

Elementary/Junior High School
Student Digital Literacy and Digital
Opportunity Survey
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**Research, Development, and Evaluation Commission
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Elementary/Junior High School Student Digital Literacy and Digital Opportunity Survey

I. Foreword

As we enter the Information Society, eliminating the “digital divide” has become one of the key tasks for the governments of different countries. The studies conducted in the past years have proven that there will always be delays in the spreading of information technology, and the analysis focused on students has shown that although almost all of the younger students in urban areas are familiar with computers and the Internet, Students living in remote mountain regions or the countryside do not have the same technology access.

In order to understand if there are any differences and the source of differences in information literacy and learning opportunities among elementary/junior high school students, the Research, Development, and Evaluation Commission (RDEC) of the Executive Yuan and the Ministry of Education have conducted the “Survey of Digital Literacy and Learning Opportunities” this year, targeted at elementary/junior high school students, their parents, and teachers. The survey covers three areas: 1. To understand the status quo of information literacy and application in elementary/junior high school students through student surveys. 2. To understand elementary/junior high school students’ household information environment through parent surveys. 3. To understand the status quo of and demand for campus information environment and to what extent information has been integrated into instruction by teachers through teacher surveys. The findings of this study are used as reference for formulating information education policies and allocating related resources.

II. Research Methods

The “Survey of Students’ Digital Literacy and Learning Opportunities” is targeted at the elementary/junior high school students in the 23 counties and cities in Taiwan, including Taipei City and Kaohsiung City. The survey also collected the information on the digital literacy of the parents of the selected students and the comments of their teachers regarding information-integrated instruction.

The focus of this project is to evaluate whether the opportunities for

elementary/junior high school students' digital learning differ between regions. In order to ensure there are enough samples from students residing in remote areas, stratified sampling was employed. The estimated number of valid questionnaires for each stratum is 1,500.

The schools in each stratum were arranged according to the number of surveyed students before systematic samplings such as multistage and PPS were conducted. The "counties/cities" were selected in the first stage, the "schools" were selected from the chosen counties/cities in the second stage, and the "participating classes" (4th, 6th, and 8th graders) were then selected from the chosen schools. Every student in the chosen classes is observed. If the total number of students in the 4th, 6th, or 8th grade in a school located in a remote area is less than 20, it will be merged with a nearby school to form a virtual sampling unit.

In the end, 108 schools participated in the survey. 36 of them were junior high schools and the remaining 72 were elementary schools.

III. Survey Schedule and Collecting Samples

After the questionnaires were approved by RDEC, the entire project was implemented between May 10th and June 14th, 2006 through interview-survey. The questionnaires' items and answers and the method of retrieval are described as below:

1. How do the students answer the questionnaires?

The survey organization sends out agents to the schools on specified dates. The agents explain to the students how to fill out the questionnaires, and collect the questionnaires right after they are completed. The total time (including explaining and filling out the questionnaires) is about 30 minutes.

2. How do students' parents and teachers answer the questionnaires?

The respondents for teacher surveys include the "information class" teachers in the chosen schools and the "lesson-giving" teachers in the 4th, 6th, and 8th grades. The questionnaires for students' parents are sent out by the students' teachers, asking the students to take them home to their parents. The teachers then collect the answered questionnaires and send them back to the survey organization.

The researcher for this study collected a total of 5,355 questionnaires from students in 108 schools, 108 campus information environment questionnaires, 1999 teacher questionnaires and 4,775 parent surveys from 106 schools. The return rate for parent questionnaires was 89.1%.

IV. Research Construct and Survey Items

Tables 1 - 3 list the main survey items in this project, and the important criteria used to establish the grading system for digital literacy. Moreover, this study not only attempt to understand the differences in students' information capacities, learning opportunities, and learning channels, but it also includes questions regarding online friendship and e-mails of pornographic content in order for us to understand students' online activities and self-protection skills.

Table 1. The Construct and Criteria for the Survey of Students' Digital Literacy and Learning Opportunities

Primary Aspect	Secondary Aspect	Tertiary Aspect	Survey Items
Individual Digital Level	Access to Information	Access to Information Equipment	1. Whether one has ever used a computer 2. Number of days of using a computer 3. Number of hours of using a computer
		Access to the Internet	1. Whether one has ever used the Internet
	Information Literacy	Basic Operations	1. Correctly turn on/off a computer 2. Operate Windows OS 3. Chinese and English input 4. Print documents 5. Make a new file folder 6. Duplicate files 7. Burn files onto a CD/DVD-ROM 8. Correctly connect computer peripherals 9. Install common application software
		Professional Knowledge	1. Write a program 2. Make a webpage 3. Install and repair computer hardware 4. Establish, construct, and manage a server
	Information Application	Information Ethics	1. Verify the size of a file before e-mailing it 2. Do not send e-mails that are not validated
		Package Application	1. Use word processing software 2. Use balance sheets or diagram-making tools 3. Use slide-show software 4. Use drafting software 5. Use image-processing software
		Internet Usage	1. Connect to the Internet 2. Search for online information 3. Send /receive e-mail 4. Send out documents via e-mail 5. Download online resources (music, software)

		Daily-life application	<ol style="list-style-type: none"> 1. Computer games 2. Online games 3. Online chat 4. Net phone
Digital Learning Opportunities	School Information Environment	Information Education (Campus Information Questionnaires)	<ol style="list-style-type: none"> 1. The availability of computer lessons 2. The starting year of computer lessons (only asked of elementary students) 3. Hours of computer lessons 4. Content of computer lessons 5. Teacher-student ratio in computer lessons 6. Computer-aided instructions
		Information Equipment (Campus Information Questionnaires)	<ol style="list-style-type: none"> 1. The availability of computer classrooms 2. Unit-student ratio in computer classrooms 3. Internet connection in computer classrooms 4. The proportion of second-hand computers in computer classrooms 5. The level of computer equipment 6. The availability of computers in each class 7. Availability of information classrooms 8. Establishment of intra-campus network
	Household Information Environment	Information Equipment (Parent Questionnaires)	<ol style="list-style-type: none"> 1. Household computer availability 2. Household Internet connection 3. Status of household computer's performance
		Attitude toward Information Education (Parent Questionnaires)	<ol style="list-style-type: none"> 1. Awareness of the importance of one's children being able to use the computer 2. Awareness of the importance of the performance of one's children in using the computer 3. Attitude toward one's children using the computer at home 4. The age levels of computer users
Personal Information			<ol style="list-style-type: none"> 1. Sex 2. Grade Level 3. Order of Birth

Table 2 Survey Construct and Criteria for Teachers' Information-Integrated Instruction

Primary Aspect	Secondary Aspect	Survey Items
Information-Integrated Instruction	Individual Instruction Activities	<ol style="list-style-type: none"> 1. Attitude toward Information-Integrated Instruction 2. Percentage of online supplementary material among classroom materials 3. Percentage of time using the computer to produce and design materials 4. Percentage of time using the computer during instruction
	Online Interactive Learning	<ol style="list-style-type: none"> 1. Use of e-mail or online message boards to discuss matters with students 2. Use of e-mail to communicate with students parents 3. Use of e-mail to communicate with other teachers.
	Difficulties in Instructions	<ol style="list-style-type: none"> 1. The plan of solving "digital divide" in one's classroom 2. Evaluation of the difficulties in Information-Integrated Instruction

Personal Information		<ol style="list-style-type: none"> 1. Seniority 2. Subjects Taught 3. Age 4. Most Recent Educational Background 5. Sex
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Table 3. Survey Construct and Criteria for Parents' Digital Literacy

Primary Aspect	Secondary Aspect	Tertiary Aspect	Survey Items
Personal Digital Level	Access to Information	Access to Information equipment	1. Whether one has ever used a computer
		Access to the Internet	1. Whether one has ever used the Internet
	Information Literacy & Application	Basic Operations	<ol style="list-style-type: none"> 1. Correctly turn on/off a computer 2. Correctly connect computer peripherals 3. Operate Windows OS 4. Chinese and English input 5. Burn files onto a CD/DVD-ROM 6. Install common application software
		Application of Package	<ol style="list-style-type: none"> 1. Word processor 2. Balance sheet or diagram-making tools 3. Slide show software
		Internet usage	<ol style="list-style-type: none"> 1. Connect to the Internet 2. Search for online information 3. Send/receive e-mails 4. Download online resources (music, software)
		Daily Life Applications	<ol style="list-style-type: none"> 1. Online chatting 2. Net phone 3. Online video conferencing 4. Digital image processing
		Professional knowledge.	<ol style="list-style-type: none"> 1. Write programs 2. Make webpages 3. Deal with computer crash or viruses 4. Install and repair computer hardware 5. Construct, establish, and manage a server
Parent's Information		<ol style="list-style-type: none"> 1. Age 2. Educational Background 3. Work status of the main financial provider 4. Total household income 5. Ethnic background 	

V. Constructing the Digital Literacy Grading System for Students and Parents

Different indicators were utilized in this survey to measure the use of computers and the Internet among elementary/junior high school students. Since different indicators have different importance when they are used to measure individual digital literacy, we thus invited 12 representatives from the industrial, governmental, and academic circles to determine the weights for the indicators using AHP before elementary/junior high school students' digital literacy were graded.

The weights of the indicators for students and parents' digital literacy are listed on Tables 4 and 5.

Table 4. The Weight of 2006 Elementary/Junior High School Students' Digital Literacy Indicator and Construct

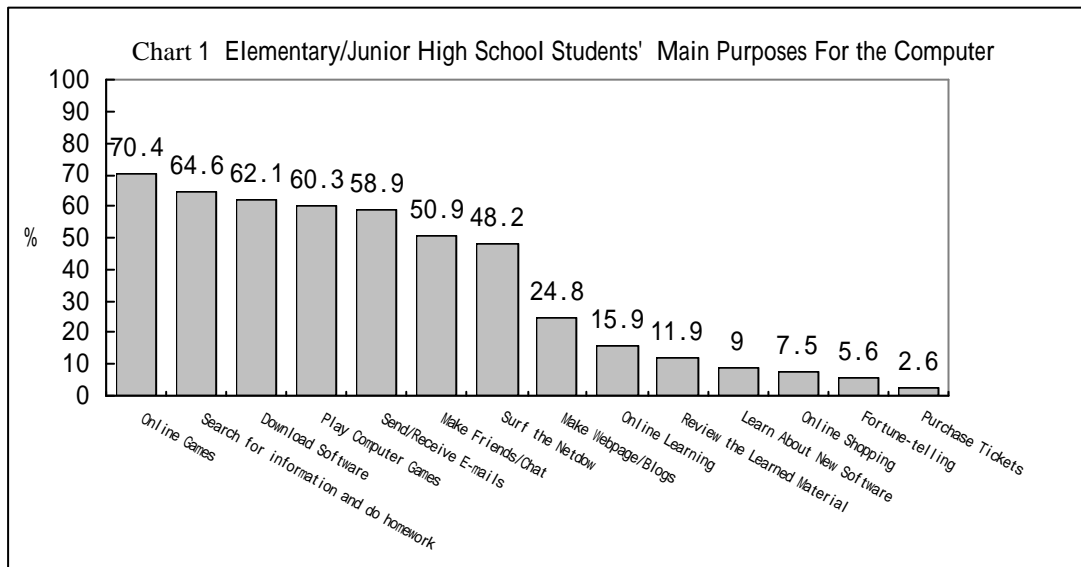
I			Primary	Second	Tertiary	Indicators
	Access to Information		0.210			
	Access to information equipment			0.576		
		Whether one has ever used a computer			0.218	0.026
		Number of days of computer use			0.380	0.046
		Number of hours of computer use			0.402	0.049
	Access to the Internet			0.424		
		Whether one has ever used the Internet			1.000	0.089
	Information Literacy		0.383			
	Computer Basic Operations			0.397		
		Chinese and English input			0.205	0.031
		Print documents			0.141	0.021
		Make new file folders			0.200	0.030
		Duplicate files			0.215	0.033
		Correctly connect computer peripherals			0.129	0.020
		Install common application software			0.111	0.017
	Computer Professional Knowledge			0.190		
		Write programs			0.098	0.007
		Make webpages			0.355	0.026
		Install and repair computer hardware			0.218	0.016
		Burn files onto a CD/DVD-ROM			0.329	0.024
	Information Ethics			0.413		
		Verify the size of file transfer			0.226	0.036
		Do not send unverified e-mails			0.774	0.122
	Information Application		0.407			
	Application of Packages			0.320		
		Word Processor			0.318	0.041
		Balance sheet or diagram software			0.196	0.026
		Slide show software			0.257	0.033
		Drafting software			0.119	0.015
		Image processing software			0.110	0.014
	Internet usage			0.438		
		Search for online information			0.269	0.048
		Send/receive e-mails			0.236	0.042
		Send files via e-mails			0.277	0.049
		Download online resources			0.218	0.039
	Daily-Life Applications			0.242		
		Computer games			0.136	0.013
		Online games			0.127	0.013
		Online chatting			0.338	0.033
		Net phone			0.399	0.039

Table 5. The Weight of Digital Literacy Indicator and Construct of the Parents of 2006 Elementary/Junior High School Students

I		Primary	Second	Tertiary	Indicators
	Household Information Environment	0.204			
	Household computer availability			0.475	0.097
	Household Internet connection status			0.351	0.072
	Method of household Internet connection			0.175	0.036
	Parents' Access to Information	0.180			
	Whether one has ever used a computer			0.523	0.094
	Whether one has ever used the Internet			0.477	0.086
	Parents' Information Literacy	0.294			
	Computer Basic Operations		0.274		
	WINDOWS operations			0.389	0.031
	Chinese and English input			0.319	0.026
	Burn files onto a CD/DVD-ROM			0.152	0.012
	Install common application software			0.140	0.011
	Computer Professional Knowledge		0.726		
	Write programs			0.059	0.013
	Make webpages			0.182	0.039
	Deal with computer viruses			0.490	0.105
	Install and repair computer hardware			0.198	0.042
	Construct and manage a server			0.070	0.015
	Parents' Information Application	0.322			
	Application of Package		0.377		
	Word Processor			0.404	0.049
	Balance sheet or diagram software			0.231	0.028
	Slide show software			0.213	0.026
	Image processing software			0.152	0.018
	Internet Usage		0.243		
	Search for online information			0.347	0.027
	Send/receive e-mails			0.373	0.029
	Download online resources			0.280	0.022
	Daily-Life Applications		0.380		
	Online chatting			0.268	0.033
	Net phone			0.501	0.061
	Online video conferencing			0.231	0.028

VI. Elementary/Junior High School Students' Digital Literacy

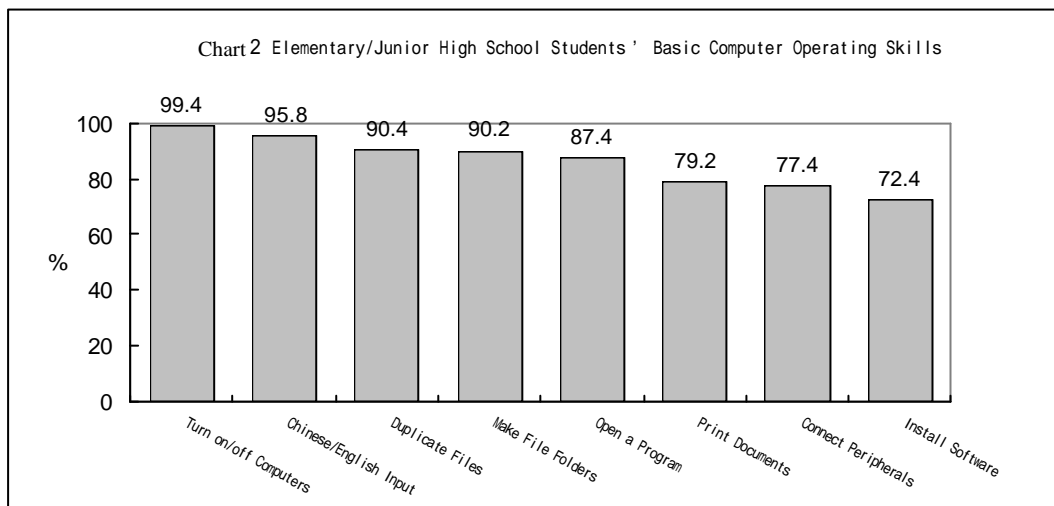
1. Almost all elementary/junior high school students in Taiwan know how to use the computer. 99.7% of them have used a computer before. The average age at which they first used a computer is 7.9 years old (about the 3rd grade). Thanks to campus information curriculum and the rapid development of the digital society, the 4th graders' young age is actually an "advantage." They first began using the computer at an average age of 6.9, which is about 2 years earlier than the 8th graders.
2. For elementary/junior high school students, playing online games is the primary reason for using the computer (70.4%), followed by searching for information and doing homework (64.6%), downloading music and software (62.1%), and playing computer games (60.3%). Moreover, many of them use the computer to send/receive e-mails (58.9%), make friends online (50.9%), or just surf the net purposelessly (48.2%).



3. To most of the students, using the computer is almost the same as logging onto the Internet. 34.8% of them are online when they use the computer. 20.4% are mostly online. 13.0% are online half of the time.
4. Most of the elementary/junior high school students already have basic computer operation skills. 99.4% of them can correctly turn on/off a computer, which is the leading skill of the eight basic operations. A lot of them (9 out of 10) also know how to enter Chinese and English input (95.8%), copy files (90.4%), make new file

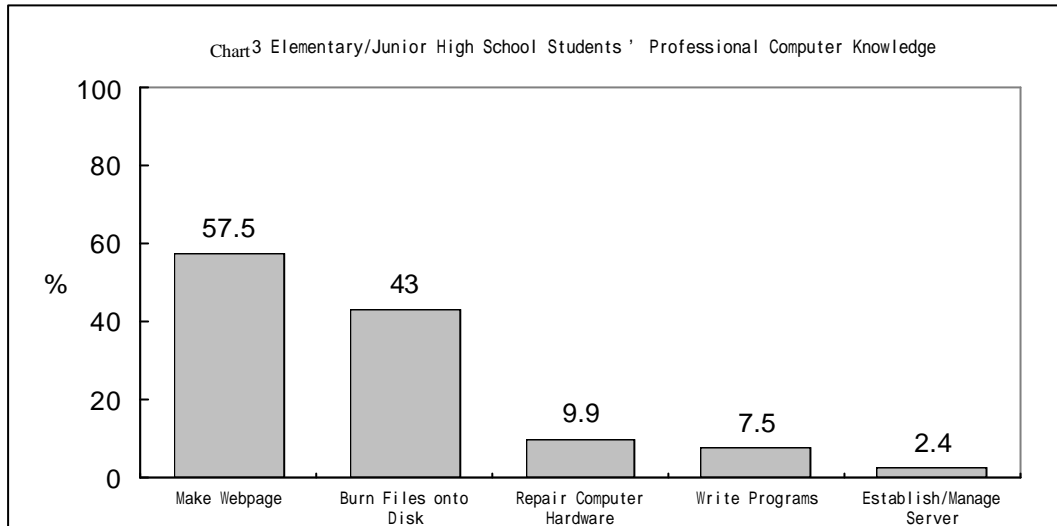
folders (90.2%), and operate Windows to open new programs (87.4%). However, fewer of them know how to print documents, connect computer peripherals (keyboard/mouse), and install software (between 72.4% and 79.2%).

- The computer-operating skills among students who reside in remote areas are not as good as those in urban areas or developed cities. Although fewer of them know how to work with Windows (80.9%), print documents (66.8%), make new file folders (82.9%), duplicate files (83.8%), and install software (65.6%), with at least 60% of them are computer literate. However, this is 8 -10% lower than the students in cities. Those who reside in the most remote areas show the weakest skills.



- Elementary/junior high school students' professional computer knowledge is measured by the indicators of knowing how to write programs, make a webpage, install and repair computer hardware, burn files onto a CD/DVD-ROM, and establish/manage a server. The findings show that most students know how to make a webpage (57.5%), followed by those who can burn files onto a CD/DVD-ROM (43.0%). Not many of them know about installing and repairing computer hardware, writing programs, or server management (less than 10%).

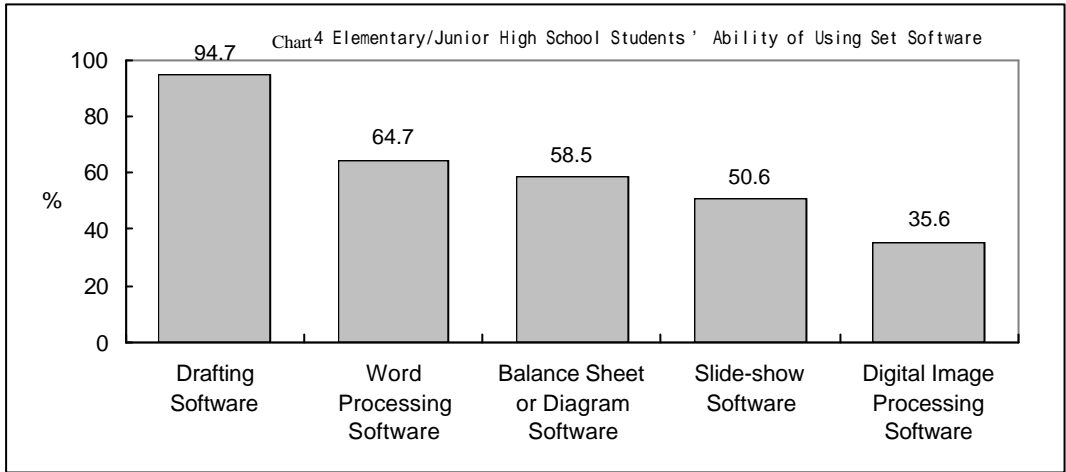
- In terms of urban/rural differences, the professional computer knowledge in students residing in remote areas is not as good as those in urban areas. 49.6% of them know how to make a webpage, which is way lower than the 60.3% of urban students. The percentage of those who know how to burn files onto optical media is also about 10% less.



8. Elementary/junior high school students' information ethics need to be improved. Although 44.6% of them consider whether larger attachments would cause problems for the recipients, 36.1% admitted that they were not aware of this. 18.9% have never used e-mail. In terms of forwarding e-mails that are provocative, funny, yet unverified, only 39.7% are careful with this. 41.0% admitted they share the unverified mails with their classmates. 18.9% do not know how to use e-mail.

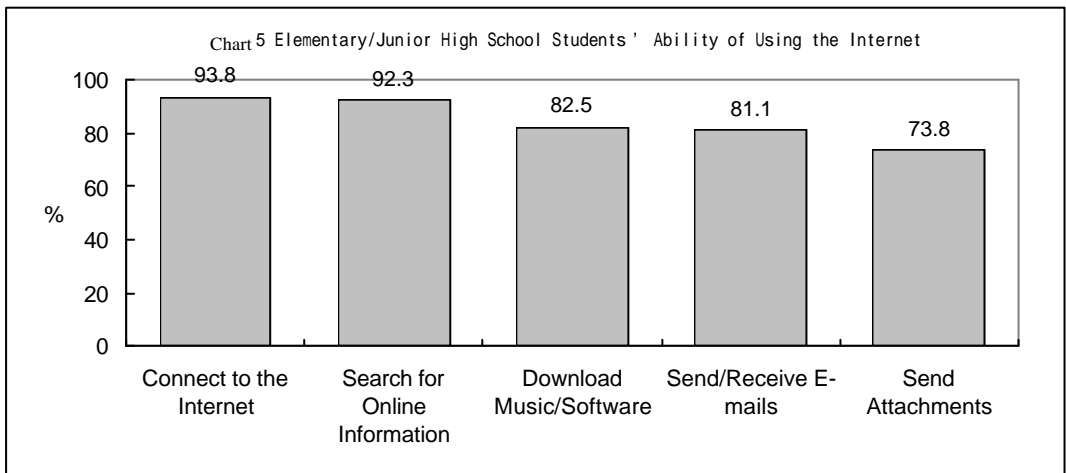
9. Almost all of the elementary/junior high school students know how to use drafting software (94.7%), followed by word processors (64.7%) and slide-show software (58.5%). Not many of them know how to use balance sheet or diagram-making tools; only 50.6% of them know how to do it. The percentage of those who know how to use digital image processing is the lowest one--only 35.6%.

10. In terms of urban/rural differences, more metropolitan students know how to use word processing, slide-show, drafting, and digital image processing software, followed by students in commercial or industrial areas. Students residing in remote areas are weaker at using package software.

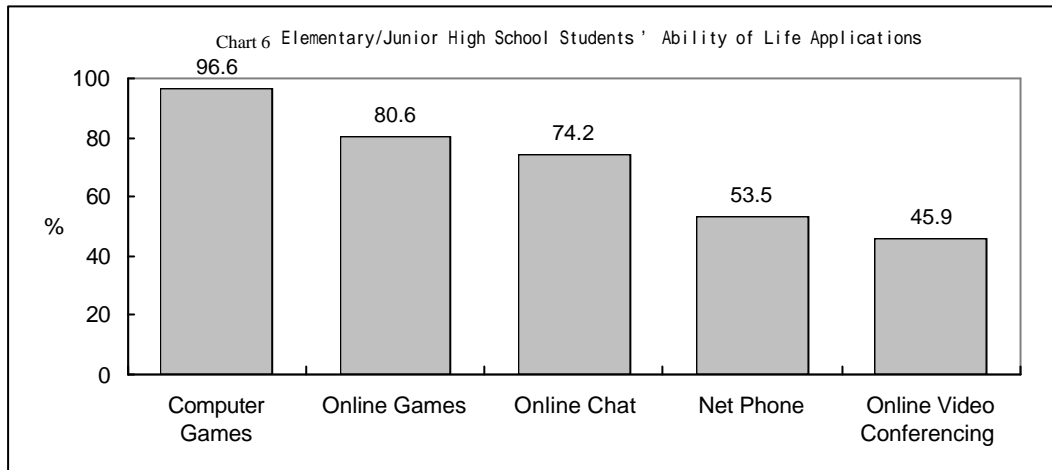


11. Elementary/junior high school students show good command in using the Internet. More than 90% of them know how to log onto the Internet and search for information, and 82.5% also know how to download music and software. More than 80% know how to send/receive e-mails, and 73.8% know how to send attachments via e-mail.

12. The percentage of knowing the different Internet applications is about 5-7% lower among students residing in remote areas. This skill is lowest for those who reside in the remotest areas.



13. 96.6% of the elementary/junior high school students know how to play computer games. 80.6% and 74.2% of them respectively know how to play online games and do online chatting using software such as MSN Instant Messenger. 53.5% know how to use net phone, and 45.9% know how to do online video conferencing. There is a significant difference between the students in urban or rural areas in terms of their love for online games and online chatting.



14. Most of the elementary/junior high school students believe that they learn basic computer operations on their own. Those who reside in remote towns/mountain regions or areas that are classified as “villages” depend more on their teachers to learn the basic skills.
15. Most of the students learned how to make webpages at school. Except for writing programs and establishing servers, students in remote areas depend more on their teachers to learn professional computer skills.
16. Elementary/junior high school students mostly acquired the skill of using package software at school. Skills such as “word processor (55.6%),” “balance sheet software (52.0%),” and “slide show software (68.0%)” are learned from teachers. This kind of dependency is increased by more than 10% among students residing in remote areas.
17. Most elementary/junior high school students learned about the Internet through independent exploration or books, followed by instructions from their family members. Those who reside in remote towns/mountain regions or areas that are classified as “villages” depend more on their teachers to learn about the Internet.
18. Most elementary/junior high school students learn about the daily-life applications of information through independent exploration or books, followed by instructions from their family members. What is worth noting is that 25.8% of the students learn about online games from their classmates and friends instead of independent explorations.

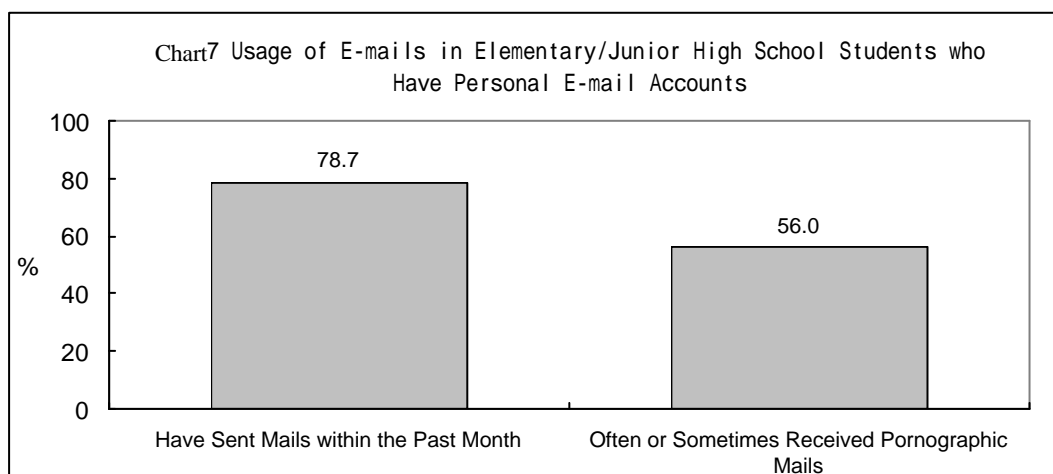
Table 6 Teacher as Main Learning Channel for Digital Literacy Indicator

unit: %

Item	Teacher
Play online games	1.5
Download music or software	5.1
Play computer games	5.2
Burn files onto a CD/DVD-ROM	5.4
Chatting online	6.0
Use net phone	6.3
Construct, establish, manage a server	7.2
Install and repair computer hardware	8.1
Install application software	10.4
Connect the computer to the Internet	10.4
Correctly connect computer peripherals	10.5
Online video conferencing	12.3
Print documents	12.9
Turn on/off a computer	17.9
Send/receive e-mails	18.1
Write programs	19.8
Search for information online	21.8
Input Chinese and English	22.2
Send files or documents via e-mail	22.2
Use digital image processing software	23.7
Use drafting software	27.8
Duplicate files	29.1
Make new file folders	29.8
Go into Windows and open applications	43.4
Use balance sheet software	52.0
Use a word Processor	55.6
Make a webpage	59.1
Use slide show software	68.0

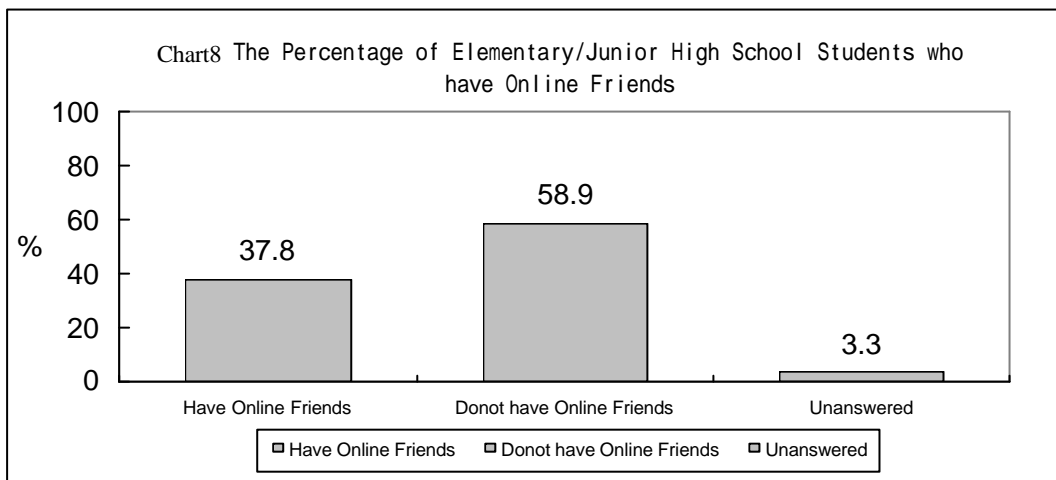
19. It is not clear whether students know if their teachers use computers in the non-computer related courses. Students in the same class answer the question differently. Looking at the overall data, 13.0% of the students stated that many teachers use computers in their instruction, 53.0% stated that their teachers seldom do so, and 32.4% expressed that they do not have Information-Integrated Instruction.

20. Students have very positive comments for classes that have Information-Integrated Instruction. 80.3% stated that computer-aided instruction made learning more interesting, and 81.5% expressed that it enhanced their learning performance. Among all grade levels, 4th graders enjoy Information-Integrated Instruction most.
21. Most of the elementary/junior high school students do not have good habits of citing online resources. Only 16.4% stated that they include the web addresses from which the information was gathered; 45.7% do so once in a while.
22. 32.0% of the elementary/junior high school students feel troubled if homework needs to be completed using the computer. As for why these students do not like doing homework using the computer, the most common reason is that they do not have printers at home (39.2%), followed by having no Internet connection at home (23.7%), having no computers or having low-performance computers (22.1%), having no suitable software (21.2%) and not being good at using the computer (20.7), and all these factors are related to computer literacy and the level of household information equipment. After separating these students according to their geographical locations, students who have low household income and are in remote schools worry more about using the computer to do homework since they have no computers, printers, or Internet connection at home.
23. 82.7% of the elementary/junior high school students have their own personal e-mail accounts, and 78.7% of them have sent/received e-mails within the past month. 56.0% of them have received pornographic e-mails, showing the pervasiveness of this kind of e-mail.



24. It is very common for elementary/junior high school students to use instant messengers. As many as 78.4% of them have MSN, YAHOO, or Skype accounts, and 67.6% of them use MSN or other programs to chat after school. 55.0% discuss homework online.

25. The channels for elementary/junior high school students to make friends are very different from those of older students. 37.8% have friends that they met purely through the Internet. Students whose parents have low educational background tend to have more online friends, and this is probably related to the level of parent control.



26. The students who do have online friends have 18 of them in average. 13.1% of them stated that their online friends know their true identities, and 6.5% of them have met their online friends.

VII. Status Quo of the Establishment of Campus Information Environment

1. In terms of the personal computers that are provided to elementary/junior high school students in schools, 95.7% are brand new, and only 4.3% are used. Also, all of them have Internet connections.
2. There is a significant difference in terms of the monitors of the school computers in different regions. The availability of LCD monitors for school computers is highest (100%) for the eastern regions and the Kinmen/Matsu areas. The availability drops to 55.9%~59.6% for schools in central and southern regions. In

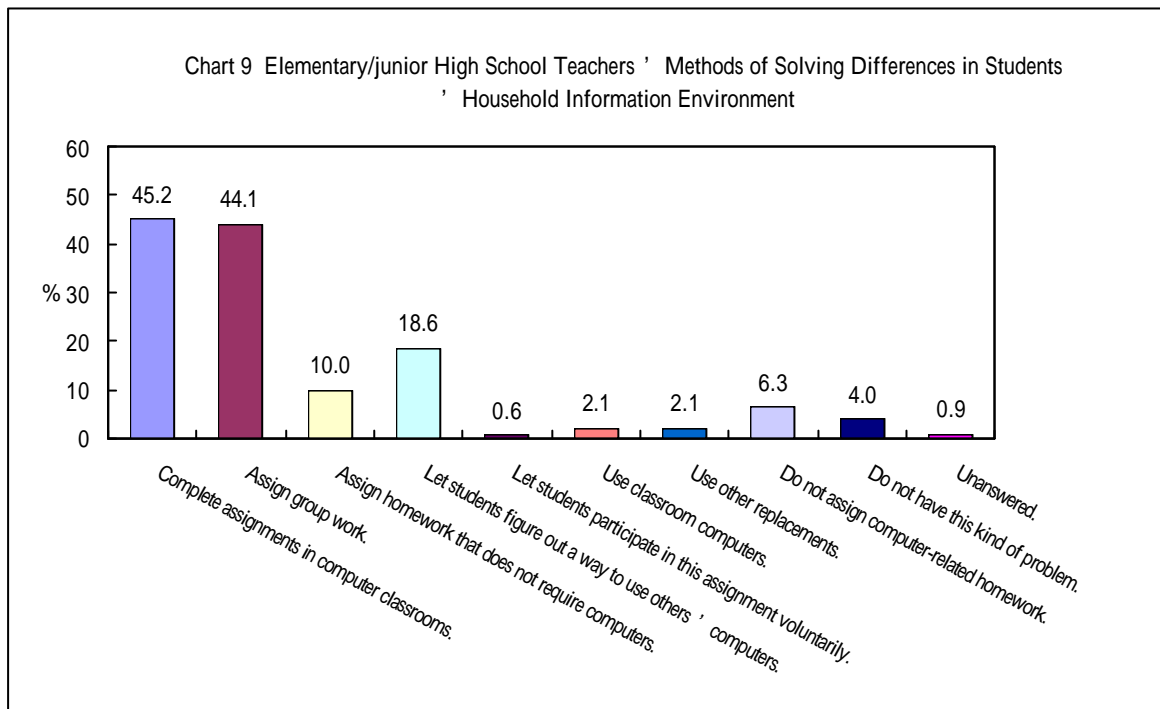
terms of the level of the computers, schools in the central region are also at a disadvantage. Only about 1/3 (34.4%) of the school computers are Pentium II or lower classes.

3. 61.5% of the schools have reached the goal of a “computer in each classroom.” 17.7% of them have computers in some of their classrooms, and 20.8% have no computers at all. By comparison, it is not common to have projectors in classrooms. Only 1.7% has Trinitron projectors. 15.9% have them in some classrooms.
4. In terms of the establishment of intra-campus network, about 80% (79.6%) of the classrooms and computer classrooms are fully connected to the Internet. As for the external network’s bandwidth, the most popular ones are 100M fiber optical and ADSL (36.2% and 32.2% respectively). The analysis shows that elementary schools have better computer equipment and intra-campus networks than junior high schools.
5. More than 90 percent of the classrooms are only open to students during school hours (93.7%). Only 6.3% of them are open to students after school or during weekends.
6. Half of the authorized software that is used by elementary/junior high school students is application software such as the Office series (99.2%), website building tools (87.6%), image processing software (85.9%), and drafting software (51.9%). Looking at the currently available software, 69.6% believe it meets the educational demands, 20.9% believe it is still insufficient, and 9.6% have no comment.
7. Two thirds of the campus information curriculum is selected by the school teachers independently (68.2%). 30.1% of curriculum is selected based on a single person’s decision. 0.7% use united materials for middle level students and self-produced material for high level students.
8. 71.3% of the schools believe they have enough computer teachers, while 28.3% believe they are lacking. Also, 70% of the information-related teachers have to teacher other courses instead of just computers.
9. 27.2% of the students learned about computers during their pre-school years.

VIII. Status Quo of Information-Integrated Instruction by Elementary/Junior High School Teachers

1. According to the survey given to teachers who teach at the 4th, 6th, and 8th grade levels, most of them do not think highly of information-integrated instruction. Only 30.9% believe computer-aided instructions are useful to express teaching content. 43.2% of them believe these programs motivate students. Yet, only 22.8% believe it will greatly improve students' learning performance. Moreover, most of the teachers (70%) disagreed with the idea that "students who learn how to use computers at an early age have a greater advantage."
2. Looking at the overall data, teachers who are male, young, low in seniority, and specialized in a subject are more positive about the effects of information-integrated instruction. In terms of the grade levels, elementary school teachers are more positive about computer-aided instruction, but junior high school teachers are not. In terms of subjects, computer teachers are most positive about information-integrated instruction, whereas math and language teachers dislike computer-aided instruction most.
3. Elementary/junior high school teachers do not depend on the Internet very much. Only about 1/4 of the supplementary materials are gathered from the Internet. These teachers also do not frequently use computers in teaching. About 1/4 of them never use information equipment when teaching (24.8%). 41.4% of the classroom materials are off-the-shelf. 58.6% are independently produced.
4. In terms of the assigned homework in elementary/junior high schools, teachers in metropolitan areas are more likely to assign homework that requires computers or the Internet (19.7%), followed by those in commercial/industrial cities. Teachers in remote areas are least likely to assign this kind of homework (15.7%).
5. The survey shows that elementary/junior high school teachers are not well aware of the household information situation of their students. 31.7% of them do not know the number of students in their classes who do not have computers at home.
6. The elementary/junior high school teachers' responses toward students who have no computers at home or whose computers are not fast enough are as follows. Most of them (45.2%) allow their students to finish homework in the computer

classrooms, followed by assigning group work so classmates who have computers can help (44.1%). 18.6% of them ask the students to think of a way to use others' computers in order to finish the homework. 10.0% assign homework that is not computer-related to students who do not have computers at home.



7. Although most elementary/junior high school teachers do not believe information-integrated instruction is effective, 77.0% of them believe this program is valued by the schools. However, 50.2% believe that parents do not value information-integrated instruction.
8. Although not many elementary/junior high school teachers conduct information-integrated instruction, 83.0% of them welcome the sharing of this kind of experience very much.
9. In terms of looking at the barriers to information-integrated instruction as first-line educators, elementary/junior high school teachers believe that the lack of hardware facilities is currently the biggest problem (64.2%), followed by having no time to design the material (48.4%). 43.0% believe that certain subjects are not suitable for information-integrated instruction.
10. Moreover, 27.7% of the teachers believe that the barrier to information-integrated

instruction is the gap between students' information literacy. 26.6% admit that teachers lack the needed information capabilities. 8.7% and 3.6% respectively believe the main problem is that parents and schools do not value this program.

IX. Status Quo of Elementary/Junior High School Students' Household Information Environment

1. 93.3% of elementary/junior high school students' households have computers. The percentage of household information equipment ownership is basically positively correlated with the level of urbanization. The rate of ownership is 87.9%, 92.2%, and 95.6% in remote areas, commercial/industrial cities, and metropolitan areas respectively.
2. In terms of students' household internet connection status, about 8 out of 10 households have Internet connection (84.0%); 92.1% of them have broadband.
3. The availability of students' household Internet is still the highest in metropolitan areas (88.1%), and is reduced to 81.9% in commercial/industrial areas and 74.8% in remote areas. Moreover, the rate of household Internet connection increases with parents' educational background, household income, and work status.

Chart 10 Elementary/junior High School Students' Household Computer Ownership

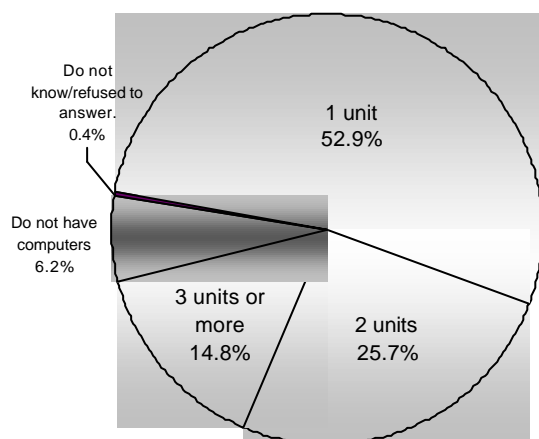
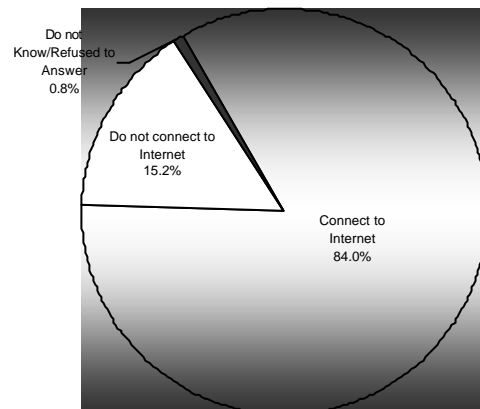


Chart 11 Elementary/junior High School Students' Household Internet Connection



4. In households that have computers, 98.1% of these parents allow children to use computers at home. 75.4% of the households share the computer. Children in

23.8% of them have their own computers.

5. The willingness of parents to upgrade the computer equipment for their children increases with their educational background and income. 85.0% of the parents who have graduate studies backgrounds are willing to upgrade their household computers for children's school needs. The willingness drops to 58.7% for parents who have had elementary school education or less. In terms of parents' ethnic background, aboriginal parents are least willing to upgrade the equipment.
6. Among the parents of these elementary/junior high school students, 76.0% of them know how to use the computer, whereas 22.2% do not. However, only 37.2% are truly able to answer or solve computer-related problems for their children.
7. In terms of professional computer knowledge, only 23.5% of the parents know how to deal with a computer crash or virus. 17.7% know how to install and repair computer hardware, 16.6% can make a webpage, 11.8% can establish, construct, or manage servers, and 9.8% know how to write programs.
8. In terms of the application of package software, many parents know how to use a word processor, but this is still only less than 50% of them (47.7%); 37.0%, 30.4%, and 25.1% know how to use balance sheet software, slide show software, and image processing software respectively.
9. In terms of the use of the Internet, 67.8% of the parents know how to connect to the Internet, and 66.0% know how to search for information online. More than 50% know how to manage, send, and receive e-mails (54.5%) and download files, software, or music (51.3%).
10. In terms of daily-life applications, only 34.9% of the parents know how to use online chatting. Less than 30% of the parents know how to use net phone (26.5%) or online video conferencing (24.1%).
11. Whether it is the understanding of information life, children's information literacy, or the importance of children's grades in computer lessons, about 80% of parents value the importance of information education.

X. Grading Digital Literacy among Students and Parents

1. By organizing the opinions of representatives from Taiwan's industrial, governmental, and academic circles in conducting the digital literacy survey of elementary/junior high school students, we have established that Information Application is a lot more important than Access to Information, and their weights are 0.407, 0.383, and 0.210 respectively. As for the four aspects of parents' digital literacy, parents' Information Application (0.322) and Information Literacy (0.294) are more important than Household Information Environment (0.204) and parents' Access to Information (0.180).
2. In terms of single indicators, experts from Taiwan's industrial, governmental, and academic circles value students' information ethics (not sending unverified e-mails) most, followed by whether they use the Internet. As for parents' digital literacy, the indicator with the most weight is whether parents know how to deal with computer viruses, followed by their household computer availability, and whether they know how to use the computer and the Internet.
3. Overall, the digital literacy in Taiwan's elementary/junior high school students is 71.1 points. By analyzing the distribution of the marks, we can see that elementary/junior high school students have the highest score in the aspect of Recent Use of Information (77.6 points), followed by Information Application (72.4) and Information Literacy (66.2), indicating that almost all these students have come in touch with computers and the Internet, and they have acquired basic computer skills. However, there are differences in terms of the frequency of computer use, information knowledge, professional knowledge, and application of package and daily-life applications.
4. In terms of urban-rural differences, digital literacy in elementary/junior high school students is positively correlated with the level of urbanization. Students in metropolitan areas showed the highest performance (72.2 points), followed by those in commercial/industrial cities (70.6 points), and remote areas (68.0); of these, the students who reside in the most remote areas performed the worst (64.9).
5. Compared to the fact that elementary/junior high school students scored more than 70 points (71.1 points), their parents' digital literacy only scored 52.6 points in average. Looking at the structure of the parents' scores, we see that

they performed highest in the aspect of Household Information Environment (87.9 points), followed by Access to Information (71.6), and they performed quite low in Information Application (41.0) and Information Literacy (29.2 points). This shows that although the parents are able to buy computers and related equipment for their children, and that they sometimes use the computer and the Internet as well, their information applications are only limited to basic operations while having a lower level of life applications.

6. The regression analysis showed that when all other variables are controlled, variables such as school locations, teachers' information-integrated instruction, students' genders, grade levels, and the availability of household computers and parents' information literacy are all important factors that influence the students' digital development. Among these variables, the availability of household computers and grade levels are the most influential factors. The former is the key to ensure fairness in information learning opportunities, whereas the latter expresses the learning results.

XI. Suggestions

Since the information education in elementary/junior high schools has been fully implemented, the digital divide between students in rural and urban areas has been reduced greatly, showing that the intervention of providing educational resources is truly an important power that creates equal learning opportunities for the younger generation.

However, although almost all elementary/junior high school students already know how to use the computer and can log on to the Internet, there are still differences in their information capabilities. Except for their equal love for online games and online chatting, students in remote areas perform worse than those in metropolitan/commercial/industrial areas in terms of computer operations, professional computer knowledge, using package, or Internet applications. This kind of low performance is even worse in those who reside in the remotest areas. According to the findings in this study, policies designed to reduce the digital divide among students should consider the following points:

1. Reduce the Influence of Family Factors on Students' Information Capabilities.

The research shows that family factors influence the next generation's learning

opportunities through many paths. Results of regression analysis indicate that when the influence of all other variables are controlled, household computer availability and parents' information capabilities are the first and second most influential factors affecting students' digital performance.

Digital divide cannot be solved by the availability of hardware alone. However, we advise the Ministry of Education to first evaluate the feasibility of providing students from low-income families with computers, seek donations from enterprises, and provide subsidies for household computers and Internet services so as to prevent the digital divide from further broadening.

Further, parents whose digital capabilities are far worse than those of their children not only cannot solve problems for their children but are also unable to control and prevent their children from entering online traps. Therefore, it is advisable that schools and communities work together to provide computer courses for these parents, which would increase the rate of computer use among middle-age/seniors and reduce the discrepancy in learning opportunities caused by family factors.

2. Remedy the Lack of Computer Hardware and Teachers in Central/Southern/Remote Areas.

Although the elementary/junior high schools in Taiwan currently all have computer classrooms with Internet connections, the computer hardware in central/southern schools is generally lacking compared to schools in northern, eastern, and off-shore areas. The problem faced by schools in remote regions is that their outward network is mostly through ADSL (60.0%), whereas about 60% of the metropolitan schools (56.3%) use 100M fiber optical networks. Since computer stability and Internet speed affect users' willingness and the planning of the material, we recommend that the needed information equipment upgrades be conducted in the future.

The study also shows that schools with higher urbanization have more computer teachers, whereas only 57.5% of the schools in remote areas believe they have enough of them. Moreover, not only are there not enough teachers in remote areas, computer teachers in these areas are more likely to teach other subjects than those in metropolitan schools.

What is mind-boggling is that, during the analysis of students' learning channels, we discovered that students who reside in remote towns/mountain regions or areas that are classified as "villages" depend more on their teachers to learn about basic computer skills and package software, except for online games and online chatting. Facing the problem of having insufficient teachers in the remote areas where teachers are especially needed to teach students computer skills, we recommend more efforts should be put into training computer teachers for schools in remote areas. On the other hand, the rationality of the current number of teachers in urban and rural areas should also be reconsidered.

3. Increase the Availability of Computer Classrooms in Schools During Holidays or After-School Hours to Increase their Accessibility for Students.

More than 90% of the dedicated computer classrooms in elementary/junior high schools in Taiwan are only open during school hours (93.7%); however, 13.0% of the students need to use computer classrooms after school, especially those in remote areas and Kinmen/Matsu, in which the availability of computer classrooms during after-school hours is 0% despite the fact that 16.2% and 23.4% of the students in these two areas respectively have the need for them.

In order to increase the availability of computers to disadvantaged students, it is recommended that schools' computer classrooms should be open to them after school. Moreover, parents who do not know how to use computers can also be recruited to sign up for supplementary education or parents' computer courses on weekends to learn computers with their children.

4. Unify the Making of Information Course Material.

Current gaps between elementary/junior high schools' information curriculum, classes of the same grade level, and the curricular differences in metropolitan, commercial/industrial, and remote schools are not only caused by the differences in the material used by each school, but also by the fact that 2/3 of these schools do not have unified computer course material. Allowing teachers to freely decide their course content does have the advantage of meeting local needs; however, the fact that teachers are not designing course material according to the standards specified by the Ministry of Education is obviously one of the causes of digital divide. Therefore, we recommend that a unified elementary/junior high school information curriculum be developed.

5. Introduce Free Software into Campuses

About 1/3 of these students would feel troubled if their homework required the use of computers. The analysis shows that 21.2% of them dislike this kind of homework because they do not have the required software at home, showing that acquiring software is also a problem for the students.

With the government's tight budget these days, elementary/junior high schools also lack the money for purchasing software. To save this kind of money, introducing free software into campuses would not only save money but also provide students with software that they can use at home.

6. Readjust the Role of Junior High School Information Curriculum.

The study shows that perhaps due to the differences in the objectives of different stages and academic pressure, the information environment in junior high schools is not only worse than that in elementary schools, but there is no difference between 8th graders and 6th graders in terms of information capabilities. However, junior high school students still spend a lot of time on the Internet, and 8th graders actually spend more time on leisure activities such as online games and online chatting. For the future, we should consider the orientation and planning of information curriculum in junior high schools. If the government believes there should be differences between each stage of information literacy development for elementary/junior high school students, then the curriculum should be designed accordingly. If junior high school students should focus on developing their capabilities in other subjects, then their basic skills of information application should be developed during elementary years.

7. Increase Teachers' Information Capacities and Their Willingness to Conduct Information-Integrated Instruction.

The study shows that elementary/junior high school teachers have low dependence on the Internet. Not only do they not use computers often in their teaching, but they also seldom use computers, digital applications, and information-integrated instruction. Moreover, teachers are not aware of the household information environment of their students. 31.7% of them do not know the number of students in their classes who do not have computers. Even

18.6% of them ask students to find ways to gain access to computers so they can complete homework that requires computers.

Elementary/junior high school teachers do not believe in the effectiveness of information-integrated instruction. Only 30.9% of them believe computer-aided instructions are useful to deliver teaching material. 43.2% of them believe it can motivate students, and only 22.8% believe it can greatly enhance learning performance. However, their students regard information-integrated instruction highly, and their parents value information curriculum very much.

As for the causes behind elementary/junior high school teachers' lack of faith in information-integrated instruction and consideration for students' information development, the biggest one is believed by the teachers to be the lack of information hardware (64.2%), followed by not having time to design the material (48.4%); also quite a lot of them believe that certain subjects are not suitable for information-integrated instruction (43.0%). Moreover, 27.7% of the teachers believe the gap in students' information literacy is the barrier to information-integrated instruction, and 26.6% believe they themselves lack the needed information capacities.

Moreover, not many classes have projectors. Only 1.7% of the schools have Trinitron projectors in each classroom. 15.9% of them have them in certain classrooms. This is probably due to the lack of infrastructure for information-integrated instruction, resulting in teachers' unwillingness to conduct Information-Integrated Instruction.

In order to increase the popularity and effectiveness of information-integrated instruction, the aforementioned problems must be resolved before teachers may be more willing to use information.

8. Control Junk Mails and Teach Students How to Protect Themselves When Using Computers.

The survey shows that 82.7% of elementary/junior high school students have their own e-mail accounts, and 78.7% of these students have sent/received e-mails within the past month. 56.0% of them have received pornographic e-mails, which is the first potential threat.

The second threat is that the channels for elementary/junior high school students to make friends are very different from the older ones. 37.8% have friends that they met purely through the Internet. 13.1% of them stated that their online friends know their true identities, and 6.5% of them have met their online friends.

Elementary/junior high schools' information education should place more emphasis on teaching students about self-protection. Parents who do not know about computers should also be educated to ensure that students can enjoy the convenience and fun offered by computers in a safer environment.