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Abstract

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This paper examines the current technology deployment, curriculum, and teacher education in both districts, and looks at barriers to technology implementation. It also briefly addresses the issue of learning, and the benefits of technology in the classroom. Despite their cultural differences, both districts face many of the same hurdles: lack of funding, teacher training difficulties, finding the right fit of software and hardware, and an ever increasing emphasis on testing. In addition, Japan, due to its unique cultural paradigms, experiences many unique obstacles also addressed in this paper.

Technology Integration

Comparing Technology Integration Kofu Middle Schools to Des Moines Public Schools

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ABSTRACT

Based on two years of experience teaching in the Kofu middle schools and ten years teaching in Des Moines Public Schools, this paper compares technology integration between Kofu, Japan middle schools and Des Moines, Iowa middle schools. For over twenty years the two cities have enjoyed a strong sister city relationship, participating in many annual cultural exchanges including a teacher exchange. Five Des Moines educators teach English in all the Kofu middle schools for one school year. Over the years attempts to create web based or electronic cultural exchanges have met with limited success. This paper examines the current technology deployment, curriculum, and teacher education in both districts, and looks at barriers to technology implementation. It also briefly addresses the issue of learning, and the benefits of technology in the classroom. Despite their cultural differences, both districts face many of the same hurdles: lack of funding, teacher training difficulties, finding the right fit of software and hardware, and an ever increasing emphasis on testing. In addition, Japan, due to its unique cultural paradigms, experiences many unique obstacles also addressed in this paper.

Introduction

When presented with the following statement, "Japanese students leave middle school with a better understanding of computers than American middle school students", most Americans offering a response, "agreed" or "strongly agreed". However, when one compares technology accessibility, utilization, and proficiency between Des Moines, Iowa middle schools and similar schools in her sister city of Kofu, Japan, the reality contradicts this perception. To understand this issue, one must examine a number of factors related to technology integration.

When studying the issues related to technology integration, one must first define the term technology. In the not so distant past, a technology rich classroom had its own film projector and tape recorder. Gradually schools moved to TVs, VCRs and video disc players. Today, the phrase "technology rich" is an ever-evolving term, but for the purposes of this discussion, technology refers to the use of computers and related software. Technology integration is defined as the use of computers/software by students and teachers to enhance student achievement. There are many examples of technology integration, including:

- Administration (record keeping, communication, test/lesson generation)
- Research (both by students and teachers)
- Direct instruction
- Drill and Practice
- Simulation activities

First, this paper compares the basic demographics of both school districts, looking specifically at teacher and student population and computer ratio. It examines the

amount of time spent by students and teachers using the computer and the type of work completed. Next, it addresses the issue of technology integration itself, specifically at the benefits for teacher and student, both perceived and real, and addresses some of the concerns for technology in schools. Finally, it looks barriers to technology integration in Kofu middle schools, those unique to the Japanese system and those shared by its American learning institutions. First, one should take a closer look at the two districts.

Des Moines Public Middle Schools (DMPS)

Des Moines is the capital of the Midwestern state, Iowa, with a population of 193,187. The school district, totaling 31,922 students, joins 40 elementary schools, 10 middle schools and 6 high schools to create the largest district in the state. Cultural diversity is high in the district, with 2,200 students in the English as a Second Language (ESL) program. Out of 6891 middle school students, 340 are ESL, making up almost 5% of the population. This does not include the mainstreamed students for whom English is a second language. Des Moines has ESL program in 17 elementary, 1 parochial (K-8), 5 middle schools, and 4 high schools. This diversity greatly alters the classroom instruction dynamics.

Technology Integration. When this author began teaching in the district eleven years ago, computers were few and far between. Roosevelt High School, with a full time staff of nearly one hundred, had a single Mac Classic to serve over one hundred staff members. That was to change quickly, and during the 1994-95 school year, Des Moines Public Schools (DMPS) created five technology pilot schools. Every classroom in the pilot schools was equipped with a teacher station (computer—Pentium Two or faster--, monitor, and printer and display device), and every classroom was wired for the Internet.

During the next two years, the technology department monitored the successes and failures experienced by these schools as teachers attempted to integrate technology into the curriculum. During the 1997-98 school year, DMPS launched its two-year L-Net project, its most ambitious technology project yet, networking sixty-four schools and the administrative offices with each other and the Internet. This project, designed to avoid the difficulties experienced by the demonstration schools, will wire each building for inter and intranet, provide a teacher station for every classroom, and a work station to each support staff person (counselors, secretaries, nurses, etc). As of July 2000, the district is on target to meet its goals, providing one of the most comprehensive networks in Iowa (Des Moines Public Schools, 1999).

According to technology purchasing officer, Ronald Meyers, in the past year Des Moines Public Schools purchased well over $2,000,000 dollars worth of hardware (in the form of computers, monitors, printers and other peripherals and software) (personal communication, June, 2000). Not included in this figure was the cost of installing and maintaining the equipment, as well as installing and supporting the network. As with any project of this magnitude, there were frustrations—technical difficulties, hardware breakdowns, and training issues; but great strides were made to increase student/teacher access to technology. Comparing the results from the Star Technology Surveys completed at the close of the 1998-99 school year to similar instruments used the prior year, one can see the results. Teacher communication improved, parent and community access to information grew, and teacher access to web resources increased (DMPS Technology, 1999).

Currently, all middle school students receive formal computer training in sixth, seventh and eighth grade. At each middle school at least one full time computer teacher covers keyboarding skills, as well as word processing, and drawing/multimedia programs. In addition, most students use CD ROM support material and Internet as a regular part of the curriculum. Keyboarding classes are designed to teach "touch-typing", a method in which the typist is able to type without looking at his/her fingers; and by scoring well in middle school, students can "pass out" of introductory keyboarding high school classes. Technology education is an important component of Des Moines middle school education, and all students are expected leave middle school with a basic understanding of keyboarding, Internet, and word processing.

Kofu Public Schools

Kofu, Yamanashi, sister city to Des Moines, Iowa, is the capital of Yamanashi Prefecture. About one hour from Tokyo by train and an hour North of Mount Fuji, Kofu it is located in the south central area of the main island of Honshu. Considered a by most Japanese to be a "rural city", Kofu has a population of approximately 200,000. The school district is composed of 26 elementary schools, 11 middle schools and 8 high schools. Unlike its Des Moines counterparts, Kofu has a highly homogenous population. According to the Kofu Board of Education (2000), only 1.4 % of the student body are foreign students, i.e., students who are on the foreign registry, and of those only a handful of students can not speak Japanese. According to Feiler (1991) the lack of diversity means greater responsibility for teachers. Feiler states:

> Compared with the United States--and most European countries as well--Japan has an essentially homogenous culture, with a common moral and religious

> heritage. Parents are more willing to give schools the authority to teach their children the common 'Japanese' values of hard work, self-sacrifice, and national pride. Teachers, the ones who assume this burden, are thus given responsibilities that stretch far beyond their classroom doors. (p. 174)

In addition, whereas Des Moines schools offer classes at a variety of ability levels in order to meet the needs of a very diverse population, the Kofu district, like most Japanese schools, offer a "one class fit all" approach. Students are placed in a class on the first day of the new term and remain with those same students, six classes a day, seven days a week until the new term begins. Although there are not classes on Sundays, clubs and special class activities are commonly held then.

Currently in Kofu each elementary school and middle school has a computer lab, with two students to a machine. Middle schools students receive little formal computer training, but do have some experience with the technology. All the middle schools offer ni nen sei students (8^{th} graders), an exploratory style class. This class meets 3-4 times, and teaches students how to turn on/off the computer, and according to many of the teachers and students surveyed, the students "play games". Third year middle school students spend a six-month session exploratory studying how to turn on/off the computer, as well as how to use basic word processing and drawing programs. Exploratory classes meet approximately once a week, but are the first classes to be cut in event of a schedule change.

In addition, teacher selection for technology courses is quite different. Whereas educators teaching in core subject areas such as math, science and English pass a comprehensive and very difficult teacher certification exam designed to test subject

content knowledge, there is no such exam for technology teachers. Also, there is no formal curriculum and computer teachers are chosen by the honei (study chief), and kocho sensei (school principal). Technology teachers are provided with limited prefectural (state) training, and most teach themselves from books and tutorials (Hoshino, K., personal communication, May 22, 2000). According to Akira Saito, sub leader of Kofu Middle School principals, industrial arts teachers are commonly chosen as technology teachers because they study computers as a part of their college course work. At the present time, there is no state-sanctioned curriculum for computers, and technology skills are not among those tested in the rigorous high school and college entrance exams (Saito, A., personal communication, April 16 and 22, 2000).

Unlike other courses, the Ministry of Education has not provided a textbook, so teachers have a little flexibility in what and how to teach. The schools are provided with a keyboarding textbook and are to teach "blind typing". This author observed a keyboarding class in which students drilled on finding the letters of the alphabet. As quickly as possible, the students hammered out the alphabet, a, b, c... using whatever fingers they chose. Their eyes were on the keyboard, and there was no correction on hand positioning. This is not to say that this did not occur in a later lesson, but for those lessons that were observed, the goal was to type the letters as quickly as possible using the "two finger" method. The drill did not use words or sentences, merely required typing the alphabet.

Nansei Middle School technology teacher, K. Hoshino, explained that Japanese middle school technology is still in its infancy. Currently, schools are still researching to find the best teaching methods, but there is still a lot of work to do. However in

agreement with most of his peers, Hoshino feels that computer skills are important and should be taught in middle school (Hoshino, K., personal communication, May 22, 2000). Unlike American education, vocational training is not a part of the regular curriculum.

When surveying all the Kofu middle schools, representatives from each school were presented the following statements, "Computer skills should be taught in middle school" and "Computer knowledge an important skill for Japanese students to have" to which all respondents save one answered "agree" or "strongly agree". However, there is a strong camp that argues that computers are the not the most efficient and cost effective ways to increase student learning, and although that is a valuable debate, it is beyond the scope of this discussion. First one must define learning and examine computer impact on that process.

What is learning?

For most educational theorists, learning is more than the ability to recall facts and formulas in testing situations. According to Hasselbring (1988), in the Milken Exchange Report: "Three broad steps [are] necessary for mastering basic skills—developing the skill initially, becoming fluent at it, and being able to apply it across different activities and content areas" (Hasslebring, 1988).

In other words, learning occurs only when a student can duplicate success in a variety of situations. If in math class, our students can complete drill and practice math worksheets, but as a McDonalds employee, can not make proper change, have they mastered the skills involved? According to Hasselbring (1988) and most learning

theorists, the answer would be no. Learning is the ability to demonstrate the desired skills across a variety of situations.

Does technology impact student learning?

If it is used correctly, the answer is yes. According to the Critical Technologies Institute as cited in the Rand study (1999 b), there are many benefits to a technology-enriched environment:

- Technology enables educators to accommodate the varied learning styles and paces of learning within the classroom. This makes available individualized instruction techniques that are a proven factor in student achievement.
- Technology encourages students to become lifelong learners, who can access analyze, and synthesize information from a variety of sources;
- Technology enables administrators and educators to reduce time spent on administration and record keeping, increasing efficiency so they can spend more time with students (Rand, 1999, a) . "A congressionally mandated review of 47 comparisons of multimedia instruction with more conventional approaches to instruction found time savings of 30 percent, improved achievement and cost savings of 30 to 40 percent, and a direct positive link between the amount of interactivity provided and instructional effectiveness" (Rand, 1999, a).
- Technology makes it possible for educators to teach at more than one location simultaneously, vastly expanding opportunities for students in small, remote areas by linking them to students in more diversely populated, urban and suburban areas. Districts do not need to hire a fulltime teacher to serve small

numbers of students at a single location. Classes can be combined and served by one teacher (Rand, 1999, a).

Mastery takes less time

In addition, the RAND study reviewed computer-based instruction in military training and found that students reached similar levels of achievement in 30 percent less time than needed to achieve the same level of competency using more standard approaches to training (Rand, 1999, a).

Benefits the special student

Technology rich environments benefit the special student as well as the talented and gifted child. "A review of New York City's Computer Pilot Program, which focused on remedial and low-achieving students, showed gains of 80 percent for reading and 90 percent for math when computers were used to assist in the learning" (Rand, 1999, a).

Technology provides the most bang for the buck

A comparison of peer tutoring, adult tutoring, reducing class size, increasing the length of the school day, and computer-based instruction found computer-based instruction to be the least expensive instructional approach for raising mathematics scores by a given amount (Rand, 1999, a).

Vice President Gore (1998), in a Time Magazine article announced that following:

> A decade-long series of studies, the Education Department reports that students in classes that use computers out-perform their peers on standardized tests of basic skill by an average of 30%. And a 1996 study showed that students with access to the Internet not only presented their final projects in more creative ways but also turned in work that was more complete and had better syntheses of

> different points of view. Numerous other studies show that children in technology-rich learning environments showed more enthusiasm, had higher attendance rates, developed better writing skills and displayed a greater capacity to communicate effectively about complex problems. (p. 54)

Technology skills needed to compete world-wide

Finally, technology proficiency is viewed as a necessary skill to compete in a global society. From fast food to the postal service to auto repair, most entry-level jobs now require computer use in their day to day operations. International business and banking is highly dependent on technology, prompting a need for public schools to provide technology education. "In a global economy, nations are pressured to improve their chances to compete on world markets, and this leads to a standardization of knowledge. As knowledge is distributed through formal education, school systems are converging across many developed nations" (Scoppio & Grazia, 2000, p. 1). Indeed Japan is investigating, "what form vocational education should take against the background of pupils' concentration on academic courses in accordance with the increase in the number of pupils wishing to enter colleges and universities" (Okuda & Hisherura, 1982, p. 13).

If technology can enhance student learning, increase school productivity and is a vital skill in the global market, what factors cause the Kofu schools to lag behind Des Moines schools in curriculum integration? There are several impediments to technology education, some unique to the Japanese educational system, while others affect both countries.

Barriers to technology integration

Film, Radio, and Instructional TV

First, one should not believe that barriers to technology integration are unique to computer technology. As film, radio and instructional TV made their appearances in the world, proponents hailed each as the savior of public education. Each medium offered educational benefits, but had its drawbacks as well. For example, "academic research on film use focused on the effectiveness of technological innovation when compared to conventional instruction" (Cuban, 1985, p. 13). Although there is some concern as to the research methodology used, "experimental classes registered test scores that were either superior or equal to results achieved by classes when films were absent from teacher instruction" (Cuban, 1999, p. 14). Yet despite the perceived or real values of film as a teaching tool, there were four major obstacles to the increased use in the classroom:

1) Teacher's lack of skills in equipment use
2) Film purchase and upkeep costs
3) Inaccessibility to equipment
4) Finding and fitting the right film to the class

In 1999, we could easily substitute the words computer or software for the word film, and the issues facing post World War II educators, are the same barriers to technology implementation today. The four obstacles sited above affect both Des Moines and Kofu teachers. First, teachers lack the necessary training and skills to properly use the equipment and the software.

Teachers are not trained to meet increasing technology demands. The US Department of Education (1999) noted:

> Professional development is key to effective technology integration and to increased student learning. Teachers need access to technology and ongoing support while they learn. They need adequate time to acquire new skills to integrate technology into their schools' existing programs and activities. And teachers learn best with, and from, their colleagues. If there is a single overarching lesson that can be culled from research about teacher professional development and technology, it is that it takes more time and effort than many anticipate. For example, the Office of Technology Assessment estimate that it can take up to five years to effectively infuse technology into schools. All teachers need to be trained and supported over that period. (p. 1)

In addition, districts need to cultivate more advanced users who are able to service, maintain the technology, as well as educate end users about the equipment and software. This is not limited to basic operations, but includes teaching strategies and curriculum integration as well. According to Matorella (1999):

> When all the computers, peripherals, software, and new laboratories have been procured and all the sites wired, there remain personnel and maintenance needs, which can be costly. A paramount need for schools is a new generation of technology leaders, part technicians, part teacher educators, part K-12 curriculum specialists. In addition these individuals may be expected to install and maintain a server and home page and to evaluate and recommend hardware and software procurements, often for two platforms. They also must be able to troubleshoot

malfunctions, make repairs, provide on demand technical assistance, supervise chat sessions, and evaluate hardware and software. (p.4-5)

Currently, both Kofu and Des Moines middle schools struggle in this area. At present, neither district has a comprehensive plan for teacher training. Whereas in curriculum areas, the districts have identified the target skills and basic knowledge that a student should have a particular point in their education, they fail to set similar goals for teachers regarding teacher training. However, both districts do offer limited computer instruction. Kofu offers several pull out classes conducted by a private provider designed to teach the most basic of computer applications. This author observed one such class, in which groups of fifteen teachers reported to the computer lab and were instructed on how to turn the computer on and off, as well as how to resize a picture in a word processing program. The class had nothing to do with teaching curriculum, and the general feeling after the class was one of dissatisfaction. "It's too hard." "It's easier if I do it by hand." "The class was too easy." "I didn't learn anything." Had the statements been in English rather than Japanese, one could be standing outside an early stage Des Moines Public Schools (DMPS) computer course.

Des Moines Public Schools made an effort to tie computer training to the curriculum, and to teach in the schools rather than in a lab situation. During the 1997-99 school years, DMPS received a grant allowing them to create ten technology support teacher positions. Their jobs were to spend one day a week in each elementary school and one day every other week with the middle schools. They were to work directly with the teachers, using real curriculum assignments, and help them integrate the technology into the lessons they were already teaching. By in large the program was successful,

however budget cuts forced the restructure of the program, cutting the ten positions to five and in some cases tripling the work loads for those remaining in the positions. As a result, the technology facilitators are able to provide little direct instruction, but rather help to design building based classes instead. DMPS does offer an incentive for teachers to take their own technology classes, by providing a stipend to take one Phase III class a year. Prior to 1999, teachers received two stipends per year for one effective teaching course, and one technology course. In summary, both districts struggle in the area of teacher training and support.

Second, early research shows that if the technology, and in this case the software, is not easy to use, and if it does not directly apply to the task at hand, teachers will not use the equipment. Just because there is equipment available does not mean a) students will learn more or b) that students will even be allowed access to it. This problem plagues educators on both sides of the ocean. Akiro Watanabe, curriculum head at Minami Middle School explained that even though the lab is available for classes to use, few teachers use it because they 1) do not feel proficient enough to teach students and 2) do not have extra time to prepare the lab (personal communication, 2000, June). Des Moines Public Schools had similar experiences with lab situations.

In the early 90s, schools scrambled to create labs, placing 20- 30 machines in a room. For security reasons, they needed to hire staff people to monitor and service the labs. Even though the lab workers provided some assistance, the machines remained idle most of the day; and when used, many were critical of how much time was spent learning vs. playing. Over the past three to five years, the district moved away from stand-alone labs, to mobile learning packs that can be used within the classrooms, and to

equipping the classrooms with the computers themselves. According to Des Moines Public schools technology director, Greg Davis (2000), in the earliest stages of technology development a stand-alone lab is not the most effective way to implement technology. Only those who are already experienced users feel comfortable taking a class into the lab. He suggested that technology could be described in a three-stage approach. In the first stage, teachers use computers to teach the same content they would normally teach. In other words, instead of using a paper worksheet, students use the computer for drill and practice exercises. The second stage occurs when teachers begin to teach the same material in a different manner using technology, for example, using computer based simulations to teach chemistry or biology. The technology is driving the change in teaching. At stage three, the teacher uses technology to teach new material in a new way. For example, a teacher might teach construction using programmable Legos. According to Davis, a lab situation is desirable at the third stage and would facilitate learning, but prior to that, it is not the most effective distribution of technology (personal communication, June).

Larry Cuban (1985) stated:

> A 1981-1982 mid year survey of computer use, done by Johns Hopkins University researchers, calculated that almost 5 million students averaged nine hours each in front of a computer during the entire year. They reported that computers went unused more than half of the school day in three out of every four schools. Most schools used the computer (usually located in tightly secured labs, the library, and math and science rooms or the principal's office) about an hour a day. Student use varied between less than thirty minutes a week for three

> quarters of lower-grade children to almost an hour a week for the same percentage of junior and senior high-school students. (p. 79)

According to Cuban (1985), Rand researchers studied sixty California schools identified as exemplary users of classroom technology and found that students spent less than an hour a week receiving instruction via the computer. The mere presence of hardware and software does not ensure that teachers will use it, let alone that students will and that learning will be the result.

Finally, budget issues continue to dictate technology adoptions. Similar to Des Moines Schools, Kofu Schools are dependant on property taxes for support. Currently, Japan faces its worst economic crisis since immediately after World War II. "Japan's economy showed steady growth until the late 80s. Then a period of unprecedented asset and stock price inflation called the 'bubble economy', swept across the nation for about three years. In 1991, when the 'bubble' burst with the plunge of stock and land prices, Japan's economy started experiencing a serious recession" (Keiichi, 1996, p. 115). In addition, falling birthrates continue to shrink school size as well as the tax base. "According to the 1994 Household Survey report compiled by the Management and Coordination Agency, the average number of people per Japanese household is 3.63" down from 5 in 1995. Records show that in the last four decades the birth rate has plunged, and many more families are only having one child" (Keiichi, 1996, p. 147). Estimates project that within the next ten years, Japan will have one of the highest elderly populations in the world and that there will not be enough younger taxpayers to cover the burden, adding pressures to school districts competing for an ever shrinking

financial pot. Like their sister city schools, as Kofu struggles to maintain aging buildings and continue to support traditional school programs, funding additional computers is not easy. "The cost of public education is shared by national, prefectural and municipal governments, augmented at upper secondary and higher education levels by tuition from parents...The national government provides almost half of total public expenditures on education" (Leestma and Bennett, 1987, p. 10).

Des Moines Public Schools received the benefit of a local option sales tax, that will pump an additional $711 million into Polk County Schools over the next ten years. In addition, E-Rate funds helped jump start technology in American schools. "The Universal Service Fund for Schools and Libraries, popularly known as the "E-Rate", provides all public and private schools and libraries access to affordable telecommunications and advanced technologies. The E-Rate means that the rate or level schools and libraries pay for services (telecommunications services, Internet access and internal connections) is discounted" (E-Rate Program. 2000). Still, with technology costs soaring, and the constant need to update and repair technology, DMPS faces the same financial pressures as Kofu Schools.

In summary, the same barriers to early technology adoptions plague educators today. Teachers lack the necessary skills to use and maintain the equipment, budget restrictions make it difficult to purchase machines and necessary software, and teachers lack access to specific equipment and software needed to fit the curriculum. There are some cultural differences that contribute to Kofu's lag in the technology race. One area would be a difference in teacher responsibilities and class structure.

Teacher time

Kofu Middle Schools struggle to fit technology education into the school. There are three major differences between Des Moines schools and Kofu schools that lead to this strain: increased teacher expectations, standardized curriculum, and entrance exams.

First of all, it is important to understand the differences in the teaching responsibilities. The structure of Kofu Middle School is different from typical Des Moines school. First, each homeroom class (maximum of 40 students), remain in the same room all day, while the teachers move from class to class.

> In the classroom desks are arranged in rows, and each pupil has a chair and desk where books are stored during the day. Rooms are generally spare, often with a single poster indicating the classroom cleaning schedule for students or the weekly list of scheduled classes. The lack of displays and decorations signals that serious study is the primary purpose of the room. Computers and other technical learning devices are not evident in the Japanese classroom. (Leestma and Bennett, 1987, p. 34)

The homeroom teacher, although teaching significantly fewer classes a week (Kofu middle school teachers average 16 classes a week, Des Moines 28) have much more responsibility for the overall well being of the student. The homeroom teacher eats lunch with the students, helps the students clean the school (there are no janitors), and is active in the child's home life as well. For example, at least once and usually twice a year, the homeroom teacher visits every child's home and conferences with the parents. What goes on during these meetings differs from teacher to teacher. One older teacher inspects every student's room to be sure it is neat and orderly. "If a student's room is out of order, other parts of his life will be disorderly as well" (Feiler, 1991). Another teacher

explained that by understanding the home life of each child, the teacher can understand the child. By going to the home and observing how the child lives and interacts with his/her family, the teacher gains insight into the student's thinking. A third teacher laughed at the question, pasted a polite smile on his face and bowed again and again. "We do a lot of this, smile and bow...laugh and bow" (Watanabe, A., personal communication, September, 1999). If a student plays hooky from school, it is usually the teacher's responsibility to find him/her, not the parent. The Japanese middle school teacher is expected to teach far more than reading, writing and 'rythmatic. Feiler (1991) described his experience with a Japanese middle school when teachers instructed students on the proper way to bathe.

> Like eating, dressing, and bowing, bathing is considered so central to Japanese culture that Sakamoto-sensei [principal] did not trust parents to teach their children the proper form. The school, he felt, must take an active role. I could only imagine the reaction in America if a school administrator set out to teach fifteen-year-old students the official way to take a shower. "First take off your clothes. Then turn on the water. Don't forget to wash behind your ears...

Needless to say, with the added "social curriculum" it is difficult to find additional time to add an entire new subject area.

Although Kofu teachers average between 15-19 classes per week, they are at school a much longer period of time. Currently, Japan schools meet the first and third Saturday of every month, although that will change with the education reforms scheduled for 2002. Club activities and practice are held on Saturday and Sundays, and

most holidays will find the teacher's room full as well. Kofu teachers' official day begins at 8:00 AM and ends at 5:15 PM, but it is common for teachers to work until at least 7:00 or 8:00 PM.

Again, this difference in teacher expectations, makes it difficult for those working from a western paradigm to understand why teachers do not "just do it", leave school when the work day is over, refuse to take on extra curriculars, make changes in curriculum that they view as prudent. "In [Japan] a strong sense of belonging to groups is basically required, and in many cases their members identify themselves with the organization" (Keiichi, 1996, p.147). In contrast to the western thinking, an individual who places his/her needs above that of the group is viewed in the poorest of light and can be shunned by the group. As quoted by Feiler, one principal explained,

> If students don't like something in school they must learn to gaman.' This word, which can be roughly translated as 'endure' or 'persevere,' is one of the primary pillars of education in Japan. 'If you want to learn how to be a good Japanese,' junior high school students are often told, 'you must learn how to suffer.' Students are coached to gammon through difficult tests, long lectures, even an occasional bad lunch". (Feiler, 1991, pp. 60-61)

This same way of thinking applies to teachers and administrators as well. The thinking is entirely different. Whereas an American teacher would say, "This doesn't work... I'm going to change the curriculum to fit my teaching style". If there is a problem in school, expect a meeting to hammer out a solution with all teachers offering suggestions. Not so in the Japanese school. The principal tells you what will be done, and the typical

Japanese teacher will gaman. Can you imagine the outcry if American teachers were expected to be at school until six o'clock in the evening, sponsor clubs on Saturdays and Sundays, and report to school during summer vacations in order to man the phones and "prepare" for classes. In Japanese schools, it is the norm. In this environment, change comes very slowly. Changes in American schools are often bogged down by bureaucracy, but the Japanese system changes with glacial speed. Regardless of the fact that most teachers recognize the need to incorporate technology education into the curriculum; however, until it is endorsed by the administration, those changes will come slowly. Beside the group paradigm hindering change, entrance tests drive the curriculum.

Preparation for tests

The Japanese curriculum is driven by entrance exams and not always by sound educational decisions. Third year students in both middle school and high schools must pass rigorous tests for entrance into high school and college, respectively. The outcome of these tests can easily determine one's future. Private cram schools, called jukus, abound in Japan.

> [Jukus] are symbolic of the fierce competition Japanese children go through to get into good schools. Very often, the competition to get into a good college, and from there into a good company, starts as early as elementary school, when children fight to get into good junior high schools and senior high schools. Because so many are people are competing for so few places, just doing your schoolwork is not enough. Cram schools make the difference, and it is not

unusual to see children going to them 2-3 hours a day for three, four, or even five days a week. (Japan as it is, 1997, p. 135)

Ironically, some say that America is to blame for Japan's current testing woes.

One of the principal tenets that the American authorities introduced into the Japanese schools during the Occupation was the idea of "total equality" based on merit, which they viewed as a means of guaranteeing democracy and avoiding the elitist domination of prewar Japan. The allies abolished the imperial university system and opened up higher education to a greater number of people. The number of universities in Japan surged from 48 in 1945 to 201 in 1950, and continued growing to reach 500 by 1980. The number of students in these universities increased accordingly, from three percent of high school graduates after the war to thirty-seven percent in 1991. To make this system more meritocratic, the Americans insisted that candidates for admission to universities earn no special points for a stunning letter of recommendation, a powerful backhand, or a talent for the oboe. Only test scores would count. Unwittingly, this plan pushed competition even lower down the age scale. Under the new system, access to competitive high schools would be determined by additional entrance exams at the end of junior high school. These days, any student who realistically hopes to attend a first-rate university must not only pass that school's exam at age eighteen but also pass an exam to enter an academic high school at age fifteen. As a result, seventy-five percent of all students attend some kind of cram schools. (Feiler, 1991, p. 182)

With such intense pressure to perform on the entrance tests, there is little extra time in the school day to add additional curriculum. An occasional "fun day" in the computer lab is all that can be spared, especially during "exam hell" of third year students. Not surprisingly, this emphasis on testing has a negative correlation on student learning. As discussed earlier, Hasslebring (1988) argues that learning occurs when a student can perform the same skill across a variety of situations. English education is prime example of that failure. Although all Japanese students study English from 7th – 12th grades, and again in college, only a small percentage of the population can speak English. They can write and read English, but they can not speak the language. According to Redford and Mastuzawa (2000), much criticism is "leveled at Japan's English education system, which seems not to enable students to acquire good communicative English skills... One cause of the problem, many experts argue, is university entrance examinations which barely test the speaking and listening abilities, while instead encouraging them to acquire extensive grammatical knowledge and transcription skills" (p. 10). Clark (1999) goes on to say, "Studying English for University entrance examinations makes a negative impact on students, as it makes them allergic to English and hinders them from developing their speaking ability" (p. 10). In the same way, testing removes teacher freedom to incorporate different ways of teaching and stymies the introduction of technology as a teaching tool.

Although not yet a reality in Des Moines, a movement towards performance based testing and "authentic assessment" with teacher raises and job security in the balance, has been mentioned. Currently, objective based tests are given at every middle school and in at every grade level. At present, there is little done with the data, and it

arrives far too late in the semester to be of much value to the teacher. Although they carry far less impact on Des Moines students when compared to their Japanese peers, Greg Davis, Technology Director for Des Moines Public Schools, sites testing as one of the main obstructions to his district's success with technology integration. "The main barrier to success with technology for DMPS now would be the focus on standardized test assessment. The bottom line is that today we don't measure the thinking skills that can be developed today with the aid of technology. As long as the focus is one ITBS results, teachers are not going to be motivated to leave stage one or two based lesson plans" (Davis, G., personal communication, May 2000). Even if tomorrow, DMPS instituted as comprehensive testing program as seen in Japan, Des Moines students would still have an edge over Kofu students because computer-applications are a separate class and a part of the district curriculum.

It appears to be an oxymoron. Technology integration will not become important in Japanese education until it is tested for in entrance tests and made a part of the national curriculum; however as in the case of English, that action could make the curriculum ineffectual. For how does one devise a paper and pencil test for technology skills? Whereas American local school districts determine curriculum for the area, Japan has a national curriculum. Japan's national curriculum is a third obstacle to technology integration.

National Curriculum

Japan has a national curriculum, developed and approved by the Education ministry. At present, computer applications are not a part of the middle school curriculum, and until that changes, one can not expect to see any significant change.

Feiler (1991) writes that teachers often complain that they have little control over what they teach, and that just as "Napoleon censored school textbooks to stress the state over the individual, so the Japanese government strictly controls what information arrives on students desks" (p. 174). He continues:

> One of the undisputed strengths of the Japanese school system is its ability to teach children cognitive skills, particularly in math and science. All public schools in Japan follow a curriculum established by the Ministry of Education in Tokyo, ensuring that all students are taught the same information at roughly the same time of year. While Western philosophy of education is based primarily on the dialogue, in which the teacher and the students exchange information, the Japanese system is based on the monologue, in which the teacher speaks and the students receive. This style, with its stress on lectures and rote memorization, is particularly suited to teaching math and science skills, especially at an early age. Every major international study of the last fifteen years has shown that Japan's children consistently outperform their Western counterparts in these two areas. (p. 278)

The problem arises when students and teachers are asked to step outside this bubble, as in technology instruction. Ask anyone who has ever taught a computer application class and he/she will tell you that no two students are working on the same element at the same time. Learning curves are different, skills range the spectrum, and teachers must be flexible. This teaching style is much more natural for western teachers. Also, the nature of technology itself, constantly changing and reinventing itself, does not

lend itself easily to this teaching style. Feiler (1991) continues, "But while the Japanese clearly excel in teaching cognitive skills, they lag far behind in teaching creative thinking. The same monolithic teaching methods that work wonders in teaching mathematical formulas and scientific data are less successful in encouraging children to interpret historical trends and express themselves in a foreign language" or technology instruction (p. 279). It is rather a dilemma. Technology education will remain an insignificant aspect of the curriculum until the Ministry of Education decides to afford it more importance by developing national guidelines and curriculum. However, as seen in other areas mandated by national curriculum requirements, this might also hamper educators' abilities to adapt and change as the technology evolves.

However, as pointed out by Kenichi, Koyama in *An End to Uniformity in Education,* in the *Japanese Education Today,*

> Implementing educational reform will not be easy. Ironically, this is partly due to the very success Japanese education has had in assisting the catch-up process. As in the case of people who come to a bad end precisely because they were once winners, so successful systems and policies tend to become inflexible and invite disaster by clinging to tried and true methods. Japanese education may be on the verge of this sort of 'tragedy of the winner'...Educators are inclined by nature to adopt a negative and passive stance on reform questions. The education system today, however, is suffering from a devastating blight...(cited in Leestma and Bennett, 1987, p. 66)

The very nature of technology requires an ability to change as the technology changes. The Japanese national curriculum is not a flexible entity. In addition, programs that are easy for the English student to master, are much more difficult to teach in Japanese.

Language barriers

The Japanese language is also a barrier to technology integration. One will never be able to word process in Japanese with the same speed that one can in English. The Japanese language is really the combination of two alphabets; Hiragana used for Japanese words and Katakana used for foreign words. Most writing, however, is done with Kanji, Chinese picture words. "Japanese has one of the most complex writing systems in the world, using three different scripts (four if you include the increasingly used Roman script Romanji. The most difficult of the three, for foreigners and Japanese alike, is Kanji, the ideographic script developed by the Chinese. Not only do you have to learn a couple of thousand of them, but unlike Chinese, many Japanese Kanji have wildly variant pronunciations depending on context" (Taylor, 1997, p. 42).

Word processing in Japanese is much more difficult than in English. The keyboard layout is the same, but each letter has the Hiragana letter as well as the roman letter, and one accesses the Hiragana alphabet by using the control key. Japanese consonants are actually two letter sounds, (ka, ki, ku, ke, ko) and many Kanji are two or more Hiragana sounds together. For example, sen sei is teacher. Four Hiragana letters combine to make that word (se n se i). The typist enters the Hiragana for a Kanji using either the Hiragana keys or the Roman letter keys. For the simple Kanji sen, there might be as many as ten different pictograms that make the same sound. A list pops up and the user selects the proper word. Sound difficult? It is. Touch-typing is impossible, and

typing at all is more difficult. Creating curriculum to teach the most basic of computer skills with a Japanese word processor is much more difficult than with English software.

Paradigm shifts needed

Ultimately, both districts could use a little paradigm shakeup. Kofu schools are still in the early stages of technology integration in which the general school of thought is that having hardware, computers, software, monitors, and Internet, means that the school has integrated technology. This is the same thinking that permeates American schools today, and a number of studies, including the Macintosh Acot Study, have shown this theory to be faulty.

In the early 80s, Macintosh Corporation conducted the Acot Study (Sandholtz, 1996). Several classrooms were chosen to participate in a pilot program, and when students arrived in the fall, each had a shiny new computer on his or her desk. In addition, each student and teacher was provided a personal computer for home use. "At the study's onset, researchers anticipated that technology would be used to support individualized learning. Students would be allowed to work at their own pace, using the technology for added drilling and practice. If teachers were offered training and allowed to progress at their own paces, researchers expected a fairly smooth transition of technology into the traditional classroom" (Sandholtz, 1996.) At first the computers were novelties. The new "toys" and software excited both the teachers and the students, but the novelty didn't last long. Soon the computers were pushed to the edge of the desk so the "real learning" could begin. Eventually the computers found their way to the classroom counters, and then were covered up to limit student distraction. The mere presence of technology does not ensure learning. In Kofu middle schools, the technology

is not within reach of the students, but rather locked in a lab that is largely off limits to the students. The computers must be easy to use, and the lessons directly related to the curriculum.

Difference in archetype

Although Des Moines Public Schools are a long way from achieving the target tech goals as revealed by the Star Technology and Readiness test, they are considerably further ahead than their Kofu sister schools. Star Technology and Readiness Test is a self diagnostic test that rates schools in the following areas:

- Hardware
- Connectivity
- Curriculum Content
- Professional Development (DMPS Technology, 2000).

The Des Moines Middle Schools scored an average of 50 out of a possible hundred, placing them just inside the high tech level. Kofu Middle Schools would score just inside the mid tech level. But upon examining the breakdown by category, Kofu schools score well only in the areas of hardware and connectivity; whereas, Des Moines experienced some success with in the content and professional development areas as well. One reason for this difference might be that technology integration is the battle cry of Washington leadership. President Clinton (1988) said, "In our schools, every classroom in America must be connected to the information superhighway with computers and good software, and well-trained teachers. We are working with the telecommunications industry, educators and parents to connect 20 percent of California's classrooms and every classroom and every library in the entire United States by the year 2000" (p. 1).

As stated earlier, national technology adoption received a jump-start due to E-Rate funding. One will not see Japanese middle schools make a major move toward technology education until it is endorsed by national, prefectural, and local leadership. A second difference in the two approaches might have to do with the archetypes used by both districts. In his 1975 article "Educational Technology: Archetype, Paradigms and Models", Ivor Davies (cited in Ely, 1996) described three archetypes—or root metaphors—, that generally describe a district's philosophy toward technology integration. The audio-visual archetype, is "one of a gum-ball machine. 'You put in your money and you are given something to chew on'" (p. 27). Currently, the Des Moines District operates primarily within this paradigm feeling that hardware can be used to:

> ...aid classroom presentations and teaching; serve as a means of improving classroom demonstrations by allowing students to experience what normally would not be available to them; help solve logistical problems...enable teachers to deal with learners in different parts of the country; enrich teaching and learning by becoming an integral part of both processes; and finally, offer a novel form of instrumenting assessment and testing procedures by making available computers and other machines so as to automate and speed up the whole examination process. (Ely, 1996, p. 27)

When examining DMPS's approach to technology integration, one might look at the archetypes described by Davies.

> Like education itself, educational technology has undergone considerable change over the last twenty years. Although the old fears about technology still exist,

> particularly when technology is narrowly conceived, the basic concepts are gradually being absorbed into the mainstream of educational thought and practice. Imagination and technology, aided by a renewed sense of craftsmanship in teaching, have together enlarged the possibilities of knowledge, action and moral obligations. At the same time, however, whilst imagination and technology have expanded the possibilities or range of choices available to educators, they have also made it more difficult to foresee the full consequences of the choices made and the actions taken. (cited in Ely, 1996, p. 15)

It is this author's opinion Kofu, on the other hand, operates in the engineering archetype:

> The Engineering Archetype came into being with the advent of programmed learning, and the application of behavioristic technology to both teaching and learning as a result of the influence of Professor B F Skinner in the early 1960s. Operant conditioning, and the shaping of behavior, became part of a radically new technology in education, and at the same time generated a good deal of emotion for and against educational technology itself. A great deal of the initial effort, therefore, involved comparing the respective performance of classroom teachers and teaching machines in order to demonstrate the advantages of the new methodology....The underlying paradigm in educational technology normally takes the form of a series of boxes and arrows, usually with a feedback loop, indicating a step-by-step approach to development work. Almost always there is a clear beginning (definition of objectives, and almost always a terminal step, evaluation. (Ely, 1996, p. 27)

It is this author's opinion, that Japanese schools are beginning to enter this archetype, evaluating technology education, developing objectives, and determining evaluation. Hoshino Sensei, Nansei Middle School technology teacher explained that, "Middle schools should teach more about computers, but now we study computers. We learn how to teach about computers" (personal communication. Hoshino, K. June 5, 2000).

Perhaps both districts would work better if they could embrace the Problem Solving Archetype.

> The associated metaphor is that of a chess game, in which players engage in an intellectual activity for which there is no one set of appropriate moves. Intense concentration ability to foresee the future consequences of current actions, flexibility, and acquired skill and learning experience are all essential prerequisites for success and a rewarding experience. So it is with educational technology. In the educational context some sort of dissatisfaction should preface development activities, and the overall goal should then to reach a state of satisfaction as quickly as possible... The order, and manner in which they are then used depends upon the character of the problem, and the aim in mind. There is no one best way, and no one way of proceeding. Neither is there one optimal solution. Everything depends upon the situation, and the skills available. (Ely, 1996, p. 28)

Freeing up instructional time

Currently, Kofu teachers average between fifteen to twenty classes per week, in contrast to Des Moines Middle Schools whose teachers have a minimum of 25 hours per week, maximum of 30. According to Stevenson (2000):

> Only about half of the Japanese teachers' daily eight or nine school hours are actually spent instructing students. In contrast, instruction typically occupies more than two-thirds of the school day of German and American teachers. ...Although Japanese teachers remain at school longer, their greater amounts of noninstructional time and their opportunities to have sustained periods when they are not teaching leave nearly half their noninstructional time for interacting with their fellow teachers and students, preparing lessons, planning, and grading papers (p. 2).

By increasing the number of instructional periods in a day, technology courses could be added to the curriculum, although this would increase the number of classes for students. However, due to the nature of a computer applications class, this does not increase homework, or take time away from necessary test preparation.

While researching these issues, this author faced a number of interesting concerns that are addressed in appendix 1.

Summary

As educators, we have 30 years of practical experience and research using computers in the classroom. Although today's computer bears little resemblance to its grandfather in price, function or software, the problems facing educators in both Kofu,

Japan and Des Moines, Iowa are relatively the same. The technology is changes as rapidly as it is purchased. Both districts continue to place new equipment into the classrooms without allowing adequate time to train teachers how to use it. Both districts invested heavily in certain technologies, i.e. the videodisk player, that soon went the way of the Edsel before teachers or students had a chance to adequately use them, let alone master them. Both districts agree with the following statement: computer knowledge is a valuable skill for Japanese/American students to have, so what barriers delay technology integration?

First, the same issues that faces educators a hundred years ago, still trouble teachers today: 1) Teacher's lack of skills in equipment use; 2) computer and software costs are prohibitive to financially strapped school districts, 3) upkeep and maintenance costs are excessive and difficult to budget for; 4) teachers and students find equipment inaccessible; and finally 5) finding and fitting the right technology application to fit the curriculum can be overwhelming and time consuming. Therefore, it is easier just to "keep doin' what we've been doin'". In addition, Kofu schools face additional cultural barriers when attempting to incorporate technology into the current curriculum. Due to a national curriculum and intense testing structure, there is little room for change and little acceptance for stepping outside the normal course work. In addition, unlike America, where the leadership has provided an active roll in pushing for technology integration, Japanese government has not provided a curriculum, or state sanctioned textbooks. As a result, change is occurring slowly. Glazer (cited in Beaucamp, 1985) stated:

> However, the basic paradox of Japanese education is that under-funded... devoid of any marked evidence of innovation [and] sharply criticized for its enormous emphasis on examinations, under attack from business for the quality of its college graduation, with limited research facilities, and a modes system of graduate education, torn by conflict between an alienated and radicalized teaching force in the elementary and secondary schools and a firmly conservative ministry of Education.... —it manages nevertheless to equip a labor force that serves the needs of Japanese business, industry and government" Why such a system is 'successful" can only be answered by pointing to Japan's unique cultural context. Every nation defines the functions that its schools will serve through a political process, but the specific shapes of these functions is a matter of cultural particularism. Such a system, in other words, can only exist in Japan. (p. 44)

In conclusion, the first decade of the 21st century is bound to bring incredible changes. With an ever-shrinking world, tied together by an immense electronic web, in which technology reinvents itself every 5-7 years, it will be interesting to see which district has better prepared its students to meet the new millennium.

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Appendix 1

Research issues

As stated by Sushil Jain, "There is no doubt that one can appreciate a foreign culture better by learning its language. So, ideally a person should be le to read Japanese if one is going to embark upon any research activity involving Japan. Unfortunately, the present writer does not read Japanese (Jain, 1989, p. 3). Jain went on to explain that this barrier did not hinder him in his research. For this author, it was a hindrance.

To secure information, I had to rely on English speakers, and even the best English speakers had their limitations. In order to obtain data from the school district, first I had to ask my English teacher, who may or may not speak much English, who would in turn ask the head English teacher, who would ask the curriculum head, who asked the principal if it was OK that I ask questions.

The survey was written in very easy English, and as a result I was not always able to ask the questions I would like. In addition, my translator, who speaks excellent English, is not a computer user so trying to explain technology vocabulary to her and have her translate it into Japanese, would be like a brain surgeon trying to explain a complicated procedure but unable to use any technical terms.

Survey Issues

The survey was delivered to each of the Foreign English Teachers, and they were instructed to ask the technology teacher to complete it, but again, the language barrier

was an issue. In addition, ideally, the survey would have been completed by all teachers in the district, as technology teachers might have a bias toward technology education. (Not necessarily true, as one teacher replied strongly disagree to the statement that technology education should be taught in Japanese Middle Schools.) The mere suggestion of this sent the earth spinning out of its orbit, and so I decided to utilize the technology teachers instead, completing one survey per building. This was comparable to the research I had available to me from the STAR Technology surveys conducted by DMPS in the spring of 1999. I compared the Kofu survey reports to the material collected by Des Moines Public Schools through the STAR surveys conducted at the completion of the 1999 school year to compile my data.