the Delphi approach indicated the important IT competencies for a business teacher education program as follows; knowledge of computer software, hardware categories, general knowledge domain, technology integration and programming skills.

Generally a number of studies have indicated some of the IT skills teachers should possess. Such skills would enable them to integrate computers and other technologies in their instructional process more efficiently. William (2000) indicated that computer competency was the ability for a teacher to possess knowledge on at least eight areas. They are; word processing, databases, spreadsheets, presentation programs, online service access, e-mail, trouble shooting the most familiar computer problems as well as the use and evaluation of software.

2.5 IT and Special Education Curriculum Instructional Needs in Asia

Some concerted efforts undertaken to find documentary evidence regarding the use of information technology (IT) in meeting instructional needs for special education program activities among special education professionals in Asian countries met with limited success. Among the possible reasons for this kind of scenario was that the
subject of research was relatively new in the Asian region. This reason was pointed out by some education professionals during the survey. Secondly, there seemed to be very few trained personnel interested in doing research and publishing articles related to IT and special education in the region. Also, it was most likely that there was a general lack of funding for research on special needs education.

This was indirectly explained by Prof Tommy Koh in 2002 who commented that in Singapore, children with disabilities were segregated and sent off to special schools which were not funded properly but left to the National Council of Social Services (NCSS) to look after them. He advised that special schools needed to be benchmarked to national standards (Channelnewsasia.com, 2002).

As a result, it was decided that some studies be carried out on the fundamental IT structures which were present in some Asian countries. This was aimed at understanding whether such structures could probably support or encourage the use of IT by special education professionals in meeting their information needs. Based on whether there was a national IT infrastructure, national education ICT policies, and master plans with adequate funding as well as non-government support or not, any possibilities of special education professionals to use IT in meeting their curriculum information needs were most likely to depend on the above mentioned factors.

A survey on the trends in the use of ICT in education in Asia and the Pacific region revealed that countries in the region were roughly categorized into three types. The first category included countries which were already integrating the use of ICT into their education systems, for example Singapore and South Korea. Secondly, there were countries which were starting to apply and test various ICT strategies but had not fully integrated ICT within their education systems. These countries included China,
Thailand, Japan, Malaysia, the Philippines and India. Lastly, there were countries which had just begun and were more concerned with ICT infrastructure and connectivity installation. They included Myanmar, Lao PDR, Vietnam, Cambodia, Bangladesh and Maldives (UNESCO, 2002).

A survey of 90 ICT projects in education in Asia and the Pacific region revealed that Singapore was very advanced in terms of integrating ICT into the education system. Based on clear national ICT policies and master plans by the Singaporean Ministry of Education, mainstream schools had all their classrooms equipped with computers and other technologies. There was a high level of Internet access to all schools and a high student computer ratio. The Ministry of Education had revised the national curriculum to ensure that ICT was an integral part of the education system nationwide. Teacher training was way far beyond computer literacy. Teacher training courses were aimed at developing teachers’ skills in putting their classrooms online, developing websites, chat rooms, communicating and participating in electronic discussions, teleconferencing and telecollaboration. Hence, teachers were prepared to effectively use ICT in curriculum practice (UNESCO, 2002).

In an effort to bridge the digital divide between mainstream schools and special schools in Singapore, Microsoft Singapore and GES Singapore Pte Ltd contributed S $ 2 million and S $ 150,000 respectively by the end of 2002 to the National Council of Social Services (NCSS). As a result, at least 20 computers were donated to each special education centre or association including Movement for the Intellectually Disabled (MINDS) – Lee Kong Garden School, Association for the Educationally Sub-normal (AESN) special school and the Spastic Children’s Association School. This was in
response and support of the National Council of Social Service’s computer assisted learning (CAL) programs (GES – Singapore, 1998).

According to Microsoft Singapore’s managing director, Saw Ken Wye, the company was determined to provide IT facilities to improve the abilities of both the physically and the intellectually challenged in Singapore. By July 2002, Microsoft Singapore had overhauled more than 3000 Personal computers equipped with Microsoft windows 98 and Microsoft Works. They were distributed to AMP, Mendaki, Sinda, E2000, the Society for the Physically Disabled and the Central, North, East and Ang Mo Kio Chinese Development Assistance Councils (Microsoft – Singapore, 2000). This probably signaled the level of preparedness among special education teachers as well as the potential to integrate IT based resources in curriculum implementation and instruction.

Generally, Asia and Pacific regional studies indicated that China, Thailand, Japan, Malaysia, the Philippines and India were some of the countries with national ICT policies and master plans. However, even among these countries there were variations regarding the levels of integration of ICT use in the curriculum and in teaching – learning experiences. There were efforts to integrate the use of ICT in the teaching of certain subjects, as in the case of Malaysia, China and Japan. However, some of these efforts were not properly coordinated and had not reached systematic nationwide proportions. Also, teachers in these countries were at different stages of utilizing ICTs as enabling tools to access information and gain knowledge from online resources. Generally, it was reported that teachers from these countries were using ICT mostly for word processing, for presentations and for spreadsheets. For example, in the Philippines, it was reported that currently ICT was not integrated at all into textbooks.
Whereas in India, ICT was taught as a separate subject, with ICT education introduced through a multi-layered approach (UNESCO, 2002).

Dakshinamurthy (2009) undertook a study where he explained the use of some IT-related resources for special needs. He explained that the use of word processing software helped to produce clean and readable text particularly among students who struggled with delays in fine motor skills. He added that the word prediction software helped students to communicate with written language. It reduced the number of strokes required to type words and provided assistance with spelling. He argued that students with mild disabilities were motivated by multimedia environments. They demonstrated higher levels of performance and attention to detail than they normally exhibited in other ordinary environments.

The literature in this section indicates that different countries in Asia were at different levels of ICT and IT application in their education systems. It was evident that non-government organizations or multinational companies for instance, Microsoft Corporation played major roles in spearheading the use of IT in education in general. The various levels and differences in the application of IT in different countries implied different experiences, levels of preparedness and exposure for special education professionals.

However, apart from addressing broad IT policies and issues at national levels, the literature has explored very few studies that tackled specific IT application questions as experienced by special education professionals or teachers in their quest for curricular information and implementation of programs, for individual students in different countries.
2.5.1 Information Technology and Education in Malaysia

Hoo (2007) investigated ICT competencies among teachers in selected schools in Bangsar Zone in Kuala Lumpur. The purpose of the study was to examine ICT competence levels among teachers. A questionnaire instrument with 112-items was administered to 240 randomly selected teachers from eight (8) urban secondary schools in Bangsar zone in Kuala Lumpur, Malaysia. The findings from the study indicated that the levels of ICT competence among teachers were at the moderate and high levels. A high percentage of the teachers understood hardware and software terms associated to educational computing and technology. They used Microsoft office word and PowerPoint software more often as compared to other software programs. They reported being able to use Internet for searching and accessing needed information. Other variables in the study such as years of computer use, qualifications and level of classes taught were found to have positive relationships with the competence level.

Microsoft – Malaysia (1999) and the Lions Club of Kuala Lumpur initiated the “donate a computer” program. Microsoft Foundation campaign provided hardware and software upgrades of Computers donated by individuals or companies. Such computers were upgraded to 32MB RAM and 4.3 GB hard disk drive to accommodate latest Microsoft versions including Windows 98, Microsoft office 2000 and front page 98. The campaign aimed to recycle computers and donate them to schools and associations. This charitable project helped to spread the use of computers and brought the benefits of technology to the less fortunate, needy students and schools.

Chong (1998) developed an Internet training package for teachers by adopting the school-based approach. The aim of the project was to expose more teachers to technology so that they could contribute more positively to Internet acculturation in
schools. The package was designed in such away that training of teachers would be conducted in the setting of an average school. A training package called the Basic Internet for Teachers (BasIT) was developed and evaluated through three instructional development stages. They were; needs assessment, design and development and formative evaluation. The first version of the package was approved after being reviewed by experts, and carrying out a series of trial runs among small groups of teachers. It consisted of the training module, an introduction pamphlet for the training package, the instructor’s manual, participant self-assessment forms, overhead transparencies and a floppy diskette – which contained supplementary software for the training course.

Furthermore, Malaysian efforts to establish ICT infrastructure received a boost when Bill Gates (Microsoft CEO and founder) donated RM1 million to seed the Malaysian Connected Learning Community. The funds were directed to four main areas. They included teacher training, software for libraries and schools, education and awareness campaigns. In May 1999, Microsoft launched the Connected Learning House. Thus the Malaysian National Library was linked with 14 state libraries to create a centralized educational and information resource for free exchange between students, teachers, parents and the larger community (Microsoft - Malaysia, 2000).

Chan (2002) highlighted some of the Malaysian government initiatives and strategies to facilitate adoption and implementation of ICT in Malaysian schools. He explained how the ministry of education had embarked on ICT as a means to developing new media as tools in the service of richer curricular, enhanced methodologies, effective school organizational structures as well as stronger links between schools and society.
Some education related ICT initiatives by the government were; The Malaysian Smart School Project, MySchoolNet (for Internet Usage), ICT training in schools, the Computerization program, the Electronic Book Project and Penang E-Learning Project.

Theaker (1997) analyzed the general situation regarding IT in Malaysian schools. He explained how Malaysia had a significant input in the production of most IT systems, its semiconductor manufacturing capability and the assembly of most system components. He added that an IT Syllabus with the National Curriculum had been defined though its delivery was in its infancy. He outlined the government’s vision of encompassing at least 10,000 schools into the smart school project by 2010 and regarded it as a flagship application for Malaysia’s Multimedia Super corridor (MSC). It was emphasized that teacher training was one of the major issues to be addressed. The education system was to be radically transformed from the traditional paradigms of acquiring knowledge. A new approach was to be based on critical thinking and creativity through the deployment of new teaching methods and multimedia technology.

On the other hand, when reporting on Asian and Pacific governments’ activities in education, a UNESCO source explained that IT literacy was high on Government priority list in Malaysia. A part from the Multimedia Super Corridor project, the government was turning schools into computerized ‘smart schools’ to promote IT literacy. Ninety schools were due to have been converted into smart schools by 1999. Furthermore, there was an effort to create a high-tech balance between the urban and rural areas. In this direction, the Mobile Internet Unit or Internet buses visited schools without computer facilities. The Mobile Internet Unit was essential as it provided ICT training and electronic classroom experience for students and electronic information access for teachers (UNESCO, 2001).
UNDP- Malaysia (2002) formed a partnership with Coca Cola and the Malaysian government to bring the joy and promise of e-learning to a new generation of students and teachers. The project was in line with the government’s vision of building a knowledge based economy. The first phase of the e-learning for life project consisted of six ICT hubs set up at selected secondary schools across peninsular Malaysia. They were equipped with Internet connectivity and state-of-the-art hardware, software and educational information resources. They also provided thousands of students and teachers with access to ICT training modules. The project supported the Ministry of Education’s drive to bring Internet access and e-learning resources to Malaysian classrooms and communities.

2.5.2 Assistive Technology and Special Education in Malaysia

Nurulisma and Halimah (2009) investigated the potential benefits of a speech browser to enhance accessibility in virtual learning environments. The study was conducted among visually impaired learners in Malaysia. A virtual learning environment was defined as an online learning environment or web pages where students were able to engage in learning activities, interacting with tutors and peers. They explained that a speech-browser integrated with a speech synthesizer helped the visually impaired to interact with materials online using sounds. As an assistive tool, the web-browser was employed to interact with instructional materials, and also comprehend on-line assignments. Since the visually impaired students depend on sounds, this was an essential assistive tool as it enhanced their capacity to engage in on-line educational activities.

Nurul and Shaffie (2009) undertook a study on an electronic signing story book. The study was conducted among deaf students in Malaysia. It was explained that this was a
useful tool even among students who were unable to sign the simple spelling of short words. The embedded sign language video motivated deaf students to learn more. When compared to materials without a sign language video, even smarter deaf students tended to get bored more easily and quickly. Therefore, the computer software with sign language helped to engage deaf students by motivating them. The sign language video helped the students to sustain longer attention spans, through the visuals offered by it.

2.6 Teacher Training Curriculum

Manisah (2010) explained that the teacher training program for a bachelor’s of education with honors (special education) at University Kebangsaan Malaysia (UKM) did not cover IT and computer subjects in its core (major) courses. However, the faculty of education recommended certain minor courses to be taken from the faculty of technology and information science. The courses taken as minor had to be related to the subjects in secondary schools, to enable their graduates of this program to teach the subject as second methodology. On the other hand, the current masters program (special education) at UKM has one core course called – technology and special education. Generally, this suggests that special education teacher graduates from UKM did not acquire sufficient computer and IT knowledge and skills of integrating computers in the instructional process. Furthermore, they were not proficient enough in accessing online or web-based materials to meet their special education instructional needs.

Sharipu (2009) observed that generally special education teachers lacked pedagogical skills and knowledge to be able to plan the use of IT in teaching and to support students’ learning. He explained that in teacher training colleges for example, only few teacher trainers used Internet innovation in the teaching of the education syllabus, where they used it for the preparation of their lessons. Other teacher trainers were still learning how
to use the basic Internet applications. He noted that since IT was learned in isolation, most special education teachers regarded its use as a burden rather than a tool that can help them in their professional development and help students to learn effectively. He also explained that some of the basic smart school concepts were not found suitable for teaching students with intellectual disabilities. He cited an example that technology integrated instruction often required students to participate in problem-solving projects. However, most students with mild or severe intellectual disabilities were unable to participate in such projects. They instead required constant assistance in the form of physical, verbal or gestured prompting to do basic activities during their learning process.

Woo (2003) examined the introduction of technology integrated instruction in Malaysian schools. He reasoned that due to insufficient IT skills and knowledge among the teachers, a fourteen week-in-service training program was initially introduced for teachers of smart schools. He reported that interviews with teachers revealed that many of them had rejected the use of technology because they felt that they lacked the technological knowledge and skills. Some teachers were so lacking in confidence that they did not even want to think about computers at all. On the other hand, interviews revealed that those teachers who regularly attended continuous professional development programs were more confident and creative in integrating computer use in the classrooms. This implied that the teacher training curriculum was unable to meet the required computer and IT preparation, as well as training needs of pre-service teachers in general.

Ragbir (2003) investigated the extent of Internet integration in teacher training colleges in the Klang Valley. A combination of qualitative and quantitative methodologies
revealed that teacher trainers differed in their confidence levels and ability to integrate Internet into their teacher training curriculum. The study identified early and late adopters among the teacher trainers based on their levels of integration of the Internet in the instructional process.

The findings of the study showed that Internet innovation has been partially diffused into the teacher education curriculum. About a quarter of the teacher trainers was able to implement changes in the educational process from traditional-driven pedagogies to Internet–driven pedagogies. Internet innovation was diffused more in terms of usage and intensity among the early adopters for professional and instructional use as compared to late adopters.

In this study, early adopters perceived Internet innovation to be important for the teaching of the education syllabus where they used it for the preparation of their lessons. They directed their students (teacher trainees) to use more Internet applications on a regular basis. They also directed them to use the WWW applications for research and to design e-mail based instructional activities for their students.

Moreover, early adopters considered inaccessible Internet links at the workplace and lack of adequate computer hardware facilities as the main barriers. On the other hand, late adopters were more concerned about acquiring basic Internet training.
2.7 Summary of Chapter

The above literature highlighted the effort and level of application of computers and IT in meeting instructional needs for both mainstream and special schools worldwide as well as in Malaysia. However, as for Malaysia the literature was particularly in reference to the general education systems most of the time. There was little or sketchy documentation available if any, in reference to IT use for instructional needs in special education environments in particular. Hence, it was imperative for this study to proceed by carrying out some exploratory studies so as to understand the exact situation on the ground regarding the Malaysian special education environment and experiences in terms of IT use for instructional needs especially in the Klang Valley areas.

On the whole, the role of IT-based resources in general education and special education in particular was expounded. It is with specific importance to this particular research study, that some factors were profoundly noticeable in the literature review. Some of them were that computers and IT-based resources were employed as prompting devices, motivators, individualized support providers as well as direct instruction providers and speech or reading facilitators. Also computer-based activities were used to provide extra practice to promote mastery of skills among students with cognitive and intellectual disabilities.

At the same time, some of the literature also suggested that computers and related technologies improved attending skills for intellectually challenged children during the learning process. This happened in the form of better eye contacts, longer attention spans, minimal disruptive behaviors and less echolalia. The above mentioned factors had different levels of importance in terms of providing instructional support for
curriculum purposes. Some of the factors were significant as far as incidental or purposeful learning was concerned.

However, more relevant to this study, were some of the resource categories as examined in the literature review. In the first place, for example, Internet-based software programs, for instance TELE-Web were customized by special teachers allowing the input of words and selecting reading activities suitable for individuals or groups of students (Englert, Manalo and Zhao, 2004). Such programs had the capability to provide feedback and information to enable special teachers to plan, revise or adjust curriculum and program objectives.

Secondly, there were web-based technologies such as the one employed in project LITT (Literacy Instruction through Technology). This was a hypermedia-based children’s literature, for students with learning disabilities (Lewis, 2000). Also the Literature Access Online (LAO) project was another online resource (Bannan-Ritland, 2000). These web-based resources were designed to provide literacy support and information for general and special education teachers to enrich their instructional activities.

Thirdly, there were web-based tools and resources such as the online resources described by Smith and Meyen (2003) which helped teachers to organize and categorize materials or instructional resources at TrackStar (http://trackstar.hprtec.org/). Another related resource was the power of 2 at (http://powerof2.org). This was a website with wealth of instructional materials for teachers organized according to content and grade levels, and acted as a useful reference source for the teaching staff. As for teachers who wished to integrate local and state standards while also meeting the needs of students
with disabilities, MCREL at (http://www.mcrel.org) was a valuable curricular instruction resource to address the situation.

Finally, some studies regarding the teacher training curriculum were examined. The studies suggested that the teacher education syllabus lacked some computer and IT elements that were necessary for equipping pre-service teachers with the required IT skills. Moreover, it was found that some teacher trainers were still unable to master some basic IT components such as the use of Internet applications, and hence unable to direct their students to use them.
The summary of the literature review is presented in the following Table 2.1

Table 2.1
Main Concepts from Literature Review

<table>
<thead>
<tr>
<th>Domain needs and information seeking practices</th>
<th>As a method or information resource</th>
<th>Citation(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Cognitive domain</td>
<td>Sought to use computer-assisted instruction (CAI) to improve achievement in mathematics, numbers, numeracy</td>
<td>Ota and DuPaul (2002)</td>
</tr>
<tr>
<td></td>
<td>Computer-based devices and specialized interfaces were applied to support the learning of vocational skills, by improving task accuracy and independence.</td>
<td>Davies et al (2002a)</td>
</tr>
<tr>
<td></td>
<td>Internet-based curricula activities and technology-enhanced learning environments on the Web (TELE-Web) provided the potential for teachers to customize reading activities for individual and group instruction</td>
<td>Englert, Manalo and Zhao (2004), Englert et al (2005)</td>
</tr>
<tr>
<td>- Social Community and Life Skills</td>
<td>- used virtual reality tools to overcome real-world training barriers like costs, safety concerns and accessibility.</td>
<td>Cromby et al (1996)</td>
</tr>
<tr>
<td></td>
<td>- used virtual reality tools to provide instruction to students with cognitive disabilities in community-based activities such as shopping, social interaction, road safety etc.</td>
<td>Langone et al (2003)</td>
</tr>
<tr>
<td>Domain needs and information seeking practices</td>
<td>As a method or information resource</td>
<td>Citation (s)</td>
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<td></td>
<td>A computer based program was used to train three students with intellectual disabilities to generalize the use of a debit card for making purchases in a grocery and drug store</td>
<td>Mechling et al (2003)</td>
</tr>
<tr>
<td>Current Level of IT Knowledge and Usage among special teachers</td>
<td>Used the World Wide Web as a research tool to supplement their lesson plans, and classroom activities in various subject areas</td>
<td>Smith and Meyen (2003), Tinker (2001), Falicki (2000)</td>
</tr>
<tr>
<td>- World Wide Web</td>
<td>As a means to customize and store Internet content to support literacy activities for children with learning disabilities</td>
<td>Scott (2003)</td>
</tr>
<tr>
<td></td>
<td>Increased time on task and decreased frustration among those unable to read. Students encountered letters, words, graphical images in realistic contexts</td>
<td>Forbes (2004)</td>
</tr>
<tr>
<td>- Online information, resources and intervention methods</td>
<td>Helped special education teachers by providing instructional strategies and intervention measures for cases with autism spectrum disorders and behavior management issues</td>
<td>Polirstok and Lesser (2003), Driskell (1999)</td>
</tr>
</tbody>
</table>
Table 2.1 (continued)

<table>
<thead>
<tr>
<th>- Electronic databases and Journals.</th>
<th>were used by special education teachers to access: a) research based instructional methods b) behavior management techniques c) classroom intervention methods</th>
<th>Edyburn (2001)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Worldwide web and Online instructional resources</td>
<td>provided the means to: a) accommodate both individual and group learners b) promote mastery of skills c) individualize feedback for specific instructional needs d) track and share data on student progress.</td>
<td>Wissick and Gardner (2002), Kurhila and Laine (2000)</td>
</tr>
</tbody>
</table>

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<tr>
<th>Barriers to the Use of IT in Special Schools</th>
<th>Example of barrier(s)</th>
<th>Citation(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Lack of IT facilities</td>
<td>Lack of upgraded computers, shortage of hardware / software, malfunctioning computers, absence of Internet access etc…</td>
<td>Klamik (2005), Simmons (2005), Wabuyele (2003), Bronson (2002), Al-Alwani (2005)</td>
</tr>
<tr>
<td>- Lack of time.</td>
<td>- Lack of time to devote to learning, familiarizing or collaborating in IT skill and knowledge related courses / projects</td>
<td>Veltman (2005), Al-Alwani (2005), Klamik (2005), Simmons (2005), Wabuyele (2003), Rogers (2007)</td>
</tr>
<tr>
<td>- Inadequate staff training</td>
<td>Insufficient professional development activities and training in IT knowledge and skills</td>
<td>Wabuyele (2003), Eteokleous (2004), Al-Alwani (2005)</td>
</tr>
<tr>
<td>- Shortage of funds</td>
<td>Lack of funds for technology and facility acquisition</td>
<td>Klamik (2005)</td>
</tr>
<tr>
<td>Desired IT-related Competencies and Skills among Special education Teachers</td>
<td>Type of skill or knowledge required</td>
<td>Citation(s)</td>
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<tr>
<td>- Basic skills and communication facilities</td>
<td>Need for basic computer operating skills, media communication and telecommunication</td>
<td>Saud (2004)</td>
</tr>
<tr>
<td>- Computer use and application Skills.</td>
<td>Basic computer operation including file management, word processing, electronic spreadsheet, database and network use… etc</td>
<td>Lee (2004), William (2000)</td>
</tr>
<tr>
<td>- Knowledge of software Programs</td>
<td>Knowledge or skills for using IT facilities for classroom activities and software programs evaluation</td>
<td>Hawsawi (2002)</td>
</tr>
<tr>
<td>- General application skills</td>
<td>Knowledge of computer software and hardware categories; technology integration and programming skills</td>
<td>Randall (2001)</td>
</tr>
</tbody>
</table>
After a careful study of the literature review on the topic of research, a conceptual framework of the study was derived. It demonstrates the relationships between the variables in this study. The framework helps in understanding that access to instructional materials from any IT-based resources for any domain depends on the level of IT knowledge and skills possessed by a professional. Now, this entire process will in turn depend on the facilitating factors or barriers in the school environment, and whether the essential IT knowledge and skills are provided to the teachers. If the school environment is positive, it will have facilitating factors and minimize the barriers, as well as equip the staff with the essential IT skills and knowledge. Then there will be a high probability of teachers using IT-based resources and vice versa. This will eventually determine the quality of program activities depending on the relevancy of resources accessed, plus their accuracy and probably ease of use.
2.8 Conclusion

The chapter has served as an overview of ongoing as well as finished studies related to this research. It has concentrated on analyzing the areas of information technology-based resources for instructional purposes in special education. The review identified several important studies and documents on significant themes and topics regarding the use of IT in meeting instructional needs for special education professionals worldwide.

Geographically, the review is based on research conducted and produced mostly in the USA and Europe. For completeness, other researches conducted elsewhere including Malaysia and the rest of the world were also analyzed.

With the information presented in this chapter as review of literature, the following chapter describes the methodology used in this study.