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Personal learning preferences, perceptions, and multiple intelligence profiles : affect on educators' attitudes about computer usage

Mary J. Dove
University of Northern Iowa

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Abstract

The purpose of this study was to explore the relationship between teachers' learning preferences, self-perceptions of multiple intelligence profiles, and attitudes toward computer usage, including the incorporation of computer technology into their classrooms. Data for this survey were obtained from a population of teaching and administrative faculty from a small, Midwest, rural public school district. Access and education that results in higher levels of experience were found to be critical variables, in agreement with professional literature to date. These factors, however, did appear to influence personal learning preferences in some instances and the multiple intelligence profiles provided valuable insight into maximizing individual benefits of computer related instruction. Processes and conclusions are of particular interest to school district staff development personnel seeking to integrate contemporary adult education perspectives into computer technology education for district professionals.

PERSONAL LEARNING PREFERENCES, PERCEPTIONS, AND MULTIPLE INTELLIGENCE PROFILES: AFFECT ON EDUCATORS' ATTITUDES ABOUT COMPUTER USAGE

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Mary J. Dove

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Date Approved

Mary J. Selke
Graduate Faculty Reader

7/6/97
Date Approved

Leigh E. Zeitz
Graduate Faculty Reader

7/9/97
Date Approved

Greg P. Stefanich
Head, Department of Curriculum and Instruction

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"One looks back with appreciation to the brilliant teachers, but with gratitude to those who
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ABSTRACT

The purpose of this study was to explore the relationship between teachers' learning preferences, self-perceptions of multiple intelligence profiles, and attitudes toward computer usage, including the incorporation of computer technology into their classrooms. Data for this survey were obtained from a population of teaching and administrative faculty from a small, Midwest, rural public school district. Access and education that results in higher levels of experience were found to be critical variables, in agreement with professional literature to date. These factors, however, did appear to influence personal learning preferences in some instances and the multiple intelligence profiles provided valuable insight into maximizing individual benefits of computer related instruction. Processes and conclusions are of particular interest to school district staff development personnel seeking to integrate contemporary adult education perspectives into computer technology education for district professionals.

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CHAPTER ONE

Background and Need for This Study

I have been working intensely with technology during the last three years as my district's K-8 technology instructor and the district's technology coordinator. My school district is a small, rural, public school system in northeast Iowa. The K-12 student population is 386 students, all housed in several interconnected buildings. Part of my job as technology coordinator is helping educators in my district incorporate the use of technology in their classrooms.

Three years ago this was an easy part of my job because we had a minimal amount of technology. There was one computer lab of sixteen Apple IIc computers and one Apple IIc computer in most of the classrooms. The lab was used for scheduled keyboarding and computer application classes taught by the technology coordinator and were rarely checked out by classroom teachers to be used with their classes.

If a person were to walk into my district today things would be much different. In the last twelve months we have updated our technology. Each teacher has a new Xinetron 120 personal computer (120pc). This is an IBM compatible machine with a 2.1 gigabytes of space on the harddrive and 32 megabytes of RAM. Each computer is connected to the Internet and networked within the building. There are now two new labs in remodeled classrooms. One lab has four PowerMacs and nineteen Mac580s. The other lab has eighteen computers that are identical to the teachers'. Both labs are connected to the Internet. The cost of this project was well over $100,000.

With the expansion of easy access to educational technology comes the need to find approaches that can maximize adult education opportunities to better facilitate the integration of technology in the classroom. Teachers need time and instruction about how and why technology fosters the educational process. I have started to build a supportive environment for educational technology called "Tech it Out!", a study/support group where teachers encourage each other to try technology applications in their classrooms. This group has been successful, but it doesn't reach the whole staff. Why are some teachers reluctant to use technology when others can't wait to try new things?

Problem Statement

Many school districts across the United States currently strive to further integrate technology not only as a body of skills and knowledge, but also as an instructional tool to be implemented in all areas of the curriculum. In Iowa the legislature has endorsed using technology to instruct with the passing of Senate File 2063 (see appendix) in 1995. This bill has allocated $130 million dollars to be spent on technology over the next five years in Iowa's public schools. Even with this support some educators are still reluctant to use computers.

Research Question

Literature states that teachers' attitudes and willingness to use computers is a function of access to computers, experience, and education. However, in some instances where these components exist, some teachers still hesitate which raises

the question of whether or not other factors also impact teachers' attitudes towards computer usage. Do personal learning preferences or self perceptions of multiple intelligence profiles, acquired as a result of life experiences in and out of the classroom, affect teachers' attitudes about computer usage and incorporating computer technology into their classrooms? How can a school district's technology coordinator better assist all district educators to learn more about computer usage in order to facilitate the incorporation of technology into their classrooms?

Purpose of Study

The purpose of this study was to see if there is a relationship between teachers' learning preferences, self-perceptions of multiple intelligence profile, and attitudes toward computer usage including the incorporation of computer technology into their classrooms. A population of K-12 teachers and administrators in one rural Midwest school district was surveyed to determine attitudes, preferences, and self-perceived multiple intelligence profiles.

Limitations/Delimitations

The main factor that contributed to the limitations of this study is population size. Because a small rural school district provided the population for this study, the population size is only twenty-nine. This was too small of a sample for valid statistical significance. Statistical analysis software (SPSS) was used only to assist with manipulation of data related to respondents' demographic information,

technological attitudes or preferences, and self-perceived multiple intelligence profiles.

Another limitation on this study is Armstrong's multiple intelligence inventory. Armstrong's multiple intelligence inventory is not a test but helps provide insight into an individual's self-perceived multiple intelligence profile.

Operational Definitions

Adult Learning: Any intentional and professionally guided activity that is designed to produce change.

Attitude: A state of mind or feeling with regard to some matter; personal disposition.

Classroom Usage: Teachers incorporate technology into their classroom with ease and comfort. Examples of this would be lessons that involve the use of technology (computers, scanners, Internet etc). Such usage would mean teachers use the computer daily.

High Computer Usage: Describes computer-related activity of a person on the leading edge of technology; knows much about emerging technologies; usually experiments with technology-based learning.

Integrating Technology into the Classroom: Means that emerging technologies must be interwoven into the total fabric of education making technology and education one (Bailey & Lumley, 1994).

Low Computer Usage: Describe a persons who make limited use of emerging technologies. Such teachers are hesitant to use technology as a part of their lesson and/or to learn how to use technology. They would rarely use the computer.

Multiple Intelligence: Gardner (1983) explained that intelligence can be expressed in multiple forms in addition to the traditional linguistic and logical-mathematical abilities; these are kinesthetic, visual-spatial, musical, interpersonal, and intrapersonal. Campbell defined Gardner's intelligences as follows:

> Linguistic intelligence is the ability to think in words and to use language to express and appreciate complex meaning. Linguistic intelligence allows us to understand the order and meaning of words, and to apply metalinguistic skills to reflect on our use of language (p. 3).
>
> Logical-mathematical intelligence is the ability to calculate, quantify, consider propositions and hypotheses, and carry out complex mathematical operations. It enables us to perceive relationships and connections, to use abstract, symbolic though, sequential reasoning skills, and inductive and deductive thinking processes (p. 3).
>
> Bodily-kinesthetic intelligence is the capacity to manipulate objects and use a variety of physical skills. This intelligence also involves a sense of timing, and the perfection of skills through mind-body union (p. 4).
>
> Spatial intelligence is the ability to think in three dimensions. Core capacities of this intelligence include mental imagery, spatial reasoning, image manipulation, graphic and artistic skills, and an active imagination (p. 4).

> Musical intelligence is the capacity to discern pitch, rhythm, timbre, and tone. This intelligence enables one to recognize, create, reproduce, and reflect on music (p. 4).
>
> Interpersonal intelligence is the ability to understand and interact effectively with others. It involves effective verbal and non-verbal communication, the ability to note distinctions among others, sensitivity to the moods and temperaments of others, and the ability to entertain multiple perspective (p. 4).
>
> Intrapersonal intelligence is the capacity to understand oneself, one's thoughts and feelings and to use such knowledge in planning and directing one's life. Intrapersonal intelligence involves not only an appreciation of the self, but also of the human condition (p. 4).

Personal Learning Preference: Is the characteristic of an individual, expressed through the interaction of one's behaviors and personality as one approaches a task.

Personal Usage: Teachers use technology for individual motives not related to their classroom. Examples of this would be using the word processor or email software to write personal letters.

Technology: The knowledge, ideas, and need to create tools by which new experiences are constructed (Garfield & McDonough, 1996).

120pc: A personal computer (pc) that is a pentium machine. The computer has a clock speed of 120 megahertz and is an IBM compatiable.

CHAPTER TWO

Provided with a computer to use in the classroom, a teacher may choose to incorporate this technology into instruction or leave it alone and never use it. How do teachers become comfortable with integrating technology into their instruction? One area to explore in search of answers to this question is the education that teachers receive about technology and how that instruction is delivered to them.

Making a Case for Change

With the dawn of a new century, pressure from the public and the rapid proliferation of technological advances highlight a need for change. Change in education is not an easy task. Some educators enter the profession with no greater goal than to perpetuate the kind of teaching that they encountered during their school years. Educators' roles, however, have changed during the last few decades. They are no longer perceived as the sages on the stage but as the guides on the side to help facilitate children's learning. Technology will play an important part of this process but using technology in the classroom will require education and educators to change.

David Thornburg, Ph.D., makes an excellent argument for why schools need to restructure education for the next century. In Thornburg's book, *Edutrends 2010, Restructuring, Technology, and the Future of Education* (1991), he provides a framework for why schools need to make a paradigm shift toward technology and how technology can play a part in educational change. Thornburg understands that change doesn't come naturally and addresses the two issues that limit technology use, access and education.

One of his major recommendations to help school districts benefit from new technologies in the future is the implementation of a staff development program.

The state of Iowa is endorsing technology to facilitate change with the passing of Senate File 2063. This action pertains to educators throughout the state of Iowa. This means that a decision to integrate technology cannot be based solely on one teacher but must be a systemic commitment on the part of the whole school district. The advent of funding should result in school district after school district using technology as a vehicle for maximizing education. Bailey and Lumley (1994) have found that successful staff development needs to have the commitment and support of school district leaders.

Needs of Adult Learners

Because technology in the classroom is no longer an inaccessible dream, educators now have a purpose for learning how to use technology. Robinson (1979) writes that adults want their learning to have relevance and value to the present. Malcome Knowles (1988), an expert in adult learning theory, also insists that, " the goal of learning is more than acquisition of knowledge, skill, or insight. Learning ought to produce more effective behavior in the lives of the learners."

School districts need to keep in mind how adults learn if they want to facilitate a positive change in technology usage. School districts also need to realize that technology will not be integrated overnight. Teachers are encumbered to integrate both the process and products of technology into the existing curriculum often while carrying out daily

instruction. The challenge of technology oriented staff development is to teach not only how to use the technology or technical skills but how to extend that technology into classroom teaching applications. Klopf (1981) writes that an adult learning environment needs to be informal and have a warm atmosphere. Adults can respond to the climate of learning when they are respected for who they are and the skills they bring to given situations.

Bailey & Lumley (1994) have identified twenty-two characteristics of an effective technology development program. Eight of those characteristics pertain to adult learning: 1) comprehensive, continuous, and evolutionary programs, 2) multiple participant incentives, 3) participant involvement, 4) adult learning principles and professionalism, 5) effective training practices, 6) meet individual needs, 7) cooperative work relationships, and 8) conducive learning environment.

A comprehensive, continuous, and evolutionary program focuses not only on learning how to use technology but also how to integrate technology into classroom teaching. Robinson (1979) states that learning new material is facilitated when it is related to what adults already know. For technology to impact learning it has to be combined with the daily curriculum (Garfield & McDonough, 1996).

A second factor is multiple participant incentives. Teachers need time to participate in classes, seminars, or workshop. Thornburg (1991) also recommends that teachers be given sufficient release time to learn and restructure lessons that will incorporate technology tools.

Participant involvement in the decision-making process is important. Adult learners prefer self-initiated, self-directed, and individualized learning experiences

(Rauch, 1988). Learning geared to meet the needs of individuals is important. The learning experience should be practical and pertinent.

Another principle to keep in mind is that the nature of technological staff development must consider the variety of adult learning styles and apply the principles of adult learning. Many adult learners appreciate a variety of teaching strategies and are quite knowledgeable about how they learn best (Apps, 1991).

Another characteristic of an effective technology staff development program is to use effective training techniques. This means that the training is linked to everyday practice. Robinson (1979) states that when learning is applied immediately it is retained. Therefore, techniques need to be used that encourage application of new skills and knowledge in a practical way.

The last two characteristics that apply to adult learning are cooperative working relationships and a conducive learning environment. Adult learners prefer an environment that is based on trust and contains low levels of risk-taking. Working cooperatively builds upon both of those circumstances. Training in new technological, applications should be conducted in a positive learning environment.

Multiple Intelligences Theory: Implications for Adult Education in Technology

Howard Gardner, a professor at the Harvard Graduate School of Education, has developed a theory of multiple intelligences that may assist staff development personnel in establishing a sound environment for adult learning. Gardner (1991) writes that the essence of his theory:

> Is to respect the many differences among people, the multiple variations in the ways that they learn, the several modes by which they can be assessed, and the almost infinite number of ways in which they can leave a mark on the world (p.8).

Mass-produced education can't take into account children's various approaches to the world. Adults are an even more heterogeneous group. Simply because of their ages, they have had a wider variety of life experiences. Adult students that enter a beginner, intermediate, or advanced class still bring a wide range of familiarity of the subject matter to class. Can one apply the multiple intelligences when planning for adult learning?

Robinson (1979) writes that one of the principles of adult learning is that adults prefer to participate actively in the learning process. Bodily kinesthetic learners prefer to involve their whole bodies in their activities and to work with concrete, real-life experiences (Campbell, 1996). Learning technology and through technology is a very active and interactive process. Rauch (1988) also reinforces that adults learn best when they are participants in the learning process.

Another principle of adult learning according to Robinson (1979) is that learning is goal-directed and adults are trying to achieve a goal or satisfy a need. When using technology on any subject area from on-line experts, listservs, or researchers all offer an inexhaustible supply of information. Such learning becomes personal and exciting as students make learning their own. This highlights the intrapersonal intelligence. The intrapersonal intelligence is the ability to understand your thoughts and feelings.

Technology provides one avenue that can touch on the intrapersonal dimension by acting as a tool to help adult learners to pursue a thought, interest, or idea into more detail, making learning more personal.

Linguistic intelligence is the ability to think in words and use language to express ideas. Computers encourage a person to write and rewrite, which develops fluency. Learning that is applied immediately is retained longer (Robinson, 1979) so adults that learn how to use a computer for linguistic applications need to apply new skill in their own world. Staff development programs need to model this technique for adult learners by encouraging immediate application in a practical way.

A technology focused staff development program is ideally linked to everyday practices (Bailey & Lumley, 1994). For example, when educators learn how to use and apply a spreadsheet for keeping grades they are accessing the logical mathematical intelligence. The logical mathematical intelligence involves the ability to calculate, measure, use logic, and solve math and science problems.

Another principle that Robinson (1979) associates with adult learning connects to the interpersonal multiple intelligence which can involve group learning. Interpersonal intelligence is the ability to understand and interact with other people in a variety of ways. Robinson writes, "group learning insofar as it creates a 'learning atmosphere' of mutual support, may be more effective than individual learning." Campbell (1996) would concur, stating that to this principal, "current research indicates, however, that when students use computers in pairs or small groups, comprehension and learning are facilitated and accelerated." When planning technological staff development for adults,

one strategy to be used is group participation, which will be more effective than individual study for the interpersonal learners.

Technology also touches upon the other multiple intelligences. Visual spatial intelligence involves the ability to think in pictures and to see and create images or designs with shape, color, and size. Using a multi-media presentation to share lessons, using a digital camera to capture images, or creating a timeline using technology highlight this intelligence.

The musical intelligence is the ability to hear and use pitch, rhythm, and tone. Technology can enhance this intelligence the same way a word processor enhances the linguistic. Music can be composed, replayed, and taught through technology.

Technology has the ability to address the diverse needs of adult learners and accommodate different learning styles and rates. If staff technology development programs elicit the needs of adult learners effective and positive change is more likely to occur.

CHAPTER THREE

Subjects

The data for this survey were obtained by surveying the total population of teaching and administrative faculty in a small Midwest rural public school district to determine computer usage attitudes and preferences and self-perceived multiple intelligence profiles. There were twelve K-6 grade elementary teachers with the least senior teacher possessing ten years of teaching experience. The secondary level had fourteen 7-12 grade teachers with the faculty's least senior teacher possessing two years of teaching experience. The administration consisted of one K-6 elementary principal completing five years in the district, one 7-12 secondary principal completing three years in the district, and one district superintendent completing three years in the district.

Contextual Setting

The faculty had experienced an increase in the easy accessibility to technology hardware. During the 1996-1997 school year the district purchased a computer for every teacher (120 pc) to have in their classrooms, installed eighteen 120pc in a secondary business lab, three 120pcs for the art room, and six 120pcs for the elementary and secondary media centers. A Mac lab was remodeled which consists of 24 computers during the 1995-1996 school year.

With the acquisition of computers, some educational opportunities had been offered. Class offerings the spring of 1997 were: Introduction to Windows '95, Microsoft Word '97, and Introduction to the Internet. District educators did not have classes offered on-

site pertaining to implementation of computer technology in the classroom. Classes of this nature are scheduled for fall of 1997. One of the reasons for this study is to assist the author (computer technology and technology education coordinator for the district) in providing better future adult instruction in the critical computer technology area of classroom applications.

Instrument

The survey instrument consisted of three parts. The first section requested basic demographic data with an emphasis on variables found in the literature to have an impact on computer usage or comfort. These variables included: gender, age, years of teaching, level of experience with computers, and number of hours of computer related in-services (see Appendix A).

The second section was intended to profile subjects' attitudes toward personal computer usage and classroom usage, plus personal learning preferences pertaining to computer technology. Items were constructed based on actual comments encountered in the course of providing computer technology instruction to adults, within a context of literature pertaining to adult learners and multiple intelligence theory. Seven statements in this section were constructed to highlight one of each of the seven multiple intelligences.

The survey instrument used to determine subjects' self-perceived multiple intelligence profiles was taken in its entirety from Thomas Armstrong's book, *Multiple Intelligence in the Classroom* (1994). Armstrong (1994) states the following in his book:

> It's important to keep in mind that this inventory is *not* a test, and that quantitative information has no bearing on determining your intelligence or lack of intelligence in each category. The purpose of the inventory is to begin to connect you to your own life experiences with the seven intelligences (p. 17).

Scores, therefore, were computed for each multiple intelligence profile (consisting of ten possible items pertaining to each of the seven intelligences) and the profiles were rank-ordered for each subject. This provided only an indicator of how items on the inventory described subjects' multiple intelligence profiles and the intelligences with which respondents could best identify based on their life experiences.

Procedure

This survey was hand delivered to twenty-nine subjects in the school district. Each subject was informed that results of this survey were to be part of the author's research paper and was given a brief overview regarding the intended purpose of the research. The subjects were also told that completing this survey was voluntary and replies would be kept anonymous and confidential. Surveys were requested to be returned back to the author in a week.

CHAPTER FOUR

Twenty-nine surveys were distributed with a request to return them within a week. Within two weeks, twenty-one (72%) surveys had been completed and returned. All of the returned surveys were useable for analysis purposes.

Demographic Data

The first section of the survey requested basic demographic data. Sixteen females and five males returned their surveys. The ages of the subjects ranged from 29 to 58 with a mean age of 43. Years of teaching experience ranged from three to thirty-eight years with a mean of twenty years in the classroom.

Attitudes: Technology in the Classroom

Self-perceived computer experience levels consisted of zero percent reporting no experience, 5% with very little experience, 52% indicating some experience, 38% reporting quite a bit of experience, and 5% reporting extensive experience with computers. Approximate number of computer in-service hours varied extensively ranging from six hours to ninety-nine hours with a mean of twenty-three hours.

The surveyed school district faculty showed a diverse range of ages but 52.4% of the surveyed population indicated they had had some personal experience with computers (see Table 1). Age seemed to play no significant factor in determining the experience level with computers. Considering personal experience levels in light of the respondents' attitudes

toward using computers in the classroom revealed strong positive attitudes toward using computers in the classroom regardless of reported personal experience levels (see Table 2).

Personal Attitudes toward Technology

The surveyed school district's attitude about general use of technology showed that no one felt they would never learn to use a computer well and no one felt that there are too many computers around (see Table 3). The overall confidence level of educators in the surveyed school district was high. Attitudes about personal use of technology appeared to be favorable. It should be noted that this had also been the case with use of technology in the classrooms. No one felt that they would not use a computer to teach or that they did not want a computer in their classroom. Despite a generally positive profile it was interesting to observe that 61.9% of the surveyed staff felt that the computer was smarter than they were (see Table 3). This feeling was less likely to be noted as number of computer in-service hours and experience increased (see Tables 4 & 5).

Personal Learning Preferences

In regard to the personal learning preferences, educator responses indicated that the surveyed school district's faculty preferences as previously mentioned in this paper were in three areas: 1) computers help to picture designs, facts, and other information, 2) computers help to clarify and record thoughts and feelings, and 3) computers help to categorize and analyze. The school district's composite for the personal learning preference of working on a computer to clarify and record thoughts and feelings highlighted a strong intrapersonal preference associated with personal computer usage. Using a computer to help categorize and

analyze displayed a logical-mathematical preference. The last area of strength in personal learning preferences involved using a computer to help picture designs, facts, and other information which showed a high spatial preference and experience (see Table 6).

When the surveyed school district faculty's composite of personal learning preferences was considered three areas showed a pattern. The first area to note involved learning to use computers alone crosstabulated with the amount of in-service hours (see Table 7).

The last personal learning preference regarding how difficult some respondents found it to sit in front of computer for a long period of time also showed a pattern (see Table 8). Four out of the five educators who indicated that it was difficult to sit in front of a computer reported only very little or some experience with computers. None of those who affirmed this statement reported extensive experience.

Multiple Intelligence Profiles

It was interesting to note that the surveyed school district's top self-perceived multiple intelligence profile was bodily-kinesthetic. The self-perceived multiple intelligence profile with the weakest representation was logical-mathematical (see Table 9).

The higher the number of reported in-service hours, the more likely respondents were to prefer learning computer skills at least somewhat on their own. Conversely, the preference of learning computer skills with a one-to-one student/teacher ratio was stronger for respondents reporting fewer computer-related in-service hours (see Table 10).

CHAPTER FIVE

Discussion

Upon reviewing the results of this study, I as a teacher-researcher would agree with Thornburg (1991) that access and education are of critical importance in making change happen. This holds true for changing teacher attitudes about computer technology and its usage in the classroom.

Results of this study indicated that amount of in-service training and level of experience were the critical variables for members of this sample. These factors, however, did appear to influence personal learning preferences, as in the instance of preference for one-to-one instruction diminishing as experiential levels increased.

While the multiple intelligence profiles did not appear to drive attitudes toward personal or classroom computer use for this small sample, knowledge of adult students learning styles and preferences can aid in maximizing individual benefits of computer related instruction. Therefore, results of the study do offer insights for technology coordinators seeking ways of better assisting teachers to learn more about computer technology.

With this initial clarification of results in place and after intensely reviewing the results of this survey, I am left asking more questions than when I began this research endeavor. Some of my findings agreed with current research yet some of the findings left many questions unanswered.

When considering survey results, focusing on attitude, teachers in this small school district were overwhelmingly positive toward technology. When the school district

educators responded to the survey question that computers are more trouble than they are worth, 95.2% disagreed. Another example demonstrating positive attitude involves responsed to the question that asked if there are too many computers around: 100% disagreed with that statement. Also the survey question eliciting responses to "the last thing I want in my classroom is a computer" indicated a common positive attitude: 95.2% disagreed with this statement.

Creating a culture for change by supplying easy access to technology may very well have fostered this overwhelmingly positive attitude toward technology. Three months before I surveyed this school district each teacher was given a personal computer for his or her desk, which created easy access. One adult learning need is to be able to make learning immediately applicable. This could at least partially explain why 100% of the respondents replied that they enjoy using computers. Having easy access fosters this positive attitude.

Thornburg's (1991) second point to affect change in using technology is education. The survey asks three questions about using technology. In response to the survey question, "I probably will never learn to use a computer very well," 100% disagreed with this question. In the case of another survey question, "I doubt if I would use a computer to teach," 95.2% disagreed with this question. Apparently this district has already had some successful education in both the process and products of technology in order to achieve such widespread positive support.

These results support Robinson's (1979) writings about adult learning. Adults want their learning experience to relate to the now, to be purposeful, and to be useful. Adults learn best when they are participants in the learning system. Instructor-centered learning

is least effective for adults. So when respondents (82.7%) replied that computers make learning fun for them, positive, active participation becomes an important factor for an adult educator to consider.

A puzzlement occurs in reviewing the participants' responses to the survey question "I feel computers are smarter than I am" wherein 61.9% agreed with this attitude. When I tried to find a pattern or trend as to why over half of the respondents would reply this way none could be found. I crosstabulated this item with the self-perceived multiple intelligence profiles, age, and gender but found no patterns. Crosstabulation with in-service hours or experience levels displayed a trend but a larger population or sample would be needed to find out if the trend is maintained. To try to satisfy my curiosity using the statistical analysis package (SPSS) I tried a quadruple crosstabulation of gender by smarter by in-service by experience level. The resulting composite table that was assembled showed no pattern or trend. Again, more sophisticated statistical treatments could be performed with data from a larger population or sample.

Two questions on the survey dealt with oppositional personal learning preferences, learning to use a computer with instruction delivered in a one-to-one student/teacher ratio and learning how to use a computer alone. Why would 52.4% of the respondents agree that they would want to have a one-to-one student teacher ratio and 85.7% indicate that they would not like to learn how to use a computer alone? I found insights to answer this question by viewing Table 10. When considering the effect of in-service hours or desire for a one-to-one student/teacher ratio one starts to notice a change once 31 hours of in-service time is achieved. Table 7, which crossed in-service hours with "wanting to learn to use a computer alone," supports this observation.

Some of the other personal learning preferences served to highlight the self-perceived multiple intelligence profiles. For example, 47.6% of the participants responded that they liked to listen to a compact disc while working on the computer. Listening to music while working is a common practice for people with a highly developed musical intelligence.

As another example, only 23.8% responded that they could not sit in front of a computer for a long period of time. This response surprised me because the top self-perceived multiple intelligence for the district was bodily-kinesthetic (see Table 9). With so many people that indicated bodily-kinesthetic at the top of their multiple intelligence profiles why would I get such a low percentage? However, when the question "I find it difficult to sit in front of a computer for a long period of time" was crosstabulated with level of experience, I noticed a pattern (see Table 8). Eleven participants reported that they had some experience with computers. All eleven were spread out on the experience continuum of those responding that they had quite a bit of experience and all felt they could sit in front of a computer for a long period of time. This could lead one to believe that the higher the level of experience the longer the duration of computer usage sessions. The lower the level of experience the shorter the periods of time spent to work on a computer. Also, very simply, it is easier to gain experience if one is willing and able to spend large amounts of time in front of a computer.

Recommendations

Based on the survey findings, this initial research could be extended in the following areas:

1. Study could be continued in the area of adult learning. An area to focus on is the student/teacher ratio. With 52.4% agreeing that they would like to have a one-to-one student teacher ratio while 85.7% disagreed that they would not want to learn computers alone need attention. Apparently 33.3% prefer a ratio other than one-to-one yet they do not want to be completely independent. An adult technology educator would benefit from information pertaining to class size and internal instructional groupings in which adult learners feel they learn best.

2. Additional research and curriculum design initiatives are required to develop innovative technology-related staff development programs that address the needs of adult learners or at least adapt established procedures to include principles of adult learning.

3. Educators of technology must become increasingly aware of adults' learning styles and then implement appropriate teaching strategies that complement these learning styles. For example, adult learners appreciate flexibility in teaching strategies such as using cooperative learning or active, hands-on learning. Learner-centered instructional approaches will be more successful than lecturing no matter the ages of the students.

4. School district adult educators in computer technology need to survey their faculties to assess the faculty's self-perceived multiple intelligence profiles. Once adult educators know their staff's self-perceived multiple intelligence profiles they can be sensitive to these profiles and adjust their instructional strategies accordingly to more accurately address needs of adult learners. For example, knowing that 47.6% of the

teachers in the surveyed district like to work while listening to a compact disc playing, an instructor could offer headphones that allow adult learners to listen to music using the computers' cd drive.

5. Additional research is needed to understand why 61.9% feel that the computer is smarter than they are. What factors contribute to this feeling? Would a larger population or sample show that gender plays a part? Would experience level? Would amount of in-service? Perhaps a more qualitative study featuring fact-to-face interviews would be the most direct path to insight here.

6. Adult computer technology educators in settings other than K-12 schools need to commit to sharing knowledge about adult learning preferences and the multiple intelligences with other professionals, such as PK-12 district technology coordinators. It is also necessary for district technology coordinators to share observations, research findings, and questions with educators in other settings.

Conclusions

As a result of this study, I would suggest that adult educators in computer technology know their audience. Results of this study support the research on needs of adult learners that were stated previously in this paper. I would recommend that adult educators obtain their adult learners' self-perceived multiple intelligence profiles which will encourage the individualization of instruction that fosters a positive learning environment. Adult educators must begin with a clear understanding of adult learning principles so they can facilitate positive change in technology attitudes and usage. The following list provides a reflective framework of considerations for adult computer technology instructors:

1. Make learning meaningful and useful to adult lives. Many teachers must understand and see clear evidence of their personal gain before they will use technology.

2. Make connections by showing users the purpose or value of technology to their students and classroom instruction.

3. Show adult technology users that they will have support in the form of time, resources, and assistance. Be consistent and follow through promptly when a need, concern or question arises.

4. Keep the learning situation informal. Adult learners prefer a low-risk environment based on trust, positive reinforcement, and encouragement.

5. Survey your faculty to obtain their self-perceived multiple intelligence profile. Once you know your faculty's top profiles be sensitive to them during learning opportunities. For example, knowing that 81% agree that computers help them clarify and record some thoughts or feelings, I would give my class the opportunity to have a direct experience using technology to clarify or record their thoughts or feelings. Other examples would be making learning segments short for a highly bodily-kinesthetic intelligent staff and allowing for frequent discussions or peer teaching with a highly interpersonal staff. These types of activities could also be geared to meet individual needs, considering an individual student's multiple intelligence profile and learning preferences for one-to-one instruction.

6. Education about technology needs to be ongoing so educators can understand the utility of the computer, expand upon personal computer experiences, then know how to implement technology into their classrooms. Education needs to be a continuous process not a one-shot time period. School districts need to promote lifelong learning so

educators feel comfortable taking risk and using emerging technologies in their classroom.

Before change can happen in technology educators need to have easy access to technology. I feel the reason why the participants in this survey had such an overwhelmingly positive attitude was ease of access to technology coupled with a working culture that encourages the use of technology and has the clear expectation, supported by resource allocations, that technology will be used throughout the school district.

In their 1997 book, *A New Vision for Staff Development*, Sparks and Hirsh state that, "Professional development of school employees and significant changes in the organizations in which they work are both required if schools are to adequately prepare students for life in a world that is becoming increasingly complex" (p. 96). A working knowledge of adult learners' personal learning preferences and multiple intelligence profiles will provide valuable insight for school district staff development personnel. This is especially true of those wanting to integrate contemporary adult education perspectives to maximize individual benefits of computer related instruction for district professionals.

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TABLES

Table 1

Experience Levels with Computers by Ages

Age	Experience Level			
	Very Little	Some	Quite a Bit	Extensive
29				1
34		1		
39		1		
40		1	1	
41		1		
42			1	
43			1	
44	1			
45		1		
46		1	2	
47		1		
49		2		
50		2		
52			1	
53			1	
55			1	
58		1		
Composite	**1**	**12**	**8**	**1**

Table 2

Crosstabulation: Experience Levels and Attitudes Toward Using Technology in the Classroom

Attitude: Classroom Computer Usage	1 Strongly Agree	2 Agree	3 Slightly Agree	4 Slightly Disagree	5 Disagree	6 Strongly Disagree
4. The last thing I want in my class-room is a computer.						
Experience						
Very Little	0	0	0	0	1	1
Some	0	0	0	1	1	8
Quite a Bit	0	0	0	0	0	8
Extensive	0	0	0	0	0	1
5.I doubt if I would use a computer to help me teach.						
Experience						
Very Little	0	0	0	0	1	0
Some	0	0	0	0	4	7
Quite a Bit	0	0	0	1	1	6
Extensive	0	0	0	0	0	1

Table 3

Profile of Attitudes toward Technology

Profile of Attitudes	1 Strongly Agree		2 Agree		3 Slightly Agree		4 Slightly Disagree		5 Disagree		6 Strongly Disagree	
Attitude: General Use	No.	Per-cent	No,	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
1. I enjoy using computers.	12	57.1	7	33.3	2	9.5	0	0	0	0	0	0
3. Computers make learning fun for me.	9	42.9	6	28.6	3	14.3	2	9.5	1	4.8	0	0
9. I will probably never learn to use a computer very well.	0	0	0	0	0	0	3	14.3	8	38.1	10	47.6
11. I feel that there are too many computers around now.	0	0	0	0	0	0	1	4.8	3	14.3	17	81.8
14. Sometimes I feel that the computer is smarter than I am.	2	9.5	8	38.1	3	14.3	3	14.3	2	9.5	3	14.3
15. Computers are more trouble than they are worth.	0	0	0	0	1	4.8	5	23.8	7	33.3	8	38.1

Table 4

Crosstabulation: I Feel the Computer is Smarter Than I Am With In-service Hours

In-service Hours	Agree	Disagree
0-10	5	1
11-20	4	3
21-30	2	1
31-40	2	1
41-50	0	1
51-99	0	1
Composite	**13** 61.9%	**8** 38.1%

Table 5

Crosstabulation: I Feel the Computer is Smarter Than I Am With Experience Level

Experience Level	Agree	Disagree
Very Little	1	0
Some	9	2
Quite a Bit	3	5
Extensive	0	1
Composite	**13** 61.9%	**8** 38.1%

Table 6

Profile of Personal Learning Preferences toward Technology

Profiles of Attitudes	1 Strongly Agree		2 Agree		3 Slightly Agree		4 Slightly Disagree		5 Disagree		6 Strongly Disagree	
Personal Learning Preference	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
2. When I use a computer it helps me to picture designs, facts and other information. (S MI)	5	9.5	8	38.1	3	14.3	1	4.8	4	19	0	0
6. I find it difficult to sit in front of a computer for a long period of time. (B-K MI)	2	9.5	1	4.8	2	9.5	1	4.8	8	38.1	7	33.3
7. If I were to learn how to use a computer I would want to be left alone.	1	4.8	2	9.5	7	33.3	7	33.3	4	19	0	0
8. I would rather spend my time reading than working on a computer. (L MI)	1	4.8	3	14.3	2	9.5	9	42.9	4	19	2	9.5
10. I would rather play Free Cell than bridge. (Inter MI)	2	9.5	1	4.8	4	19	5	23.8	4	19	5	23.8
12. If I were to learn how to use a computer I would want one-to-one student teacher ratio.	2	9.5	5	23.8	4	19	4	19	4	19	2	9.5
13. Working on a computer can help me clarify and record some of thought and feelings. (Intra MI)	4		7	33.3	6	28.6	2	9.5	2	9.5	0	0
16. I feel comfortable with computers because they help me categorize and analyze. (L-M MI)	4	19	7	33.3	6	28.6	2	9.5	2	9.5	0	0
17. When I am working on a computer I like to have a musical compact disc playing. (M MI)	2	9.5	5	23.8	3	14.3	6	28.6	5	23.8	0	0

Key. S MI = Spatial Multiple Intelligence
B-K MI = Bodily-Kinesthetic Multiple Intelligence
L MI = Linguistic Multiple Intelligence
Inter MI = Interpersonal Multiple Intelligence
Intra MI = Intrepersonal Multiple Intelligence
L-M MI = Logical-Mathematical Multiple Intelligence
M MI = Musical Multiple Intelligence

Table 7

Crosstabulation: Computer In-service Hours and Prefer to Learn Computers Alone

	Prefer to Learn Computer Alone					
	1 Strongly Agree	2 Agree	3 Slightly Agree	4 Slightly Disagree	5 Disagree	6 Strongly Disagree
In-service Hours						
0-10	0	0	0	1	4	1
11-20	0	0	0	4	2	2
21-30	0	0	0	2	0	1
31-40	0	1	1	1	0	0
41-50	0	1	0	0	0	0
51-99	0	1	0	0	0	0
Composite	**0**	**3**	**1**	**8**	**6**	**4**

Table 8

Crosstabulation: Level of Experience and Difficult to Sit in Front of a Computer for a Long Period of Time

Experience	1 Strongly Agree	2 Agree	3 Slightly Agree	4 Slightly Disagree	5 Disagree	6 Strongly Agree
Very Little	1	0	0	0	0	0
Some	1	1	1	1	5	2
Quite a Bit	0	0	1	0	2	5
Extensive	0	0	0	0	1	0
Composite	**2** 9.5%	**1** 4.8%	**2** 9.5%	**1** 4.8%	**8** 38.1%	**7** 33.3%

Table 9

Top Self-Perceived Multiple Intelligence Profile

Multiple Intelligence	Number of Respondents
Bodily-Kinesthetic	8
Interpersonal	5
Musical	4
Spatial	3
Intrapersonal	2
Linguistic	2
Logical-Mathematical	1

Note. If a participant's self-perceived choices resulted in more than one multiple intelligence profile with equally high scores for the participant, more than one profile was tabulated as a top choice.

Table 10

Crosstabulation: Computer In-service Hours and Prefer to Learn Computers One-to-One

	Prefer to Learn Computers One-to-One					
	1 Strongly Agree	2 Agree	3 Slightly Agree	4 Slightly Disagree	5 Disagree	6 Strongly Disagree
In-service Hours	0	0	0	0	0	0
0-10	1	2	2	1	0	0
11-20	1	2	0	2	1	1
21-30	0	1	1	0	1	0
31-40	0	0	0	1	2	0
41-50	0	0	1	0	0	0
51-99	0	0	0	0	0	1
Composite	**1**	**5**	**4**	**4**	**4**	**2**

APPENDIX A

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Section 1. NEW SECTION. 295.1 LEGISLATIVE FINDINGS AND INTENT.

The general assembly finds that it is in the public interest to develop and equitably fund instructional technology within the public schools of this state to ensure that school students, teachers, and administrators are equipped and prepared to excel in the twenty-first century. Toward that goal, it is the intent of this chapter to establish and fund a school improvement technology program.

Sec. 2. NEW SECTION. 295.2 SCHOOL IMPROVEMENT TECHNOLOGY APPROPRIATION.

1. a. There is appropriated from the general fund of the state to the department of education for the fiscal year beginning July 1, 1996, and ending June 30, 1997, the sum of fifteen million dollars for the school improvement technology program.

b. There is appropriated from the rebuild Iowa infrastructure account of the state to the department of education for the fiscal year beginning July 1, 1996, and ending June 30, 1997, the sum of fifteen million dollars for the school improvement technology program.

c. There is appropriated from the general fund of the state to the department of education for each fiscal year of the fiscal period beginning July 1, 1997, and ending June 30, 2001, the sum of thirty million dollars for the school improvement technology program.

2. From the moneys appropriated in subsection 1 other than the moneys allocated in subsection 3, for each fiscal year in which moneys are appropriated, the amount of moneys allocated to school districts shall be in the proportion that the basic enrollment of a district, bears to the sum of the basic enrollments of all school districts in the state for the budget year. However, a district shall not receive less than fifteen thousand dollars in a fiscal year. The Iowa braille and sight saving school, the state school for the deaf, and the Price laboratory school at the university of northern Iowa shall annually certify their basic enrollments to the department of education by October 1. The department of human services shall certify the average student yearly enrollments of the state training school, the Iowa juvenile home, Woodward state hospital-school, and Glenwood state hospital-school to the department of education by October 1.

3. From the moneys appropriated in subsection 1, for each fiscal year in which moneys are appropriated, the sum of four hundred fifty thousand dollars shall be divided among the area education agencies based upon each area education agency's percentage of the total full-time equivalent elementary and secondary teachers employed in the school districts in this state. An area education agency may contract with an appropriate accredited institution of higher education in Iowa to provide staff development and training in accordance with section 295.3.

4. For each year in which an appropriation is made to the school improvement technology program, the department of education shall notify the department of revenue and finance of the amount to be paid to each school district and area

education agency based upon the distribution plan set forth for the appropriation made pursuant to this section. The allocation to each school district and area education agency under this section shall be made in one payment on or about October 15 of the fiscal year in which the appropriation is made, taking into consideration the relative budget and cash position of the state resources. Prior to the receipt of funds, school districts shall provide to the department of education adequate assurance that they have developed or are developing a technology plan as required by section 295.3 and that funds received under this section will be used in accordance with the required technology plan.

5. Moneys received under this section shall not be commingled with state aid payments made under sections 257.16 and 257.35 to a school district or area education agency and shall be accounted for by the local school district or area education agency separately from state aid payments.

6. Payments made to school districts and area education agencies under this section are miscellaneous income for purposes of chapter 257 or are considered encumbered. Each local school district and area education agency shall maintain a separate listing within their budgets for payments received and expenditures made pursuant to this section.

7. Moneys received under this section shall not be used for payment of any collective bargaining agreement or arbitrator's decision negotiated or awarded under chapter 20.

8. For purposes of this section, "school district" means a school district, the Iowa braille and sight saving school, the state school for the deaf, the Price laboratory school at the university of northern Iowa, the state training school, the Iowa juvenile home, Woodward state hospital-school, and Glenwood state hospital-school.

Sec. 3. NEW SECTION. 295.3 SCHOOL IMPROVEMENT TECHNOLOGY PLANNING.

1. The board of directors of a school district shall adopt a technology plan that supports school improvement technology efforts and includes an evaluation component. The plan shall be developed by licensed professional staff of the district, including both teachers and administrators. The plan shall, at a minimum, focus on the attainment of student achievement goals under sections 280.12 and 280.18, shall consider the district's interconnectivity with the Iowa communications network, and shall demonstrate how, over a four-year period, the board will utilize technology to improve student achievement. Technology plans shall be kept on file in the district and a copy sent to the appropriate area education agency. Progress made under these plans shall be included as part of the annual report submitted to the department of education in compliance with sections 280.12 and 280.18.

2. Each area education agency shall develop a plan to assist school districts in the development of a technology planning process to meet the purposes of this chapter. The plan shall describe how the area education agency intends to support school districts with instructional technology staff development and training. For the fiscal year beginning July 1, 1996, and ending June 30, 1997, prior to the receipt of funds, each area education agency shall provide the department of education adequate assurance that a technology plan as required under this section has been or is being developed. For the fiscal year beginning July 1, 1997, and for each succeeding fiscal year, each area education agency shall

submit its plan to the department of education. The department shall approve each plan prior to the disbursement of funds.

3. The Iowa braille and sight saving school, the state school for the deaf, and the Price laboratory school at the university of northern Iowa shall develop a technology plan that supports and improves student achievement, demonstrates how technology will be utilized to improve student achievement, and includes an evaluation component. Plans and an annual progress report shall be submitted to the state board of regents and the department of education.

4. The state training school, the Iowa juvenile home, and the Glenwood and Woodward state hospital-schools shall each develop a technology plan that supports and improves student achievement, demonstrates the manner in which technology will be utilized to improve student achievement, and includes an evaluation component. Plans and an annual progress report shall be submitted to the departments of human services and education.

Sec. 4. NEW SECTION. 295.4 SCHOOL IMPROVEMENT AND TECHNOLOGY EXPENDITURES.

1. School districts, as defined in section 295.2, subsection 7, shall expend funds received pursuant to section 295.2 for the acquisition, lease, lease-purchase, installation, and maintenance of instructional technology equipment, including hardware and software, materials and supplies related to instructional technology and staff development and training related to instructional technology, and shall establish priorities for the use of the funds. However, funds received by a school district pursuant to section 295.2 shall not be expended to add a full-time equivalent position or otherwise increase staffing.

2. Funds received by an area education agency pursuant to section 295.2 shall be expended for the costs related to supporting school districts within the area served with technology planning and equipment, including hardware and software, materials and supplies related to instructional technology and staff development and training related to instructional technology.

Sec. 5. NEW SECTION. 295.5 REPEAL.

This chapter is repealed effective July 1, 2001.

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APPENDIX B

Technology Survey

1. What is your gender? _____ male _____female

2. What is your age? _____

3. How many years of teaching have you instructed? _____

4. Indicate your level of experience with computers.

____ none ___ very little ____ some ___ quite a bit ___ extensive

5. Approximate the number of hours you have had on computer related in-services.

_____ hours

Please rate the following statements by circling the appropriate response:
Note: 1=strongly agree 2=agree 3=slightly agree 4=slightly disagree 5=disagree 6=strongly disagree

1. I enjoy using a computer.	**1 2 3 4 5 6**
2. When I use a computer it helps me to picture designs, facts, and other information.	**1 2 3 4 5 6**
3. Computers make learning fun for me.	**1 2 3 4 5 6**
4. The last thing I want in my classroom is a computer.	**1 2 3 4 5 6**
5. I doubt if I would use a computer to help me teach.	**1 2 3 4 5 6**
6. I find it difficult to sit in front of a computer for a long period of time.	**1 2 3 4 5 6**
7. If I were to learn how to use a computer I would want to be left alone.	**1 2 3 4 5 6**
8. I would rather spend my time reading than working on a computer.	**1 2 3 4 5 6**
9. I will probably never learn to use a computer very well.	**1 2 3 4 5 6**
10. I would rather play Free Cell, a computer card game, than bridge with a group of friends.	**1 2 3 4 5 6**
11. I feel that there are too many computers around now.	**1 2 3 4 5 6**
12. If I were to learn how to use a computer I would want a one-to-one student teacher ratio.	**1 2 3 4 5 6**

13. Working on a computer can help me clarify and record some of my thoughts or feelings. **1 2 3 4 5 6**

14. Sometimes I feel that the computer is smarter than I am. **1 2 3 4 5 6**

15. Computers are more trouble than they are worth. **1 2 3 4 5 6**

16. I feel comfortable with computers because they help me categorize and analyze. **1 2 3 4 5 6**

17. When I am working on a computer I like to have a musical compact disc playing. **1 2 3 4 5 6**

Check those statements that apply to you.

___ Book are very important to me.

___ I can easily compute numbers in my head.

___ I often see clear visual images when I close my eyes.

___ I engage in at least one sport or physical activity on a regular basis.

___ I have a pleasant singing voice.

___ I'm the sort of person that people come to for advise and counsel at work or in my neighborhood.

___ I regularly spend time alone meditating, reflecting, or thinking about important life questions.

___ I can hear words in my head before I read, speak, or write them down.

___ Math and/or science were among my favorite subjects in school.

___ I'm sensitive to color.

___ I find it difficult to sit still for long periods of time.

___ I can tell when a musical note is off-key.

___ I prefer group sports like badminton, volleyball, or softball to solo sports such as swimming and jogging.

___ I have attended counseling sessions or personal growth seminars to learn more about myself.

___ I get more out of listening to the radio or a spoken - word cassette than I do from television or films.

___ I enjoy playing games or solving brainteasers that require logical thinking.

___ I can comfortably imagine how something might appear if it were looked down upon from directly above in a bird's-eye view.

___ I like working with my hands at concrete activities such as sewing, weaving, carving, carpentry, or model

building.

___I frequently listen to music on radio, records, cassettes, or compact discs.

___ When I have a problem, I'm more likely to seek out another person for help than attempt to work it out on my own.

___ I am able to respond to setbacks wit resilience.

___ I enjoy entertaining myself or others with tongue twisters, nonsense rhymes, or puns.

___ I like to set up little "what if" experiments (for example, "What if I double the amount of water I give to my rosebush each week?")

___ I frequently use a camera or camcorder to record what I see around me.

___ I would describe myself as well coordinated.

___ I play a musical instrument.

___ I have at least three close friends.

___ I have a special hobby or interest that I keep pretty much to myself.

___ Other people sometimes have to stop and ask me to explain the meaning of the words I use in my writing and speaking.

___ My mind searches for patterns, regularities, or logical sequences in things.

___ I enjoy doing jigsaw puzzles, mazes, and other visual puzzles.

___ My best ideas often come to me when I'm out for a long walk or a jog, or when I'm engaging in some other kind of physical activity.

___ My life would be poorer if there were no music in it.

___ I favor social pastimes such as Monopoly or bridge over individual recreations such as video games and solitaire.

___ I have some important goals for my life that I think about on a regular basis.

___ English, social studies, and history were easier for me in school than math and science.

___ I'm interested in new developments in science.

___I have vivid dreams at night.

___ I often like to spend my free time outdoors.

___ I sometimes catch myself walking down the street with a television jingle or other tune running in my mind.

___ I enjoy the challenge of teaching another person, or groups of people, what I know how to do.

___ I have a realistic view of my strengths and weaknesses (borne out of by feedback from other sources).

___ When I drive down a freeway, I pay more attention to the words written on billboards than to the scenery.

___ I believe that almost everything has a rational explanation.

___ I can generally find my way around unfamiliar territory.

___ I frequently use hand gestures or other forms of body language when conversing with someone.

___ I can easily keep time to a piece of music with a simple percussion instrument.

___ I consider myself a leader (or others have called my that).

___ I would prefer to spend a weekend alone in a cabin in the woods rather than at a fancy resort with lots of people around.

___ My conversation includes frequent references to things that I've read or heard.

___ I sometimes think in clear, abstract, wordless, imageless concepts.

___ I like to draw or doodle.

___ I need to touch things in order to learn more about them.

___ I know the tunes to many different songs or musical pieces.

___ I feel comfortable in the midst of a crowd.

___ I consider myself to be strong willed or independent minded.

___ I've written something recently that I was particularly proud of or that earned me recognition from others.

___ I like finding logical flaws in things that people say and do at home and work.

___ Geometry was easier for me than algebra in school.

___ I enjoy daredevil amusement rides or similar thrilling physical experiences.

___ If I hear a musical selection once or twice, I am usually able to sing it back fairly accurately.

___ I like to get involved in social activities connected with my work, church, or community.

___ I keep a personal diary or journal to record the events of my inner life.

___ I enjoy word games like Scrabble, Anagrams, or Password.

___ I feel more comfortable when something has been measured, categorized, analyzed, or quantified in some way.

___ I prefer looking at reading material that is heavily illustrated.

___ I need to practice a new skill rather than simply reading about it or seeing a video that describes it.

___ I often make tapping sounds or sing little melodies while working, studying, or learning something new.

___ I would rather spend my evenings at a lively party than stay at home alone.

___ I am self-employed or have at least thought seriously about starting my own business.